

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:

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
September 10, 2015
Santa Fe, New Mexico

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

This matter came on for hearing before the
New Mexico Oil Conservation Commission on Thursday,
September 10, 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.

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Also Present:

Darr Shannon

1	H E A R I N G I N D E X			
2	LIGHTNING DOCK GEOTHERMAL CASE-IN-CHIEF:			
3	WITNESS DAVID W. JANNEY			
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1 (Time noted 9:20 a.m.)

2 CHAIRPERSON CATANACH: At this time, I will
3 call case 15357, which is the applications of Lightning
4 Dock Geothermal H1-01, LLC, for approval to inject into
5 a geothermal aquifer through three proposed geothermal
6 injection wells at the site of the proposed Lightning
7 Dock Geothermal Power Project, Hidalgo County, New
8 Mexico.

9 Call for appearances in this case.

10 MS. HENRIE: Mr. Chairman, Commissioners,
11 Michelle Henrie for Lightning Dock Geothermal.

12 MR. LAKINS: Mr. Chairman, Commissioners,
13 Charles Lakins on behalf of Protestant AmeriCulture and
14 Damon Seawright, and he is seated here to my left.

15 MS. MARKS: Allison Marks on behalf of the
16 Oil Conservation Division, also making an appearance in
17 case 15365.

18 MR. DOMINICI: Good morning, Commissioners.
19 I am Pete Domenici, Jr., on behalf of the Hidalgo Soil
20 and Water Conservation District, who are intervenors in
21 this case.

22 And I am here with my client. This is Darr
23 Shannon. She is the vice president of the Conservation
24 District. She is also a county commissioner from
25 Hidalgo County. And I have spoken with Counsel

1 Brancard. At some point she would like to make a
2 non-technical public comment. I just wanted to let you
3 know she was here.

4 CHAIRPERSON CATANACH: Are we going to
5 consolidate this case at this time with the other case?
6 (Non-verbal response.)

7 CHAIRPERSON CATANACH: Let me call case
8 15365, which is also the application of Lightning Dock
9 Geothermal HI-01, LLC, to place Well No. 63A-7 on
10 Injection-Geothermal Resources Area, Hidalgo County, New
11 Mexico.

12 And are the appearances the same in this
13 case?

14 MS. HENRIE: I believe so, Mr. Chairman.

15 CHAIRPERSON CATANACH: Are there any
16 additional appearances in this case?

17 (No response.)

18 CHAIRPERSON CATANACH: Okay.

19 So just for your information, we are going
20 to do our best to try to finish this case today. I
21 don't know if that's possible. But I would like to
22 advise your witnesses to be concise and not to get too
23 far off track.

24 It's going to be a long day and we are going
25 to be working a long time. So if we can just try and

1 keep it as concise as possible that would help.

2 Will the witnesses in these two cases --

3 MR. BRANCARD: I think they'll be sworn in
4 one by one.

5 CHAIRPERSON CATANACH: Okay. We will do
6 that.

7 Can you call your first witness.

8 MR. BRANCARD: Let's deal with some
9 prehearing matters.

10 We had a prehearing conference among the
11 attorneys two days ago. There was a motion to vacate,
12 which to the Commissioners awareness was denied by the
13 Commission Chair, to move ahead with today's hearing.

14 We also have a notice of intervention by the
15 Hidalgo Soil and Water Conservation Commission. We
16 asked for sort of a more detailed statement from
17 Hidalgo, and that was presented by Hidalgo. Nothing was
18 filed in opposition to that notice. And so unless there
19 is opposition, we want to --

20 MS. HENRIE: May I say something?

21 MR. BRANCARD: Go ahead.

22 MS. HENRIE: Mr. Chair, we are not going to
23 oppose the intervention. Our concern was -- as we are
24 setting forth the procedures and the precedent for
25 geothermal hearings, our concern was that people would

1 just be allowed to intervene without having standing and
2 it could be anybody. And so that is why we raised the
3 concern.

4 After receiving notice and hearing more
5 about why they felt they had standing and their
6 concerns, we are fine with the intervention.

7 Thank you.

8 MR. BRANCARD: If there was a notice, we
9 will just view it as being granted.

10 MR. DOMENICI: Thank you.

11 CHAIRPERSON CATANACH: Are there any other
12 issues?

13 MS. HENRIE: Mr. Chair, I just wanted to
14 remind the Commission, we had filed an amended proposed
15 order to have some procedural matters. It suggested
16 that the application for a hearing be denied.
17 Obviously, we are here at a hearing so that they are
18 probably moot, but there are some additional procedural
19 matters in this order that really again go to the
20 precedent of geothermal proceedings.

21 Also in this order are the Oil Conservation
22 Division's proposed conditions of approval. And we
23 support those, don't have any problems with those. And
24 so I wanted to -- we have copies here of the amended
25 proposed order. Would it be appropriate to just give

1 copies to the Commission and make sure that it's
2 something you have a chance to consider?

3 MR. BRANCARD: I believe that is in the
4 record. As it's been submitted it's in the file. So
5 since there is no motion pending, there is nothing to
6 rule on at this point, and it would be considered along
7 with all the other evidence at the end of the hearing.

8 MS. HENRIE: So given that, Mr. Brancard,
9 just for my clarification, are the Division's conditions
10 of approval officially entered as exhibits or do I need
11 to do that --

12 MR. BRANCARD: No. The Division did its own
13 prehearing statement and submitted exhibits. So the
14 Division will be the one entering those proposed --

15 MS. HENRIE: Are they in the record or not?

16 MR. BRANCARD: They are a party to this
17 proceeding, and then they will proceed with their
18 documents.

19 MS. HENRIE: Okay. We might enter those as
20 well just to be sure. Thank you.

21 MR. DOMENICI: Could I have a copy of that?

22 MS. HENRIE: Absolutely.

23 CHAIRPERSON CATANACH: You may call your
24 first witness.

25 MS. HENRIE: Mr. Chairman, Commissioners,

1 our first witness is David Janney.

2 CHAIRPERSON CATANACH: Will the witness
3 please stand and be sworn in.

4 MS. HENRIE: Before we get started, I would
5 just like to make sort of an opening argument, just a
6 little bit of a statement of our case.

7 We are here to talk about the Lightning Dock
8 Geothermal system and the larger Animas Valley aquifer,
9 the water-bearing zone down in Hidalgo County. It is an
10 area south of Lordsburg. Mr. Janney will talk about it.

11 We feel strongly that the concern and fears
12 of the protestant and the intervenors will be addressed
13 in this hearing. We have some good science to explain
14 why those concerns are -- why this project is not going
15 to be contributing to those concerns. There's some
16 scientific correction that we think needs to happen.

17 So that's what we are going to present to
18 you today. We think it is going to be about four hours
19 maybe, until lunch, maybe after, to get through our
20 case.

21 Another matter of procedure, I would just
22 like to suggest, Charles, we go ahead and approve all of
23 your exhibits and witnesses and you go ahead and approve
24 all of ours. That may save a little time.

25 MR. LAKINS: I don't think that's going to

1 be a problem, and, procedurally, for saving time, I
2 agree to that.

3 MS. HENRIE: And OCD's exhibits as well, I'd
4 like to go ahead -- do you have problems with OCD's
5 exhibit, which was the conditions?

6 MR. LAKINS: Well, that's in their
7 prehearing statement, so it's part of the record.

8 MS. HENRIE: Okay. If that's acceptable to
9 Commission.

10 CHAIRPERSON CATANACH: Is that okay?

11 MR. BRANCARD: Well, normally at the end of
12 your witness's testimony, you move your exhibits, so do
13 you want to move -- I think it would better just to do
14 that. It's good that we don't have any problems with
15 them. But, just as a formality, after your witnesses
16 testify and those exhibits have been used, then you
17 normally move those exhibits into the record.

18 MS. HENRIE: David is not testifying as an
19 expert, but with my experts, do I need to tender them as
20 well after I qualify them?

21 CHAIRPERSON CATANACH: Yes.

22 MS. HENRIE: Okay, very good. Thank you
23 for the clarification. I will sit down if I am not
24 offending anyone.

25 MR. LAKINS: Are we all going to have

1 openings?

2 MR. BRANCARD: Do your opening before your
3 witnesses.

4 MR. LAKINS: Yes, sir.

5 MR. BRANCARD: Mr. Lakins, we think it best
6 if you do your opening before your witnesses.

7 MR. LAKINS: Okay. That is what I want to
8 do right now.

9 MR. BRANCARD: No, but they're doing their
10 witnesses first.

11 MR. LAKINS: Oh, I see, not at the beginning
12 of the hearing but at the beginning of my case.

13 MR. BRANCARD: Right.

14 MR. LAKINS: Roger that.

15 MS. HENRIE: All right. We will go ahead
16 and proceed with Mr. Janney.

17 DAVID W. JANNEY
18 having been first duly sworn, was examined and testified
19 as follows:

20 DIRECT EXAMINATION

21 BY MS. HENRIE:

22 Q. Mr. Janney, please tell the Commission who you
23 are and what you do.

24 A. My name is David Janney. I am a professional
25 geologist. I'm registered in California and Wyoming. I

1 have been practicing minerals exploration for nine
2 years.

3 Q. Can you speak up a little bit more.

4 A. Indeed. My name is David Janney. I'm a
5 professional geologist registered in California and
6 Wyoming. I have nine years experience in minerals
7 exploration, primarily focused on epithermal deposits in
8 the basin and range of Nevada. Many of those deposits
9 are extinct hot spring systems or fossil hot springs
10 systems similar to the system responsible for
11 mineralization in the Lightning Dock area.

12 I also have 22 years experience of environmental
13 consulting in addition to that. I have worked on a
14 number of projects, ground water related, geologic
15 investigation related in California, Wyoming, New
16 Mexico, Colorado, Utah, and Arizona.

17 And I have been the permitting and compliance
18 manager for Lightning Dock Geothermal since December of
19 2011.

20 Q. And, David, are you Lightning Dock's agent for
21 purposes of OCD?

22 A. Yes.

23 Q. So you are familiar with various G forms and
24 permitting requirements and applications?

25 A. Yes.

1 Q. As Lightning Dock's agent, have you filed G-112
2 forms to permit injection wells that have been approved
3 by the Division or the Commission?

4 A. Yes.

5 Q. Now, did you prepare the G-112 application forms
6 that are the subject of this hearing?

7 A. Yes.

8 Q. And are you familiar with AmeriCulture's
9 Exhibit M? And let me show you what that is.

10 A. Yes.

11 Q. And what is that exhibit?

12 A. This is the application package for the 13-7 and
13 I suspect the 15-8, the 76-7, and 83-A7 are all included
14 in --

15 Q. When you say 13-7, 15-8, those are different
16 injection wells?

17 A. Right. Those wells are named based on cattleman
18 nomenclature.

19 Q. So where they are located within a section?

20 A. That's correct. Each one of those cattleman
21 squares is a 10-acre square within a 640-acre section.

22 Q. So when we talk numbers that sound crazy, we are
23 talking about different wells?

24 A. That is correct.

25 Q. Okay.

1 A. It is basically an 11-by-11 grid that starts in
2 the northwest corner of a section and moves down to the
3 southeast corner of a section.

4 Q. So AmeriCulture's Exhibit M is indeed exactly --
5 it looks the same as the forms that you, in fact,
6 tendered?

7 A. That is my signature.

8 Q. Okay. Very good.

9 So when you filed each of these applications was
10 it submitted to the Division in duplicate?

11 A. Yes.

12 Q. And when you filed each, did the application
13 include a plat showing -- I'm going to list a few
14 things, four things -- the location of the proposed
15 injection well, the location of all of the wells within
16 a radius of one mile from the injection well, the
17 perforated open hole interval in each of those
18 surrounding wells, and the ownership of all geothermal
19 leases within that one-mile radius?

20 A. Yes.

21 Q. For each of those four applications?

22 A. That is correct.

23 Q. When you filed each of the G-112 application
24 forms, did each application include a log of the
25 proposed injection well if available?

1 A. No logs were available. The wells had not been
2 constructed.

3 Q. Okay. And the regulations allow you to not file
4 logs if the wells have not been constructed?

5 A. Yes. Once the well is constructed, the logs are
6 submitted with one of the other G forms that are
7 required that are basically attached to the G-112, which
8 is the application to inject.

9 Q. I have another long question for you so bear with
10 me. When you filed each of the G-112 application forms,
11 did each application include a diagrammatic sketch of
12 the proposed injection well, showing casing strengths,
13 including diameters and setting depths, quantities used
14 in tops of cement, perforated or open hole interval,
15 tubing strings, including diameters, setting depths, and
16 the type and location of packers, if any?

17 A. Yes.

18 Q. When you filed each of the G-112 application
19 forms, were copies of the form G-112 without the
20 attachments -- and that's the plat, the log, and the
21 sketch, were copies sent to all other geothermal lease
22 owners within a one-half mile radius of the proposed
23 injection well?

24 A. Yes, where applicable.

25 Q. Do the regulations allow you to send the G-112

1 form without all of those attachments?

2 A. Yes.

3 Q. Will each of the proposed injection wells be
4 cased, cemented, and equipped in such a manner that
5 there will be no danger to any natural resource,
6 including geothermal resources, usable groundwater
7 supplies and surface resources?

8 MR. LAKINS: Objection. Calls for an
9 ultimate conclusion of fact and a legal conclusion as
10 well.

11 MS. HENRIE: I am just for opinion.

12 CHAIRPERSON CATANACH: I will allow that.

13 A. Yes.

14 Q. David, what I am handing you are OCD Exhibits 1
15 through 8. Can you take a look at those and please tell
16 me what they are?

17 A. They are the conditions of approval for the four
18 injection wells that we have proposed.

19 Q. And can you tell me more? There are two sets of
20 conditions of approval, one is for drilling and one is
21 to place the well on injection -- or what are they?

22 CHAIRPERSON CATANACH: I'm sorry,
23 Ms. Henrie, what are we looking at here?

24 MS. HENRIE: We are looking at OCD Exhibits
25 1 through 8 that were tendered with their prehearing

1 statement. These are the conditions of approval for the
2 injection wells. And there are copies here that I can
3 give to the Commission if you would like.

4 MR. LAKINS: For clarification, that's also
5 Lightning Dock's Exhibit 5 -- my error. I retract that.
6 That's a tab in my personal folder.

7 (Laughter.)

8 MS. HENRIE: I do have copies here,
9 Mr. Chairman, if you would like. We can give them to
10 the Commission.

11 CHAIRPERSON CATANACH: Go ahead.

12 A. I believe -- the answer to your question is, yes,
13 these are conditions of approval for both the G-101 and
14 the G-112, which are the applications to drill and the
15 application to inject.

16 Q. Okay. Do you see any corrections that need --

17 A. I saw one minor typographical error on the 15-8.
18 It's unit L, not unit E, I believe.

19 Q. And so that is both for the drilling and the
20 injection --

21 A. That is correct.

22 Q. Do you have any opposition to these conditions of
23 approval?

24 A. No. They are very similar to conditions for
25 approval for previously permitted and placed on

1 injection wells.

2 MS. HENRIE: At the close of our
3 presentation, we will move for admission of OCD Exhibits
4 1 through 8 as corrected. And, again, that correction
5 is with regard to well 15-8. It should be unit L
6 instead of unit E.

7 Q. So, David, I see that you have a PowerPoint
8 presentation. Was this presentation prepared by you or
9 at your direction?

10 A. Yes.

11 Q. And would you like to proceed with that. I will
12 actually be the person --

13 A. Pushing the button.

14 Q. Yes. So go ahead and tell me when to push the
15 button.

16 A. Just for the purposes of education and location,
17 we wanted to put up a slide that shows, with respect to
18 the southwest corner of the state, the location of the
19 Lightning Dock Geothermal project. It's down in the
20 boot heel, approximately 16 air miles southwest of
21 Lordsburg.

22 Next slide, please.

23 Q. Push the button?

24 A. Yes, please.

25 This particular slide shows the location of the

1 power plant and the well locations. It's a little less
2 visible then I would like to have it. But it also has
3 the regional groundwater flow in the upper left-hand
4 corner, which is to the northwest. It's difficult --

5 Q. Speak up, please.

6 A. So the power plant is basically in the lower
7 center of the slide, right here. The production well,
8 45-7, is located immediately east of the power plant.
9 The primary injection well, 55-7, is located immediately
10 east of 45-7.

11 There's a pipeline that runs from 55-7, this blue
12 line here, up to 53-7, another injection well that's
13 currently on injection. And that line runs over to
14 63-7, the other well that is currently on injection.

15 Q. Can I stop you right there.

16 MS. HENRIE: I'd just note that Lightning
17 Dock's Exhibit 1 includes a map that you could follow
18 along maybe a little better if you are not able to see
19 the screen. It also shows the well locations.

20 Q. I'm sorry to interrupt, David. Please proceed.

21 A. No worries.

22 In conjunction with each of the wells are
23 monitoring wells. It was a requirement of the discharge
24 permit to have a monitoring well approximately 100 feet
25 downgrading of each of the injection wells.

1 And therefore monitoring well 1-A is downgrading
2 of 55-7. There is also, for our benefit, a monitoring
3 well, 1-B, which is actually upgrading of 55-7.
4 Downgrading of 53.7 is monitoring well 2. Downgrading
5 of 63-7 is monitoring well 3.

6 There are two other monitoring wells on the south
7 end of the parcel, monitoring well 6 and monitoring well
8 5. And there is a deep monitoring well, 47-7, in that
9 area as well.

10 So these wells are upgradient of the zones of
11 injection and upgradient of the naturally upwelling
12 geothermal plume.

13 And then downgradient of the power plant, we are
14 required to have another monitoring well, which is MW-4,
15 right there.

16 The other thing I would like to point out on this
17 slide are the locations of the proposed injection wells
18 that were protested. 15-8 is off to the east here in
19 State section 8. 76-7 is immediately south of the
20 Rosette greenhouses in this area here. 13-7 is over on
21 the west side, the northwest side of the Lightning Dock
22 property here. And 63A-7 is actually co-located on the
23 63-7 pad in this area here.

24 The other thing I want to point out is
25 AmeriCulture's Federal Well No. 1, which is located

1 here, and to point out AmeriCulture's State Well 1,
2 which is located here.

3 Q. So, David, you talked about monitoring wells.
4 Does Lightning Dock monitor any AmeriCulture wells?

5 A. No. Prior to commercial power plant start-up, we
6 requested, as per the discharge permit, permission to
7 access wells on AmeriCulture property, McCants'
8 property, and Rosette property.

9 That letter was sent out via registered mail if I
10 recall correctly. And we never received a response from
11 any of those letter recipients.

12 Q. And we brought this visual --

13 MS. HENRIE: Commissioners, we used it in
14 2013.

15 Q. David, can you just walk us through, point to
16 some of the main features so that we are all oriented
17 towards the site.

18 Where is the power plant on this? In fact,
19 there's a magic marker. Maybe you will draw in the
20 power plant.

21 A. You can see this area is nearly graded for the
22 power plant, so it's basically right there.

23 Q. Where is the production well?

24 A. 45-7 is located immediately east of the power
25 plant.

1 Q. And we've got a primary injection well?

2 A. 55-7.

3 Q. And point to that, please.

4 A. Immediately east of 45-7.

5 Q. And the other two existing injection wells?

6 A. And then there's a pipeline that runs from 55-7
7 up along this ditch, and then goes east of 53-7 and then
8 further east to 63-7.

9 Q. Can you put a star where the proposed injection
10 wells are going to be, just so we've got a picture in
11 front of us? A big star.

12 A. (Witness complies.) So that is going to be
13 63A-7.

14 Q. Okay. Approximate is fine.

15 A. 76-7, located approximately here.

16 Q. So that is kind of by Dale's house, Dale McKants'
17 house?

18 A. Right. South of the greenhouses.

19 Q. Okay.

20 A. 15-8 on state land.

21 Q. On state trust land. I'm not sure the
22 Commissioners can hear you.

23 A. And I think 13-7 is going to be just off the
24 board here, just a little bit further west. So we will
25 put it here (drawing).

1 Q. Okay. And AmeriCulture property, if you could
2 kind of just point to that.

3 A. Well, the lease, there's a ten-acre lease here
4 and a 15-acre lease here.

5 MS. HENRIE: I will put this over here for
6 now just if people need bearings. I will get it set up
7 in a minute to where everybody can see it a little
8 better. Thank you for indulging me.

9 Q. So are you familiar with the Lightning Dock
10 Federal BLM geothermal mineral leases?

11 A. Leases, yes. We have two of them. One is for
12 2,500.96 acres and the other one for 640 acres.

13 The larger of the two is outlined by this dashed
14 line. And a 640-acre one-section lease is outlined by
15 that line. It's 34790 on the large lease and 108801 on
16 the smaller lease.

17 Q. For our bearings, where is the blacktop highway?

18 A. The state highway or Geothermal Road?

19 Q. The state highway.

20 A. I think it's this line here.

21 Q. So that's the route from I-10 down to Cotton
22 City?

23 A. That's correct.

24 Q. And where is geothermal road?

25 A. I believe this line over here.

1 Q. And so the Rosette greenhouses, where are they?

2 A. They are the white in this area.

3 Q. And the power plant would be where?

4 A. Immediately west of that.

5 Q. And where is AmeriCulture?

6 A. That green spot right there is just west of the
7 AmeriCulture greenhouses.

8 Q. Okay. Thank you. I am just trying to make sure
9 everybody kind of has their bearings.

10 Are you familiar with the AmeriCulture leases and
11 fee service ownership?

12 A. Yes. I have seen them on maps a number of times.
13 One is ten acres and one is 15 acres.

14 Q. Are they represented on the screen?

15 A. These pink squares here, the larger 15-acre lease
16 off to the west and the ten-acre lease off to the east.

17 Q. So when you said 15-acre lease, did you mean
18 15-acre ownership of the fee surface?

19 A. Yes.

20 Q. So AmeriCulture owns 15 acres. The lease is ten
21 acres of minerals from the state land office; is that --

22 A. That is my understanding.

23 Q. Okay. And so, David, in your opinion, does this
24 proposal protect correlative rights?

25 A. Yes, as far as I know --

1 MR. LAKINS: Objection. Calls for a legal
2 conclusion.

3 MS. HENRIE: One of the criteria that we are
4 trying to prove is correlative rights. There is a
5 regulatory and a statutory definition of what
6 correlative rights means.

7 It is tied to acres. And we just wanted to
8 present to the Commission the acres that are -- the
9 acres of geothermal minerals that are leased by
10 Lightning Dock Geothermal and the acres that are leased
11 by AmeriCulture.

12 Q. And, David, we should probably note with regard
13 to the 15-acre fee ownership, does AmeriCulture lease
14 those mineral rights or what's going on with that?

15 MR. LAKINS: We have an objection.

16 MS. HENRIE: You're right, Charles. Let me
17 withdraw that question. I am sorry.

18 The objection was that we had asked for
19 legal opinion. And as I had said, there are statutes
20 and regs that do define correlative rights, and we were
21 trying to make a case to support those statutes and
22 regs. And if that is a legal opinion, I will withdraw
23 the question.

24 I think the Commission just needed to know
25 what the lease acreage and ownership was.

1 CHAIRPERSON CATANACH: So do you have
2 another witness that is going to further address the
3 correlative rights issue?

4 MS. HENRIE: Yes, I do.

5 CHAIRPERSON CATANACH: Maybe we should leave
6 that for now.

7 MS. HENRIE: Fair enough. Let's see.
8 AmeriCulture tendered a background and compliance report
9 as Exhibit E. And that is a report that was submitted
10 by Mr. Janney. I wanted to let him walk the Commission
11 through it. We will need a copy of it in front of him
12 for him to do that. It has been some time since he
13 worked on it.

14 (By Ms. Henrie (cont'd:))

15 Q. But would you just tell the Commission what was
16 going on with the report, why it came to be what it
17 says?

18 A. Right. This annual water quality monitoring
19 report and background concentration report was required
20 under the terms of the discharge permit that was issued
21 for the project in 2008, so it spelled out the sampling
22 frequency and the analytes for all the production and
23 injection wells as well as the location of the
24 monitoring and the sampling frequency and analyte list
25 for those monitoring wells in addition to the production

1 and injection wells.

2 So this document presents the results of all of
3 the sampling that was done prior to commercial power
4 generation and some of the post commercial power plant
5 generation analytical results in the 45-7 production
6 well and power plant discharge as well as some of the
7 monitoring wells.

8 Q. So, Mr. Janney, basically, what does the report
9 conclude?

10 A. If you turn to the end of the report, the
11 conclusions in a nutshell basically say that fluoride
12 concentrations in ground water in the Lightning Dock
13 Geothermal area are natural occurring due to upwelling
14 geothermal system, that fluoride concentrations in the
15 production well, 45-7, have remained constant over the
16 period for the samples that were collected here,
17 basically represent -- and those fluoride concentrations
18 range from about 12 milligrams per litre to 14
19 milligrams per litre, and that the analytic results also
20 indicate that running the water through the power plant
21 does not contribute anything to that water.

22 Therefore, the analytical results of the influent
23 to the power plant and the discharge from the power
24 plant are relatively the same as far as constituents of
25 potential concern are concerned.

1 It also indicates that there is some groundwater
2 mounding around the points of injection in the range of
3 four to six feet. It also explains some of the
4 interesting analytical results that were received from
5 the laboratory for the 45-7 production well in December
6 and January. That would be December of 2013 and
7 January of 2014. There were three samples that were
8 collected that had anomalously low fluoride
9 concentrations and anomalously low TDS and sulfate
10 relative to the other samples that were collected from
11 45-7; and, interestingly, anomalously high radionuclides
12 relative to previous and post samples.

13 Q. So what was going on with all of that?

14 A. Ultimately that is explained in one of the
15 paragraphs in the conclusions, the tubing that's used to
16 collect the sample from 45-7 is decontaminated prior to
17 running the sample through the tubing and into the
18 sample container. And I believe that that deionized
19 water was just not totally flushed from that sample
20 tubing prior to running the sample into the sampling
21 container. And, therefore, we have those anomalously
22 low concentrations of fluoride and some of the other
23 constituents in the water.

24 Q. And so, David, before you go on, are we going to
25 have other witnesses talk more about the mounding and

1 the chemistry and some of the details?

2 A. Yes, Dr. Shomaker and Dr. Miller, and they have
3 vastly more experience in hydrogeology and hydro
4 geochemistry than I do, and they are going to address
5 that issue.

6 Q. I just wanted to walk through the big picture on
7 this permit. I also want to ask, with the report, is
8 the chemistry provided?

9 A. Yes.

10 Q. And speaking of chemistry, do you have anything
11 more you want to say about the report?

12 A. Well, there were some other things that were
13 spelled out in the conclusions of the report, but I am
14 sure they have read it, so we can proceed.

15 Q. Let's talk about chemistry. What are we seeing
16 on the screen here?

17 A. This slide was used in the 2013 hearing. And the
18 only reason --

19 MR. LAKINS: I object. Where is this as an
20 exhibit?

21 MS. HENRIE: It's not an exhibit. It's
22 mine.

23 MR. LAKINS: Then I am going to object to
24 its use because it wasn't provided ahead of time.

25 MS. HENRIE: It was used in 2013, Charles.

1 It --

2 MR. LAKINS: It wasn't disclosed for this
3 hearing as an exhibit.

4 MS. HENRIE: Not as an exhibit. We are not
5 tendering this as an exhibit. May we proceed?

6 CHAIRPERSON CATANACH: Yes.

7 A. As you said, this slide was used in 2013. And
8 this slide basically shows a comparison of the water
9 sampled from 45-7, 53-7 and 63-7, Lightning Dock's
10 production well and its three injection wells, in
11 comparison with water sampled from AmeriCulture State
12 1 -- we have three different samples from AmeriCulture
13 State 1 and one sample from AmeriCulture State 2 and one
14 sample from Rosette State 3, which, if you look to the
15 board in the back of the room, you will see is actually
16 north of the AmeriCulture wells.

17 And really this is just a graphic representation
18 of the chemistry of these waters. And the purpose of
19 this is just to show that the concentrations of sodium
20 and potassium on the left-hand side and sulfate on the
21 far right and chloride and fluoride down the center
22 access are relatively equal in the waters that are
23 pumped from the 45-7 and the waters that were sampled in
24 the 53-7, the 55-7, and the 63-7 prior to injection into
25 those wells.

1 Q. So on the left we've got deep wells. What kind
2 of ranges of depth are we talking about?

3 A. Well, the shallowest production casing is in the
4 55-7, and that is at 1,050 feet. The bottom of 53-7 is
5 the deepest well and that's at 4,441 feet.

6 And the screened intervals in the 45-7 range from
7 about 1,737 down to 2,900. The screened interval or the
8 lined interval in 53-7 ranges from about 1,680 down to
9 4,441 and the screened or the lined interval in 63-7
10 ranges from 1,500 down to 3,500.

11 Q. So over on the right, are those shallow wells,
12 characterized most of the shallow wells?

13 A. They are indeed. I believe AmeriCulture's State
14 Well 2 is the deepest well out there. But I believe
15 that AmeriCulture's State 1 has a total depth of
16 399 feet. It may be lined; it may be open hole to that
17 depth. I think it's cased to about 150 feet. But,
18 nonetheless, the total depth on that well is 399 feet.

19 I'm not sure at this point when the sample from
20 AmeriCulture's State Well 2 was collected, but I believe
21 that well has a total depth of 2,100 feet. But it was
22 drilled to that depth over the course of a number of
23 years. And that sample may have been collected prior to
24 deepening the well from about 900 feet down to that
25 total depth of 2,100 feet.

1 And Rosette State Well 3 I believe has a total
2 depth of 440 feet, and I think it's open hole from 400
3 to 440 feet.

4 Q. So does this slide basically show that whether
5 the water is deep or shallow the geothermal water pretty
6 much has the same signature?

7 A. Yes.

8 Q. And I want to direct your attention to Exhibit 2,
9 this is Lightning Dock's Exhibit 2, which will be in
10 your green binder there. Tell me what this is.

11 A. This table is excerpted from the Water Quality
12 and Background Concentration Report. And the purpose in
13 making an exhibit out of it is to show that there's no
14 changes in water chemistry as that water is produced
15 from 75-7 and runs through the power plant and is
16 discharged from the power plant prior to injection into
17 the 55-7.

18 As you can see, the primary constituent and
19 concern in this proceeding is fluoride. And as you can
20 see from the analytic results of 45-7, those
21 concentrations range really from 11 to 14 milligrams per
22 liter.

23 I discussed earlier the issues that we had with
24 the three samples from 45-7 on January 7th,
25 January 28th, and February 25th of 2014.

1 Q. That is the three rightmost columns?

2 A. Almost. There is one prior to that,
3 December 19th of 2013.

4 Q. Okay.

5 A. But those are the samples that I believe were
6 contaminated with deionized water that had not quite
7 been purged from sample tubing prior to placing that
8 sample in the sampling container.

9 But the date range on the samples from 15 days to
10 180 days after power plant start-up is a direct
11 comparison above and below. And so if you compare the
12 fluoride concentrations in those three samples on 2/25,
13 1/28 and 1/7 with the fluoride concentrations of plant
14 discharge on those same dates, you will see that the
15 fluoride concentrations in plant discharge has basically
16 remained constant over time.

17 At January 7th, 2014, it was at 14 milligrams per
18 liter, and, then, 180 days later, it was at 12
19 milligrams per liter. And those concentrations
20 basically agree 101 with the concentrations in 45-7
21 prior to running it through the power plant.

22 And that's really the thing I primarily wanted to
23 show in this slide.

24 And you can see that the TDS, the sulphate and
25 the boron and the chloride concentrations in 55-7 or

1 plant discharge water are basically equal to those in
2 45-7 when it comes out of the ground.

3 Q. So plant start-up was?

4 A. December 20th.

5 Q. What year?

6 A. 2013.

7 Q. So this gives us a snapshot of before and after
8 plant start-up?

9 A. That is correct.

10 MS. HENRIE: With that, I am going to pass
11 the witness, but also move Exhibits OCD 1 through 8,
12 which were the Conditions of approval, and move
13 Lightning Dock Exhibit 1, which were the two aerial maps
14 that show ownership and well locations, and Lightning
15 Dock Exhibit 2, which is this chemistry table you are
16 looking at now.

17 MR. LAKINS: No objection.

18 CHAIRPERSON CATANACH: OCD Exhibits 1
19 through 8 will be admitted and Lightning Dock Exhibits 1
20 and 2 will be admitted.

21 (Oil Conservation Division's Exhibits 1
22 through 8 were offered and admitted.)

23 (Lightning Dock Geothermal's Exhibits 1 and
24 2 were offered and admitted.)

25 CHAIRPERSON CATANACH: Mr. Lakins, your

1 witness.

2 CROSS EXAMINATION

3 BY MR. LAKINS:

4 Q. Can you still see this all right, Mr. Janney?

5 A. Yes.

6 Q. A couple of things. Mr. Janney, you said that --
7 Mr. Janney, I just want to make sure I understand for
8 clarification some of what your testimony has been.

9 The fluoride that you are talking about is out of
10 53-7? The fluoride test that you were just talking
11 about -- excuse me -- 55-7; is that right?

12 A. Are you talking about in reference to this
13 exhibit (indicating)?

14 MS. HENRIE: Can we clarify which exhibit
15 for the record, please?

16 A. Actually, there are fluoride concentrations for
17 two wells on that exhibit, 45-7, the production well,
18 and 55-7, the primary injection well.

19 But the lower set of analytical results on this
20 exhibit are power plant discharge prior to injection
21 into 55-7.

22 Q. All right. I want to get at the fluoride level
23 that you are talking about is what's in the production
24 well 45-7?

25 A. Correct.

1 Q. And you have monitoring wells placed on the
2 property, correct?

3 A. Correct.

4 Q. We don't have the fluoride levels from those
5 monitoring wells here today, do we?

6 A. Yes, they are in the background concentration
7 report that you submitted as an exhibit.

8 Q. Can you show me where exactly --

9 A. Table 6, I believe.

10 Q. I don't have a table 6 in here.

11 A. I have one in my ring binder. It is the last of
12 the tables in the back of the report. It is not an
13 embedded text table.

14 CHAIRPERSON CATANACH: What report are we
15 talking about?

16 THE WITNESS: The Background Concentration
17 and Compliance Report, Exhibit B. It's an AmeriCulture
18 exhibit.

19 By Mr. Lakins (cont'd):

20 Q. This page, table 6, that looks like this
21 (indicating).

22 A. Yes, I believe that is correct.

23 Q. And the fluoride levels from those wells are all
24 lower than the fluoride level from the production well,
25 correct?

1 A. Yes.

2 Q. So the existing data is that the fluoride levels
3 in the monitoring wells --

4 CHAIRPERSON CATANACH: Mr. Lakins, we really
5 can't see that one. Can we move this back?

6 MR. LAKINS: Yes, sir. Thank you. (Moving
7 stand back.) Does that work, sir?

8 CHAIRPERSON CATANACH: Yes.

9 Q. (By Mr. Lakins:) So just to establish that the
10 fluoride levels in these monitoring wells as of the data
11 that Lightning Dock submitted in the sample, the
12 fluoride levels in the monitoring wells are all less
13 than the fluoride level in the production well?

14 A. With the exception of Monitoring Well 3. There
15 was one sample collected on November 24th, 2013, that
16 was 12 milligrams per liter fluoride. And that's prior
17 to plant start-up. So that was a naturally occurring
18 fluoride concentration at that location at that point in
19 time.

20 Q. And you don't have the fluoride levels of
21 AmeriCulture's well?

22 A. I have seen some of that analytical data.

23 Q. And what have you seen?

24 A. We compared those analytical results and the
25 Stiff diagrams that were presented moments prior to this

1 and those fluoride concentrations in AmeriCulture State
2 Well 1, I believe, range from approximately 8.8 to
3 10.2 milligrams per liter.

4 Q. What about AmeriCulture's Federal well?

5 A. I don't believe I have ever seen fluoride
6 concentrations for that well.

7 Q. Now, Mr. Janney, I would ask you to turn to --
8 let me back up for a moment.

9 Turn to the locations of your proposed injection
10 wells. One is here, close by 62-7, correct?

11 A. Yes.

12 Q. One is down here at the southern edge of the Rose
13 Farm buildings?

14 A. Yes.

15 Q. And one is over here (indicating)?

16 A. Yes.

17 Q. Where is the fourth one?

18 A. To the right, to the lower right-hand corner east
19 of the greenhouses.

20 Q. Okay. And the proposed injection depth is
21 150 feet, correct?

22 A. In three of the wells, that is correct. It is
23 500 feet in 13-7 but 150 feet in the other three.

24 Q. Over here it's 500; and the other three, the
25 proposed injection well depth is 150 feet.

1 A. Yes. That's the bottom of the production casing.
2 It's lined from there to 500.

3 Q. On the applications, that's the shallowest depth
4 of the proposed injection?

5 A. Yes.

6 Q. Is that not into the shallow alluvial aquifer?

7 A. It is in the shallow alluvial aquifer.

8 Q. Now I ask you to turn to AmeriCulture's Exhibit

9 C. Are you there?

10 A. I believe so.

11 Q. Page 3, which has paragraph 15 on it -- are you
12 there?

13 A. Yes.

14 Q. Okay. Now at the last hearing back in 2013, the
15 Commission found that Los Lobos presented evidence -- I
16 am going to skip to the last part there -- I will read
17 it. "Los Lobos presented evidence that the geothermal
18 plume production zone in 52-7"-- which was over there --
19 and --

20 MS. HENRIE: Just for clarification,
21 Charles, you said at the last hearing. This is from
22 2008.

23 MR. LAKINS: No. Exhibit C is the order
24 from 2013.

25 MS. HENRIE: No. Go to the end. It's

1 signed by Mark Plesner.

2 MR. LAKINS: Hang on. Is your C not the
3 same C? It's in the book that I gave you.

4 MS. HENRIE: Oh, okay. My C I downloaded
5 so...

6 MR. LAKINS: You've got 5B and C backwards.

7 MS. HENRIE: Sorry. Okay. Thank you for
8 that clarification.

9 Q. (By Mr. Lakins:) Let's get back to the
10 question -- that the Commission found that at the 2013
11 matter that Los Lobos presented evidence that the
12 geothermal plume production zone in wells 53-7 and 55-7
13 are the same -- that's these here, 53-7 and 55-7,
14 correct?

15 A. (Nodding head.)

16 Q. And that the geothermal fluid flow intervals
17 occur in the same geologic formations.

18 And that's those two deep wells, correct?

19 A. (Nodding head.)

20 Q. And they are not directly connected to the
21 alluvial aquifer at 400 feet below ground surface in
22 AmeriCulture's State No. 1 well, correct?

23 A. That's what it says.

24 Q. Here is what I am trying to figure out. If
25 previously Los Lobos evidence showed that the production

1 zone was in a different strata than the shallow alluvial
2 aquifer, why is Los Lobos proposing to inject into the
3 shallowest alluvial aquifer?

4 A. In order to maximize the production of the power
5 plant.

6 Q. Now, since the power plant came on line, there
7 have been changes in the monitoring wells, have there
8 not?

9 A. Yes. I think we testified in 2013 that it is all
10 connected.

11 Q. Well, the finding was that they were not in 2013,
12 that's the evidence back then.

13 But since the production began, there have been
14 increases in the water levels in these monitoring wells,
15 true?

16 A. Yes. I stated earlier that there has been four
17 to six feet of mounding observed in those monitoring
18 wells.

19 Q. Even though the injection levels -- and you are
20 currently injecting, basically, from 55-7 initially,
21 correct?

22 A. All three of those injection wells are currently
23 taking fluid.

24 Q. When did 63-7 come on line? When did you start
25 injecting the 63-7?

1 A. I believe it was February. I can't say for
2 certain. Mr. Morrison may have more information about
3 that.

4 Q. How about 53-7?

5 A. About the same time.

6 Q. What is the injection amount into those wells?
7 What are they taking?

8 A. I think currently they are in the neighborhood of
9 150 to 250-gallons per minute.

10 Q. Do you have any data whatsoever to show that?

11 A. I don't. But Mr. Morrison may.

12 Q. Okay. And the injection depth at 53-7 is
13 1,050 -- excuse me, at 55-7 is 1,050, correct?

14 A. Correct.

15 Q. Deep?

16 A. Yes.

17 Q. And the injection depth at 53-7 is what?

18 A. They are all relatively -- 53 and 63 are about
19 1,500 feet. It is 1,500 feet to the bottom of the
20 casing in 63 and about 1,680 in 53.

21 Q. So the injection activities at 1,000 to 1,500 to
22 almost 1,700 feet are affecting the monitoring wells,
23 true?

24 A. Yes.

25 Q. And the monitoring wells, the depth of the

1 monitoring wells are 50 to 85 feet, are they not?

2 A. Roughly.

3 Q. So the injection activity that is currently
4 ongoing is affecting the shallow alluvial aquifer,
5 true?

6 A. Well, there is a measured response in shallow
7 ground water to deep injection. And because I am not
8 qualified at this point as an expert witness in
9 hydrogeology or hydro geochemistry, I'm going to defer
10 the more definitive answer to that question to Dr.
11 Shomaker or to Dr. Miller.

12 Q. Let me put it this way. Since Lightning Dock has
13 been injecting deep, you have observed increases in the
14 water levels in the shallow monitoring wells, true?

15 A. Yes. That is clearly stated in our October 20,
16 2014, report.

17 Q. And in processing the decreases in the water
18 levels at the production well, true?

19 A. Well, one would expect a cone of depression to
20 form when that pump is turned on. But we have evidence
21 to show that that water level is not in decline, that it
22 is stable, that it is in equilibrium. And Dr. Shomaker
23 will speak to that.

24 Q. How much has it gone down?

25 A. I don't recall the pre-pumping depth water in

1 that well. I believe it stabilized right about 300 feet
2 below ground surface.

3 Q. So --

4 A. And so has the mounding stabilized as well.

5 I need to comment that based on our depth water
6 results in the monitoring wells and the depth of water
7 in 45-7, that the system appears to be in equilibrium
8 with respect to pumping and injection.

9 Q. At current production?

10 A. That's correct.

11 Q. And your proposal is essentially to quadruple
12 that?

13 A. I am not aware of that.

14 Q. You are wanting to drill four more injection
15 wells, true?

16 A. Right. But that doesn't mean that there won't be
17 a balanced approach to injection.

18 Q. Well, your proposal is for four shallow injection
19 wells, correct?

20 A. At 500 gallons per minute per well.

21 Q. So 2,000 gallons per minute more of injection?

22 A. Correct.

23 Q. And so you will also be increasing production?

24 A. Correct.

25 Q. And increasing production will come from 45-7?

1 A. Correct.

2 Q. And how about 55-7?

3 A. That may be turned into a production well.

4 Q. How about 53-7?

5 A. Those will only be injection wells at this point.

6 Q. So your production will increase at 45-7 and
7 55-7?

8 A. Correct.

9 Q. And the fluoride from 45-7 to 55-7 is higher than
10 the existing background in monitoring wells?

11 A. Well, as I stated earlier, we have a 12-milligram
12 per liter fluoride concentration in Monitoring Well 3
13 and that there are a number of pre power plant samples
14 collected by OCD that indicate fluoride concentrations
15 in shallow water in the southern greenhouse area that
16 range between 12 and 15.46 milligrams per liter of
17 fluoride so --

18 Q. Go ahead.

19 A. (No response.)

20 Q. Now if you turn to our Exhibit P once again, page
21 4, the beginning of page 4, table 6, those are the
22 background threshold values -- sorry, you are not there
23 -- wrong page. This page (indicating), the narrative
24 page 4.

25 A. Oh.

1 Q. Page 4 on the bottom, are you there?

2 A. Yes.

3 Q. Your data shows the Monitoring Well, Fluoride,
4 that's the far left column, correct? NWFNG/L?

5 A. Which table are you on in the text?

6 Q. This page 4 at the bottom.

7 A. That is not the same as my page 4.

8 Q. It is in the beginning. It is about the sixth
9 page in from the beginning.

10 There you go.

11 A. Oh. This is the 2015 document, not the document
12 that we spoke of earlier.

13 Q. This is the most current information?

14 A. That's correct.

15 Q. Okay.

16 A. So I haven't previously testified about this
17 document.

18 Q. Sorry?

19 A. I haven't previously testified about this
20 document.

21 Q. Are you familiar -- you just testified you are
22 familiar with the fluoride in the monitoring process?

23 A. That's correct. I am on page 4, table 6.

24 Q. And the fluoride levels in the monitoring well,
25 the highest one is 12, correct?

1 A. Yes.

2 Q. And the lowest one is 1.3, correct?

3 A. Yes. Upgradient of the upwelling geothermal
4 plume.

5 Q. And they are all lower than the fluoride level in
6 your production well, correct?

7 A. Well, as I stated earlier, the analytical results
8 for post power plant start-up on 45-7 indicates a
9 relatively flat line of fluoride concentrations from
10 45-7 at 12 milligrams per liter.

11 Q. Agreed.

12 But my question was, the data that you have
13 developed demonstrates that the fluoride level in the
14 monitoring wells which are located fairly close to where
15 you intend to inject, the fluoride level in the existing
16 data that you have shows that the fluoride level in the
17 monitoring wells and in the shallow water is lower than
18 the fluoride level known to exist in the production
19 well, true?

20 A. In some cases that's true. But it's all
21 spacially related to the upwelling geothermal plume.

22 Q. Have you observed any increases in fluoride in
23 the monitoring well since production began?

24 A. Yes. I believe one well has shown some
25 increases. And that would be MW-1A.

1 Q. And that's --

2 A. Immediately north of 57. The primary injection
3 well.

4 Q. Any other shown increase?

5 A. There may be some less than 1 milligram per liter
6 increases, but we could go to the table to observe, if
7 you wish.

8 Q. Where does that data show the changes in the
9 fluoride levels in any of the monitoring wells?

10 A. It is table 6 from the previous background
11 concentration report.

12 Q. Now, this table 6 is a single number. Do you
13 have any data that shows a change in the fluoride from
14 one test to the next?

15 A. Yes, those wells were recently sampled, and those
16 results were provided to OCD at the end of last month.

17 Q. Because table 6 was a start-up. We don't have
18 here today --

19 CHAIRPERSON CATANACH: Sorry, Mr. Lakins.
20 What are we looking at?

21 MR. LAKINS: I'm sorry, sir. The table 6 in
22 Exhibit P that is towards the back. It looks like this
23 (indicating), sir.

24 CHAIRPERSON CATANACH: Are you referring to
25 line 6?

1 MR. LAKINS: Those are fluoride, but I am
2 also referring to the date at the top that is in
3 November and December of 2013. So that's data from --

4 A. Pre-plant. And those wells have recently been
5 sampled and there were some increases observed.

6 Q. Do you have that here today to show us what that
7 is?

8 A. I don't believe I do.

9 Q. But there have been increases?

10 A. In some of the monitoring wells, on the order of
11 one to two milligrams per liter, if I recall correctly.

12 Q. One to two?

13 A. Yes. In Monitoring Well 1A.

14 Q. In Monitoring Well 1A, the closest to the current
15 injection well?

16 A. Yes.

17 Q. Are you saying that Monitoring Well 4 has not
18 seen any increase in fluoride or you just don't know?

19 A. I don't recall without having that data set in
20 front of me.

21 MR. LAKINS: Does anyone here have that data
22 set with them?

23 THE WITNESS: It has been submitted to OCD.

24 MR. LAKINS: That's not my question. Does
25 Lightning Dock have that data with them today to present

1 to the Commission?

2 MS. HENRIE: Mr. Lakins, I think you are
3 badgering my witness. I think you made your point.

4 MR. LAKINS: It is just a question.

5 Q. (By Mr. Lakins:) It's not here?

6 A. I have a document on my computer, yes. But it
7 has already been submitted to OCD.

8 Q. Now, Mr. Janney, you proposed one of the shallow
9 injection wells, 63A-7?

10 A. Yes.

11 Q. Why are you proposing that in such close
12 proximity to the existing 63-7?

13 A. Because we believe there's permeability there.

14 Q. And that's proposed at 150 feet?

15 A. Yes.

16 Q. And that 150 feet depth is very near in depth to
17 Monitoring Well 1A, which is at 80 feet?

18 A. Yes. And there is also another monitoring well,
19 MW3 just on the north side of that pad.

20 Q. Have you seen any changes in Monitoring Well 3
21 fluoride levels?

22 A. Not that I recall at this point.

23 Q. You have seen changes in the water depth?

24 A. Yes. Mounding occurs in that vicinity.

25 Q. Mounding occurs in 3, yes?

1 A. Yes. But not to the extent that it does in 1.

2 Q. And have you seen increases in 5?

3 A. I don't recall that we have specifically. I
4 think Dr. Shomaker is going to address the mounding
5 issue more specifically.

6 Q. Very good.

7 And it is your opinion that injecting at 150 feet
8 would not impact the underground drinking water --

9 MS. HENRIE: Objection. Define "impact."

10 MR. LAKINS: Harm.

11 Q. You testified it wouldn't harm --

12 A. Well, I think --

13 MR. BRANCARD: I believe, as you objected,
14 this is a fact witness, not an expert witness. So we
15 are trying to avoid him giving opinions here.

16 MR. LAKINS: Very well. Point taken. I am
17 just going from my notes.

18 Q. Do you know if Lightning Dock has prepared and
19 submitted to the OCD a water replacement plan?

20 A. I'm not aware of one.

21 Q. Mr. Janney, just to kind of clarify the
22 appropriate witness, would it be you or would it be
23 Mr. Miller that would be the one addressing the
24 background threshold values for other areas outside of
25 the monitoring wells?

1 A. Dr. Miller.

2 Q. Very good.

3 MR. LAKINS: I pass the witness. If I may
4 ask for a break for a drink of water.

5 CHAIRPERSON CATANACH: Let's take a
6 ten-minute break.

7 (Brief recess.)

8 CHAIRPERSON CATANACH: All right. Let's get
9 started. Ms. Marks, do you have any questions of this
10 witness?

11 MS. MARKS: Yes, I do.

12 CROSS EXAMINATION

13 BY MS. MARKS:

14 Q. Mr. Janney, I just have a couple of questions for
15 you. Ms. Henrie moved to admit Oil Conservation
16 Division's Exhibits 1 through 8 which also appeared in
17 the amended proposed order submitted by Lightning Dock
18 Geothermal HI-01, LLC.

19 Of the exhibits that were moved into the record,
20 I want to draw your attention to Exhibits 3 and 7. In
21 your testimony earlier, you discussed a proposed
22 correction to a unit, correct?

23 A. Yes.

24 Q. I believe you testified that the unit number or
25 letter should be corrected from E to L; is that correct?

1 A. I believe that's correct.

2 Q. And so would you suggest that the Exhibits 3 and
3 7 should be corrected as well?

4 A. I would.

5 Q. And these proposed conditions of approval with
6 respect to placing the well on injection and with
7 respect to drilling a geothermal resource as well are
8 basic conditions of approval that Lightning Dock has
9 seen before and conditions you have no objections to; is
10 that correct?

11 A. Yes, that's correct.

12 MS. MARKS: I have no further questions.

13 CHAIRPERSON CATANACH: Mr. Domenici.

14 MR. DOMENICI: Thank you.

15 CROSS EXAMINATION

16 BY MR. DOMENICI:

17 Q. What is your position with the project? How
18 would you describe your --

19 A. I have been the permitting and compliance manager
20 there since 2011.

21 Q. And as part of that, are you familiar with the
22 permit that was in place when you took that job in 2011,
23 the groundwater discharge permit?

24 A. I have knowledge of it.

25 Q. And since you took your position, have you been

1 responsible for compliance with that permit?

2 A. That is correct.

3 Q. And is that permit transferred at some point in
4 time from the original party who obtained it --

5 A. To Lightning Dock? From Los Lobos to Lightning
6 Dock?

7 Q. Yes.

8 A. Essentially, yes. Everything is transferred from
9 Los Lobos to Lightning Dock.

10 Q. You say everything, but you understand to do a
11 transfer of discharge permit there's a --

12 A. That's correct. But the discharge permit expired
13 in August of 2014.

14 Q. And what is the status of that discharge permit?
15 You said it expired.

16 A. That is correct. Based on an opinion rendered by
17 Mr. Brooks after the 2013 hearing with OCC, I believe it
18 was his opinion that that discharge permit was not
19 necessary, that OCD had within its jurisdiction the
20 ability to regulate us with conditions of approval on
21 various forms or applications that we submitted.

22 Q. So did you submit an application that governs the
23 wells that were subject to the discharge permit?

24 A. I'm not sure I follow the question. Please
25 restate the question.

1 Q. So the discharge permit had a number of wells
2 permitted pursuant to the discharge permit?

3 A. Injection and production wells, is that what you
4 are referring to?

5 Q. That is my understanding; is that your
6 understanding?

7 A. That is correct.

8 Q. And then the permit was allowed to expire?

9 A. That is correct.

10 Q. Without a renewal application?

11 A. For the reason I just stated, yes.

12 Q. And then my question is so were all of those
13 wells put under permit and compliance under another
14 permit or compliance instrument?

15 A. There is an agreement, at this point verbal,
16 between Lightning Dock and the Oil Conservation Division
17 that agrees to monitor water quality in the production
18 well and in power plant discharge and in the monitoring
19 wells on a certain frequency and to provide those
20 analytic results to the Division.

21 So, in effect, the monitoring conditions of that
22 discharge permit are being met.

23 Q. What is the foundation or what is the -- who is
24 involved with this verbal agreement?

25 A. Well, the chief of the Environmental Bureau and

1 Lightning Dock's attorney.

2 Q. Who is the chief?

3 A. Jim Griswold.

4 Q. And would someone, say, like my client, the Soil
5 and Water Conservation District, would we have any
6 reason other than this hearing to be aware that those
7 requirements remain in effect? Do we have any
8 information in the public domain that that requirement
9 remains in effect other than what I'm hearing right now?

10 A. Well, we received a letter from Mr. Griswold on
11 May 15th of this year, I believe. And that basically
12 outlined in writing the requirements for monitoring
13 going forward.

14 Q. And as I read the discharge plan, there's closure
15 requirements; are you familiar with the closure
16 requirements?

17 A. At this point, no.

18 Q. Do you understand that closure requirements
19 continue regardless of whether a discharge permit is
20 renewed or expires?

21 A. I'm not aware of the closure requirements.

22 Q. And so you don't know, one way or another, if
23 Lightning Dock is subject to closure requirements for
24 the discharge permit issued by the OCD?

25 A. I do not.

1 Q. And do you know if typically discharge permit
2 closure requirements require that the permit holder
3 restore the area impacted by the discharge permit to
4 some specific levels or condition?

5 A. Define "area of impact," please.

6 Q. Let me just make it broader.

7 Do you know if -- does Lightning Dock have any
8 plans to meet the closure requirements of the 2008
9 discharge permit?

10 MS. HENRIE: Can I just object. Can you
11 specify -- are you looking at the --

12 MR. DOMENICI: This is Exhibit B. It's the
13 last page of the permit.

14 MS. HENRIE: Okay. So it's AmeriCulture
15 Exhibit B.

16 MR. DOMENICI: There's attachments but it's
17 the last page of the permit.

18 MS. HENRIE: So not the last page of the
19 exhibit but of the permit?

20 MR. DOMENICI: Page 23.

21 MS. HENRIE: Do you have that in front of
22 you so he can at least see what you are looking at?

23 MR. DOMENICI: That would be on page 18, at
24 the top left corner.

25 THE WITNESS: Okay. Would you restate your

1 question, please.

2 Q. (By Mr. Domenici) Is Lightning Dock required to
3 satisfy -- as compliance manager for Lightning Dock,
4 would you agree with me that Lightning Dock is required
5 to satisfy the closure requirements of paragraph 23?

6 A. I would say that since this discharge permit is
7 expired, but since we are years and years from closure,
8 I would think that Lightning Dock would on their own
9 accord satisfy those closure requirements. But I
10 haven't seen anything in writing.

11 Q. And if those requirements are to -- and it says
12 -- the last sentence says, OCD may require additional
13 financial assurance if surface water and/or ground water
14 is impacted pursuant to the WQCC regulation cited there.

15 Do you see that?

16 A. I do.

17 Q. And you would agree that the injections that have
18 already taken place under this permit that's in front of
19 you and then the objections that are proposed as part of
20 this procedure, they will impact the ground water?

21 A. There will be a response. There will be mounding
22 and there will be potential changes in chemistry.

23 Q. And when we say "chemistry," just so I'm clear
24 and the record is clear, chemistry, does that include
25 the increase in the levels of regulated Water Quality

1 Control Commission constituents?

2 A. Yes.

3 Q. And there will be impacts and elevated levels of
4 fluoride are expected as a result of this application
5 that we are here today on, correct?

6 A. Yes.

7 Q. And those impacts will be in the shallow alluvial
8 groundwater aquifer, correct?

9 A. Yes.

10 Q. And fluoride is regulated by the WQCC as a human
11 health standard, correct?

12 A. 1.6 is the State MCL. 2.0 is the Federal
13 Secondary MCL. And 4.0 is the primary MCL. And all of
14 the water in the greenhouse area and water downstream
15 for miles is above the 4.0 drinking water quality
16 advisory. It is ubiquitous in many places throughout
17 the valley.

18 MS. HENRIE: And will one of our other
19 witnesses be testifying to that?

20 THE WITNESS: Yes.

21 A. That is not drinking water.

22 Q. When you say it's not drinking water, you are
23 testifying as a fact witness that no one drinks that
24 water; is that what you're saying?

25 A. No. I'm testifying as a fact witness that

1 compared to the state and federal MCLs for fluoride that
2 water is not fit for human consumption.

3 Q. But you are not testifying to this Commission
4 that people don't drink that; is that correct?

5 A. I cannot say that. It would be folly if they
6 did.

7 Q. Are there treatment processes, domestic treatment
8 processes to remove that fluoride or reduce it that are
9 available?

10 A. Yes. Both at the domestic level and at the
11 commercial level. I believe that aluminum is the
12 primary treatment method. But I think Dr. Miller can
13 address that later.

14 Q. And do you understand that the WQCC regulations,
15 the groundwater regulations, they use the term
16 "background"; are you familiar with that --

17 A. I am.

18 Q. And you would agree with me -- it sounds like
19 something in your prior testimony -- the injections that
20 are proposed as part of this application will increase
21 the fluoride above the background?

22 A. I don't believe that to be true. In a document
23 that we submitted to OCD earlier this year, Dr. Miller
24 ran PRO UCL for fluoride and other constituents and
25 calculated with that software background threshold

1 values for fluoride, TDS, and sulfate, I believe.

2 And those concentrations established in that
3 document are basically set at 17 milligrams per liter
4 for fluoride. And there is no evidence at all in any of
5 the water produced from 45-7 that that concentration
6 will be reached.

7 Fourteen is the highest we've seen, but it seems
8 to have stabilized at 12 since production began.

9 Q. Are you familiar with the term in the Water
10 Quality Control Commission regulations of the "existing
11 concentration," the term "existing concentration"?

12 A. Not directly familiar.

13 Q. What do you consider the readings from the
14 monitor wells to establish with respect to the
15 background or just in concentration or the condition at
16 the location of the monitor wells?

17 A. Well, I think I stated previously that depending
18 upon where you are relative to the upflow plume, those
19 fluoride concentrations vary.

20 And fluoride concentrations in shallow wells in
21 the greenhouse area have analytic results that indicate
22 concentrations up to 15.46 milligrams per liter. So
23 that is a background concentration for fluoride.

24 Q. So do you consider -- you take the highest
25 reading you can find and you call that background --

1 A. No. The program takes all of the readings and
2 runs them through algorithms and compares standard
3 deviations and other things that Dr. Miller can explain
4 in detail and arrives at a background threshold value
5 for fluoride or any of the other constituents that are
6 modeled.

7 Q. So looking at the OCD exhibits which are the
8 conditions -- do you have those in front of you?

9 A. Yes.

10 Q. So first of all, let me ask, if I may, just to
11 clarify, you would agree that the background
12 concentrations in the shallow aquifer vary depending on
13 whether they are influenced by what I think you called
14 the upwelling plume or whether they are not influenced
15 by it, correct?

16 A. Correct. But you have to consider the upwelling
17 plume as a whole in this particular case.

18 MS. HENRIE: Excuse me. We have a witness
19 who is going to testify to all this stuff.

20 Q. If you are not comfortable answering, let me
21 know.

22 MR. DOMENICI: Or object and I will withdraw
23 the question. I am trying to get this from a compliance
24 standpoint, is my approach, so we are clear.

25 Q. So looking at the conditions of approval, what is

1 your understanding as to what OCD will be monitoring
2 for -- will be requiring your client or your employer to
3 monitor for in the monitoring --

4 A. I believe in the May 15th letter the analytical
5 requirements are spelled out on a quarterly and annual
6 basis.

7 Q. And I understand there is a requirement to look
8 for certain things. But is there a trigger that says,
9 if you find certain things, you have to adjust?

10 A. There is a trigger that says, if you find certain
11 things, you have to resample.

12 I don't believe there's anything that says
13 adjustments are required. I believe that after the
14 resampling, the analytical results are reviewed and
15 discussion takes place based on that second set of
16 analytical results.

17 Q. So the monitoring is basically data gathering, if
18 I am correct?

19 A. Yes.

20 Q. That is spelled out in these conditions?

21 A. And in the May 15th letter from OCD to Lightning
22 Dock.

23 Q. How is the May 15th letter different from the
24 conditions? Do they apply to different wells?

25 A. No. There are selected wells in quarterly

1 monitoring events and there are selected wells in annual
2 monitoring events, so depending upon where you are in
3 the calendar year, different constituents or different
4 wells are sampled.

5 Q. Let me ask just a real basic question. So the
6 discharge permit expired, a letter was written -- I
7 guess a verbal agreement was made?

8 A. And then the letter was written -- followed that,
9 right.

10 Q. Was there any public process for the transfer of
11 the discharge permit obligations to this letter
12 agreement between Lightning Dock and OCD?

13 A. Not to my knowledge.

14 Q. And did the opinion of Mr. Brooks discuss or
15 indicate that the public was allowed to be excluded from
16 the transfer of the discharge permit to a letter
17 agreement, if you know?

18 A. I don't know the answer to that.

19 Q. Was that letter made public?

20 A. The May 15th letter?

21 Q. I guess it was a legal opinion from Mr. Brooks.

22 A. Oh, yes, I believe so.

23 Q. Was it posted on a website anywhere that you are
24 aware of?

25 A. Isn't it in the proceedings from 2013?

1 Q. And so if I may, is it your understanding that
2 the agreement in this letter goes on indefinitely or
3 does it have an expiration period or a renewal period?

4 A. It is indefinite, is my understanding.

5 Q. And would the permit -- if this permit is issued,
6 is this indefinite, the one that we are here for today?

7 A. The conditions of approval?

8 Q. Yes.

9 A. Yes.

10 Q. And the application itself?

11 A. It has an expiration date. If we don't drill the
12 well within a specified period of time, it would expire.
13 But assuming the well is constructed as designed under
14 these conditions of approval, yes.

15 Q. Okay. And I understood from your testimony there
16 is no replacement plan --

17 A. Correct.

18 Q. -- as part of any submittal from Lightning Dock?

19 A. It is a non-consumptive use of water resources.

20 Q. And my understanding -- would another witness be
21 better to testify as to the extent that the injected or
22 exposed water will move over time?

23 A. Dr. Shomaker would be more prepared to answer
24 that question.

25 Q. Is there a model to say where that impact will be

1 20 years from now?

2 A. There has not been to my knowledge.

3 Q. Or is there any calculation as to where that
4 impact will be over time?

5 A. I would ask Dr. Shomaker to address that.

6 Q. To your knowledge as compliance and permitting
7 director, is there anything in your mind that you can
8 testify to as to where the extent of the impacts from
9 these 500 -- 400- or 500-gallon permit injection wells
10 will be over five-, ten-, 20-year intervals?

11 A. I think Dr. Miller or Dr. Shomaker would be
12 better suited to answer that.

13 Q. Is there any submittal that has that information?

14 A. Not to my knowledge.

15 Q. Will the -- as permit and compliance manager, are
16 you aware, one way or another, if the injection volumes
17 will extend outside of what you consider the upwelling
18 geothermal plume?

19 A. I don't believe that they will.

20 Q. What is your basis for that?

21 A. The mounding we see in the current monitoring
22 wells due to injection.

23 Q. Does that provide sufficient data to determine
24 how these wells will mound or the water will proceed, is
25 that what you are testifying?

1 A. I think Dr. Shomaker would be better suited to
2 answer that question.

3 Q. My understanding was that you designed these
4 wells because -- or selected them and designed the
5 casing so they would be more permeable and you would be
6 able to disperse more water; am I incorrect in that?

7 MS. HENRIE: I object. He didn't design
8 these wells.

9 Q. You applied for those wells because they would be
10 capable of dispersing more water?

11 A. Yes.

12 Q. And just to go back and then I'll move on. Is
13 there any level, that you as permitting and compliance
14 manager, level of increase in fluorides that you would
15 feel -- that shows up in the monitoring plan that is
16 part of this set of conditions, is there any level in
17 here that you think and can testify to that would cause
18 an adjustment of the injection use or activities?

19 A. If we exceeded the current background threshold
20 value for fluoride.

21 Q. And would that be in the influent or the effluent
22 that leaves your plant or would that be measured at the
23 monitor wells?

24 A. At the monitor wells. But plant influent and
25 plant discharge are measured regularly as well.

1 Q. So if the plant influents become above the
2 background fluoride levels, then you would be concerned?

3 A. Absolutely.

4 Q. So the background fluoride level is really at the
5 heart -- if I'm correct -- it's at the heart of the way
6 you as Lightning Dock's permitting and compliance
7 manager are sort of measuring the tipping point of where
8 Lightning Dock should stop or --

9 A. Adjust.

10 Q. Adjust --

11 A. Yes.

12 Q. And when was the background fluoride study
13 conducted?

14 A. Well, there were samples collected by Lightning
15 Dock prior to commercial power generation in November
16 and December of 2013. And those values in addition to
17 values of fluoride and other constituents that were
18 collected in 2008 by Lightning Dock, in 1996 by OCD,
19 and, I believe, 1983 by OCD were all used in the Pro UCL
20 model to establish background threshold values for
21 fluoride.

22 Q. And when was the model run -- my question is when
23 was this established?

24 A. Earlier this year.

25 Q. After you already were operating?

1 A. Yes. If you look at the discussion in the
2 background and compliance report regarding background
3 threshold values for a fluoride in the shallow water
4 bearing zone, the narrative there should explain why
5 there was not enough statistical data in the monitoring
6 well samples to be used in that calculation and why
7 samples collected by others previously needed to be
8 added to that data set to supply a statistically valid
9 sample population for that analysis.

10 Q. And is that an exhibit to this proceeding?

11 A. Yes, sir.

12 Q. And are your monitor wells screened?

13 A. Yes.

14 Q. What is the screening interval?

15 A. The lower 20 feet.

16 Q. And why is that -- why is that selected if you
17 know?

18 A. That was one of the conditions in the discharge
19 permit. And that's first water, that is the shallow
20 water drain zone. That's what they wanted to monitor.

21 And that goes back to the 2008 discharge permit,
22 and I was not a party to the discussion of preparation
23 of that discharge permit.

24 Q. Just so I am clear, when you say the lower
25 20 feet, I am just not clear what that means.

1 A. 60 to 80 feet, 65 to 85 feet. I don't think we
2 have anything deeper than 85 feet. There's usually five
3 feet of screen above the water table.

4 Q. And then the injection that is proposed here --
5 the objection wells would be screened from 150 feet to
6 500 feet?

7 A. In the immediate plant area and then further to
8 the west in 13-7, it's 500 and below.

9 Q. And how far below?

10 A. 215, if necessary.

11 MR. DOMENICI: Thank you. That's all I
12 have.

13 MS. HENRIE: Mr. Chairman, if I can do some
14 redirect and maybe add some clarity to some of the
15 things that have been discussed.

16 MR. BRANCARD: Maybe you want to wait until
17 after the Commission asks questions.

18 MS. HENRIE: You're right. Thank you.

19 EXAMINER BALCH: I think I gathered that
20 there is a witness later that will discuss the need for
21 shallow versus deep injection wells?

22 THE WITNESS: Yes.

23 EXAMINER BALCH: Then I have no questions
24 for you.

25 COMMISSIONER PADILLA: And with that, I will

1 save my questions for later.

2 EXAMINATION BY CHAIRPERSON CATANACH

3 CHAIRPERSON CATANACH: Mr. Janney, I was not
4 fortunate enough to be present for the last couple of
5 hearings. But can you just basically explain the
6 operation here for your power plant, just in general
7 terms?

8 THE WITNESS: I can in general terms with
9 counsel's permission, but I would rather Mr. Morrison do
10 that because he is intimately acquainted with it.

11 CHAIRPERSON CATANACH: So you have another
12 witness that will take care of that?

13 THE WITNESS: Yes.

14 CHAIRPERSON CATANACH: Well, is there a
15 geologic witness that will discuss the various
16 formations?

17 MS. HENRIE: Yes.

18 CHAIRPERSON CATANACH: Okay. I am a little
19 confused. I believe you said that there is going to be
20 elevated levels of fluoride, are expected. Where would
21 those elevated levels of fluoride come from? Are you
22 talking about the plume itself, the uplift?

23 THE WITNESS: In some cases, the fluoride
24 adding monitoring location is lower than the fluoride
25 concentration in plant discharge. So proximal to those

1 injection points, we would expect to see some elevated
2 fluoride.

3 MS. HENRIE: And, Mr. Chairman, we are going
4 to have people kind of explain the dynamics of the
5 geothermal system and the larger aquifer. I know it's
6 hard in context with the first witness, but we are
7 planning in tell you about that.

8 CHAIRPERSON CATANACH: Okay.

9 EXAMINATION BY COMMISSIONER PADILLA

10 COMMISSIONER PADILLA: I think I actually
11 have one question. Can you explain the testing process
12 that you referred to that resulted in some erroneous
13 results?

14 THE WITNESS: The samples from 45-7 in early
15 2014?

16 COMMISSIONER PADILLA: The deionized water.

17 THE WITNESS: Right.

18 Well, the water comes out of the ground at
19 roughly 312 degrees, and in order to prevent it from
20 flashing, it has to be run through an ice bath. And
21 there's a 22-foot to 30-foot long piece of stainless
22 steel tubing coiled inside of a 55 gallon drum,
23 basically according to ASTM method 948 I believe, that
24 allows that water to be cooled to below flashing prior
25 to placement in the sampling container.

1 And prior to each sampling event, that
2 stainless steel tubing is decontaminated with a run of
3 deionized water or perhaps deionized water with a little
4 nitric acid. And then it is triple rinsed with DI after
5 that.

6 COMMISSIONER PADILLA: And that is all
7 taking place on the surface; I take it you're not
8 talking about any --

9 THE WITNESS: It is all on the surface right
10 next to the well head, that is correct.

11 COMMISSIONER PADILLA: Thank you.

12 CHAIRPERSON CATANACH: I don't believe I
13 have anything else. You may proceed.

14 REDIRECT EXAMINATION

15 BY MS. HENRIE:

16 Q. So, David, let me just ask, in the permitting
17 process, when you go to drill an injection well, is
18 there a permit application, conditions of approval that
19 are attached to that well?

20 A. Yes.

21 Q. And then when you place a well on injection,
22 similarly, is there a separate permitting process,
23 conditions of approval that are attached to that?

24 A. Yes.

25 Q. And so those conditions of approval go with the

1 well. Some of those might relate to drilling, to
2 testing during drilling, but there are some that then go
3 on in perpetuity; is that your understanding?

4 A. Yes.

5 Q. So those structures are in place for all of the
6 wells that have been drilled and also we are now trying
7 to get those structures in place for the new proposed
8 injection wells going forward; is that your
9 understanding?

10 A. Those structures are in place for all production
11 and wells that are placed on injection.

12 Q. Okay.

13 A. And, yes, to the second part of your question.

14 Q. So in terms of this Commission or the OCD
15 regulating Lightning Dock, it would be through those
16 conditions of approval going forward?

17 A. That is correct. That was Mr. Brooks' conclusion
18 in 2013.

19 Q. But, then, in addition, does Lightning Dock have
20 other things, like, for example, a groundwater
21 monitoring plan that have been filed with OCD?

22 A. Yes. The groundwater monitoring plan was filed
23 in late 2013 prior to the power plants' start-up.

24 Q. So Lightning Dock continues in perpetuity
25 monitoring in compliance with that plan that is filed

1 with OCD?

2 A. That is correct.

3 Q. And OCD accepted that plan?

4 A. That is correct.

5 Q. Okay.

6 Reference was made to a water plan of
7 replacement. Do you know what that is?

8 A. I have not seen one for this site.

9 Q. Do you recall whether a State Engineer finding of
10 impairment was a prerequisite requirement to that
11 plan?

12 A. It may have been. I do not recall.

13 MS. HENRIE: That was all I wanted to ask.
14 I just wanted to kind of explain the regulatory methods
15 for this project.

16 So with that, I will let the witness step
17 down.

18 MS. MARKS: I'm sorry. I just have a couple
19 of more follow-up questions. It is follow-up to --

20 MR. BRANCARD: We can go on forever. We
21 have a lot more witnesses to get through here.

22 CHAIRPERSON CATANACH: What is your question
23 in reference to?

24 MS. MARKS: To the discharge permit.

25 CHAIRPERSON CATANACH: Briefly.

1 RECROSS EXAMINATION

2 BY MS. MARKS:

3 Q. Mr. Janney, were you present for the
4 conversations regarding a discharge permit?

5 A. How far back are we speaking?

6 Q. Mr. Brooks said there was no longer a need for a
7 discharge permit.

8 A. I think he verbalized that in this room at that
9 time.

10 Q. Was that because the State's privacy application
11 shows that classified geothermal injection wells are
12 regulated under the Geothermal Resources Conservation
13 Act, and not pursuant to Water Quality Act and WQCC
14 regulations? Do you recall --

15 A. I believe that is correct. But I would have to
16 read it to be certain.

17 Q. Was there ever a discussion also that there was
18 never a discharge occurring by Lightning Dock?

19 A. That is correct.

20 MS. MARKS: Thank you. I have no further
21 questions.

22 CHAIRPERSON CATANACH: Thank you. This
23 witness may be excused.

24 MS. HENRIE: Mr. Chairman, Commissioners,
25 let me tell you who is going to come speak to you. I

1 should have done that right at the beginning for
2 clarification to everyone.

3 Our next witness we are going to call is
4 Monte Morrison, who is vice president of operations for
5 Cyrq Energy, which is the parent of Lightning Dock
6 Geothermal. He is going to talk to some of the business
7 perspective, but he also was a power plant operator for
8 30-plus years, and so he can talk about how the power
9 plant works, about how geothermal power plants work, not
10 only this power plant but other places as well.

11 He is going to be followed by Dr. John
12 Shomaker who will talk about hydrology, hydro geology,
13 geology and some of the aspects -- the geothermal -- the
14 aspects of this geothermal system and of the larger
15 valley reservoir.

16 He will be followed by Roger Bowers, who is
17 a geologist who has been involved in this project since
18 1987. And he can talk about the geology as well as some
19 of the history of the project. .

20 And then Dr. Greg Miller will be our last
21 witness. And he is a hydro geochemist and can talk
22 about some of the chemical properties of the water, what
23 we see down deep, what we see on top and how this
24 geothermal upwelling in the plume comes up and interacts
25 with the native groundwater.

1 So we've got all of these kind of cued up
2 for you. Monte doesn't know things like that about this
3 particular reservoir. That's not what he's here for.

4 He's here to talk about business operations
5 and geothermal power plants in general.

6 So with that, I would like to call Monte
7 Morrison.

8 CHAIRPERSON CATANACH: Would you please
9 swear in the witness.

10 MONTE MORRISON
11 having been first duly sworn, was examined and testified
12 as follows:

13 DIRECT EXAMINATION

14 BY MS. HENRIE:

15 Q. Would you please introduce yourself to the
16 Commission.

17 A. Certainly. My name is Monte Morrison. I am a
18 native Nevadan. I attended the University of Nevada,
19 Reno, Mackay School of Mines, with a degree in chemical
20 engineering, 1986.

21 And I was in geothermal power actually a year
22 before that, starting as an intern. I progressed
23 through the Ormat companies until 1992 when I began
24 managing my first set of plants. And I continued
25 through six companies. And I've managed geothermal

1 power plants in Nevada, California, Hawaii, Utah, and
2 now I am becoming more familiar with the power plant in
3 New Mexico.

4 I am a professional engineer, licensed in Nevada
5 in chemical engineering and a licensed emergency medical
6 technician for my other set of duties, which is the vice
7 president of safety for Cyrq Energy as well.

8 I recently joined Cyrq through the sale of the
9 Soto Lake Geothermal Power Plant in Nevada. And I moved
10 from my previous employer, Alterra Power, out of British
11 Columbia and joined Cyrq in late January of 2015.

12 Q. Monte, will you please tell the Commission who is
13 Cyrq Energy and what is its relationship to Lightning
14 Dock Geothermal HI-01 --

15 A. Certainly.

16 Cyrq Energy is a multi-state geothermal power
17 plant owner, operator, and developer. We currently have
18 facilities in southwest Utah at Thermo 1, in western
19 Nevada at Soto Lake Geothermal and an acquisition in
20 progress of Petua Geothermal.

21 And as it relates to Lightning Dock Geothermal
22 HI-01, Cyrq Energy is the sole member of Raser Power
23 Systems, which is the sole member of Los Lobos Renewable
24 Power, which is the sole member of Lightning Dock
25 Geothermal HI-01, LLC. So it's a tiered relationship in

1 the corporate structure.

2 Q. Thank you. And to answer the Chairman's
3 question, please tell us how the power plant works.

4 A. Certainly. Lightning Dock Geothermal is a plant
5 that is very similar to many other organic rank and
6 cycle binary geothermal power plants. So in general
7 terms these plants take hot water out of the ground,
8 typically by pumping, almost exclusively by pumping.
9 You take that water to the surface, and then you run it
10 through heat exchangers where we extract heat as our
11 form of potential energy and move that heat into the
12 secondary fluid -- hence the term "binary."

13 In the case of Lightning Dock, the secondary
14 fluid is R245, a refrigerant. In other sites, it's a
15 hydrocarbon, such as pentane or butane.

16 When the heat is transferred from the hot water
17 passing through the heat exchangers, it boils, and then
18 it slightly super heats the secondary fluid, in this
19 case the R245. That energy then is transferred as a
20 driving force to turn a turbine or, in this case, four
21 turbines through four separate cycles.

22 Those turbines in turn turn a generator, and
23 that's the driving force to make the electricity through
24 a common synchronous generator that is routine to
25 industry. After the R245 energy is mostly spent through

1 the turbine process, it is then sent to a condenser, in
2 this case air-cooled condensers where we pass air across
3 coils.

4 It cools the 245 to a point where it condenses.
5 And then it drains into the suction of a pump. That
6 pump pumps it back to the vaporization side of the
7 process. And it goes, in essence, around and around
8 through that process.

9 The geothermal water, after it passes through the
10 heat exchange process, is then cooled, and it is sent to
11 the injection wells in a 100 percent recycled situation.

12 Unlike a flash plant where there is consumption,
13 binary geothermal is a 100 percent reinjected process.

14 Q. Does the water ever come into contact with the
15 R245 or anything?

16 A. No. The water from the time it is pumped out of
17 the well or wells through the process -- unless there is
18 an upset through a broken tube or something like that --
19 and in a plant as young as Lightning Dock that would be
20 highly unusual -- the water is then sent through the
21 process and either through natural pressure from the
22 outlet of the plant or a booster pump is then pumped
23 into the injection wells.

24 Q. So at Lightning Dock, what is the temperature of
25 the water when it comes out of the ground and then after

1 it passes through the heat exchanger going back into
2 reinjection?

3 A. Certainly. The production temperature is very
4 stable, and it is approximately 312 degrees Fahrenheit as
5 it is pumped out of the ground. We use a pump in order
6 to maintain a liquid phase. It never turns into steam.
7 It stays as a pressurized, saturated water, as a liquid.

8 And as it's sent through the heat exchange
9 process, the water is cooled, because, as I said, we are
10 extracting the heat to make our electricity. The exit
11 of the power plant temperature is dependent on the
12 number of operating units. Currently we have four
13 installed with others in development.

14 It is also dependent on the ambient air
15 temperature. The higher the air temperature, the less
16 efficient the process is. And that will cause the
17 outlet temperature to vary.

18 So to answer the question, right now the outlet
19 temperature is between 180 and 210 degrees Fahrenheit.
20 But that number can vary, typically downward, because as
21 we have more units in operation and we enter the colder
22 winter months, we'll extract more heat and the unit will
23 run better and we will have cooler injection
24 temperatures.

25 But all air cooled power plants have a wide range

1 of injection temperatures based on several variables.

2 Q. So, Monte, is there a scenario where the
3 injectate would be 80 degrees or something cold?

4 A. It is very unlikely. There's very minor
5 scenarios during a brief period of start-up, for
6 minutes. But it is highly unusual.

7 Typically, you will see much higher injection
8 temperatures during upset conditions, where the
9 geothermal water is bypassed around the operating units
10 and sent directly to injection during an upset, during
11 an unfortunate utility interruption or a plant stoppage,
12 and so that would be the case.

13 It is very unusual to see injection temperatures
14 below about 160 degrees Fahrenheit on any of these
15 binary type plants.

16 Q. So the water is still hot; when we call it
17 "cool," it's still hot?

18 A. We call it "cool," we call it "cold"; the
19 operators will call it the cold side of the plant. In
20 essence, it is still a very hot -- from my safety side,
21 it is still a process that is hot enough to be dangerous
22 to people. You have to insulate the pipes and be
23 cautious of it.

24 Like I said 150, 160; we wouldn't want it any
25 cooler than that, because the properties of the water

1 can become corrosive or scaling. I'm not as familiar
2 with Lightning Dock; but my other facilities, we like to
3 keep it above 150 to be injected.

4 Q. So you mentioned Lightning Dock now has four
5 units and there are other units coming into place. Will
6 you please talk about the surface plans for this
7 location, this facility?

8 A. Certainly. Our plans are -- currently we've just
9 been in the process of improving the existing four 1.0
10 megawatt gross units. They are in service, they are in
11 place. The fourth one is actually starting today after
12 some maintenance work.

13 And then the plans are we currently have been
14 building out phase II. And the first part of phase II
15 is there is construction completed on site. We have
16 concrete in place. We have equipment, heat exchangers
17 and turbines and generators and such for an additional
18 one, a 2.3 megawatt unit and an additional 0.975
19 kilowatt unit. Those two are being built as we speak.
20 And those will be air cooled as well.

21 And further to that, we have -- the next set of
22 equipment will be installed as phase II. And that
23 construction will commence later this year and in early
24 2016, where we will add two additional 2.3 megawatt
25 units and an additional .975 megawatt unit.

1 Q. So these proposed injection wells, how do they
2 fit into the plan for expansion?

3 A. Certainly. As with all of these commercial sized
4 geothermal power plants, they typically start with a
5 reduced amount of production and injection as you prove
6 out the field and the process. And currently we are
7 producing out of 45-7 and injecting primarily into 55-7.

8 These four additional shallow injection wells as
9 well as our expectations for the existing 53 and 63-7,
10 what they will allow us to do is to increase production
11 of our geothermal water to 5,000 GPM as a nominal
12 amount. And when you have increased production, you
13 need increased injection.

14 And so the shallow injection wells that are being
15 permitted, their intent is to lengthen and to increase
16 the breadth of the injection area. You typically want
17 to have a broad rock mass -- speaking as I've heard from
18 the geologists over my years, you want to have a broad
19 rock mass that you're injecting into.

20 And so what this allows is a well field that is
21 then able to be managed, which is what I do. We manage
22 the well fields in all of our sites in order to maximize
23 the injection, minimize the return to production in
24 order to have a balanced well field.

25 And what this allows is for the maximum amount of

1 electrical generation, which is our product, and, hence,
2 the maximum amount of revenue.

3 That said, we need to be able to do that for the
4 life of the facility, which is, you know, approximately
5 30 years.

6 Q. So Lightning Dock has injection wells 63-7, 53-7,
7 another one not on our picture out to the west, 17-7.
8 Why can't Lightning Dock just change those wells for its
9 injections?

10 A. Well, unfortunately, the part of geothermal power
11 that is the most challenging for all of the developers
12 and all of the companies I've worked with is being able
13 to drill a well that is a winner every time. And,
14 unfortunately, 53-7 and 63-7 have shown themselves to be
15 a marginal injector.

16 This is not uncommon. It has happened at other
17 sites I have managed. And the plan going forward --
18 actually, as we are speaking today, we are improving the
19 pipelines out to 53 and 63-7 to allow plant injection
20 pressure to go out there.

21 What we'll do is we will increase the pressure
22 going to those wells through a traditional normal steel
23 pipeline, like we have to 55-7. And so over time, when
24 you apply the pressure from the outlet of the plant to
25 those injection wells, slowly over time typically they

1 will improve.

2 And I'm not speaking as a geologist; I'm speaking
3 as an operator. And I have seen that occur at several
4 other facilities that we manage. We most recently had
5 success at Soto Lake Geothermal, where we were able to
6 improve an injection well from a near zero injection to
7 capability to in excess of 2000 GPM over the course of
8 three years.

9 It's not a quick process, but it is a process
10 that is proven over time.

11 Now, that said, in the meantime, as we are
12 building phase II, we do need to be able to improve the
13 production out of 45-7 through the existing pump or even
14 a larger one and then return 55-7 to its original
15 permitted condition, which is a production well.

16 That will then give us our production, which will
17 be centered, as we can see from the drawing, centered
18 near the facility, and then injection distributed around
19 the facility to the east, north, and west, which will
20 broaden the injection capabilities of the plant.

21 Now, selfishly for me, what that allows is we
22 will be able to produce and inject the adequate amount
23 of water to run the equipment at its general capacity
24 based on the time of the year.

25 Q. So you talk about well field management and

1 production and capacity and all of this sort of stuff,
2 tell the Commission what you are managing for. Is it
3 the long-term? I mean what happens when you -- how do
4 you manage a well field? When you get to tweak, how do
5 you do that?

6 A. Certainly. From my perspective, we manage
7 several items. The three legs of our stool in our
8 organization are a safe working environment for our team
9 and environmentally sensitive.

10 We are a green energy company. We don't burn
11 things and create CO-2. It's our core value to be
12 environmentally sensitive to the water that we're given
13 to use. And the third is that we have to generate an
14 adequate revenue to be a profitable company.

15 That said, what we manage through that is we'll
16 manage the well field daily, hourly, where the
17 operators, the plant manager, and myself will manage the
18 well field by watching injection temperatures and
19 pressures on all of our active wells, and we will
20 provide those -- that data back to our geologist and our
21 hydrologist and to me. And as we watch that, we look
22 for certain indications.

23 The operators will look for changes in pressure.
24 Hopefully, we would see a reduction in well head
25 pressure in an injection well. That would be indicated

1 or collaborated by additional injection flow. And from
2 that we would watch.

3 We also watch to see that our production wells
4 are not changing negatively in temperature. This is
5 critical. Even our CEO watches that number from all
6 four of our facilities every day in the reports. We all
7 watch that very closely.

8 Now, the analysis as to why things change we
9 leave to the geologists and hydrologists. But the fact
10 is that we record it, we monitor it and we adjust daily
11 and hourly as needed to keep a well field operating in
12 what I would call the best situation.

13 Now, that said, Ms. Henrie, we do that in order
14 to keep these well fields productive, meaning they have
15 adequate heat to generate electricity for the life of
16 the project. It does us no value to, say, inject a high
17 volume into an area that you'd have very quick returns
18 to a production well, and, hence, cooling. It's, in
19 essence, a flash in the pan.

20 You'd see very high production rates from the
21 plant. And then, very quickly, you'd follow that by
22 very low production rates, and that has no value to us
23 as a company.

24 Now that all said, we do all that while I hold my
25 plant managers to the standard of all the conditions of

1 all of our permits, not just injection permits, but we
2 have many others. And so they are held responsible for
3 managing this within the limits of all of the conditions
4 of our leases and permits.

5 Q. And all that data managing and that monitoring is
6 realtime all the time, correct?

7 A. Correct. We do training. Our operators who are
8 on site 24/7 -- we are green energy but we are also base
9 load renewable. So we do operate -- our existing
10 projects run typically around 99 percent of the year.
11 We do have several days of downtime for plant outages
12 for maintenance and then upsets from utility
13 interruptions.

14 But for that 99 percent of the time, the
15 operators are there day and night, and the plant manager
16 is there virtually every working business day. And they
17 look for the changes. They will see it far before I
18 will see it or the geologist will see it at the end of a
19 monthly report.

20 And so that is our approach. We treat them as
21 they're managers of that facility and that well field,
22 and they need to be the first eyes to see a change.

23 Q. I have just two more questions.

24 You talked about changes. Have you had
25 experiences of breakthrough or other kind of changes

1 that would affect the long-term sustainability of the
2 well field and what happens in those kinds of
3 situations?

4 A. Certainly.

5 Everything we do is in -- planning, and then we
6 review what we are doing, we build a plan, we execute
7 the plan, and we review the results. And that's in
8 power plant operations. It is in well field operations.
9 It is safety management. It is all of our aspects.

10 And so we have had -- in my history at our
11 Stillwater Geothermal Plant in northern Nevada, in 1989
12 we did have a very quick breakthrough. Our injection
13 wells were too close to our production wells. And we
14 had a rapid temperature decline.

15 We saw that. We made changes in 1990. And by
16 1991, we had recovered to near the original production
17 temperatures.

18 At our Empire Power Plant, again in northern
19 Nevada, we had very shallow injection wells that were
20 near 100 feet of casing depth. And one of them caused a
21 flow to the surface. The operators were able to witness
22 this. I distinctly remember the call. We called the
23 equivalent of the agency in Nevada, the Nevada
24 Department of Environmental Protection, Underground
25 Injection, and we reported it. We stopped it literally

1 within hours of detecting a stream on the surface that
2 was hot water.

3 We found that that well could not be used. We
4 continued to use its twin and other wells in the area
5 for many, many years after that. We sold the plant in
6 1996, so I am not sure of after that. But we were able
7 to evaluate the results of a change, a negative change.

8 We acted on those very quickly, and then we
9 proceeded to move on. And then we drilled other
10 injection that provided normal recirculation, which is
11 from the production well through the plant to injection
12 and then optimally it's far enough both in height, in
13 depth, and in distance from production that it provides
14 the liquid level to keep pumping. Because if you move
15 all of your injection far away, then your liquid level
16 will fall and the pumps will stop operating and then you
17 have no plant -- but far enough that you have adequate
18 residence time between injection and production to mine
19 the heat -- because we do, that's who we are, we do mine
20 the heat off the rock faces -- and then far enough away
21 for mining heat, close enough to allow the same water
22 molecules to go from production to injection in an
23 infinite cycle over the life of the plants.

24 And that's been typical. We did actually have
25 one event where we actually increased temperature. But

1 this is not always the case. That was a huge benefit to
2 us at our Soto Lake plant. But we can't ever count on
3 that. That was just a fortunate turn of events.

4 Q. So the last question from me is why is the
5 Lightning Dock Power Plant expanding?

6 A. Well, we are expanding because we have -- part of
7 the challenges that come with geothermal power and all
8 power in the United States right now is the ability to
9 obtain a negotiated power purchase agreement.

10 We have such an agreement with PNM, we are
11 currently producing into that system and selling the
12 electricity. But we have a larger power purchase
13 agreement than the equipment installed on site will
14 satisfy. So we have milestones and agreements with not
15 only our off-taker who is buying our commodity but also
16 our financial backers who are funding us to purchase the
17 equipment.

18 As the equipment is installed, we need additional
19 heat for it. And so from that we will need to have
20 adequate injection and production. And that plan is
21 then being carried out by the continued use of 45-7, the
22 conversion back to production of 55-7, the use of 53-
23 and 63-7, which we expect to see improvement over the
24 course of the next two to three years, and then the four
25 applications for injection wells that will be

1 redistributing the balance of the water in the well
2 field.

3 MS. HENRIE: No more questions. I pass the
4 witness.

5 CHAIRPERSON CATANACH: Mr. Lakins.

6 CROSS EXAMINATION

7 BY MR. LAKINS:

8 Q. Sir, are your power purchase agreements with any
9 entity other than PNM?

10 A. Unfortunately, I am not familiar with that. I
11 have not yet taken over the operation of the facility as
12 it is transitioning from development and commissioning
13 in my joining the company. I'm sorry, I can't answer
14 that. I don't know.

15 Q. You would agree that any given geothermal
16 production site is geologically unique?

17 A. As I have been told and as I have experienced it,
18 yes, they have what has been told to me to be a thermal
19 anomaly, where you were able to either have a surface
20 expression of hot water or steam to the surface. We
21 like it to be deeper so we are able to pump it. But,
22 yes, they are unique from what I've been told is routine
23 geology, which is just temperature with depth that
24 doesn't give us anything unique.

25 Q. Maybe that wasn't a really good question.

1 Would you agree that each of the sites that you
2 are familiar with -- because you were talking about a
3 couple of other sites --

4 A. Very much.

5 Q. -- the geology at your site in Nevada, as an
6 example, is unique and distinct and different from the
7 site where Lightning Dock is?

8 A. Based on distance, I would have to agree. But
9 I'll leave the definition of "unique" to the geologists.

10 Q. "Different"?

11 A. Different.

12 Q. And one of the things that you said is that --
13 and to make sure I understand this right -- you had
14 talked about how you wanted to see the same molecules
15 from production back into injection; is that...

16 A. Over time we understand that won't be 100 percent
17 complete. But we do understand -- and my most
18 experience is with Soto Lake Geothermal, so let me speak
19 to that. I have been there since it was a green field
20 in 1987 until Monday when I left to come here.

21 And so what has happened is that you do see a
22 homogenization of the water typically. You will see
23 that the same water will pass from production to
24 injection and back again.

25 There is some that does move other directions.

1 And I'm sure that there's some that comes in from unique
2 directions. Again, the hydrologist will speak of it.
3 But the way I manage is that I need to have an adequate
4 level of water in the wells to be pumped and I need the
5 injection to be adequately far away that the water is
6 allowed to reheat to return.

7 Q. To make sure I understand, essentially, then, the
8 goal of the injection is to have the water go back to
9 where it can be reheated and then be extracted again?

10 A. I would say that's a secondary goal. The primary
11 goal is that it is injected in a way that it follows all
12 the conditions of the permit. As you manage the field,
13 when you have achieved number 1, yes, you'd want it to
14 be able to mine the heat and return to production
15 because of the secondary need of maintaining the liquid
16 level that is -- the well's pumped from.

17 Q. So if the injection wells are situated in such a
18 way that the injected fluid does not return to the
19 production zone, what happens?

20 A. Well, I think as far as geologically, I'd have to
21 leave that to our geologists and hydrologists.

22 If I produced from a well and the liquid level in
23 that well declined, I would reduce production until at a
24 point where I could no longer pump from that well.

25 There's various things that you can do to affect

1 that. But I can't really speak of where the water would
2 go from injection. I don't think I am qualified to say
3 that. I think I am qualified to say, if I don't have
4 adequate production, I would have to reduce it until I
5 maintained safe operating parameters for my pumps.

6 Q. Would you agree that any given reservoir has a
7 certain maximum capacity, and if you extract beyond
8 that, the reservoir would be depleted?

9 A. I would say each reservoir does have limits
10 because we are in a geographic area. Speaking to those
11 limits, what I have experienced is that we need to
12 manage the fields that we have. Most of the ones I have
13 been involved with have been expanded over time. And
14 none of my plants have shut down due to a lack of
15 resource.

16 Q. Now, you are talking about hot water; "hot" is a
17 relative term, is it not?

18 A. It is a relative term.

19 Q. 160 degrees in your hand is pretty darn hot?

20 A. Yes, it is. From my EMT background, that would
21 definitely result in a burn.

22 Q. Putting 160-degree water back into the geothermal
23 reservoir is actually putting cooler water into the
24 reservoir, correct?

25 A. It is putting water that has been cooled back

1 into the reservoir, that is correct.

2 Q. And the goal then is that that water reheats and
3 is used again?

4 A. Yes. But let me say that the injection wells,
5 whether it is Lightning Dock or others, typically have
6 not been produced, so we may have some temperature logs
7 in them, but I can't state for certain that the
8 injection wells have the same temperature in them
9 naturally that the production wells do.

10 Q. And would you agree it is possible to extract too
11 much, and when you inject that cooler water, the
12 reservoir will ultimately cool down?

13 A. That can occur. It can occur, but then that
14 comes to the management of the resource to minimize that
15 effect.

16 Q. And that's really dependent upon the scientific
17 aspect of what is the maximum capacity?

18 A. I would agree that's one aspect.

19 Q. One aspect.

20 And just to make sure I understand, the current
21 production, is it four megawatts?

22 A. The current production capacity is at four
23 megawatts. We are not there today because we are in the
24 finishing stages of improving the existing surface
25 equipment with nothing to do with the well field.

1 Q. What's the current actual capacity?

2 A. The current capacity as of yesterday, it was
3 about almost two megawatts gross and it was about 1.5
4 megawatts average net.

5 Let me give you -- when we talk about the output
6 of a plant, being the obsessive engineer that I am,
7 there's different ways of qualifying that. Yesterday
8 the plant made 27 megawatt hours. So that in a 24-hour
9 period is about 1.2 or -.3 average. But during the cool
10 of the morning, it did better than that. And during the
11 heat of the afternoon, it did a little worse.

12 Q. But you said the average is about 1.5?

13 A. About. And it's improving as we go day by day
14 right now.

15 Q. But the plant as built can do four?

16 A. Four megawatts gross less the needs of the plant,
17 the pumps and motors and devices that are required for
18 the process as well as for pumping the water.

19 Q. And you want to add 8.9 in two phases?

20 A. In phase II we do, yes.

21 Q. What is the total between phases I and II,
22 because I got it as 8.9 from what you said?

23 A. Adding it in my head, we are at about that, and
24 those are gross capacities off the generator. So from
25 four and then adding about 8.9.

1 Q. So from four up to almost 13?

2 A. Gross, yes.

3 Q. So you want to go from the 1.5 where you are
4 averaged at now to 13?

5 A. I would need to qualify that.

6 Currently three of the turbine generator sets are
7 capable of running at their 1.0 megawatt. We are still
8 in the commissioning phases of the improvements that
9 were completed all summer. And so we are building to go
10 from the four megawatts gross capacity to the 13.

11 Q. So what was the average over the last year then?

12 A. Gosh, sir, I hate to tell you this, but I don't
13 know because I haven't studied it. I only joined the
14 company in January and I don't know.

15 Q. Okay.

16 MR. LAKINS: I pass the witness.

17 MS. MARKS: I have no questions for the
18 witness.

19 MR. DOMENICI: Just a couple.

20 CROSS EXAMINATION

21 BY MR. DOMENICI:

22 Q. Are you familiar with the term in geothermal
23 power production related to the water of a closed loop
24 system?

25 A. On the geothermal side, yes.

1 Q. On the geothermal side.

2 A. I am familiar with a term that the definition may
3 be similar to yours.

4 Q. And what would that be?

5 A. Mine would be that we are producing and injecting
6 from a resource that is potentially bounded. And it
7 isn't an open resource -- again, I am not a geologist.
8 I am a surface guy. So I hear them a lot, but I am not
9 one.

10 So I would view it as one that is from a resource
11 that is more of a -- it's limited in its width and
12 breadth as opposed to having natural water flowing past
13 the site, which I have managed one of those as well,
14 underneath ground water flowing.

15 Q. And what do you consider this site?

16 A. I would leave that to the geologists. My lack of
17 familiarity with the geology leaves me pretty uninformed
18 there.

19 Q. But you managed a site that you would consider
20 not a closed loop?

21 A. Yes, I have managed the site that was non-closed
22 loop. It's Steamboat outside of Reno, Nevada, where
23 water was migrating out of the Sierra Nevadas toward the
24 valley in the Truckee Meadows. And they are unusual.
25 From my experience, they are typically unusual to have a

1 site where water is flowing past the site in a surface
2 arrangement.

3 Q. And in terms of the -- not looking laterally but
4 looking up and down --

5 A. Yes.

6 Q. -- do you know whether this is a closed loop
7 site?

8 A. Again, sir, I will defer to my
9 geologist/hydrologist.

10 Q. Just based on operations, do you know if this
11 site was represented to the community as being a closed
12 loop geothermal project; do you know one way or another?

13 A. Due to my term with the company, I don't know
14 those representations.

15 Q. In your experience managing these kinds of
16 operations, has that been important to your neighbors,
17 whether or not your facility was operating in a closed
18 loop aquifer or as this one you mentioned that you
19 manage where the water was flowing through?

20 A. I would say it is important that the resources
21 were managed to mitigate the challenges that come with
22 injection through either temperature or level decline.

23 I would say as far as being in a totally
24 segregated or separated system, I can't represent that,
25 to what it was said to the neighbors there.

1 MR. DOMENICI: That is all I have. Thank
2 you.

3 EXAMINATION BY EXAMINER BALCH

4 EXAMINER BALCH: So, Mr. Morrison, 13
5 megawatts planned through phase II, right?

6 THE WITNESS: Yes, sir, gross.

7 EXAMINER BALCH: Is that a cap or is there a
8 potential for more?

9 THE WITNESS: Well, we would like to
10 think -- because we are developers, we'd to think always
11 that there is a potential to improve the site or be able
12 to be near it. Right now that is the limit of the
13 equipment that has been purchased and the limit of the
14 power purchase agreement that has been procured.

15 It is also the intentions of the company to
16 operate at the level with our existing production wells
17 and future injection wells, to manage it and produce and
18 optimize the site at that point. That would be --

19 EXAMINER BALCH: So phase II would be
20 dependent upon the performance of phase I --

21 THE WITNESS: At any of our sites, that
22 would be correct, yes. Any future expansion is based on
23 previous performance.

24 EXAMINER BALCH: I know you're talking about
25 a 30-year design life.

1 THE WITNESS: Yes, sir.

2 EXAMINER BALCH: But you would probably like
3 to see it also go on longer than for 30 years?

4 THE WITNESS: Yes.

5 EXAMINER BALCH: 30 years is the minimum
6 that you think you can get from the information that you
7 have and the rate you want to produce?

8 THE WITNESS: If that's a question, I
9 probably spoke from my experience. Most of my sites
10 that I have operated are in service.

11 I started in 1985, and every site that I
12 have managed is currently still in production, and a
13 couple of them have gotten there.

14 The surface equipment typically will wear
15 out in 30 years. The production wells at Soto Lake,
16 Stillwater, Empire, Steamboat, southern California,
17 Hawaii, they will go on beyond that and most have.

18 There are needs to drill in the future for
19 wells that degrade through corrosion and other effects.
20 But the equipment, typically the efficiency of it, much
21 in the way automobiles are, 30-year cars don't get the
22 mileage of 2015s. So that's the -- that is sort of the
23 tipping point when you look at repowering a project.

24 The well field is such that I expect the
25 wells that I have managed at Soto Lake to go far beyond

1 30 years. And their 30-year anniversary would be --
2 '87, so it would be 2017.

3 EXAMINER BALCH: Also as a business,
4 30 years would be what you're looking at?

5 THE WITNESS: Thirty years would be the look
6 at as far as the durability. That's typically an
7 industry standard that I'm familiar with.

8 EXAMINER BALCH: Do you work with a lot of
9 engineers?

10 THE WITNESS: I do. I typically work more
11 with business and operations people. I am an engineer
12 but I typically am not with too many of them.

13 EXAMINER BALCH: So you're familiar with the
14 engineering safety factor?

15 THE WITNESS: Oh, yes.

16 EXAMINER BALCH: Of two times or more. So I
17 am presuming that if your business plan is taken into
18 effect, then you could probably do more than you already
19 are trying to attempt?

20 THE WITNESS: More in what regard?

21 EXAMINER BALCH: Well, you could produce
22 more water and you would produce more energy in theory.

23 THE WITNESS: Yeah, that engineering safety
24 factor kind of goes out when you get into hydrology and
25 geology. So I will speak to the sites that I manage

1 that I'm much more familiar with.

2 My intent is to produce the water that the
3 wells are capable of, inject in such a manner that I
4 maintain that, that I don't degrade my temperatures and
5 I have long durability.

6 I would typically be very disappointed if I
7 had a well that could produce twice the amount of water
8 and I couldn't extract it. That would be disappointing
9 to me. And, typically, we would want to be able to
10 produce at the limits of the well.

11 Actually, one of the wells at Lightning Dock
12 is so good that we probably will have some capacity left
13 in that well, in 45-7, because the means through the
14 pumps are -- through physics, they are just incapable of
15 producing what the well can deliver.

16 I hope that answered your question. I
17 didn't mean to be cagey.

18 EXAMINER BALCH: No, that's fine. Similarly
19 for the injection site, I believe one of the reasons why
20 you are in this room in front of the Oil Conservation
21 Commission is that we deal with wells --

22 THE WITNESS: Yes.

23 EXAMINER BALCH: And injection.

24 THE WITNESS: Yes.

25 EXAMINER BALCH: And injection pressure

1 limits and things like that?

2 THE WITNESS: Certainly.

3 EXAMINER BALCH: So those factors all have
4 to be taken into account in your design of your disposal
5 field --

6 THE WITNESS: Yes.

7 EXAMINER BALCH: Or your recycle field?

8 THE WITNESS: It would be better termed,
9 yes, yes.

10 EXAMINER BALCH: Right. Which comes to the
11 next question and I think it's mirroring what Mr. Lakins
12 was saying. If you are injecting shale, are you going
13 to be able to ensure long term enough recycle to be able
14 to keep your production up at a high enough level?

15 THE WITNESS: I will let the geologist speak
16 to the underground pathways and methods.

17 What I would manage would be the injection
18 pressure limitations based on the first entry into the
19 well. I will manage to the temperature that the
20 production wells produce at, and watching those to the
21 tenth of a degree over time.

22 And we watch for changes in pressure and
23 volume that are atypical. Our regulatory body in Nevada
24 is very keen on this. And we do watch those plots very
25 closely. So I think I will leave the subsurface view to

1 the geologist. I would tell you what I would watch and
2 what I will manage from the surface.

3 EXAMINER BALCH: From an operational point
4 of view --

5 THE WITNESS: Yes.

6 EXAMINER BALCH: I am asking a little bit
7 after Mr. Domenici's question.

8 THE WITNESS: Uh-huh.

9 EXAMINER BALCH: Is your design for the
10 project to gradually deplete the reservoir over 30 years
11 or is it to constantly maintain it --

12 THE WITNESS: Oh, my gosh. Absolutely we
13 would want the resource to be in 30 years, after I am
14 far retired, to be adequate for a repowering of the
15 facility to produce additional electricity through more
16 efficient means.

17 Certainly we would not ever intend to
18 deplete a resource intentionally. Because the time
19 frame we are dealing with in power plant time, the
20 30-year period, to me is so great that you need to work
21 today to have it the same next year and in ten years and
22 in 30 years.

23 Certainly we may plan for a very small
24 degradation in temperature, and that has occurred across
25 geothermal fields all over the western U.S. and

1 internationally. But we certainly wouldn't ever do
2 anything to exacerbate that. We would do everything in
3 our power to maintain it.

4 And I have some very selfish reasons for
5 that. I have budgets to maintain, I have generation
6 forecasts to make. And if we lose one degree of
7 temperature -- it is the old thing, if you are losing
8 money on a widget, you can't make it up on volume.

9 If you're using your geothermal and you lose
10 temperature, you're not going to make any more
11 electricity unless you're more efficient. And at some
12 point, that's a losing battle.

13 That said, I'm selfishly wanting the highest
14 temperature for the longest time possible.

15 EXAMINER BALCH: Thank you, Mr. Morrison.

16 THE WITNESS: You're welcome.

17 EXAMINATION BY COMMISSIONER PADILLA

18 COMMISSIONER PADILLA: Can you quantify the
19 small degradation that you just referred to?

20 THE WITNESS: It varies on every field I
21 have operated. Some wells have a temperature decline of
22 potentially a degree a year; others, much less. And the
23 ones Ms. Henrie asked me to describe, they were much
24 higher in the short term. And then those wells were
25 stopped. I mean, we physically stopped and made radical

1 adjustments due to those changes.

2 So we would potentially budget for less than
3 one degree per year.

4 COMMISSIONER PADILLA: Going back to the
5 safety side of the coin, what kind of injection
6 pressures are we talking about for this project?

7 THE WITNESS: Again, because we are not --
8 we are producing at 312 degrees. I will give you a
9 little background. We are producing at 312 degrees;
10 therefore, we have to have a production pressure that is
11 in the 100 psi range, plus or minus. And that's in
12 order to maintain the steam in liquid phase. We don't
13 want the steam to break out.

14 And we also don't want any gases. Now, I am
15 totally unfamiliar with the amount of CO-2 or other
16 dissolved gases in this water, but I will speak to my
17 other sites. We would need to maintain a little bit of
18 pressure to maintain those in solution. So that said, a
19 typical 312-degree production well will be produced at
20 about 100 psi, maybe 110.

21 After it passes through numerous tubes,
22 valves, pipes, and such through the process and it is
23 cooled, we would inject at less than 100 psi. But that
24 said, that is dependent on each individual injection
25 well.

1 An injection well with a 1,500-foot solid
2 casing could be injected into at a much higher pressure
3 than one with 150, of which three of ours are projected,
4 and 500. And so we would limit that at the well head,
5 if needed, to maintain it under the permitted injection
6 pressure. And those vary on the gradient and the
7 temperature of the water typically.

8 COMMISSIONER PADILLA: Mr. Janney touched on
9 the fact that 63-7 and 63A-7 -- or 63A-7 was being
10 permitted close to 63-7 because it had desirable
11 porosity levels, for which he had testified that the
12 63-7 was a marginal well. I am just wondering if you
13 can clarify.

14 THE WITNESS: Because I was not involved in
15 the drilling of 63-7 and because of the vast difference
16 of the height of first injection, I will let the
17 hydrologist answer the question. But I could only
18 assume why that is the case.

19 I would make assumptions, but it would only
20 be guessing and not giving you fact.

21 COMMISSIONER PADILLA: Thank you.

22 THE WITNESS: You are welcome.

23 EXAMINATION BY CHAIRPERSON CATANACH

24 CHAIRPERSON CATANACH: Mr. Morrison, do you
25 know if the reservoir temperature varies from the

1 shallow to the deeper injection wells?

2 THE WITNESS: I do not know that.

3 CHAIRPERSON CATANACH: And currently you are
4 not bringing any outside sources of water to inject into
5 the injection wells; it is all producing from the
6 formation --

7 THE WITNESS: That is correct. Everything
8 that we produce from 45-7 is being injected into the
9 field with no other waters being introduced.

10 CHAIRPERSON CATANACH: Currently you're
11 producing out of 45-7 and injecting into 55-7; is that
12 correct?

13 THE WITNESS: Generally, yes, that's
14 correct. With 53-7 and 63-7, there are some small
15 pipeline upgrades but they have been injected into as
16 well over time.

17 CHAIRPERSON CATANACH: Smaller amounts?

18 THE WITNESS: Yes. That's the reason for
19 injection permits we're requesting for certain.

20 CHAIRPERSON CATANACH: Is the injection
21 interval in the 45-7 the same as the producing
22 interval -- I'm sorry. The 45-7 and the 55-7, is that
23 the same interval, do you know?

24 THE WITNESS: Unfortunately, sir, I don't
25 have the schematics well evaluated yet on how the wells

1 are constructed.

2 CHAIRPERSON CATANACH: They are pretty close
3 in proximity. Have you seen a reduction in the
4 temperature of the producing well with that?

5 THE WITNESS: I have not seen it. But,
6 again, my time is limited. I have not heard of a
7 temperature decline in that. They are very close
8 together, and I haven't seen that temperature in my
9 limited time of watching the site.

10 CHAIRPERSON CATANACH: So you don't know --

11 THE WITNESS: I don't know.

12 CHAIRPERSON CATANACH: Were you involved in
13 the planning of the location of the four injection
14 wells?

15 THE WITNESS: No, sir, I was not.

16 CHAIRPERSON CATANACH: Would it be your
17 opinion that the way the proposed injection wells are
18 situated that you would expose more of the formation
19 than has currently been exposed to injection and
20 possibly gain more heat that way by exposing more of the
21 formation to water injection?

22 THE WITNESS: Based on my surface experience
23 at other sites, by lengthening and broadening the
24 geography of where the wells are placed, yes, that would
25 be the case; as well as by deepening the zones where the

1 water would have to migrate from the more shallow
2 injection points to the deeper production points.

3 I am just making a general observation. If
4 you took the site, made a cube of it, laid it on its
5 side, we could all agree to that, I think.

6 CHAIRPERSON CATANACH: I have nothing
7 further.

8 EXAMINATION BY MR. BRANCARD

9 MR. BRANCARD: I have a question. So the
10 application is for four new injection wells. Are those
11 four injection wells intended to get this project all
12 the way through phase II and the 13 megawatt goal or may
13 there be need for more injection wells along the way?

14 THE WITNESS: It is my understanding they
15 will, but as the wells have yet to be drilled and the
16 risk that comes with drilling -- if anybody in
17 geothermal likes that risk, they are usually unusual and
18 they go out of business too quickly.

19 It is our intent that if each were
20 successful, yes, this would take us to a point where we
21 are able to produce from the two existing producers of
22 which one we are using as an injector currently, 55-7,
23 we would inject as much as we can under permit to 53 and
24 63, and the balance to the four shallow injectors
25 through phase II.

1 And then it is certainly my expectation that
2 53 and 63 would then improve over time and we would have
3 a broad spectrum of injection capabilities at this site
4 that we are able to produce locally and inject in that
5 length and breadth.

6 CHAIRPERSON CATANACH: One more. What is
7 the mechanism by which injection performance might
8 improve in the 55-7 and 63-7?

9 THE WITNESS: The mechanics of the rock I'll
10 leave to the experts.

11 As I watch the gauges through my operators
12 and I read the reports, what we see is over time the
13 wells will be limited to the maximum injection pressure;
14 slightly under, we never want to go over. You never
15 want to approach a notice of violation. So that is just
16 good, prudent business practice.

17 Over time you will see wells that take
18 almost no injection. And I will speak to the one that I
19 am most familiar with at our site in Nevada. And over
20 time that well improved where it barely kept the
21 pipeline warm during very cold winter operations.

22 And over time, it would slowly improve, and
23 the operators would -- and I mean very slowly. You
24 would increase the valve opening one or two percent
25 after a month or two, because what they would see is

1 that the injection pressure would very slowly decrease.

2 And as that decreased -- usually the
3 injection flow rate is inversely proportional to
4 injection pressure. So as the injection pressure
5 declined, you can increase flow.

6 In just general terms, we would go from --
7 the lowest a flowmeter can typically record is maybe
8 50 gallons a minute. You would see it go from 50 to 100
9 as the operator would make a step change.

10 All of us, my plant manager and the shift
11 supervisors and such, would see that and we would ask,
12 What's going on?

13 The operator would say, Well, I saw the
14 injection pressure go down and I was able to open the
15 valve and return the pressure back to near the permitted
16 limit.

17 And that will occur on a time to time
18 basis -- at Soto Lake, it took three years.

19 So that is the mechanism that we would use,
20 the conditions of the permits, good prudent operation.
21 And, at the same time, we are watching production
22 temperatures.

23 Now this field is very small in number of
24 wells. We have other fields that have 13 producers and
25 injectors total, and it is more complicated. But we do

1 the same thing at those sites.

2 COMMISSIONER PADILLA: Just one more
3 question. Have you ever seen the reverse happen?

4 THE WITNESS: I have. Only on a production
5 well, where I saw the temperature increase from 330 to
6 360 over the course of weeks. And it was a very deep
7 well, and our understanding was that we were opening the
8 resource -- and I am talking very deep, like a 9,000
9 foot directional well. And it was open for 7,000 feet.
10 And we feel that we were getting deeper flow that we
11 didn't anticipate.

12 So I have seen it once, a production well
13 increase in temperature dramatically. Some will change,
14 you know, over the course -- they will move around 1
15 degree or so. We never get nervous over that.

16 COMMISSIONER PADILLA: Thank you.

17 THE WITNESS: You're welcome.

18 MR. BRANCARD: Let me just follow up on the
19 question I asked then.

20 So is there sort of a linear relationship
21 between the amount of power you are trying to get and
22 the amount of liquid that is moving through the system?

23 THE WITNESS: Absolutely, sir. We use the
24 term "heat rate." It's the same as used in thermal
25 power plants, whether you are using the radiation from

1 nuclear or burning coal or gas. From a certain amount
2 of potential energy, you will generate a certain amount
3 of electricity through the efficiency of the process.

4 So that said, we typically on this project,
5 at 212 degrees, we expect about 2 kilowatts per gallon
6 per minute nominal, meaning, we get to about
7 5,000 gallons a minute, we will generate about
8 10,000 kilowatts or ten megawatts.

9 Now, that is all dependent on ambient air
10 temperatures and the number of units that are on line
11 for maintenance purposes. But, generally, that's the
12 case. It is a linear relationship. Where that does
13 break down is in the heat of the summer in air-cooled
14 condensers, you do have a much quicker fall-off in
15 production.

16 One of our sites actually moves ten
17 megawatts in one day. From the heat of the day to the
18 cool of the day, it will move ten or more megawatts. It
19 is very troubling to management when they see this in
20 Salt Lake City. We've explained it to them.

21 That is a nominal number, using the annual
22 energy we generate in megawatt hours over the course of
23 a year and the average production flow rate, it is about
24 linear at about 2 kilowatts per GPM.

25 MR. BRANCARD: So if you are now producing

1 sort of at a average of one-and-a-half megawatts and
2 your goal is 13 --

3 THE WITNESS: Our goal is 10. The 13 would
4 be gross, because we do have the parasitic load from
5 pumps and motors and fans and computers and coffee
6 machines and so on.

7 MR. BRANCARD: So one-and-a-half to ten net?

8 THE WITNESS: Right.

9 MR. BRANCARD: Are you looking then at an
10 increase in injection of six to seven times the --

11 THE WITNESS: No, sir. We are looking at --
12 the production well currently can produce in excess of
13 2,000 gallons a minute. And we can inject that into
14 55-7. So our intent would be to supplement the
15 injecting through the four shallow injectors, improving
16 through 53 and 63 in order to accommodate the entire --
17 and I didn't get into this, and if I may speak freely on
18 one bit of physics -- is that okay?

19 EXAMINER BALCH: I'm a geophysicist so go
20 for it.

21 THE WITNESS: All right. There we go. You
22 know this, then, so we're good to go.

23 The water actually shrinks in volume over
24 the course of cooling. And this process from 312 to,
25 say, 160 degrees Fahrenheit, the water will generally

1 shrink about 8 to 9 percent. So if you produce 5,000,
2 really you are only going to inject about 4,500 gallons
3 per minute.

4 The mass is the same. If you put it on a
5 scale, that mass of water is the same. But, physically,
6 if you could contain a gallon of 312-degree water in a
7 sealed high pressure vessel, that same gallon when you
8 cool it to 160 will physically shrink about eight to
9 nine percent. And I say about because it depends on the
10 injection temperature.

11 So to answer your question, we are looking
12 to inject that 4,500 gallons a minute, where currently
13 we can inject into 55-7 all that the 45-7 will produce.
14 So it's an increase of about two times, a little more
15 than two times, not the six times.

16 The reason we are producing so low right now
17 is we are in the final stages of commissioning the
18 improvements on the equipment at site. The site is new,
19 the manufacturer had some improvements. We are very
20 pleased to have them do that for us. And so we are just
21 in the mode of improving production.

22 The site could produce on a hot summer day
23 right now probably more on the order of about 70
24 megawatt hours, give or take. And, again, my lack of
25 familiarity -- I am guessing a little bit -- you know,

1 in the 60 to 70 megawatt hours instead of the 27.

2 And that is nothing to do with the resource.

3 None. It's solely due to the process equipment at the
4 surface and its availability.

5 Does it make sense?

6 EXAMINER BALCH: You didn't mess it up.

7 THE WITNESS: That's good. Thank you.

8 CHAIRPERSON CATANACH: Anything further of
9 this witness?

10 MS. HENRIE: No.

11 CHAIRPERSON CATANACH: This witness may be
12 excused. How long is your next witness?

13 MS. HENRIE: It is Dr. John Shomaker, and I
14 anticipate a lot of questions.

15 MR. BRANCARD: Mr. Domenici, you have a
16 non-technical witness?

17 MR. DOMENICI: She will just take two
18 minutes if you want to do that. No problem. Then
19 she'll get to go home. But she did be here after lunch,
20 too.

21 CHAIRPERSON CATANACH: Let's do your
22 statement.

23 MS. SHANNON: I am just giving an emotional
24 statement, more or less. Thank you for letting me
25 speak. I will go quickly.

1 THE COURT REPORTER: Please state your name.

2 MS. SHANNON: I'm sorry. I am Darr,
3 D-a-r-r, and my last name is Shannon. I am from
4 Lordsburg, New Mexico. I am a commissioner of Hidalgo
5 County and the vice chairman of the Hidalgo Soil and
6 Water Conservation District.

7 My family has been from Hidalgo County for
8 125 years. And I have a very, very, very deep love for
9 my county and everything that goes on in it.

10 Hidalgo Soil and Water Conservation District
11 is charged with protection, conservation, and wise use
12 of our natural resources located within our district.
13 We have been following with some concern and great
14 interest the development of geothermal energy in the
15 Animas and southern Hidalgo County area.

16 In the spring of 2013, concerned citizens
17 brought to our attention the issues they had with the
18 geothermal initiative brought on by Cyrq/Lightning Dock
19 Geothermal, specifically the reinjection process.

20 In our effort to better understand the
21 process and form an unbiased conclusion, several public
22 meetings were held and information was given out
23 concerning the geothermal energy projects.

24 At our regular monthly meeting on
25 November 17, 2013, it was explained to us that it would

1 be a closed-loop system and that it would have no effect
2 upon our shallow water aquifers, which we were extremely
3 concerned about at the time. And that is the reason why
4 we requested this meeting.

5 The deep geothermal water would be extracted
6 and then reinjected into the same deep geothermal waters
7 with no mixing or interfering with our shallow water
8 aquifer that is used for irrigation, human consumption,
9 livestock water, and other domestic uses.

10 Over the last year and a half, several
11 expensive deep wells have been drilled and used with
12 very limited success. And the proposal has now changed
13 to reinject the water into the much shallower waters'
14 aquifer. This mixing of water will have a tremendous
15 detrimental effect on our water quality as the
16 geothermal water has different properties than the water
17 we are currently using and consuming.

18 This violates the original intent and
19 permitted request -- and I emphasize the word
20 "permitted" -- that has allowed this development to go
21 forward to start with.

22 The Hidalgo Soil and Conservation District
23 wishes to go on record as extremely opposing these
24 requests.

25 Thank you very much for your time.

1 EXAMINER BALCH: Ms. Shannon, you are
2 opposing the shallow water injection?

3 MS. SHANNON: Yes, sir. Sorry I sat down.
4 Do you need me to come back up?

5 CHAIRPERSON CATANACH: That's all right.

6 MS. SHANNON: Yes, sir, we do oppose; I mean
7 we are extremely concerned.

8 CHAIRPERSON CATANACH: Thank you,
9 Ms. Shannon.

10 MS. SHANNON: Thank you.

11 CHAIRPERSON CATANACH: I guess we will break
12 for lunch at this time.

13 MR. BRANCARD: I just wanted to bring up in
14 regard to non-technical statements, we received -- and I
15 think I forwarded it to the parties -- a statement by a
16 Mr. McKants. I forwarded it to the party that week.

17 I believe he wanted to put something in the
18 record. And I can pass that around and folks can look
19 at that.

20 CHAIRPERSON CATANACH: Have you seen the
21 documents?

22 MR. LAKINS: No.

23 MR. BRANCARD: It was submitted to
24 Commission Clerk also.

25 MR. LAKINS: Mr. Brancard --

1 MR. BRANCARD: I forwarded an e-mail from
2 Mr. McKants. And, basically, he took his e-mail and
3 turned it into --

4 MR. LAKINS: Oh, that one. That was not
5 just recently. That was some time ago?

6 MR. BRANCARD: Some time ago.

7 MR. LAKINS: Yes. I have seen it.

8 MR. BRANCARD: Okay.

9 MR. DOMENICI: I will take a look at it.

10 MR. BRANCARD: We can talk about it after
11 lunch.

12 MR. DOMENICI: Sure.

13 CHAIRPERSON CATANACH: Let's break till
14 about 1:30.

15 (Lunch recess from 12:20 p.m. to 1:35 p.m.)

16 ---oOo---

17 CHAIRPERSON CATANACH: We will call the
18 hearing back to order and turn it over to Ms. Henrie.

19 MS. HENRIE: We would like to call John
20 Shomaker as our next witness.

21 CHAIRPERSON CATANACH: Please swear the
22 witness in.

23 JOHN SHOMAKER
24 having been first duly sworn, was examined and testified
25 as follows:

1 MS. HENRIE: First, Mr. Chairman and
2 Commissioners, I am going to be asking to qualify
3 Dr. Shomaker as an expert. His bio and credentials are
4 in your exhibits under the Shomaker tab.

5 DIRECT EXAMINATION

6 BY MS. HENRIE:

7 Q. And with that, Dr. Shomaker, I'm going to ask you
8 to just tell us who you are and some of your credentials
9 to be qualified as an expert in hydrogeology and also
10 geology.

11 A. Yes, thank you.

12 I'm John Shomaker, one of the principals in the
13 consulting firm in Albuquerque called John Shomaker and
14 Associates and a geologist and hydro geologist by
15 education and experience.

16 I have a bachelor's and master's degree in
17 geology and master's and Ph.D. degrees in hydrogeology.
18 My experience in hydro geology began in 1965 with the
19 U.S. Geological Survey.

20 And then I had four years with what was then
21 called the New Mexico Bureau of Mines and Mineral
22 Resources.

23 And beginning in 1973, I have been a consultant
24 in hydro geology dealing with groundwater problems of
25 all kinds, almost all in New Mexico.

1 Q. Very good.

2 MS. HENRIE: Commissioner, I would move to
3 qualify the witness as an expert.

4 CHAIRPERSON CATANACH: Any objections.

5 MR. LAKINS: No objections.

6 CHAIRPERSON CATANACH: So qualified.

7 Q. Dr. Shomaker, did you testify before this
8 Commission at the 2013 hearing?

9 A. Yes, I did.

10 Q. And what was the gist of your testimony back
11 then?

12 A. The testimony I gave at that time was partly
13 about a general description of the hydrologic aspects of
14 the geothermal system, partly about the fact that
15 testing up until that time had led to the conclusion
16 that the system would be a closed-loop system in
17 equilibrium.

18 I spoke a little bit about a pumping test that
19 had been carried out by AmeriCulture.

20 Q. And what does equilibrium mean?

21 A. To me, when I use the term "equilibrium" in this
22 context, I am talking about a system in which the
23 pumping from the geothermal production well and
24 reinjection into injection wells are in balance so that
25 the flow from the injection well or at least the

1 pressure response comes into equilibrium with the
2 drawdown in the production well, so it is truly a closed
3 loop.

4 Q. And what kind of data would tell you whether the
5 Lightning Dock Geothermal system has come into the
6 equilibrium post plant start-up? What kind of data
7 would tell you that?

8 A. The primary information would be the pumping
9 water levels in the production well and the casing head
10 pressure in the injection wells.

11 Q. Has that data been provided to you?

12 A. Yes, it has.

13 Q. And I'm going to direct you to Exhibit 3, so
14 Lightning Dock Exhibit 3. And could you tell me, was
15 Exhibit 3 prepared by you or at your direction?

16 A. Yes, it was.

17 MS. HENRIE: I would like to move admission
18 of Exhibit 3.

19 MR. LAKINS: No objection.

20 CHAIRPERSON CATANACH: Exhibit 3 will be
21 admitted.

22 (Lightning Dock Geothermal Exhibit 3 was
23 offered and admitted.)

24 MS. HENRIE: Thank you.

25 Q. Please walk the Commission through this exhibit.

1 What does it show?

2 A. Yes. I would like to begin on the second page of
3 Exhibit 3 with a sort of logical sequence with the
4 graphs relating to production well 457.

5 On this graph there are three plots. One is the
6 temperature that has been measured as the well has been
7 produced since the beginning of last year. And that's
8 the orange symbols. And then the flow rate, the pumping
9 rate from that well is indicated with the green symbols,
10 and the depth to water, the pumping water levels in the
11 well are indicated by the purple symbols.

12 And in my examination of this plot, it appears
13 that the water levels have not changed very much and the
14 flow rates, the pumping rates, have not changed very
15 much since the latter part of 2014. And the temperature
16 also has been very stable during the whole period once
17 the plant was in operation.

18 In moving to the first page of the exhibit
19 relating to injection well 55-7, here the casing head or
20 injection pressure at the surface is given by the green
21 plot. The flow rate is given -- excuse me -- I meant by
22 the blue plot. The flow rate is given by the green part
23 and the ratio of the flow to injection pressure is given
24 by the red symbols.

25 And here again it appears clear that since late

1 2014 the flow rate has not changed greatly in terms of
2 its trend, and the pressure has not changed very much in
3 terms of its trend. The ratio of flow to casing head
4 pressure did not change very much during most of 2014.
5 And then it rose significantly in the latter part of
6 2014 and has been relatively stable since then.

7 The combinations of fairly consistent flow rate,
8 pumping rate, and injection rate into the 55-7 and the
9 fairly consistent pumping water levels in 45-7 and
10 fairly consistent casing head pressure in 55-7 lead me
11 to believe that the system is in equilibrium, things are
12 stable and, therefore, that a closed loop exists.

13 Q. And I think I heard you say this, but let me ask
14 anyway, what, if anything, have you learned about the
15 temperature of the production well, 45-7?

16 A. Looking again at the second page of the exhibit,
17 here the orange plot is the temperature. And it has
18 been essentially stable at approximately 312 degrees
19 Fahrenheit since very early in 2014.

20 Q. So if the temperature were going down, that
21 orange line would dive off?

22 A. That's correct.

23 Q. Are the monitoring wells also in equilibrium?

24 A. I think they are. The water levels in the
25 shallow monitor wells generally rose during the early

1 part of the operation. But in the last number of
2 months, those water levels are relatively stable,
3 suggesting that whatever groundwater mound has been
4 created in response to the injection has now become
5 stable as well.

6 Q. At the hearing in 2013, do you recall discussion
7 about a boundary condition between the production well
8 45-7 and the injection well 55-7?

9 A. Yes, I do.

10 Q. And what would you expect to see in this data if
11 such a boundary existed?

12 A. If there were a barrier to flow or to pressure
13 response, propagation of pressure across a boundary, I
14 would expect to see the water levels in the production
15 well decline and I would expect to see the casing head
16 pressurize, given the same pumping rate and injection
17 rate.

18 Q. Do you recall where the boundary -- what was the
19 source of the hypothesis system about boundary
20 condition?

21 A. I think there are two conceptually. One is that
22 there is a mapped fault and clearly is a fault between
23 the two wells, which, apparently, from the records that
24 we have just been discussing, is accompanied by enough
25 fracturing that it does not constitute a barrier.

1 The other source of the concept that there might
2 be a barrier to flow arose from the interpretation of a
3 pumping test that Mr. Witcher prepared on behalf of
4 AmeriCulture.

5 Q. If you could turn to Exhibit 4, and let me ask
6 you if that is a report of the pumping test that you are
7 referring to?

8 A. Yes, it is.

9 Q. And can you describe to the Commission, just real
10 briefly, what was involved in this well test?

11 A. There were two observation wells and one well
12 being pumped. One of the observation wells was on the
13 same side of the projected fault as the pumped well and
14 the other observation well was on the opposite side.

15 And the interpretation of the test was that --
16 and it is given in this report -- was that a barrier
17 must exist because of the late onset of drawdown effects
18 in the monitoring well or the observation well that was
19 on the opposite side of the fault.

20 Q. And how did the report get to that conclusion?
21 What methodology?

22 A. I don't think that the results or the data from
23 the monitor well on the opposite side of the fault was
24 actually used in the calculation. I think the
25 conclusion was drawn based on the evident late arrival

1 of drawdown effects shown in the plot.

2 Q. Okay. And did they use a Cooper Jacobs or Tice
3 equation to get there?

4 A. The test was interpreted using the Cooper Jacobs
5 simplification of the classic Tice equation. But,
6 again, that interpretation seems to have applied only to
7 the monitor well or the observation well that was on the
8 same side of the fault.

9 Extending that same interpretation, using the
10 same method to the well that was on the opposite side of
11 the fault, I found no indication that a barrier existed,
12 and, in fact, given the different distances of the two
13 monitor wells from the pumped well, the two sets of
14 responses seemed to be perfectly consistent.

15 Q. AmeriCulture's prehearing statement had
16 discussions about ground water or shallow ground water.
17 Can you describe the shallow ground water in the
18 Lightning Dock area?

19 A. I think the shallow ground water should be
20 thought of -- in the Lightning Dock area, within the
21 area of the geothermal anomaly, should be thought of as
22 a part of the geothermal system. The geothermal water
23 rises from depth and fractures.

24 The water arrives there, I think, through flow
25 through a semiconfined or a leaky artesian aquifer at

1 depths and then rises through fractures until the
2 fractures reach the base of the valley fill and then
3 that water moves into and mixes with water in the
4 shallow aquifer. I think such mixing also occurs at
5 depths below the alluvial fill.

6 And I think we will hear testimony from
7 geochemical background that goes to the point of mixing
8 the hottest geothermal water with the fresh recharge at
9 depths considerably below the bottom of the valley fill.

10 But, certainly, when the geothermal water already
11 partly mixed reaches the bottom of the valley fill, it
12 mixes with still more fresh recharge and the mixture
13 moves down gradient in the Animas Valley.

14 So, in my mind, the shallow aquifer, the alluvial
15 fill or the valley fill contains part of the geothermal
16 system. The system as a whole is the water in the
17 fractures in bedrock and also water, top fluoride-rich
18 water in the valley fill.

19 Q. So if it is hot fluoride-rich water, even if it
20 is not the hottest, most fluoride-rich water, and even
21 if it's shallow and not at depth, if it's hot and
22 fluoride-rich, you would characterize it as part of the
23 geothermal system?

24 A. Yes, I would, because some of the development of
25 this geothermal resource in general has been from

1 shallow wells, from wells that were completed in the
2 valley fill.

3 Q. And do you have an opinion -- one of the
4 questions from the Commissioners earlier was about the
5 scope of the impacts from the mounding or from the
6 effects of the power plant well field or the power plant
7 operations in the geothermal system.

8 Do you have any thoughts about the scope of what
9 those effects might be, geographic scope?

10 A. I think as long as the system -- let's put it
11 this way. As long as the geothermal project involves a
12 closed loop, involves reinjection into the geothermal
13 system, as I defined it, the effects will not go much
14 beyond the limits of that geothermal system, just
15 because all the water that's moving as a result of the
16 pumping and reinjection from the project will stay
17 within that system.

18 On the other hand, certainly, pumping and
19 reinjection changes the way mixing occurs. It changes
20 the distribution of pressure in the system and will also
21 change, to some degree, the chemistry within the system.
22 And we have already seen that. We know that the
23 pressure changes as a result of the injection because of
24 the mounding that's occurred.

25 We also know that the mounding, if the system is

1 a closed loop with balanced injection and pumping, we
2 know that the mounding represents an increase in
3 groundwater head, at the higher, at the upper part of
4 the system which moves that water downward, so that we,
5 in effect, create a flow loop within the geothermal
6 system, with water moving down to replace the water
7 that's been pumped.

8 So I think the effects will stay in the system in
9 that way.

10 Q. So would you expect that the proposal for these
11 injection wells, would you expect these wells to expand
12 the scope of the geothermal system laterally?

13 A. I think the geothermal system is a natural
14 phenomenon, and I don't think the addition of wells will
15 change its size and configuration.

16 As I said, I think that the placement of pumping
17 and injection wells and their depths will change the way
18 mixing occurs and will change the relative groundwater
19 heads and, to some degree, the chemistry.

20 Q. Would that be true of all wells in the geothermal
21 system, including AmeriCulture's and the old Rosette
22 wells?

23 A. Yes, I think so. I think it would apply to all
24 of them.

25 Q. And let me go back just a second, back to

1 Exhibit 4. And I asked probably the wrong question. We
2 talked a little bit about using the Cooper Jacobs
3 solution as a way to analyze or frame the data that was
4 derived from that pump test.

5 And I just wondered if you think the Cooper
6 Jacobs was the right approach for evaluating data
7 obtained from this well test.

8 A. The Tice equation and the Cooper Jacob variant,
9 which is a simpler solution to the Tice equation, is
10 designed for an infinite homogenous isotrophic fully
11 confined aquifer, none of which tests are met here,
12 because we have at least a depth, a permeability almost
13 entirely confined to fractures and we think that the
14 system has significant limits, not very far from the
15 center of the geothermal system.

16 So Cooper Jacob would be a thing to try, but it
17 is certainly not a fully appropriate way of modeling the
18 system.

19 Q. And, Dr. Shomaker, I have seen in writing and
20 heard it said that this Exhibit 4 well test shows that
21 well 55-7, which is right now Lightning Dock's injection
22 well, is in direct hydraulic connection with shallow
23 water wells.

24 A, does the report prove anything about the 55-7
25 and, B, how much connection is there in the Lightning

1 Dock -- or I should say actually the geothermal system,
2 how connected are the deep wells and the shallow wells?

3 A. Let me make two answers.

4 Q. To two questions, fair enough.

5 A. The data that were collected in well 55-7 during
6 this pumping test that is represented in Exhibit 4 only
7 consisted of about seven hours of water level
8 measurements made right at the end of nearly two days of
9 pumping.

10 There was kind of a complicated pumping system
11 scheme. After the part of the test that was interpreted
12 came pumping from two other wells, two additional wells,
13 which complicates things.

14 There were very few measurements at the end. No
15 measurements during the bulk of the pumping period. No
16 pre-pumping measurements, no record of water levels in
17 that well prior to pumping.

18 And it is interesting to note that in some
19 information received from AmeriCulture, which actually
20 came from the state engineer measuring water levels in
21 the well in the area, the range or variation among three
22 of the state engineers' water level measurements, taken
23 at the same time on the same day, is almost as great as
24 the range of variation in the measurements that were
25 taken of the 5-7 well.

1 And so I think I would be tempted to reject all
2 of the data from the 55-7 well measurements, partly
3 because there was no connection in terms of data with
4 almost all of the pumping test and partly because the
5 range or variation, it seems that it could well be
6 within instrumental error, the way that measurements
7 were made, or the small random variations in water
8 levels that occur in wells anyway, especially geothermal
9 wells. So I would not draw any conclusions from the
10 55-7 test.

11 Q. That being said, deep wells and shallow wells
12 within the geothermal system, are they in relationship
13 with each other?

14 A. Yes. I promised you two answers and I only gave
15 you one. The answer to the second question is that I
16 think all the wells in this system, regardless of depth,
17 are connected in the sense that the system itself
18 consists of water moving in fractures until those
19 fractures reach the bottom of the valley fill aquifer in
20 there. Of course, the valley fill aquifer connects
21 everything.

22 So I think it would be correct to say that the
23 water being pumped from well 45-7 and injected into 55-7
24 would be in some degree of connection.

25 Q. One of the protestant's concerns is the

1 AmeriCulture federal well. The state engineer's number
2 was A444. And I think you know where the well is. It's
3 not actually labeled on that chart, but if you look real
4 close, you can see where it's been placed.

5 And the concern is that -- there you go, John.
6 Excellent.

7 A. Sorry. I'm getting a little old.

8 Q. And the concern is that there's been some
9 mounding in that well, which I think protestant is going
10 to say attributed to 55-7 or the injection well that we
11 have been operating.

12 What are your thoughts about that?

13 A. Again, the water level measurements made, I
14 gather, by the state engineer and furnished by
15 AmeriCulture as part of an exhibit, do indicate that the
16 water level in that well has risen and has risen more
17 during the course of the production from Lightning
18 Dock's production well and injection into its injection
19 well. That Well A44 water level has risen more than the
20 water level in monitor well about halfway between the
21 injection well and the A444.

22 So, yes, in looking at that record of water
23 levels, I think mounding has occurred. It is evident to
24 me that Well A44 is immediately downgradient to the
25 west -- I am speaking now of the surface gradient --

1 from AmeriCulture's own facilities.

2 And, as I understand it, AmeriCulture is not a
3 closed loop system. We've talked a lot about closed
4 loop geothermal systems in which all the water stays
5 within the system.

6 I think the AmeriCulture geothermal activities
7 are open, in that geothermal water is pumped and it's
8 mixed with cold water from outside the geothermal area
9 and then simply discharged on the ground.

10 And I think the areas in which that water is
11 discharged can probably be seen on the aerial photo in
12 the form of evident vegetation on the west side of
13 AmeriCulture's facility in here and just upgradient or
14 upstream from the A444 well.

15 The A444 well is very shallow and casing begins
16 right at the water table at about 60 feet. And it seems
17 clear to me that a large part of the mounding must
18 result from recharge of effluent from AmeriCulture's
19 facility that is just discharged into the surface
20 drainage.

21 I should also point out that I believe the
22 historic development of geothermal waters, geothermal
23 heat before Lightning Dock's project began was also open
24 to the environment. The water was produced from
25 wells -- geothermal water was produced from wells within

1 the geothermal system and then simply discharged on the
2 ground.

3 And that clearly represents a much different
4 threat to other ground water, potable ground water, than
5 a closed loop system does.

6 Q. And, Dr. Shomaker, at one time -- let me ask this
7 differently. Do you see any strata within the
8 geothermal system?

9 A. There are strata. I think that certainly the
10 geologic picture which I believe another witness will
11 address in more detail includes sedimentary rocks which
12 are stratified. And certainly there are strata within
13 the valley fill aquifer.

14 On the other hand, the geothermal system, the
15 water in the geothermal system is in fractures, not
16 limited to specific stratigraphic zones. And so I think
17 it's difficult to talk about this geothermal system as
18 residing in a particular stratum if the system as a
19 whole is interconnected by fracturing and extends all
20 the way from the depth at which the hottest water enters
21 that fracture system all the way to the water table.

22 Q. I think this is the last question from me. But
23 Commissioner Shannon brought up that we at one time said
24 to the community, Here's what the project looks like --
25 and that has changed. Can you comment on what was

1 different between then and now?

2 A. Yes. Before the production began, the concept
3 involved pumping from and reinjecting into a fracture
4 system, a fracture system that could be reached and
5 could be accessible at a significant depth, depths below
6 1,000 feet.

7 As we have learned more as more drilling has been
8 done, a better understanding of the system has arisen
9 through the closed loop test that I testified about two
10 years ago; and, still more recently, information has
11 been collected during the early operation.

12 We now understand the system as this whole that I
13 have talked about today that extends all the way from a
14 leaky artesian aquifer at depth through fractures that
15 crosscut the entire geologic section all the way into
16 the valley fill.

17 Q. So our scientific understanding now is based on
18 everything we could get our hands on, but it's different
19 than what it was a few years ago?

20 A. That's correct.

21 Q. And just to be clear, in the geothermal system,
22 water moves up through fractures, moves down through
23 fractures. But you don't see the system expanding
24 laterally, you don't see the water spilling out like
25 this?

1 A. No, I don't. And the reason is whatever is
2 pumped out is reinjected and vice versa, whatever is
3 reinjected is being -- we've now changed the relative
4 heads in the system so that whatever is injected will be
5 moving toward the pumped well.

6 And so I think all the water involved in this
7 project will stay within that geothermal system. I have
8 made the point clearly that mixing patterns will change
9 and they have evidently changed already and the
10 groundwater heads have changed, but only within that
11 system.

12 Q. And that geothermal system goes all the way from
13 the surface down to the deep geothermal source. If it's
14 hot water, if it's high fluoride water, even if it's
15 mixed water, it's part of that geothermal system?

16 A. Yes.

17 But let's also be clear on the fact that the
18 geothermal system itself as a natural system does
19 discharge, because the water at great depth is at higher
20 head than the water at the water table. So there has
21 been a constant upflow of geothermal water in nature
22 before any development took place.

23 And that upflow has led to a plume of, in effect,
24 geothermal water, mixed, original geothermal water with
25 fresh recharge that has formed a plume that extends for

1 many miles downgradient to the north from the Lightning
2 Dock project.

3 So, in my opinion, the project itself, the
4 pumping and reinjection and its effects will all stay
5 within the system, but the system itself discharges
6 water into the groundwater system and always has.

7 Q. And that's naturally occurring?

8 A. That occurs naturally. And that accounts for a
9 high fluoride plume and a high temperature plume that we
10 will hear more about from Mr. Miller.

11 MS. HENRIE: All right. With that,
12 Mr. Chairman, I pass the witness.

13 CHAIRPERSON CATANACH: Mr. Lakins.

14 MR. LAKINS: Thank you.

15 CROSS EXAMINATION

16 BY MR. LAKINS:

17 Q. Dr. Shomaker, good to see you again.

18 A. Good to see you, sir.

19 Q. Dr. Shomaker, do you remember seeing this diagram
20 a few years ago as part of Mr. Richards' presentation in
21 this same room?

22 A. I remember seeing a diagram like that. I can't
23 recall specifically whether it was an exhibit during the
24 2013 hearing.

25 Q. This is part of our Exhibit B.

1 One thing you just talked about, Dr. Shomaker,
2 was sort of an overall description of makeup of the
3 geothermal reservoir. Okay. And what I heard you
4 describe was that the pressure at depth is a higher head
5 and there's a constant upflow and then there is a plume
6 that goes to the north?

7 A. Yes, sir.

8 Q. Is that kind of a visual of your description that
9 you just gave?

10 A. This is not inconsistent with my description.

11 Q. So water comes up from depth and mixes shallow
12 and it exits -- it moves to the north, correct?

13 A. That's correct. I think mixing occurs at greater
14 depth than is suggested here. I think mixing occurs in
15 that fracture system that is labeled upflow zone at
16 greater depths.

17 And I think the evidence for that is in the
18 chemistry and isotope chemistry that Dr. Miller will
19 deal with.

20 Q. Is it your testimony that all the water in the
21 alluvial fill comes from depth?

22 A. No, sir.

23 Q. Where does the water in the alluvial fill come
24 from, the shallow alluvial fill?

25 A. Some of the water in the valley fill is fresh

1 recharge, from precipitation mostly on the higher slopes
2 to the east.

3 Q. And that shallow alluvial fill, some of that
4 mixes with the geothermal, correct?

5 A. Yes, some of that mixes with hot geothermal water
6 and creates thereby a mixed geothermal water within the
7 alluvial fill.

8 Q. Within the shallow alluvial fill?

9 A. Correct.

10 Q. And then the shallow alluvial fill, the general
11 flow is to the north and away from the hot geothermal
12 source, correct?

13 A. That is true. I think in terms of today's flow
14 pattern, that is correct.

15 I think pattern of high fluoride waters which are
16 suggestive of geothermal waters extends to the south and
17 southwest from the Lightning Dock project area. And
18 that has to do, I think, with other geothermal water
19 rising into the system.

20 Q. But the general flow of the shallow alluvial flow
21 is to the north?

22 A. Yes, sir.

23 Q. And I thought I heard you testify that the water
24 that potentially would be injected through these permits
25 into the shallow alluvial fill would make its way back

1 to depth; is that your testimony?

2 A. I think -- yes, my testimony is that the water
3 that is going to be reinjected at whatever depth,
4 whether at great depths or at the 150 feet, is going to
5 stay within this geothermal system, which to me includes
6 all of the red that is shown on this diagram except for
7 the part that is labeled outflow plume.

8 I think the geothermal system -- and we know this
9 is true because some of the geothermal production --
10 some of the utilization of geothermal heat has come from
11 water in the shallow aquifer in the valley fill.

12 Q. What I am trying to understand is if you have
13 water that is injected into the shallow alluvial fill
14 and it is at 150 feet, not at depth -- let's just talk
15 about 150 feet -- which you do agree is the alluvial
16 fill, yes?

17 A. I think it depends on where you are. I don't
18 know from my own knowledge whether that involves valley
19 fill in every case or not.

20 Q. Where the drilling locations are, let's take this
21 one over here, 13-7, do you know if that is in the
22 shallow alluvial fill of 500 feet?

23 A. I suspect it is, yes, sir.

24 Q. Do you know anything about the water chemistry of
25 13-07 at all?

1 A. No, sir.

2 Q. Do you know anything about the geology of 13-07
3 location well?

4 A. I don't think the well has been drilled. And I
5 think the geologists in the room probably -- the other
6 geologists that have involved themselves with the
7 project probably know better what to say about the
8 geology.

9 Q. Now, the other location, the 76-7 at 150 feet, to
10 your knowledge is that in the shallow alluvial fill?

11 A. I think it probably is. But, again, I don't know
12 for sure, and I don't think the well has been drilled.

13 Q. Are you familiar with the monitoring well
14 geology?

15 A. I think all of the monitoring wells are in valley
16 fill.

17 Q. And they go down to 85?

18 A. I think the deepest is about 85 feet, yes.

19 Q. So can you explain to me, are you familiar with
20 the geology between the shallow alluvial fill and the
21 production depth of the wells?

22 A. Only in a general way. I think the best source
23 of geologic information would probably be Mr. Bowers.

24 Q. Well, you're the hydrologist?

25 A. Yes.

1 Q. "Hydro" is the movement of water?

2 A. Correct.

3 Q. Can you explain to me how in injection in an
4 alluvial fill at 150 feet water would migrate through
5 strata into a deep reservoir?

6 A. Where you've shown me that injection to take
7 place is not in the geothermal system. You have
8 indicated it far downgradient from the geothermal
9 system, and what you've described would not occur.

10 Q. I am talking about what you testified to. That
11 is what I want to get at -- is that you testified that
12 these locations of these proposed wells at 150 feet, in
13 the shallow alluvial aquifer, the water would migrate
14 downgradient and to depth where you also testified
15 there's a higher pressure.

16 Can you explain to me how the water in the
17 shallow alluvial fill that is moving northward would
18 migrate to depth of 1,000 to 1,500 feet?

19 A. What I was talking about in my testimony was what
20 would take place within the geothermal system. And in
21 my opinion the geothermal system includes this water.

22 And my testimony is that water injected here,
23 even in the shallow system, in terms of mass balance,
24 would stay in this zone because although there is a
25 natural upward flow, we are also going to be pumping at

1 the same rate that the sum of all the injections will be
2 taking place at. So we are creating a lower pressure
3 which will be balanced by injection.

4 Q. You would be basically creating a cone of
5 depression down?

6 A. Yes, sir.

7 Q. -- down the depth?

8 A. Yes, sir. We know that, for example, we have
9 300-odd feet of pumping level drawdown in the 45-7 well.
10 So we have created a downward or a cone of depression.
11 And we are putting water into the fracture system in
12 various places within this system. And we are putting
13 water into water that is already geothermal water. It
14 is mixed with some fresh recharge, but it is already a
15 geothermal water. It is part of this system.

16 Q. So I understand your position then, it is that
17 you will have a cone of depression down here and the
18 natural flow is upward and out to the north but the
19 water injected into this shallow reservoir area here
20 would be drawdown?

21 A. Yes. We are keeping the mass balance constant
22 within this zone as far as the project is concerned, the
23 pumping and reinjection. And we are changing the mixing
24 pattern as I have pointed out.

25 And there may very well be increases in some

1 constituents in this zone, in the mound that is created
2 there. And it is possible that water -- that in that
3 water, as it moves downgradient, will move downgradient
4 in the system.

5 So we are admitting the evident fact that not
6 only water levels change but water chemistry changes as
7 a result of pumping in the injection.

8 Q. So the water chemistry will change?

9 A. I think there will be a difference in the mixing
10 patterns, because we are injecting into a different part
11 of the system different fractures at different depths.

12 Q. And can you say with any degree of scientific
13 specificity that the mixed water will not exceed any
14 underground drinking water standards?

15 A. Certainly not. The water that moves in this
16 natural flow downgradient already exceeds the fluoride
17 standard.

18 Q. How about in all the monitoring wells?

19 A. We're now talking about this plume. Everything
20 that I have talked about so far has been in this -- in
21 the geothermal zone itself, in the geothermal system.

22 Q. Okay. Well, let's talk about the monitoring
23 wells and the impacts to any other wells. All right.

24 Can you testify with any scientific precision --
25 that's the wrong phrase. Can you tell me, for instance,

1 in monitoring well 5, whether or not the proposed
2 injection from what is well 76-7 would exceed the water
3 quality standards that exist in those wells, change them
4 to exceed drinking water standards?

5 A. I think there will be an increase in fluoride
6 concentration. I don't purport to predict how much that
7 will be.

8 Q. So you can't tell us if it will not exceed
9 drinking water standards?

10 A. In the first place, I don't remember whether
11 monitor well 5 exceeds the fluoride standard now. And
12 since I don't know that, I also do not know whether it
13 would exceed it in the future. And I'm not going to
14 predict what it will be in the future.

15 Q. How about any of the other wells? Can you give
16 us any testimony with any degree of scientific certainty
17 that the injection at the proposed injection sites,
18 which you admit will change the water chemistry, that
19 the wells that have below existing drinking water
20 standards will not be changed to existing drinking water
21 standards?

22 A. I don't know what the fluoride concentrations and
23 other concentrations will be once the system reaches
24 equilibrium again.

25 Q. Let me make sure I understand. You said that in

1 your opinion the existing operation has reached
2 equilibrium?

3 A. Sorry. I didn't understand you.

4 Q. The existing operation as it's ongoing now has
5 reached equilibrium?

6 A. I think it has, yes.

7 Q. How do you explain the mounding in the monitoring
8 wells?

9 A. The mounding is part of that equilibrium. The
10 cone of depression is basically a pressure change at
11 depth. We don't see that reflected at surface, but we
12 do see the -- well, maybe we do. We just don't have
13 monitoring wells that show it. But we do have a
14 response at the water table that's attributable to the
15 reinjection.

16 To pump water from a well requires that you lower
17 the head there. And to reinject water in such a way
18 that it will form a closed loop requires that you raise
19 the head somewhere else. And that raising of the head
20 somewhere else is reflected in the mounding that we have
21 discussed.

22 And I should point out that there has been a
23 groundwater mound there since the beginning of the
24 project. The first water levels, the first measurements
25 before any production were contoured and show the

1 presence of a groundwater mound. And I think that is
2 simply an expression of the upwelling from depth of the
3 geothermal water.

4 And as the operation has continued that mound has
5 grown, has increased in elevation. And I think once
6 injection is back -- injection into the applied for
7 wells has continued for a period, that that mound will
8 look different, it will probably be higher. And, again,
9 I would expect it to reach an equilibrium position.

10 Q. Will there be more water leaving, flowing north
11 out of the plume? Will there be more water up here that
12 will be leaving the system in that event (indicating on
13 chart)?

14 A. I don't think so. I think the fact that the
15 system within or the pumping and reinjection within the
16 geothermal system will be in equilibrium means that the
17 raising of the mound, if you will, simply reflects that
18 the fact that the greater heads will be pushing water
19 down in the system to replace what's been pumped.

20 So I don't think there is reason to believe that
21 more water would leave the system because of the mound,
22 because I think that -- I think what will happen is that
23 the increase in the downward component of flow will
24 occur.

25 Q. How does the downward flow component increase?

1 A. One reason that it increases is because of the
2 mounding; the head has been raised at the water table
3 and, therefore, downward flow would increase.

4 Q. So if I understand you correctly what you are
5 saying is you took more water up here and you are going
6 to fight mother nature's natural flow and, essentially,
7 push against it?

8 A. What we are actually saying is that the upward
9 gradient would be decreased, which algebraically is the
10 same as a downward gradient. But we are decreasing the
11 differential head in the upper direction by creating the
12 mound.

13 Q. So my understanding of what you just said is that
14 by injecting up here, the upflow would just be slower,
15 it wouldn't reverse --

16 A. We're replacing the water that's being pumped,
17 the depth. So we have a decrease in the upward flow
18 above that position.

19 Q. But does a decrease in the upward flow result in
20 a downward flow from the alluvial fill through strata
21 and back down to the production zone?

22 A. I think it results in a net decrease in upward
23 flow.

24 Q. How large is the upflow zone?

25 A. I have seen a variety of maps. And I think,

1 since I'm not a geothermal energy expert, I should
2 probably defer that to people who are. And it really is
3 essentially the zone that has been mapped through which
4 geothermal water rises.

5 Q. So can I properly paraphrase your answer as you
6 don't know?

7 A. I have no professional opinion about it, that's
8 correct.

9 Q. You said there is no evidence of a barrier
10 between AmeriCulture's State well and its Federal well;
11 is that correct?

12 A. I have seen no evidence.

13 Q. Why is its chemistry different?

14 A. I think one reason the chemistry -- let me ask
15 you, you asked about the AmeriCulture Federal well and
16 the AmeriCulture State well?

17 Q. Correct.

18 A. Is the chemistry you are asking about related to
19 the AmeriCulture Federal well?

20 Q. Between those two wells, yes.

21 A. I think one profound influence on the water
22 chemistry in the AmeriCulture Federal well would be the
23 return flow from AmeriCulture's operations, recalling
24 that not all of that water is geothermal water that's is
25 discharged into the arroyo.

1 Some of that water, as I understand the system
2 there, is cold water, which has much different chemical
3 characteristics, notably smaller fluoride concentration.
4 So looking at that shallow well placed, as it is,
5 directly downgradient from the effluent discharge from
6 AmeriCulture's facility, I would expect to see a water
7 chemistry change in the direction of the water in the
8 alluvial aquifer, the valley fill aquifer outside the
9 geothermal zone.

10 Q. So as I understand your testimony then it is that
11 your opinion that the water chemistry is different is
12 based upon AmeriCulture's pumping of its well?

13 A. No, sir.

14 Q. And its discharging water onto the surface? I am
15 not quite following you.

16 A. Let me say it again. I think it would -- it's an
17 easy way to explain a change or a difference in the
18 chemistry of the AmeriCulture Federal well, to look at
19 the fact that it is placed so that it is likely to be --
20 the shallow aquifer there is likely to be recharged by
21 the wastewater effluent that's discharged into the
22 arroyo.

23 And since that wastewater discharge is partly
24 composed of water from the alluvial fill, cold water
25 from outside the geothermal zone, we would expect to see

1 that influence the water quality in the AmeriCulture
2 Federal well.

3 Q. Do you attribute any change in AmeriCulture's
4 well water chemistry to Lightning Dock's operations?

5 A. That is beyond my realm of study. I think
6 Dr. Miller may want to ponder that question before he
7 gets on the stand.

8 Q. And your field of expertise is the movement of
9 water, correct?

10 A. Yes, sir.

11 Q. In your opinion, is water that's being injected
12 into Well 55-7 having any effect of making it to
13 AmeriCulture's wells?

14 A. No, I wouldn't think it would be.

15 Q. Is it making it up to the monitoring wells that
16 are located in this vicinity?

17 A. I doubt very much that it would. I think that
18 what we will see is pressure response, but that's not
19 the same as actual water moving from one well to
20 another.

21 Q. So is it your testimony, then, that the water
22 that is being injected, the actual wet water that is
23 being injected is not having any effect other than
24 pressure on the remaining -- on the wells in the
25 remaining area?

1 A. I don't think we know quite enough to say that
2 it's not reaching any other well. I think predominantly
3 the water that's being injected into well 55-7 is moving
4 through a network of fractures largely toward the
5 pumping well 45-7.

6 There may be water, injected water, seen in
7 another well at some time. But I don't think we know
8 enough to know exactly when or where that would occur.

9 I think the great preponderance of the water that
10 is being injected will find its way through fractures
11 directly into the sink in the groundwater head
12 represented by the pumping well 45-7.

13 Q. So you don't know?

14 A. I am not sure my answer was quite as simple as
15 that, Mr. Lakins.

16 Q. What would the effect of the well -- of the four
17 proposed wells be on the actual water movement within
18 this shallow alluvial aquifer fill?

19 A. I think it will be, as I said earlier in my
20 direct testimony, that will be changes in the pattern of
21 mixing and, therefore, there will be some changes in
22 groundwater chemistry and certainly some changes in
23 groundwater head very much on the order of the changes
24 that we have already seen into a year's operation.

25 Q. Are you aware that the levels of water of

1 AmeriCulture's wells actually rose after Lightning
2 Dock's injection commenced?

3 A. I am aware that the water level in AmeriCulture
4 Federal well rose, yes, sir.

5 Q. Would you attribute that to Lightning Dock's
6 operation?

7 A. A part of it may be. It is not very far away
8 from where mounding was observed in monitor well 2.

9 I think a more likely explanation is the one that
10 I have already given having to do with direct recharge
11 of AmeriCulture's wastewater effluent under the ground
12 in the place where it could easily infiltrate the
13 aquifer that could be found in that well.

14 Q. Are you familiar with the time frame of the
15 change in that well and when it changed in comparison to
16 AmeriCulture's operations?

17 A. I'm familiar with the measurements that were in
18 the State Engineer record, and I took the measurements
19 in the monitor well MW-2 for essentially that same
20 period. And the beginning and the end of the period
21 varied by a few days in each case.

22 But for a parallel period, the water level in the
23 AmeriCulture Federal well seems to have risen more than
24 the water level rose in the monitor well MW2.

25 Q. Are you familiar with that the operation

1 continued and AmeriCulture's operation was in place
2 before Lightning Dock's operation began and there was no
3 change in the federal well, and the federal well level
4 rose after Lightning Dock's operation began; are you
5 aware of that?

6 A. Yes. And I think in the beginning of that last
7 response, I said I thought -- and I intended to say that
8 I think part of the response in the AmeriCulture federal
9 well may be related to Lightning Dock's operation for
10 the reason that it is not very faraway from where we see
11 mounding.

12 But the fact that mounding during that period of
13 common data has been greater in the AmeriCulture Federal
14 well suggests to me that there is some other thing going
15 on, which I'm suspecting is the discharge of wastewater
16 from AmeriCulture's operation.

17 Q. Turning to Lightning Dock's Exhibit 3, can you
18 tell us how those measurements were made, what was
19 utilized?

20 A. I didn't make the measurements. These
21 measurements were furnished by Lightning Dock to me to
22 interpret. So I am not in a position to describe how
23 they were taken.

24 Q. Do you know who would have the answer to that
25 question, Dr. Shomaker?

1 A. I would ask Lightning Dock management who took
2 these measurements and they would tell me. I don't know
3 personally who did.

4 Q. I ask you to turn to Exhibit P in the blue binder
5 there, please, sir.

6 A. (Witness complies.)

7 Q. Are you there?

8 A. Yes, sir.

9 Q. Have you seen the report from Mr. Janney to
10 Mr. Griswold before?

11 A. I have seen a lot of this data, Mr. Lakins, but I
12 don't remember whether I'd seen this report.

13 Q. Let me stop there and just ask to switch gears
14 ever so slightly.

15 Are you familiar with water sampling protocol and
16 data compilation?

17 A. In a general way. My sphere of activity is much
18 more in the realm of groundwater flow and related
19 issues. So if the question is going to be about
20 sampling, I think it would be better directed probably
21 to Dr. Miller.

22 Q. Fair enough.

23 Now, do you recall -- I ask you to turn to
24 Exhibit C in that binder, C as in Charlie, and turn to
25 the third page at paragraph 15.

1 A. Yes, sir.

2 Q. And at that previous hearing back in 2013, the
3 evidence that was presented was that the geothermal
4 fluid production zone in well 53-7 and well 55-7 were
5 the same. That came largely from you, did it not?

6 A. I think it probably did. I would have agreed
7 with that.

8 Q. And that the geothermal fluid flow of intervals
9 occur in the same geologic formations. That came
10 largely from you, did it not?

11 A. I am not sure about that part, but I wouldn't
12 disagree with it.

13 Q. And that they are not directly connected to the
14 alluvial aquifer at 400 feet below ground surface, that
15 came largely from you as well, did it not?

16 A. I don't think that I would have been quite that
17 explicit. I may have been.

18 But my testimony today is that the fracture
19 system that constitutes this geothermal system does
20 extend to the base of the valley fill aquifer and the
21 geothermal water rises into the valley fill aquifer.

22 Q. So then is it your testimony today that the
23 evidence presented back in 2013 was wrong?

24 A. I would say that the last part of the sentence in
25 paragraph 15 is certainly oversimplified. We could have

1 a long discussion about what was meant by "directly";
2 but I would say today that the geothermal system is made
3 up of water that is flowing in fractures from a deep
4 leaky artesian zone, flowing upward in fractures until
5 it reaches the base of the valley fill and then moving
6 into the valley fill.

7 Q. So the water that's injected then in well 55-7 at
8 1,050 feet, that's not cased off from the shallow
9 aquifer then, is it?

10 A. It is cased off from the shallow aquifer.

11 Q. But it is connected to it, it makes it into the
12 shallow alluvial aquifer at 400 feet?

13 A. I think the testimony I would give is that the
14 fracture system connects all the way from the deep
15 artesian -- leaky artesian aquifer all the way to the
16 water table. And so there is flow, there is a movement
17 of the ground water, but I do believe that the 55-7 well
18 is cased well through the valley fill.

19 Q. But the water that is injected makes its way up
20 to the shallow alluvial aquifer?

21 A. The pressure response, I think, does. I
22 don't know -- I know that when we speak of water making
23 its way, we need to be careful about that difference. I
24 think what we will really be seeing is the pressure
25 response, and that's what accounts for the mounding.

1 Q. So the pressure response is the pressure is up?

2 A. The pressure is increasing because of the
3 injection and that causes the water table mounding
4 that's been observed.

5 Q. If the pressure is increasing and the water is
6 moving up, how do you explain how water moved down for
7 more injection?

8 A. Well, more injection into the geothermal zone
9 reduces the head gradient, the upward head gradient,
10 because we are taking that water out as it's being
11 injected. We are balancing the inflow with the outflow.

12 Q. In your opinion, is it possible to construct a
13 well in the geothermal reservoir that cases off and
14 prevents water from flowing into the underground
15 drinking water source?

16 A. I'm not sure I grasp the question.

17 Q. Let me try it again. In your opinion, is it
18 possible to construct a well, an injection well within
19 the geothermal source such that the injected water does
20 not mix with the underground drinking water source?

21 A. The underground drinking water source would be
22 outside the geothermal system. And, therefore, my
23 answer would be it is possible. Because the water that
24 is at the water table, the shallow ground water in the
25 alluvial fill or in the valley fill within the

1 geothermal system is not, strictly speaking, drinking
2 water because of its elevated fluoride concentration.

3 Q. But you are aware that there are drinking water
4 wells, that Mr. Seawright and AmeriCulture actually has
5 a domestic drinking water well on its location?

6 A. I am aware, yes.

7 Q. And is that well not within the geothermal -- the
8 reservoir area?

9 A. I think it is, but I think it is a water well
10 used for drinking, which, in my opinion, is to be
11 distinguished from a water well that produces from a
12 drinking water source.

13 Q. Where is it drawn from?

14 A. The drinking water source in my opinion would
15 have to be outside the geothermal system, because the
16 quality of the water within the geothermal system is not
17 suitable for drinking.

18 Q. Can you give me the definition of an underground
19 source of drinking water?

20 A. I think there are probably several definitions.
21 One that probably fits what you are asking about is
22 underground water that people drink.

23 Q. Are you familiar with the Code of Federal
24 Regulations, the Federal Code of Regulations definition?

25 A. I am not going to quote it without looking at it,

1 no, sir.

2 Q. Would you agree that Federal regulation 40-C-FR
3 applies because these are classified injection wells?

4 A. They probably do, yes, sir.

5 Q. Now, you are making the distinction between the
6 source of water that is AmeriCulture's drinking water
7 well from its other wells. But you also said that
8 there's no barrier between the wells, correct?

9 A. If by AmeriCulture's drinking water well, you are
10 referring to the A44 well or the AmeriCulture Federal
11 Well, what I would say is that there is no barrier, I
12 see no evidence for a barrier between that and
13 AmeriCulture's hot well.

14 I see that there is a significant difference in
15 water quality as between the two. And I think a large
16 part of the difference may be attributable to the
17 recharge of much fresher water as effluent from
18 AmeriCulture's operations.

19 The reason that water would be fresher, if that
20 is the case, is that it comes largely from the cold
21 water supply that is not within the geothermal system.
22 A cold water well would be producing from further west
23 from the valley fill where it contains better quality
24 water.

25 Q. How about any other wells in that area, domestic

1 livestock wells and irrigation wells, is there any way
2 to insure that there is no leasing of water for any of
3 the wells that are in that outflow plume?

4 A. I don't think things will change very much in the
5 outflow plume once we're outside the geothermal system
6 because the mass balance will be at zero within the
7 geothermal system. We will see that water staying in
8 place.

9 Q. So your belief is that the water that would be
10 injected in this area will not continue in the outflow
11 plume and flow in the existing alluvial point?

12 A. I don't think there will be a measurable effect.
13 I think that the water that's involved in the geothermal
14 system, the pumping and the injection, will stay there
15 because it's a closed loop.

16 I think the fact of mounding is an indication of
17 increased groundwater head, which is tending to reduce
18 the upward gradient so that the system will be -- within
19 itself will be a loop. And I don't think there will be
20 very much movement down that -- or very much change in
21 the chemistry in that plume.

22 And I invite you to ask Dr. Miller the same
23 question because he is the one that has looked at the
24 chemistry.

25 MR. LAKINS: I pass the witness.

1 CHAIRPERSON CATANACH: Ms. Marks, any
2 questions.

3 MS. MARKS: Yes.

4 CROSS EXAMINATION

5 BY MS. MARKS:

6 Q. Dr. Shomaker, do you want to give a legal
7 definition of underground source of drinking water?

8 A. No, ma'am.

9 MS. MARKS: I have no further questions.

10 CHAIRPERSON CATANACH: Mr. Domenici?

11 CROSS EXAMINATION

12 BY MR. DOMENICI:

13 Q. Are you familiar with the definition of "ground
14 water" within the water quality regs?

15 A. In a general way. I am not going to quote the
16 regs without having them in front of me.

17 Q. And I quote, "Ground water means interstitial
18 water which occurs in saturated earth material and which
19 is capable of entering a well in sufficient amounts to
20 be utilized as a water supply."

21 Are you familiar with that?

22 A. Yes, sir.

23 Q. And everything in the blue and the red would be
24 ground water, correct?

25 A. It would.

1 Q. And you are not here to testify that the
2 groundwater regulations -- excuse me -- the water
3 quality control regulations that apply to ground water
4 do not apply to any of the red water -- I think you
5 called it the geothermal system --

6 MS. HENRIE: I need to object. This is a
7 legal conclusion. And there is a definition in those
8 regs that carves out geothermal waters --

9 MR. DOMENICI: Where is that?

10 MS. HENRIE: Give me a minute. I'll find
11 it.

12 MR. DOMENICI: Let me just continue.

13 Q. As far as the definition I just gave you,
14 everything in that red area would be capable of -- it
15 would be interstitial water capable of producing a well
16 as far as you know?

17 A. As long as we allow the word "interstitial" to
18 include fractures, yes, sir.

19 Q. Now, looking at that, and then if you will turn
20 in your exhibit book to Exhibit 4, page 5. This sort of
21 looks like -- I'm not sure what you call it -- a
22 geologic cross section.

23 Do you see the diagram?

24 A. I do, yes.

25 Q. And have you prepared a geologic cross section

1 that would assist you in your opinions that you just
2 rendered?

3 A. I have not prepared one, no, sir.

4 Q. Is there a specific geologic cross section that
5 you can refer to that you'll base your opinion on, and
6 particularly the opinion that the mass balance of four
7 shallow injection wells with one deep production well
8 means that all the water stays within that system, is
9 there a cross section you can point to that helps you
10 validate that opinion?

11 A. I don't think that a cross section would be the
12 way to understand that opinion. I think the fact that
13 the system is constituted flow in fractures is the basis
14 of the opinion. And exactly what strata those fractures
15 are in is not so relevant. I think it is the presence
16 of the fractures.

17 And I think the evidence from the water level
18 history and both the production and injection wells and
19 the monitoring wells indicate that that whole system is
20 interconnected, to some degree, and that that is the
21 basis of my opinion.

22 A good geologic understanding is obviously an
23 important thing too. And I think that Mr. Bowers can
24 provide that.

25 Q. Looking at this, do you dispute that the well

1 55-7 is approximately 7,000 -- if I have this
2 correctly -- how deep do you interpret that well to be?

3 A. This diagram indicates that its total depth is
4 7,001 feet.

5 Q. In your analysis of this equilibrium, mass
6 balance equilibrium, doesn't the depth of the production
7 well make a difference?

8 A. I think the evidence for the understanding of the
9 system as a closed loop comes after we have seen and
10 experienced the water level history in the production
11 and the injection wells.

12 Certainly, on the ground and in the mechanism
13 itself where in the fracture system the water is pumped
14 from and where it is reinjected to will make a
15 difference in the pattern of mixing that occurs.

16 So I think the evidence for the closed loop is in
17 that water level history and that that isn't inferred
18 from the geologic cross-section. And, in the first
19 place, I don't think the injection into well 55-7 is
20 anywhere close to 7,001 feet deep. I think it's much
21 closer to 1,000 feet.

22 Q. As far as the production, how deep is the
23 production?

24 A. My recollection is it is around 1,500. But we
25 should consult a geologic cross section to see.

1 Q. And how wide is the screen for that production
2 well?

3 A. I don't recall.

4 Q. The purpose for which I'm asking this is do you
5 have an opinion as to how long it will take the system
6 to come into equilibrium; is it instantaneous?

7 A. No, sir.

8 Q. So there will be a lag time where the injected
9 water will not be pulled down by a production well
10 that's substantially deeper and perhaps not located
11 proximate to those injection wells?

12 A. That's correct, there will be a lag time.

13 Q. And during that lag time, the injection water
14 will be spreading laterally into the outflow plume,
15 correct?

16 A. I don't think so. I think the system water flow
17 is slow enough that the water will stay in the
18 geothermal system. I don't think we will know the
19 definitive answer to that until we have seen the water
20 level history and the water quality history.

21 Q. So are you saying that the water would mound on
22 top of the injection wells but it wouldn't move
23 laterally, is that your testimony?

24 A. I think it will mound. I don't think there's a
25 doubt in my mind that further mounding will occur. But

1 I think that mounding has the effect of increasing the
2 head to move water downward. And while it may be that
3 some water moves laterally out of the geothermal system,
4 the total amount -- the total change in the water in and
5 water out is zero. So there would not be a net flow as
6 a result of the geothermal system.

7 And whether the effect of the mounding is such as
8 to move water that already exists at the water table
9 further downgradient somewhat more rapidly than it moves
10 now remains to be seen. But it will still stay in the
11 outflow plume of hot spotted fluoride water that moves
12 out into the shallow aquifer in the valley.

13 Q. Well, it will stay within the plume, but it will
14 actually increase the mass of the plume?

15 A. I don't think it will increase the mass of the
16 plume because we are not adding any water to the system.
17 To the degree that we're increasing the head in the
18 mound area, we are decreasing the head at greater depth.
19 So we are inducing a net downward flow, which is what
20 makes the system a closed loop.

21 Q. Just so I'm clear, is any system with fractures
22 in it a closed loop? If you produce and inject the same
23 amount of water in a fractured system, ipso facto it's a
24 closed loop system; is that your testimony?

25 A. If the fractures are interconnected and if they

1 are limited, if the area within which the fractures
2 occur is bounded.

3 Q. And so if the production is 5,000 feet and
4 1,000 feet, it is still a closed loop; it doesn't matter
5 the differential of depth between the wells?

6 A. If the factors are all interconnected and if the
7 system is bounded, I think that's correct.

8 Q. When you say if the system is bounded, what do
9 you mean?

10 A. If the factors don't exist or are closed or that
11 the permeability that they represent becomes zero at
12 some distance away from the geothermal window.

13 Q. Where is this geothermal system, as you call it,
14 bounded?

15 A. I was asked that question by Mr. Lakins. And I
16 referred to the experts in geothermal energy
17 development. There is at least one of those here today
18 that would answer the question better than I can.

19 Q. But that is an essential assumption to your
20 conclusion as I understand your testimony?

21 A. It is a basic assumption in that conclusion, yes,
22 sir.

23 Q. And you are not giving -- that's an assumption
24 that you are relying on a third party for, am I
25 understanding that correctly? You are not reaching that

1 conclusion yourself?

2 A. I am reaching that conclusion based on the
3 studies of the geothermal reservoir, the geothermal
4 system that I have seen. And they indicate that this is
5 a discrete hot spot. There appear to be other hot spots
6 like it. And there may be extension of it to the south
7 and west. But it is a discrete window into the leaky
8 confined aquifer that carries the really hot water.

9 Q. Well, do you agree that under the oil and gas
10 regulations an underground source of water means an
11 aquifer that supplies water for human consumption or
12 contains ground water having a TDS concentration of
13 10,000 milligrams or less and that it is not an exempted
14 aquifer?

15 A. If you are reading from the document you say you
16 are, then I agree that that is what it says.

17 Q. And we agree, we are not dealing with excess of
18 10,000 TDS water anywhere in what we have been
19 addressing here?

20 A. No, sir.

21 Q. So, Dr. Shomaker, I know you testified many
22 times. How many geothermal projects have you testified
23 in relation to?

24 A. I don't remember testifying about a geothermal
25 project other than this one. I would have to think

1 about that a minute before I was certain of that answer.
2 But this is the only one I remember.

3 Q. And how many salt water disposal well
4 proceedings, if any, have you testified in?

5 A. I haven't testified in any. We've done some salt
6 water disposal wells, but I have not given testimony in
7 hearings about that.

8 Q. How many times have you given testimony, if any,
9 that a geothermal system is in equilibrium based on the
10 injection wells are constructed in comparison to the
11 production wells?

12 A. The system that we are talking about and the
13 equilibrium that I have talked about is based on the
14 basics of groundwater hydrology and, in effect, has
15 nothing to do with the fact that it is a geothermal
16 system.

17 So I have testified a great many times about head
18 changes that would occur as a result of pumping and
19 recharge. And I think the fact that I have testified
20 about those groundwater basics on many occasions extends
21 to this situation regardless of the fact that it's about
22 a geothermal resource.

23 Q. So what is an example of a case where, the
24 testimony you've given, where the production well is,
25 say, 2000 feet beneath the injection well or the

1 proposal well location, and you testified that that
2 situation is not in equilibrium?

3 A. I don't remember testifying about a case in which
4 an injection well was not in equilibrium with a
5 production well. Again, I think it's simply an exercise
6 of basic groundwater hydrology, and the fact that the
7 heads in the two wells have reached an effective steady
8 state tells me that the pressure connection exists and
9 that enough water is flowing across -- flowing from the
10 one field into the other, that the system is a closed
11 loop.

12 Q. And did you help design the well locations that
13 are proposed?

14 A. No, sir.

15 Q. You didn't select those?

16 A. No.

17 Q. Did you design the length of the screens in those
18 wells?

19 A. No, sir.

20 Q. Did you have anything to do with the design or
21 location of the injection wells?

22 A. No, I did not.

23 Q. And have you done any analysis -- or would that
24 be another witness -- as to whether or not those
25 injection wells actually are within what you're calling

1 the geothermal system?

2 A. They are; to the extent that the geothermal
3 system can be recognized by the presence of hot water
4 and high fluoride concentrations in the area, they would
5 be within that.

6 Q. And that is based on other well data?

7 A. Yes.

8 Q. And as far as the -- was the entire screen length
9 of those wells within the geothermal system?

10 A. I think it is, because, in my opinion, the
11 definition of the geothermal system encompasses the body
12 of fractured bedrock and the part of the valley fill
13 aquifer in which hot high fluoride water occurs.

14 Q. But my understanding was that the monitor wells
15 are much shallower at some of those locations -- are you
16 assuming the hot fluoride-rich water goes deeper than
17 the monitoring wells?

18 A. Yes.

19 Q. And what's the basis for that assumption?

20 A. I think just looking at the records of the deeper
21 wells and at the periphery of the system, which, in my
22 understanding, is not well defined. It may be well
23 defined as the people who have looked at the water
24 quality more closely have recognized it.

25 I may be mistaken about that point. There may be

1 good quality water under hot water upgradient from the
2 geothermal system, but I doubt it.

3 Q. What is "good quality" water?

4 A. In my testimony, it would be water that is not
5 geothermal water, therefore, as I'm defining it, not hot
6 and not high fluoride.

7 Q. Now looking at the chart here, do you know if
8 there is irrigated agriculture in -- well, from being on
9 the site, is there irrigated agriculture within the
10 vicinity?

11 A. I know that there is irrigated agriculture to the
12 west and generally further out into the valley. I think
13 there had been irrigation very close by. But, as I
14 recall, the recent irrigation has been to the west of
15 the area.

16 Q. And do you know if the Animas Basin is being
17 adjudicated?

18 A. I think an adjudication is in progress. I don't
19 know whether it has been completed.

20 Q. Do you know if irrigated water is being
21 adjudicated or proposed, recognized in the vicinity?

22 A. If the adjudication is in progress, then
23 irrigation rights would be included in that.

24 Q. Do you know where the closest irrigation
25 production well is to this location?

1 A. I couldn't say at the moment. I think probably
2 just to the west of the geothermal project, I think
3 there's probably an irrigation well.

4 Q. And how deep is that well?

5 A. I don't remember.

6 Q. Do you know if the Animas Basin is considered a
7 mined aquifer?

8 A. Yes, sir. It has been, I think, by the State
9 Engineer.

10 Q. What does that mean, can you tell the Commission?

11 A. I think a mined aquifer or a mined basin is one
12 in which the withdrawals have exceeded the recharge over
13 a period and the water levels therefore have declined.

14 Q. Do you know one way or another if water from the
15 plume, the downgraded plume from the geothermal system
16 is usable for irrigation?

17 A. I don't know of my own knowledge what effect
18 fluoride has on usefulness in irrigation.

19 Q. I wasn't at the last hearing. Could you explain
20 to me, why are more deep wells not being proposed for
21 today, rather than these four shallow wells, if you
22 know?

23 A. I do not know. I was not involved in the
24 discussions that led to the application.

25 Q. Do you know any reason a deep well wouldn't

1 create the same equilibrium, mass balance, that you have
2 described?

3 A. A deep injection well certainly would create the
4 same closed loop as I have described.

5 Q. And is there a problem with the injection wells
6 that have already been installed, putting them to use?

7 A. I think Mr. Morrison or Mr. Janney has told the
8 Commission that the deep wells that have been drilled so
9 far have not encountered enough open fractures so that
10 there would be enough hydraulic conductivity to accept
11 the desired flows of injection water.

12 Q. But at the last hearing those wells were proposed
13 to take the injection water, if I understand correctly?

14 A. I believe that's true, but we would need to look
15 at the record of the hearing to be sure. I can't
16 remember.

17 Q. And I think that is what the permit was at the
18 time, for those --

19 A. I think that's correct.

20 Q. You are involved in a lot of well drilling, more
21 than I am, but deeper wells are more expensive than
22 shallow wells?

23 A. Yes, they are.

24 Q. And a several-thousand-foot well is quite a bit
25 more expensive than a 150- to 500-foot well?

1 A. That is correct, yes, sir.

2 Q. So in some ways this is an economic issue, would
3 you agree with me on that?

4 A. Its implications are certainly economic, yes,
5 sir.

6 Q. And is it -- strike that.

7 MR. DOMENICI: I am just about done.

8 Q. When you talk about this equilibrium, did you
9 calculate a rate of upflow from the artesian force?

10 A. No, I have not.

11 Q. But you do agree there is an artesian force or an
12 artesian head?

13 A. Yes. There is a head differential that makes the
14 hot water move up. It is less dense than the shallow
15 water for the beginning.

16 Q. And then my understanding, from looking at the
17 reports, there also is a downgradient in the shallow
18 alluvial?

19 A. Yes, sir, I suspect there would be.

20 Q. And is that going to be changed by these
21 injection wells?

22 A. In the area where mounding occurs within the
23 geothermal system, there will be a change in gradients,
24 yes.

25 Q. And what will the change be?

1 A. I'm not able to predict that because we haven't
2 yet seen what that mounding will be.

3 Q. Just to wrap up, so in the agenda notice for this
4 hearing, the issue was stated as -- the issue addressed
5 concern of whether the proposed injection will
6 contaminate any underground source of drinking water or
7 otherwise cause waters of the state of New Mexico to
8 exceed applicable water quality standards.

9 And there is another section.

10 But with respect to that only, you are not
11 offering any opinions one way or another on that; is
12 that correct?

13 A. My opinion is that the proposed injection will
14 change the mixing pattern within the geothermal system
15 but that that water is already in general hot and high
16 fluoride water and will not meet the fluoride
17 standard.

18 Q. Will the fluoride levels in that water be
19 increased?

20 A. In some wells, it very likely will be, because it
21 has been shown already to have increased in some
22 monitoring wells.

23 Q. Do you -- strike that. In the conditions OCD has
24 proposed, they are talking about there must be an OCD
25 approved water quality monitoring plan for the

1 geothermal project. Are you familiar with that
2 condition?

3 A. I have heard it spoken of, yes, sir.

4 Q. And you have seen similar types of conditions on
5 other water rights matters where monitoring plans are
6 required?

7 A. Certainly, yes, sir.

8 Q. What is the public supposed to understand from
9 that, if you know; what is the monitoring plan the
10 people of Hidalgo County can expect based on this
11 condition?

12 A. The monitoring plan is one that will be approved
13 by the public's representatives in the form of the OCD.

14 Q. At some point in the future?

15 A. Yes, sir.

16 Q. And will it -- would there be a way to monitor
17 whether or not your opinion that the mass balance is in
18 equilibrium and therefore there is -- therefore the
19 water injector is not leaving the geothermal system, is
20 there a way to monitor that?

21 A. There certainly is a way to monitor whether the
22 proposed pumping and reinjection has created changes in
23 water quality or groundwater head that would be
24 interpreted as water leaving the system. So the data
25 would be there on which to base that interpretation,

1 yes.

2 Q. And what would that be, just so as to totally
3 understand?

4 A. I think the combination of water level
5 measurements, the measurements of groundwater head and
6 measurements of groundwater quality would provide the
7 data that could be interpreted to answer your question.

8 Q. And would there need to be new or additional
9 monitor wells to gather the data to perform the
10 analysis?

11 A. I think there are enough wells. I think
12 monitoring of all the existing wells of whatever
13 ownership within the geothermal system and also some
14 wells peripheral to it would be valuable.

15 Q. What do you mean by "peripheral"?

16 A. The wells that are not within the geothermal
17 system but that are very close to it, within a quarter
18 of a mile or something.

19 Q. And are any of those wells available currently
20 today?

21 A. I don't know.

22 Q. Thank you.

23 MR. DOMENICI: That is all I have.

24 CHAIRPERSON CATANACH: Commissioner.

25 EXAMINATION BY COMMISSIONER BALCH

1 EXAMINER BALCH: Good afternoon.

2 THE WITNESS: Good afternoon.

3 EXAMINER BALCH: I just have a few
4 questions, Dr. Shomaker.

5 THE WITNESS: Uh-huh.

6 EXAMINER BALCH: I am a little bit curious
7 about the gradient and the flow of that outflow plume;
8 do you have a sense for the strength of that gradient or
9 any sort of volume of what that flow might be?

10 THE WITNESS: I haven't tried to calculate
11 it. It wouldn't be difficult to do. The State Engineer
12 has a groundwater flow model that could be used for that
13 purpose and it would really be simple to do without the
14 model.

15 EXAMINER BALCH: So in the context of
16 5,000 gallons per minute of pumping from the well, is
17 that a large proportion of that flow or a small
18 proportion of that flow?

19 THE WITNESS: I don't do arithmetic in my
20 head on the stand, I'm sorry to say.

21 EXAMINER BALCH: Just a gut feeling would be
22 fine.

23 THE WITNESS: Well, in the first place, the
24 flow in the loop would be 5,000 gallons a minute, but
25 the net flow, the net change of flow at the boundary of

1 the geothermal system would be zero as far as the
2 pumping and injection are concerned.

3 The only potential change in the flow would
4 be related to the mounding to the extent that greater
5 lateral flow occurred. And I think most of the effect
6 of the mounding is to increase the vertical.

7 EXAMINER BALCH: And that was my reason for
8 the question about the strength of the flow down
9 gradient, is you need to have significantly higher
10 mounding to impact a strong down flow gradient than you
11 would a weak one.

12 THE WITNESS: Yes, sir.

13 EXAMINER BALCH: So do you have any sense or
14 a feeling for how strong that downward gradient flow is?

15 THE WITNESS: How strong it would be in the
16 future, I do not. I think it could certainly be
17 calculated based on what we know now from the current
18 head relationships based on the current operation.

19 EXAMINER BALCH: It sounds like your current
20 interpretation is that the mixing of the water from deep
21 in the aquifer to near the surface, it's really going to
22 provide a similar chemistry, irregardless of whether
23 you're extracting some from the middle of it and
24 injecting some from the middle and some near the
25 surface -- there may be some slight variations.

1 Do you think that the fact -- I think
2 Mr. Domenici brought up, that they are mining the
3 basin -- that there's any potential for expanding the
4 width of the plume, east and west?

5 THE WITNESS: My recollection of the system
6 in the valley as a whole of the groundwater system is
7 that the water levels are, nowadays, after a long period
8 of mining, that the water levels are roughly stable
9 again, and have been for a while.

10 And so while there is a -- would be a
11 gradient toward the axis of the valley from the position
12 of the plume, I don't think that the mining of ground
13 water would change that much.

14 And I think -- I have not looked lately to
15 see what the water levels are doing in the valley. But
16 when I have looked at it previously, it appeared that
17 the period of very significant mining ended decades ago
18 and that things have been fairly stable since.

19 EXAMINER BALCH: So if we have a system in
20 equilibrium and we have a mass balance, any widthwise
21 growth would probably morbidly impacted by the outside
22 factors than the mining of the aquifer in the basin?

23 THE WITNESS: Yes. If the plume, once it's
24 outside the geothermal system, is not affected by a
25 change in groundwater heads in the valley, then it will

1 stay, more or less, as it is.

2 If it is affected by an increased gradient
3 within the valley fill as a whole, then it would be
4 larger, become larger.

5 EXAMINER BALCH: So I am going to ask you a
6 grand hypothetical question. 1,000 years from now if
7 you are at the end of the plume, are you going to notice
8 a difference in the water chemistry, at the north end of
9 the plume?

10 THE WITNESS: At the north end of the plume.
11 In terms of the rate of flow of ground water in the
12 system, I would say no. The movement of a fluoride
13 molecule in that plume is so slow that 1,000 years might
14 not lead you to a change in water quality at the north
15 end of the plume.

16 EXAMINER BALCH: Do you think the injection
17 pattern of the proposed wells would impact the shape of
18 the plume besides -- really the only impact is going to
19 be your mounding and if there is a sufficient gradient
20 to overcome --

21 THE WITNESS: I think that's right. I don't
22 think it will affect the plume once it has left the
23 geothermal system area.

24 EXAMINER BALCH: If you were to have your
25 four wells granted and you start injection and then the

1 monitoring well were to exceed the baseline, what would
2 happen then?

3 THE WITNESS: I don't know. I think
4 management would have to answer that question.

5 EXAMINER BALCH: And I think this may be
6 just a clarification. But I believe you implied that
7 injection even at a shallow level would mostly likely
8 have an impact on AmeriCulture by increasing -- sorry --
9 by decreasing their depth of the water table because of
10 some mounding; it would be unlikely that chemistry
11 changes would occur because of that mounding all by
12 itself?

13 THE WITNESS: Yes. I think that's probably
14 true, although there certainly will be a little change
15 in chemistry because of the change in the mixing
16 pattern. And so there may be some change in the water
17 chemistry in the AmeriCulture wells as there has been in
18 the monitor wells.

19 EXAMINER BALCH: Will those be small or
20 large?

21 THE WITNESS: I think they'll be small.

22 EXAMINER BALCH: I do agree with you that
23 the concept of equilibrium does not apply to only one
24 type of case. That's my last question.

25 CHAIRPERSON CATANACH: Mr. Padilla.

1 EXAMINATION BY COMMISSIONER PADILLA

2 COMMISSIONER PADILLA: It is nice going
3 after Dr. Balch because he threw some of my questions in
4 with his.

5 I just have one question for you. With
6 regard to the stratigraphic image that we see on
7 Lightning Dock Exhibit 4, page 5, which you referred to
8 earlier, did you say that the entire basis for the
9 communication between these different levels or
10 reservoir bodies -- I guess is a very generic way to
11 term them -- is due to the naturally occurring fracture
12 patterns?

13 THE WITNESS: That is my opinion, yes, sir.

14 COMMISSIONER PADILLA: Is there any other
15 basis for communication other than the naturally
16 occurring fracture patterns?

17 THE WITNESS: Well, hydro geologists are
18 reluctant to say that there's such a thing as zero
19 hydraulic conductivity. So to the extent that there is
20 some hydraulic conductivity in most any rocks, there
21 would be some communication. But I think the great
22 preponderance of flow near enough all of it is in
23 fractures.

24 COMMISSIONER PADILLA: Thank you,
25 Dr. Shomaker.

1 EXAMINATION BY CHAIRPERSON CATANANCH

2 CHAIRPERSON CATANACH: Just a couple.

3 Dr. Shomaker, the geothermal system you are
4 describing, does that go from depth all the way to the
5 surface?

6 THE WITNESS: In terms of hydrology, it goes
7 all the way to the water table, all the way from the
8 depth which it emerges from, I think, the artesian
9 aquifer all the way to the water table.

10 CHAIRPERSON CATANACH: To the bottom of the
11 water table or does it go all the way through the water
12 table.

13 THE WITNESS: I think all the way to the
14 water table because of mixing. I think we have mixing
15 of fresh recharge from upgradient that combines with
16 that geothermal water.

17 CHAIRPERSON CATANACH: So within the
18 geothermal system, all that water has already been
19 affected by the deep intrusion of the geothermal water.

20 THE WITNESS: I believe that's true. I
21 think the fact that there are shallow, relatively
22 shallow heat production wells in the area demonstrates
23 that the ground water in the valley fill aquifer within
24 the geothermal system area is partly geothermal water.

25 CHAIRPERSON CATANACH: So would you agree

1 that all the parties that own property here are within
2 the geothermal system as you defined it?

3 THE WITNESS: I believe that's the case. I
4 think my testimony about where the boundaries of the
5 system are was a little vague, and I referred to
6 primarily Mr. Bowers. But I think it's true that all of
7 those properties are within the system.

8 CHAIRPERSON CATANACH: Is there a
9 difference in the temperature of the rock as you go
10 deeper; is there a temperature difference.

11 THE WITNESS: I think there would be, yes,
12 sir. Again, I think Mr. Bowers would be a better place
13 to answer that.

14 CHAIRPERSON CATANACH: That's all I have.

15 MS. HENRIE: Mr. Chairman, if I could just
16 move Exhibit 4. And I have one other item of business,
17 which is to read from the Water Quality Act, 74-6-12(G).
18 And it says, "The Water Quality Act" -- and this is the
19 statute, not the regulations -- "does not apply to any
20 activity or condition subject to the authority of the
21 Oil Conservation Commission pursuant to provisions of
22 the Oil and Gas Act and other laws conferring power on
23 the Oil Conservation Commission to prevent or abate
24 water pollution."

25 Just so the Commission is aware that's the

1 basis of the Division's position in 2013 as to why
2 geothermal should be regulated by the Geothermal
3 Resources Conservation Commission Act and not by the
4 Water Quality Act.

5 CHAIRPERSON CATANACH: Exhibit 4 will be
6 admitted. And this witness may be excused.

7 (Lightning Dock Geothermal's Exhibit 4 was
8 offered and admitted.)

9 (Brief recess.)

10 CHAIRPERSON CATANACH: Let's go. You may
11 call your next witness.

12 MS. HENRIE: My next witness is Roger
13 Bowers. Come on up, Roger, and I will be asking to
14 qualify him as an expert in geology.

15 ROGER BOWERS
16 having been first duly sworn, was testified and examined
17 as follows:

18 DIRECT EXAMINATION

19 BY MS. HENRIE:

20 Q. If you would please tell us about yourself. We
21 are going to qualify you as an expert in geology, so
22 tell us about your education and training.

23 A. I received a bachelor of science degree in
24 geology and a master's of science degree in geology at
25 the University of Texas at Arlington. Part of that, I

1 did do most of my undergraduate work at the University
2 of Utah.

3 When I started graduate school in January of
4 1973, I also got a part-time job at Penn Oil Company in
5 Dallas, Texas, and worked there doing air photo studies
6 on the overthrust area of Wyoming. So it gave me a lot
7 of good practical experience.

8 Two months before I received my master's degree,
9 I was hired full time at Hunt. And this was in March of
10 1974. Later that year, without going into a lot of
11 history of the Hunt family -- this is the infamous Hunt
12 family of Dallas, Texas.

13 The patriarch H.L. Hunt passed away in 1974, and
14 turned over control of Hunt Oil Company to his youngest
15 son, Ray. I worked for Bunker, Herbert and Lamar Hunt.
16 And they formed a separate company called Hunt Energy
17 Corporation.

18 And one of the reasons for that is because,
19 starting in late 1973, they heard about this newfangled
20 thing called geothermal. And they along with several
21 other oil companies decided to take a serious look at
22 geothermal as an alternate energy resource.

23 I was one of the few that had any knowledge of
24 the western United States, so I was given the task of
25 doing some preliminary research, regional studies to

1 pick areas where we might obtain the leases.

2 The federal regulations for geothermal went into
3 effect in 1974. And there was a literal land rush of
4 lease applications to the Bureau of Land Management.

5 We had picked up or we had filed for leases all
6 throughout the western United States. We had identified
7 over a million acres of prospective geothermal
8 properties. And it became my job to start exploring all
9 that acreage. This was even before the leases were
10 issued by the Bureau of Land Management. It took them
11 months to get their system in place.

12 So we started doing reviews. We started deciding
13 what needed to be done where. And that really started
14 our on-the-ground exploration program in late 1974,
15 1975.

16 I was the staff geologist. I eventually worked
17 my way up to the operations manager for the geothermal
18 department of Hunt. And eventually I became the
19 geothermal manager for Hunt.

20 I stayed with Hunt Energy until February of 1987.
21 You may recall in 1986 the Hunts filed for bankruptcy
22 thanks to the silver fiasco. But we shut down the
23 department, and I departed on very good terms with them.
24 In fact, it is part of my severance package.

25 They gave me a lot of data that we had generated

1 over my 14 years with the company. And that included
2 prospects here in New Mexico. We explored areas all the
3 way from Jemez Springs, Valles Caldera, on south, Truth
4 Or Consequences, Radium Hot Springs, all the way down to
5 the Mexican border. So it gave me a feel for the Rio
6 Grande rift.

7 In addition to that, we had numerous properties
8 in the basin and range, western Utah all throughout
9 Nevada, Oregon, Idaho and California. I explored all of
10 those properties. When I say I explored them, I would
11 design the exploration programs, where there would be
12 geophysical surveys, drilling programs, and, at any one
13 time, I may have up to ten crews working for me in the
14 field.

15 Hunt was a very lean company. And we were
16 basically managers of the programs. Any technical
17 services, if we needed an expertise, we contracted it,
18 whether it be drillers or geophysical companies to run
19 the surveys.

20 So my involvement with Lightning Dock started in
21 1987 after I left Hunt. And I had dealt with Amax while
22 I was at Hunt. Amax had the lease NM34790. And we had
23 done joint ventures at places like Cove Fort, Utah, so I
24 was very familiar with the Amax folks.

25 And they had an agreement with another party. It

1 was Geothermal Properties out of New York City. And
2 when Amax decided to get out of geothermal about 1985,
3 that lease was to revert to Geothermal Properties who I
4 had also worked with.

5 By early 1987, Geothermal Properties did not
6 really want the lease back but they wanted to keep an
7 involvement with it. So I joined with three other
8 individuals and we formed Lightning Dock Geothermal,
9 Inc. That is a New Mexico corporation, and it took
10 ownership in 1987 of the Federal Geothermal lease at
11 Lightning Dock.

12 From that point on, I became involved. We didn't
13 have a lot of money to do studies, but we slowly put
14 together what available data we had. We also inherited
15 all of the data, whether it be drill hole logs,
16 temperature data, geophysical surveys from Amax, who had
17 explored the area since 1975.

18 In 2000, the Department of Energy announced some
19 research grants for the geothermal industry and
20 Lightning Dock applied for some of those grants, and we
21 won some of those grants. We were the only project
22 basically in the state of New Mexico.

23 We partnered with Ormat, which is a big producer
24 and builds power plant equipment and has numerous
25 properties on line. It is a worldwide company.

1 We partered with Ormat to do an initial study of
2 Lightning Dock which involved gathering all available
3 information. As part of that, we contracted out or we
4 subcontracted certain aspects of the research to a
5 company called Geothermex, which has been a consulting
6 company to the geothermal industry since the mid-1970s.
7 And we also contracted work out to Dr. David Blackwell
8 at Southern Methodist University, who is an
9 internationally known heat flow expert.

10 So my involvement with Lightning Dock continued,
11 although it was sporadic. Early 90s we started doing
12 more and more field studies. In 2000, we got the
13 grants. 2001 we ran geophysical surveys. In 2003, we
14 drilled holes. In 2004, more geophysical surveys.

15 And, finally, in 2006, our partner in New York
16 passed away, and we decided to sell the company. We
17 sold the company in 2007 to two individuals who then
18 later sold the federal lease to Razor Corporation, which
19 is now Cyrq Energy and Lightning Dock H-I-01.

20 So that is a brief history. I've worked -- in
21 1987 I decided to consult on my own, and I have been
22 consulting ever since. I worked for numerous other
23 geothermal companies. I worked on evaluations of
24 properties all throughout the western United States,
25 primarily focusing on properties or resources within the

1 basin and range.

2 MS. HENRIE: With that, Roger, let me tender
3 you as an expert in geology.

4 MR. LAKINS: No objection.

5 CHAIRPERSON CATANACH: Mr. Bowers is so
6 qualified.

7 Q. Roger, thank you for that background. I think it
8 is very important. I want to give you a chance to talk
9 about any geology briefly, if you would like, and then
10 we also have slides that show some of the exploration
11 efforts. I want to go through those pretty briefly as
12 well.

13 A. Okay.

14 Very quickly, just to familiarize everyone, this
15 is a slide of the regional geology. Lordsburg is at the
16 top of the map. The town of Animas is south in the
17 middle part of the map.

18 I must explain that this geologic map is very,
19 very simplified. It was created more than ten years ago
20 for a small private presentation. It omits a lot of
21 detail. It was primarily developed to show the tertiary
22 volcanics, which are the pink areas labeled with a TV.

23 In the western part, central part, you see a blue
24 area called KPC. Those are old sedimentary rocks. And
25 they go from Cretaceous all the way to Precambrian

1 granites, intrusive rocks down in place on the very
2 south end where Highway 80 goes through. It's called
3 Grand Gap. So, again, it is extremely simplified.

4 The other thing we wanted to show on here, you'll
5 see a circular dotted line, black dotted line. It is
6 labeled as the near Calder and Outer Ring Fracture. And
7 this was taken from a work published by Elston, Deal,
8 and Logsdon as New Mexico Bureau of Mines Circular No.
9 177.

10 Q. Let me just point out to the Commissioners that
11 is Exhibit 6 in your binders.

12 A. That publication really became the basis, laid
13 the groundwork for a lot of subsequent work on the area.

14 Also shown on that slide is a north/south dashed
15 line. That is the mapped Animas Valley Fault. And the
16 other thing I would like to point out is the red in the
17 bottom center there labeled QB. That is a
18 quaternary basalt flow that is on the surface. And you
19 can drive right across it as you go west of Animas.

20 So, again, this was a slide that was developed
21 many years ago just to be a general overview for a
22 presentation.

23 Q. And, Roger, is this the lease area?

24 A. That is the lease area. There is two leases
25 there. The larger one is the NM3479, which is the

1 Federal lease. And then the smaller square one is
2 108801. Those are both BLM leases that are owned by
3 Lightning Dock.

4 Q. Next slide?

5 A. Yes.

6 Q. Do you want to talk about underground or talk
7 about --

8 A. Let's go to the history.

9 This is just to provide you with a quick overview
10 of the history of exploration. I mention the
11 regulations went into effect in 1974.

12 Companies started in 1975, if not sooner. Most
13 of them were oil companies, but not all of them. You
14 had Hunt, Phillips, Chevron, Union. But then you had
15 companies that were more into mining, like Amax.

16 Prior to that, though, there were some water
17 samples that were taken and analyzed. And this goes all
18 the way back to Reader's work in 1948 and 1954. This is
19 with my understanding that when the -- this was a major
20 producing cotton-growing area and Reader was one of the
21 first to do some groundwater studies and monitor the
22 wells in the valley, but he also did some chemistry.

23 And then in 1949 all the way through 1968, there
24 is a gentleman named Somers who came out and sampled the
25 wells. And at this point, the hot water well at

1 Lightning Dock had been discovered.

2 It was drilled by a farmer who wanted to irrigate
3 his cotton fields, and he got this horrendous hot water
4 instead of cold water.

5 So Somers actually sampled the discovery well out
6 there and a couple of others. And then Amax came in in
7 1975 -- it is hard to distinguish the colors from here.
8 But they took additional water samples. Delashay came
9 in in 1975. He was associated with Amax. Logsdon came
10 in in 1981 and took additional water samples.

11 And then in -- also in 1981, we had New Mexico
12 State University take some. And, then, finally,
13 Lightning Dock in cooperation with OCD took some samples
14 in 1985 and 1986. And, lastly, I have on there Dr. Dave
15 Norman at New Mexico Tech took some samples in the
16 1990s.

17 And these are just samples for which chemical
18 analyses were run that we thought could be useful to
19 identify what was going on in the valley.

20 Q. We will move through these kind of quickly, but
21 we wanted to show the Commission sort of the scope of
22 the study that's been involved in the valley.

23 A. Back up one.

24 Q. Okay.

25 A. Again, Amax, starting in 1976, drilled numerous

1 holes up and down the valley. They went all the way
2 south of Animas, all the way up almost to Interstate 10,
3 and just were drilling over the place. This was kind of
4 a shotgun approach, but there were reports of hot water
5 wells elsewhere in the valley. So they were doing a
6 regional reconnoissance exploration program.

7 They came in with a second round in 1976. And
8 Phillips Petroleum also came in in 1976, drilled a few
9 holes. Most of them were somewhat close to Lightning
10 Dock.

11 And Aman Oil came in and drilled a few holes.
12 Those were mostly between Lightning Dock and Interstate
13 10 to the north.

14 And then Amax came in about the 1978, 1979 time
15 frame and drilled four deep temperature gradient holes.
16 And if you can see, those are the larger green dots
17 right on the east side of the Federal lease at Lightning
18 Dock.

19 Most of the gradient holes were anywhere from 3
20 to 500 feet deep. And, keep in mind, temperature
21 gradient holes are small diameter holes. They usually
22 completed them with 2-and-7-eighths-inch tubing or
23 something like that, so you could go back into the hole
24 and take temperature measurements over a period of time.

25 Q. Data from these TG holes, would that be an

1 example of some of the information you got from Amax?

2 A. We have data from every one of these holes that
3 is shown on this map.

4 Q. The next slide?

5 A. Yes.

6 I apologize for the mishmash on this, but it
7 shows other geophysical surveys that have been done.
8 The triangles that you see are actually a dark green,
9 but they are scattered throughout the whole region
10 there.

11 Those are gravity stations that the data are in
12 the public domain. And we worked with Dr. Randy Keller
13 at the University of Texas at El Paso, and he provided
14 public domain data.

15 In 1978, Amax again ran a large or flew a large
16 areomag survey that covered basically the whole valley,
17 actually extended eastward and west to the border, but
18 focused on Animas Valley. They were looking for
19 magnetic anomalies.

20 And then in blue more focused up and down, north
21 and south of the Geothermal lease is an areomag survey
22 that we, Lightning Dock Geothermal, Inc., flew in 2001
23 with a DOE grant.

24 More recently, Cyrq Energy/Lightning Dock, LLC,
25 flew another areomag survey in 2014, just last year.

1 And that's the diagonal rectangle in red in the middle.
2 And that was to provide much greater detail in the
3 resource area.

4 One other survey was MT, mag needle Tallert
5 survey. And that's by the dashed line. It's a little
6 larger. It covers a fairly large area and it was run by
7 Lightning Dock in first rounds in 2011 and the second
8 few detailing stations within that same box last year in
9 2014.

10 These are seismic lines that have been run in
11 Animas Valley. And they go back to 1969. There was an
12 oil company out of Houston, Cockrell Corporation, and
13 they were looking at the petroleum potential of the
14 Animas Valley.

15 They ran two seismic lines, and they are hard to
16 see. They overlap. But there is an eastwest red line
17 and a north, south red line almost right up and down the
18 Animas fault.

19 There also was another company called Harvey
20 Geophysical that ran some speculative lines. Some of
21 these geophysical companies would just go run lines on
22 spec that they thought they could later license to oil
23 companies or other companies, which they do and they
24 did. Those are in the blue. Those were run in 1982.

25 Lightning Dock came in in 2002, again using a DOE

1 grant.

2 And two east lines in yellow across the lease
3 area, we evaluated those.

4 And then we came back in later in 2002, November,
5 and ran additional east, west lines across the Animas
6 Valley fault zone. This was to test some hypotheses
7 that there may be additional resources up and down the
8 Animas Valley fault. And so we wanted to confirm the
9 location of the fault to see if we had any indication of
10 other potential resources. And so we ran those east,
11 west lines in November of 2002.

12 Finally, in early 2004, we came back in and redid
13 an east, west line and a diagonal line that went real
14 close to well 55-7. We wanted to get a better
15 interpretation for that.

16 And, coincidentally, that diagonal line that runs
17 from northwest to southeast essentially went right over
18 the location for well 45-7 even though it was several
19 years apart.

20 Finally, in August 2011, Cyrg decided to do a 3D
21 seismic survey. And that is outlined by that pink box.

22 So this just gives an idea of Lightning Dock
23 Geothermal, Inc. When I was a part of it, we did look
24 at the Cockrell seismic lines. We did get a license for
25 part of the Harvey lines. And all of the rest of the

1 data were ours.

2 So there is a tremendous database and quite a
3 history of exploration in Animas Valley.

4 Q. Next question, Roger. Do you recall reports from
5 any of these studies that provide information about
6 reservoir capacity and what can you say about what the
7 reports state?

8 A. There's been a few reports done on the reservoir
9 capacity. The reservoir estimates, probably the first
10 one was a well-known publication put out by the U.S.
11 Geological Survey. It was Circular 790. I believe the
12 final publication date was 1978.

13 It was the first federal government assessment of
14 geothermal resources in the United States. And they
15 covered all of the states including Alaska, and did
16 their best to calculate what the true energy potential
17 would be for geothermal resources.

18 Very little other than a couple of hot wells were
19 known at Lightning Dock. But they compared it to other
20 basin and range resources primarily in the Nevada that
21 they had a little more information on.

22 They did have to make some assumptions. They
23 used an average volume size for the size of the
24 resource, some heat flow. And they calculated that
25 there were probably in the range of 24 megawatts

1 potential at Lightning Dock, a very acute assumption.

2 Subsequent to that, in 2001, I mentioned that
3 Lightning Dock had commissioned a couple of studies as
4 part of the DOE grant. One of them was to Geothermex.
5 And they have studied just about every geothermal
6 resource in the United States and around the world.

7 They give their professional opinion. They do
8 sophisticated calculations. And they did a resource
9 estimate based on their calculations. And if I remember
10 right, they gave a range of basically 9 to 15 megawatt
11 capacity.

12 Also in that year, 2001, I mentioned that we had
13 contracted or subcontracted Dr. David Blackwell at
14 Southern Methodist. He is known as a heat flow expert.
15 He independently did his calculations. And he came up
16 with a size estimate of 5 to 15 megawatts.

17 Later after Lightning Dock drilled four deep
18 gradient holes in 2003, we asked those contractors to
19 update their estimates. And, indeed, Dr. Blackwell did
20 and came out with an estimate of greater than 15
21 megawatts. Also Roy Caniff, who was president of
22 Lightning Dock, he was an engineer. And he did his
23 estimate and again came out with roughly the same range.

24 The last one that I am aware of was done in 2010.
25 It was done by a company called Isor. They are

1 basically the Icelandic equivalent of the U.S.
2 Geological Survey. And because Iceland is rich in
3 geothermal, that is their specialty.

4 They came in and they reviewed all of the data.
5 And they came up with an estimate of anywhere from 19 to
6 35 megawatts.

7 So there have been several estimates,
8 calculations on the size of the resource.

9 Q. It sounds like there's lots of different opinions
10 of that out there?

11 A. There are. And most of them give their opinions
12 as a range of values. Who knows what it ultimately will
13 be. But there's a lot of very strong opinions on it.

14 Q. And do you have an opinion on what the reservoir
15 could produce?

16 A. I am not a reservoir engineer, and it is really
17 not in my area of expertise. I look at the geology and
18 more at the temperature, rather than doing all the
19 calculations. I have just an opinion, that it's easily
20 ten to 20 megawatts.

21 And as more wells are drilled and we get more
22 data, that is a moving target. It is a dynamic process
23 to constantly reevaluate the resource itself, get a
24 better understanding of what is going on.

25 But I guess my main comment would be as we gain

1 new data, it seems to be getting larger.

2 Q. So, Roger, I would like to turn to some history
3 now because you did testify about your involvement with
4 the Lightning Dock site and the lease and so forth.

5 Could you look at Exhibit 5, Lightning Dock
6 Exhibit 5 in the green binder.

7 A. I got it.

8 Q. And can you identify that for us?

9 A. Yes, I can. This is a joint facility operating
10 agreement. It is dated the 6th day of September, 1995.

11 Q. And who is it between?

12 A. Lightning Dock Geothermal, Inc., a New Mexico
13 Corporation; and AmeriCulture, Inc., a New Mexico
14 corporation.

15 Q. And I just wanted you to read into the record one
16 provision from here, and that's over on page 6.

17 MR. LAKINS: I object to the reading into
18 the record. The document will be admitted as an
19 exhibit --

20 MS. HENRIE: That's fine.

21 Q. I would just like to call the Commission's
22 attention to a paragraph on page 6, item B-3.

23 Roger, do you have an understanding of that
24 paragraph?

25 A. Yes, I do. Perhaps I should explain why this

1 agreement came about.

2 Q. Please do.

3 A. Lightning Dock, as the owner of the Federal
4 Geothermal lease --

5 MR. LAKINS: Which paragraph are we at
6 again?

7 MS. HENRIE: Page 6, paragraph B, as in boy,
8 3.

9 MR. LAKINS: Okay. Thank you.

10 MS. HENRIE: Okay.

11 A. When Lightning Dock obtained the lease from
12 Geothermal Properties in New York, it was a Federal
13 lease. And it's a rather unique situation in geothermal
14 that you have private landowners who own the surface
15 land under federal minerals or over federal minerals.
16 So it is called a split estate lease.

17 And what happened is when the lease was first
18 issued way back in I believe it was 1979, because they
19 were private landowners, the BLM required an operating
20 agreement with those private landowners to account for
21 access and development.

22 When Lightning Dock, Inc., got that lease, those
23 operating agreements came with it. There were two of
24 them, one with Thomas McCants and one with Dale Burgett
25 as Rosette, Inc.

1 Later when AmeriCulture purchased the 15 acres
2 which was shown previously on the one slide, BLM came to
3 Lightning Dock and said, You need an agreement. And by
4 that time they were no longer called operating
5 agreements. They had developed this joint facility
6 operating agreement.

7 So Lightning Dock, Inc., signed this agreement
8 with AmeriCulture for that 15 acres that is under-liened
9 by the Federal Minerals.

10 Q. And, briefly, what does the agreement do?

11 A. It just provides for operations. It gives
12 Lightning Dock the authority to go ahead and develop
13 geothermal. There are certain provisions in there. One
14 of them is that AmeriCulture cannot use any part of
15 their lease for electricity generation. It can only be
16 for direct use.

17 The other provision is that they are not allowed
18 to drill deeper than 1,000 feet, and that Lightning
19 Dock, Inc., does have all the authority to develop that
20 lease for geothermal electricity generation. Those were
21 the main distinctions.

22 Also, there was a provision in there that should
23 AmeriCulture be harmed or degraded in any way from loss
24 of heat, that Lightning Dock would provide replacement
25 heat for them in their operations. So it protected both

1 sides, so no one lost or no one gained.

2 Q. And next, Roger, I have just a couple of
3 historical reports, and I wanted you to read a couple of
4 sections from them and I brought copies for Counsel.

5 I wasn't intending to admit these as exhibits,
6 but I am happy to share them with you all.

7 Do you know what these are?

8 MR. LAKINS: I am going to totally object to
9 the use of this. This was not disclosed prior. This is
10 six pages, single spaced, and I haven't even had a
11 chance to look through it and analyze it before a
12 question is asked.

13 MR. BRANCARD: The Commission doesn't have
14 copies.

15 MS. HENRIE: Let me tell you where I am
16 going and then maybe that will help you understand the
17 context.

18 These are two historical documents, one
19 describes a visit to Rosette and it describes the use of
20 water by Dale Burgett at the time. And it actually
21 calculates the extent of that use of water.

22 And I think that's relevant because there
23 are some questions about use of the geothermal system
24 and Burgett was using a heck of a lot of water out
25 there, which just kind of shows what happens when there

1 is use; in other words, AmeriCulture was not harmed by
2 that use by Dale because of the very great extent.

3 The other report describes AmeriCulture
4 Federal Well No. 1, casing depth of 60 feet, and how
5 that well is influenced by Service Bar.

6 Roger can testify to those points because he
7 is familiar with them. He doesn't need this. But it
8 would be something you could read into the record if you
9 want.

10 MR. LAKINS: This is a 6-page document
11 without a signature on the back. It is hearsay. I have
12 no opportunity to cross-examine the person who wrote it.

13 The document is something that happened
14 almost -- more than 20 years ago. 1998 is the date on
15 it. It is not relevant to the purposes of today's
16 hearing and Applicant meeting its burden of proof for
17 this hearing.

18 And it wasn't disclosed before this very
19 moment, so I object to its use or any reference to it.

20 MR. BRANCARD: This is not Mr. Bowers'
21 document, is it?

22 MS. HENRIE: He can identify it, though. It
23 was his business partner's document and so Roger can
24 identify it or he can just use it to refresh his
25 recollection of facts from the past.

1 MR. BRANCARD: I would think -- I'm not sure
2 where you are going with all of this and how it is
3 relevant to your application. But just ask the
4 questions of the witness --

5 MS. HENRIE: Okay.

6 MR. LAKINS: I would also object to the
7 relevance of anything that happened in 1998. How is a
8 site visit in 1998 relevant to what's on the ground
9 today and the Applicant's burden of proof.

10 And Mr. Bowers here has testified that he's
11 an expert geologist, not here as to facts about what
12 happened by somebody else back at that point in time.

13 MS. HENRIE: He has also testified that he
14 has been active with the Lightning Dock lease for many,
15 many years. And if we are going to have anyone ever in
16 front of this Commission who can explain how the Rosette
17 operations really looked at the time when they were up
18 and running and operating, and not anymore, it's going
19 to be someone who knows it from the past.

20 MR. LAKINS: And how is what happened with
21 Rosette relevant to the application before the
22 Commission?

23 MS. HENRIE: Because Rosette was using
24 geothermal wells, a lot of water, a lot of water from a
25 lot of geothermal wells at the time. And look at what

1 happened, the aquifer is still hot and AmeriCulture is
2 still in business despite huge uses of water out there
3 on site. And I think it's interesting information for
4 the Commission to consider whether our proposed
5 injection wells are going to have any effect.

6 MR. LAKINS: I further don't think it is
7 relevant because Rosette's operation did not involve
8 injection, and we are talking about injection.

9 MS. HENRIE: We are talking about a
10 geothermal system.

11 CHAIRPERSON CATANACH: Let's go ahead and
12 allow you to question him on it. It seems to be kind of
13 interesting.

14 MS. HENRIE: Okay. Thank you, Mr. Chairman.
15 BY MS. HENRIE (cont'd):

16 Q. So, Roger, are you familiar with a site visit in
17 1998 to the Burgett or Rosette facility?

18 A. Yes, I am.

19 MR. LAKINS: If he doesn't have personal
20 knowledge, I am going to object entirely.

21 Q. Were you there?

22 A. I was there. And it was, I believe, February.
23 It was a cold winter morning. And Roy Caniff and I --
24 Roy was president of Lightning Dock Geothermal, Inc.
25 And we made the trip out there to see what Mr. Burgett

1 was doing as far as his geothermal heating that night.

2 And during the cold winter nights, he would use
3 the hot water from several different wells to heat his
4 greenhouses. And every bit of that water was being
5 disposed of on the surface, allowed to run down that
6 ditch that you see running north, south there.

7 And we easily estimated that he was pumping more
8 than 2,000 gallons per minute, all of which was being
9 dumped on the surface. And this was water that was
10 close to 200 degrees Fahrenheit. We observed it, we
11 documented it, we measured it. We later reported it to
12 OCD. We were dealing with Roy Johnson at the time.

13 Q. Did Roy make an estimate of the total acre feet
14 being used, acre feet per year --

15 MR. LAKINS: Objection. Speculation. This
16 is hearsay. How is it relevant? Mr. Burgett who was
17 pumping water almost 20 years ago --

18 CHAIRPERSON CATANACH: Let's just focus on
19 what he can answer from his personal knowledge.

20 MS. HENRIE: Okay.

21 Q. Roger, going to the other report that I was going
22 to read out of, can you describe the history for Federal
23 Well No. 1?

24 A. I first knew it as the Beale Well. It was
25 drilled by Tom McCants, but there was a competing rose

1 grower. His name is Tom Beale. He was out of the
2 Seattle, Washington area. And he wanted to move to
3 Lightning Dock.

4 Tom Beale had drilled this well, which is now
5 AmeriCulture Federal No. 1. Roy Caniff and I did
6 personally run temperature surveys in that well and also
7 observed and documented that during rainstorms that well
8 could cool down by as much as 40, 50, 60 degrees
9 Fahrenheit just from the cold water rain runoff. But it
10 was very shallow.

11 So later when AmeriCulture purchased the 15 acres
12 from Tom McCants, the well, as far as I know, became
13 their property. But the fact is that there were extreme
14 temperature variations noted in that well, again very
15 shallow, subject to cooling from just rainstorms in the
16 area.

17 Q. Thank you. New topic.

18 Roger, from your experience, do you know what the
19 principle of correlative rights means?

20 A. Yes. I had some firsthand experience when I was
21 at Hunt Energy. Basically, in my mind, it means where
22 different operators or landowners are producing from the
23 same resource or common pool, if you will.

24 The correlative rights means that they get that
25 portion of the resource based on their surface acreage.

1 It is a way of preserving the resource, and not
2 overproducing it.

3 Probably the best example I can think of is the
4 geysers, although it's a dry steam field. There were
5 many different producers. They overproduced it and all
6 of a sudden, you had a huge field-wide pressure decline.
7 And it put some of them out of business.

8 The one I had personal involvement with was at
9 Cove Fort, Utah, and it was with Union Oil Company.
10 Hunt had some adjoining leases, and it was believed to
11 be a common resource, so correlative rights came into
12 play based on the acreage.

13 Q. So do you believe that these proposed injection
14 wells will harm AmeriCulture's correlative rights?

15 A. Not at all.

16 Q. Let's go through each of the proposed injection
17 wells and talk about them and talk about what you think
18 will happen in that area to the injected cool fluid. We
19 say "cool" fluid, but it's still quite hot. But let's
20 kind of go one by one.

21 Out to the west is 13-7. What do you think will
22 happen out there?

23 A. Based on nearby temperature data, I think it may
24 have a very slight warming effect, but I think it will
25 be very minor. There is a well just to the south of it

1 that produces warm water. There is a gradient hole just
2 to the north of it that we have temperature profiles on.

3 And based on that information, I would conclude
4 that it would have a pretty minimal impact on it from a
5 temperature standpoint.

6 Q. Because the ground water is already pretty hot?

7 A. The ground water is already pretty warm out
8 there.

9 Q. Let's go to 63A-7, which is marked on the graphic
10 there, 63-7.

11 A. Right. That is proposed just off to the
12 southeast of well 63-7. And, again, based on
13 temperature surveys and drilling logs, geophysical logs
14 from that well, it will basically -- the water being put
15 back in will basically be the same temperature as what
16 is already there in that well.

17 Q. And so going clockwise over to State Land 15A
18 that's down kind of on the lower right-hand corner...

19 A. It's east of the greenhouses there. It is just
20 across the line. It is on state land. I've got two
21 well controls, one just to the north of it that Dale
22 Burgett drilled and then another one just to the
23 southwest of it.

24 The injected water will probably have a slight
25 warming effect. But at the same time, it's already

1 headed towards the main greenhouse area, which is a lot
2 hotter.

3 So I would think that in a very short distance
4 that temperature is going to equilibrate. So it may
5 have a slight initial warming, but it would dissipate
6 quite rapidly in my opinion.

7 Q. And down south of the greenhouses by Dale's house
8 with the white square at the bottom.

9 A. And that's almost the opposite. It would
10 probably have a slight cooling effect, because it's that
11 area down there that Mr. Burgett drilled some of his
12 hottest wells. You've got temperatures exceeding
13 230 Fahrenheit at 200 feet of depth.

14 And so it's already the hot area plus the
15 groundwater flow is to the north. So there actually may
16 be a slight cooling, but I think there is enough flow
17 there that the temperatures would equilibrate very
18 rapidly.

19 Q. So when you talk about temperature equilibration,
20 what do you mean?

21 A. Just the temperature of the injected water
22 matching the ground water. I mean, overall, you are
23 putting in such a small amount of water into such a
24 large system that the temperatures are going to modify
25 or equilibrate, balance out, very, very quickly, plus

1 you've got a big mass of hot rock down there.

2 So the small amount of -- the relatively small
3 amount of water going into those injection wells, I just
4 don't see having any large effect on the temperature
5 regime.

6 Q. So you don't see it having any effect on any of
7 the AmeriCulture wells to the north?

8 A. Well, I think that's so far north that they
9 probably wouldn't see anything from a temperature
10 standpoint.

11 Q. Roger, are you familiar with Exhibit No. 4 which
12 is the report on the AmeriCulture well test back in
13 2000? The report is dated 2001.

14 A. Yes, I have seen it.

15 Q. Do you have any comments on this report?

16 MR. LAKINS: What exhibit are you at?

17 MS. HENRIE: Exhibit 4.

18 MR. LAKINS: Okay.

19 A. I guess, in a general sense. I'm not a
20 hydrologist, so I will defer to Dr. Shomaker and
21 Dr. Miller on the actual pump test.

22 But a couple of comments that come to mind, his
23 figure 2 on page 4, it shows one thing I didn't show on
24 my slides of the history. It has scheme reserve well
25 55-7 on the central part.

1 And then north of that, by roughly two miles, is
2 the Cochrell No. 1 Federal Pyramid Well. And so he uses
3 those as his primary comparisons.

4 Those are basically the only two deep holes that
5 were drilled in Animas Valley. Steam Reserve 55-7,
6 which is 7,001 feet, and the Cochrell Pyramid Well went
7 to 7,400 feet. So those are the only deep ones. They
8 are useful for providing a geologic overview and
9 Mr. Witcher did use that.

10 I don't necessarily agree with his interpretation
11 of the geophysical faults based on the geothermal or the
12 geophysical surveys I've looked at. There is some
13 question exactly where these faults are.

14 And the west, northwest basement structure,
15 again, I don't argue with that. It has been identified.
16 My only comment on that is that it is an extremely old
17 structure. This is Laramide, which is millions of years
18 old, and in my opinion, basically, has nothing to do
19 with the geothermal system.

20 And that goes back to the publication by Elston,
21 Deal and Logsdon, New Mexico Circular 177. They
22 proposed a northeast, southwest trending cross structure
23 in there. And based on the data that I've seen, I would
24 agree with that.

25 So rather than a northwest trending structure,

1 there is more of a northeast structure. But that's a
2 differing opinion from the geologic basis.

3 If I remember correctly here, I was concerned
4 about the monitoring of some other wells during the
5 pumping test. And at that time, as an owner of
6 Lightning Dock Geothermal, we were very concerned about
7 Well 55-7. That well was property of Lightning Dock
8 Geothermal, Inc. Mr. Burgett and no one else had any
9 authorization or right to go into that well. It was a
10 trespass. But, more than that, I would question the way
11 that they took water level measurements.

12 Other than that, I will defer to others on how
13 they'd want to comment on it.

14 Q. Did Mr. Witcher or anyone else have access to all
15 of the studies and the reports and the data that you had
16 access to?

17 A. Not that I am aware of.

18 MS. HENRIE: Mr. Chairman, with that, I'll
19 pass the witness.

20 CROSS EXAMINATION

21 BY MR. LAKINS:

22 Q. Mr. Bowers, good afternoon. You used the term
23 geophysical system in your testimony.

24 A. Okay.

25 Q. Right?

1 A. I believe I did. I probably did. I've used that
2 terminology for years.

3 Q. That phrase actually is not included in New
4 Mexico's Geothermal Act, is it?

5 A. I don't know.

6 Q. And you are not qualified as a reservoir engineer
7 by your own admission, right?

8 A. That's correct.

9 Q. And so your testimony about the effect of
10 Lightning Dock's proposed injections on all of the wells
11 is your personal opinion and not an expert opinion that
12 you are qualified to give, correct?

13 MS. HENRIE: Objection. He was qualified as
14 a geologist.

15 MR. LAKINS: Right. But he also said he is
16 not a reservoir engineer.

17 MS. HENRIE: Reservoir engineers calculate
18 capacity. They don't talk about heat flow necessarily.
19 Geologists can talk about heat flow.

20 THE WITNESS: May I respond?

21 MS. HENRIE: Sure, you may respond.

22 A. My response is based on temperature data of the
23 rock.

24 Q. (By Mr. Lakins:) So you don't know what is going
25 to happen with the water flow, though; you are not a

1 hydrologist?

2 A. That is correct.

3 Q. So you don't know what impact any of the water
4 injection may have anywhere, do you?

5 A. No, I don't.

6 Q. All of your testimony about potential impacts on
7 the water flowing into AmeriCulture's well, you are not
8 qualified to give that opinion, correct?

9 A. It was just based on temperature data.

10 Q. I understand that you said that the proposed
11 injection would not harm Mr. Seawright of AmeriCulture's
12 correlative rights?

13 A. That's my understanding.

14 Q. That was your testimony?

15 A. My testimony.

16 Q. And what do you base that on?

17 A. My understanding of how correlative rights work.

18 Q. And you said your understanding is based upon the
19 surface acreage, correct?

20 A. Yes.

21 Q. Are you familiar with the definition of
22 correlative rights in New Mexico's Geothermal Act?

23 A. I couldn't recite them, no.

24 Q. I am going to read it to you.

25 A. Okay.

1 Q. This is from NMAC 19-14-17, which is Definitions
2 in the Geothermal Power Act: (C), Correlative Rights.
3 Correlative rights shall mean the opportunity afforded,
4 insofar as it is practicable to do so, the owner of each
5 property in a geothermal reservoir to produce his just
6 and equitable share of the geothermal resources within
7 such reservoir, being an amount so far as can be
8 practicably determined and so far as can be practicably
9 obtained, without waste, substantially in the portion of
10 the quantity of recoverable geothermal resources under
11 such property bears to the total recoverable geothermal
12 resources in the reservoir and for such purposes to use
13 his just and equitable share of a natural energy from
14 the reservoir.

15 Now, that definition doesn't include surface
16 area, does it?

17 A. I did not hear that.

18 Q. Wouldn't you agree that, for instance -- the
19 lease MN108-801, that's the 640 acres, right?

20 A. Correct.

21 Q. There has been no geothermal resource found that
22 can be developed in that lease, is there?

23 A. Not yet, no.

24 Q. In the entire leased area, there is only the one
25 geothermal resource and that's the one that we are

1 talking about that has been identified as practicably
2 developable, correct?

3 A. As so far identified, yes.

4 Q. So the correlative rights under New Mexico law
5 has to do with what can be obtained from the resource,
6 not based upon total surface area; would you agree with
7 that?

8 A. Yes, I would agree with that. I was asked to
9 give him my opinion based on my experience. And I
10 always understood that it was based on surface area of
11 the defined resource.

12 Q. Understood.

13 Will the reservoir temperature drop as a result
14 of the injection proposed?

15 A. I would be very surprised that it would.

16 Q. I have to take it, you probably have a lot of
17 knowledge of the geology of the area?

18 A. I have a fair amount. I don't know how you would
19 quantify it.

20 Q. And that top 400 is an alluvial fill?

21 A. It depends where you are.

22 Q. Where the proposed injection site is, is that
23 within the alluvial fill?

24 A. For the most part, except 76-7.

25 Q. What's the geology -- sorry -- except for 76-7,

1 did you say?

2 A. Yes. And it has not yet been drilled. But it
3 seems to be on what we call the siliceous cap of the
4 geophysical system. So it may not be 400, 500 feet of
5 valley fill. It may not be 150 feet of valley fill.
6 That's based on the old Burgett wells that would hit the
7 hard silicified rock at its shallowest at about
8 150 feet. So I can't say that's valley fill.

9 Q. Okay. The other three are?

10 A. I don't know. They haven't been drilled yet, but
11 I suspect they would be.

12 Q. And are you familiar with the remaining geology
13 between the alluvial fill -- let's take well 55-7, that
14 well. Is that one you drilled?

15 A. No. I was not involved with that. That was
16 Amax.

17 Q. Which ones did you drill -- were you involved in,
18 I should say?

19 A. I was directly involved in deep gradient holes
20 drilled in 2003. They're labeled as TG 12-7, 52-7, 36-7
21 and 57-7.

22 Q. Thank you. So the well 55-7, are you familiar
23 with the geologic strata that exists at that one?

24 A. Yes, I am.

25 Q. And could you explain what it is?

1 A. Off the top of my head --

2 MS. HENRIE: Do you want to put up those
3 well logs?

4 THE WITNESS: If we could put up a cross
5 section or a well section?

6 MR. LAKINS: Sure. If Ms. Henrie has that,
7 that would be great.

8 MS. HENRIE: I will just try to get it on
9 the screen.

10 (Pause to project the illustration.)

11 A. What was your question?

12 Q. Just to explain the geologic strata of that well.

13 A. Okay. First of all, the yellow -- well, to
14 qualify this, this was taken from the mud log of the
15 drillers. Again, I was not on this.

16 The well was spudded in late 1984 by Amax and
17 completed in early 1985. It was logged by a
18 professional logging company, a mud logging company.

19 Basically the yellow near the top is alluvium.
20 There is an orange unit in the middle of that yellow and
21 those are silicified sediments that we believe are
22 produced by the geothermal waters.

23 Most of those alluvial sediments are volcanic in
24 origin. There are all sorts of different volcanics that
25 come off the Pyramid Mountains and even evidence of some

1 sediments that came from the Peloncillos on the west
2 side of the valley.

3 That pink section is what we call volcanic
4 clastics. And, again, it's just all volcanic types of
5 rock. They are indurated, which means they have some
6 hardness to them when you drill through them. It is not
7 just loose alluvium.

8 And then you have that complete section of the
9 pink of these volcanic clastics.

10 That brown unit immediately under it is where you
11 get into older sedimentary rocks. And these are
12 believed to be probably Mesozoic in age.

13 The blue is a limestone unit.

14 And below that I think you get into a shaley
15 limestone. And then you get into some dolomite. And it
16 goes on down for dolomitic limestone, shaley limestones,
17 and other Paleozoic units.

18 What this does not show is that it goes to
19 7,000 feet, which would be way down to the bottom of
20 screen. And at that depth, they got into what they
21 called the Precambrian granite.

22 Q. Okay. Thank you. And all of those Lightning
23 Dock four wells, that top layer is the alluvium. How
24 deep is that layer in those wells, in that area?

25 A. I would have to estimate. If you look at depths

1 are in vertical lettering off the left of each well.

2 You can see 500, 1,000, those are depths.

3 Q. So the top 150 feet of each of the known wells is
4 alluvium, of those four wells?

5 A. Roughly, yes.

6 Q. And the same thing with the AmeriCulture wells?

7 A. Yes, sir.

8 Q. Now, you are talking about the Joint Facility
9 Operating Agreement --

10 MR. BRANCARD: Would the parties be okay
11 with that being printed out and available to the
12 Commission?

13 MS. HENRIE: This is confidential. We don't
14 mind showing it to you, but I don't want it in public
15 records. And if I give it to the Commission, it is
16 going to go on the Internet.

17 EXAMINER BALCH: It puts us in a little bit
18 of a quandary, because we have a site where we have
19 Mr. Witcher's report and then we have all of your great
20 data, in 2-D lines, 3-D lines, small scale aeromag, a 3D
21 survey, and we have none of that data available to us to
22 help make our decision. This really is a challenge.

23 MS. HENRIE: Mr. Chairman and Commissioners,
24 with respect, as I read the regulations, we are not
25 asking you guys to characterize the reservoir. We are

1 trying to explain what's going on.

2 EXAMINER BALCH: Some of the questions we
3 want to answer or at least I want to answer have to do
4 with the scale and size and characteristics of that
5 reservoir.

6 MS. HENRIE: Which is why I brought the
7 witnesses to try to help answer those questions.

8 You know, we could try to do something to
9 show you some of that information. But I can't have it
10 in public records. It is trade secret. We have worked
11 very hard to compile that information. And it means
12 something to the company.

13 I don't know what you guys do in oil and
14 gas.

15 EXAMINER BALCH: Usually you don't have the
16 data given to you. You have the interpretation given to
17 you, so something that summarizes the data that's
18 available to you would be useful, a cross section for
19 example. It is not the data, it is not the well logs,
20 it's not the seismic cross section; it's an
21 interpretation. That's what we get from the oil
22 companies.

23 MS. HENRIE: So a different interpretation
24 than my witnesses have been providing?

25 EXAMINER BALCH: Well, we are getting a

1 verbal description or a conclusion from the knowledge
2 that's presumably in their heads. But we have nothing
3 visual that we can reference when we want to ask a
4 pointed question about where the fault is.

5 And I presume you know exactly where the
6 fault is, because you have all that great data. And all
7 we know is there is a fault, and there's different
8 interpretations on which direction that goes.

9 So Mr. Witcher's report has it trending
10 north, northwest. He thinks it's north, northeast.
11 Where is my proof?

12 MS. HENRIE: We go with Elston, which is in
13 your materials. I can circle with my team tonight and
14 try to figure out what to provide you. What we have
15 been trying to do is tell you reasons why we think the
16 Witcher report is wrong, provide you with Elston, which
17 we think is right --

18 EXAMINER BALCH: But some illustrations of
19 why and where the data came from would be incredibly
20 useful for that purpose.

21 MS. HENRIE: The Elston report?

22 EXAMINER BALCH: If you are going to tell us
23 Mr. Witcher's report is wrong, I want to know why and
24 have some evidence of why it is wrong.

25 MS. HENRIE: Okay. When Dr. Miller

1 testifies, we will do that.

2 MR. LAKINS: May I?

3 EXAMINER BALCH: It is his
4 cross-examination. I interrupted him. Actually, I am
5 not sorry.

6 MR. LAKINS: I think that the aspect of
7 confidentiality was just thrown out the window by
8 putting a confidential document up in a public hearing
9 where there's members of the public here that now have
10 it.

11 Ms. Henrie has asserted that it's trade
12 secret; however, in the hearing that we had, we
13 discussed my motion to vacate, reset because we wanted
14 some documents.

15 Their legal expert said that underlying
16 scientific data is not trade secret. I think it would
17 be most beneficial for the Commission to have that
18 document for its review. And it could be stamped as
19 confidential, not for public release, because the
20 Commission has the ability to do that, to keep things
21 confidential, and that it ought to be produced for the
22 Commission's benefit.

23 MS. HENRIE: If I may respond if we are
24 doing argument. What our intellectual property attorney
25 said, yes, scientific data at data point is not trade

1 secret; the compilation of the data is. When you take
2 all of the information you have to create logs or data
3 compilations, that does become trade secret. An
4 individual data point is not protectable. But what they
5 are asking for are things that have actually been
6 compiled.

7 MR. BRANCARD: I think Mr. Lakins is correct
8 that we can work out a confidentiality agreement here on
9 these matters. We certainly had a wild and wooly Oil
10 and Gas versus Potash a few years back in which a large
11 portion of the record ended up being stamped
12 confidential, even though it was it an Oil Conservation
13 Commission hearing.

14 MS. HENRIE: And just to be clear, I don't
15 mind doing that to give you guys some information. I am
16 not letting them take it home.

17 MR. BRANCARD: They can sign a
18 confidentiality agreement.

19 MS. HENRIE: I don't want them taking it
20 home. If they want to look at it, that's fine. I don't
21 want them taking it home.

22 These are project deponents, business
23 competitors. And we spent a lot of money developing
24 this resource; and, in fact, maybe we will talk about
25 some of the requests for information that go back

1 historically as we've been trying to develop the
2 resource and they just want our data. They just want
3 our information.

4 EXAMINER BALCH: Presumably the data would
5 support your arguments.

6 MS. HENRIE: And tell them more about the
7 resource.

8 EXAMINER BALCH: Unfortunately, I think I
9 need to know more about the resource.

10 MS. HENRIE: So can we make a deal with you
11 guys to make an agreement -- I haven't ever done in
12 camera in court, but we could...

13 MR. LAKINS: I would say that Lightning Dock
14 can't have it both ways. If they don't want to give it
15 to us, then they shouldn't give it to you; if they want
16 to give it to you, then they need to give it to us too.
17 And I am fine with not getting it.

18 MS. HENRIE: So you see how it really is.

19 MR. LAKINS: So then nobody gets it. The
20 Commission had a benefit of a look and had the benefit
21 of testimony, but if Lightning Dock wants to keep it
22 from everybody, then we will keep it from everybody.

23 MS. HENRIE: No, Charles. I said I wouldn't
24 mind sharing it with the Commission, I just want to keep
25 it from you.

1 MR. DOMENICI: If I could make my objection
2 on the record. I think whatever expert opinions are
3 offered and that you would rely on as the Commission,
4 that there needs to be a basis for those opinions.

5 So whenever I get a chance to argue, I will
6 argue some of these opinions really shouldn't be given
7 much weight. There is no data to support; they're just
8 statements.

9 EXAMINER BALCH: That's my point quandary.
10 It really is. I have to then decide which expert do I
11 believe more.

12 I have to tell you the one who gives you
13 something; at least I can go home and look at it
14 tonight.

15 MR. BRANCARD: Do you want to think about it
16 overnight?

17 MS. HENRIE: Thank you.

18 MR. LAKINS: Okay.

19 CROSS EXAMINATION (resumed)

20 BY MR. LAKINS:

21 Q. Turning to Exhibit 5, which is also
22 AmeriCulture's Exhibit O for the Commission's reference.
23 Is that the Joint Facility Operating Agreement that you
24 were referencing a little bit earlier, Mr. Bowers?

25 A. Yes, sir.

1 Q. That agreement did only pertain to 15 acres,
2 correct?

3 A. That's correct in my understanding, yes.

4 MR. LAKINS: Thank you. I pass the witness.

5 CROSS EXAMINATION

6 BY MR. DOMENICI:

7 Q. Sir, did you help locate any of the four proposed
8 new injection wells?

9 A. I did not locate them, but I reviewed them.

10 Q. After someone had suggested where they would go?

11 A. Yes.

12 Q. What did you review them for or what was the
13 nature of your review?

14 A. Again, basically, from the temperature standpoint
15 and the valley fill, the geology.

16 Q. And was the objective to try to make sure there
17 was a screened interval in the valley fill so that the
18 quantity of water injected in those could be absorbed?

19 A. Yes. We are always looking for permeability to
20 inject.

21 Q. So you have been on this project for decades, it
22 sounded like. Hasn't it always been obvious that the
23 best place to inject would be the alluvium; to any
24 geologist that would be obvious, wouldn't it?

25 A. Basically, yes, but it's not guarantee. Sure, it

1 would always be nice. I guess I don't understand -- I
2 mean --

3 Q. Well, you are also looking for strata that would
4 absorb the water?

5 A. Right.

6 Q. My question is isn't it obvious that the alluvium
7 should be given at least primary consideration as the
8 best place to take high volumes of water?

9 A. It would certainly be a consideration.

10 Q. Why is it being proposed now after the facility
11 is already up and operating rather than at the time of
12 the first application, if you know?

13 A. I really don't know the answer to that, basically
14 because I haven't been involved in that aspect of it
15 since I left the company in 2007 or I sold my interest
16 in the company.

17 Q. In 2007?

18 A. Yes. I am just a consultant to the company now.

19 MR. DOMENICI: Thank you. That is all I
20 have.

21 MS. MARKS: I have no questions for this
22 witness.

23 EXAMINER BALCH: I have a couple of
24 questions.

25 THE WITNESS: Uh-huh.

1 EXAMINATION BY COMMISSIONER BALCH

2 EXAMINER BALCH: Sorry. I didn't mean to
3 interrupt your cross-examination there.

4 My primary question, of course, is where are
5 all the great cross sections and geologic maps, from
6 this wonderful data you have. But I had that one
7 answered already.

8 THE WITNESS: May I?

9 EXAMINER BALCH: Sure.

10 THE WITNESS: Believe me, I understand your
11 concern. There was a significant amount of data
12 released as part of Lightning Dock Geothermal, Inc.'s,
13 final deal we recorded in 2005. That is in the public
14 domain, and it summarizes a lot of the geophysics, the
15 deep gradient holes that were drilled. So that is in
16 the public domain.

17 EXAMINER BALCH: So you could have based
18 your presentation off of that?

19 THE WITNESS: Yes.

20 EXAMINER BALCH: And maybe differentiate a
21 little bit on your interpretation, and that would be
22 useful.

23 THE WITNESS: Okay.

24 MS. HENRIE: Okay.

25 THE WITNESS: The other aspects of it, I

1 have no control over what the company decides to
2 release. But I understand what you're saying.

3 EXAMINER BALCH: Do you think you know the
4 boundaries of the geothermal anomaly?

5 THE WITNESS: I think I have a reasonable
6 idea. I will qualify that by saying it seems like every
7 time we drill -- we insert drills in another well or
8 gets new information, it's changing.

9 It's a dynamic process. To me it's part of
10 the scientific process. You get some data, you build a
11 model. And in this case, I've -- you can call it
12 multiple working hypotheses or whatever. But you build
13 a model and then you go out and get some more data.

14 You have to see if that fits the model. And
15 if it doesn't fit, you don't throw that data out. Those
16 data are real. You have to adjust your model and your
17 thinking to fit the data as long as you know that those
18 data are reliable. So it is an ongoing dynamic process
19 that you continue forever.

20 I do that on any project that I evaluate or
21 am involved with. So over the years as new wells have
22 been developed as these geophysical surveys have been
23 run, it changes that model. It changes the size and the
24 scope of what we believe the resource to be.

25 EXAMINER BALCH: It gets bigger every time

1 you add some data?

2 THE WITNESS: So far everything I've seen
3 indicates that it's --

4 EXAMINER BALCH: So if you imagine the
5 geothermal anomaly as a plume coming up, as a cylinder,
6 what would the diameter of that cylinder be?

7 THE WITNESS: It's actually not a cylinder.

8 EXAMINER BALCH: I know that.

9 THE WITNESS: It's an oblong shape. I can
10 reference --

11 EXAMINER BALCH: A cross-sectional area
12 would be fine as well.

13 THE WITNESS: Yeah. It could be huge. And
14 I go back to Elston, Deal and Logsdon; it's one of the
15 exhibits here. Maybe that would be the best way to
16 reference it, if I can find it here.

17 It is Exhibit 6. This is Bureau of Mines
18 Circular 177. I am looking for a contour map.

19 MS. HENRIE: Page 34.

20 EXAMINER BALCH: There is one on 24 as well.

21 THE WITNESS: What was the other page
22 number?

23 MR. LAKINS: Which page?

24 EXAMINER BALCH: 34 is geochemistry. Look
25 at 24. 24 is heat.

1 THE WITNESS: This one. Page 24 is the one
2 I was looking for, figure No. 9.

3 EXAMINER BALCH: Where is the Lightning Dock
4 lease area on that map?

5 THE WITNESS: It would be the -- basically
6 the center of that little bull's-eye. Now, the way I
7 read this map, each square on there is a section or one
8 square mile and the bull's-eye is in the eastern half of
9 section 7. But if you started adding up the squares
10 within those contour lines, it could be very big.

11 Now is that the boundary of the actual
12 resource at great depth? Who knows.

13 And that gets into another --

14 EXAMINER BALCH: So you have a lot of
15 groundwater data from seven different sources over
16 70 years. I presume you have mapped the plume, the
17 plume that's coming off of this thing going up north.
18 Does it fit this description?

19 THE WITNESS: It does. Now, these are
20 temperatures. These -- I deal more in temperatures than
21 I do with the waters themselves. The other factor you
22 got to take into consideration is depth. And we know
23 that it changes at depth.

24 There's another diagram in here that is a 3D
25 diagram near the back. It is on page 40. And this is

1 their 3D rendering of what might be going on down there.
2 You can see the hot wells, and there's really not a good
3 scale on this per se.

4 But this is where they developed their
5 hypotheses that the actual heat source at depth is an
6 area to the southwest of the shallow thermal anomaly.
7 And it could be several miles down there.

8 So it's not a straight-up-and-down cylinder
9 is I guess all I am trying to say. There is excellent
10 evidence that at depth it goes to the southwest. The
11 question is what depths are you talking about.

12 You're talking two, three, four kilometers,
13 maybe miles at depth. So it is not a
14 straight-up-and-down cylinder.

15 EXAMINER BALCH: These are all things that
16 have a direct impact on the capacity of those rocks and
17 their ability to transfer that heat to water for a
18 sustained period of time. So I am certain that
19 Lightning Dock, sir, has looked at this intensely and
20 they have a feeling, a good feeling based on the science
21 of how much heat they are dealing with. And I am not
22 getting that information.

23 THE WITNESS: Right. And I'm not the person
24 to give you the answer on that. They've had other
25 people look at it who are more qualified than I am of

1 that aspect of it.

2 EXAMINER BALCH: We don't have a geothermal
3 person talking today or later and your case will be
4 geochemistry and then you are going to stop.

5 MS. HENRIE: Correct.

6 EXAMINER BALCH: No one is going to talk
7 about geothermal anomaly. So you're kind of it.

8 THE WITNESS: Okay.

9 EXAMINER BALCH: Does your nice 3D survey
10 kind of pair up with this interpretation on page 40?

11 THE WITNESS: It does. It also shows that
12 the hot wells area is -- has a lot of faults and
13 fractures in it which is allowing the hot water to come
14 up from depths. Like Dr. Shomaker described, it's
15 fractured rock.

16 EXAMINER BALCH: The system came to
17 equilibrium at the current rate of production in less
18 than eight months, so there's obviously a good deal of
19 fracturing down there. That's the dominant portion,
20 isn't it?

21 THE WITNESS: Yes, I think that is.

22 EXAMINER BALCH: Is the surface area of the
23 geothermal anomaly much greater than the diameter of
24 those four wells as a whole?

25 THE WITNESS: Yes, in my opinion it is.

1 EXAMINER BALCH: And where approximately in
2 that anomaly are they at? Are they center, east, west?

3 THE WITNESS: The center is basically right
4 there in the middle of the greenhouse complex if you
5 look at that map. So the closest two would be 63A-7 and
6 76-7 down to the south. They would be closest to the
7 center of it.

8 EXAMINER BALCH: And you have how many miles
9 to the edge of the anomaly, which direction of
10 kilometers, whatever you want to give?

11 THE WITNESS: Probably close to a half a
12 mile.

13 EXAMINER BALCH: In any given direction?

14 THE WITNESS: Yes.

15 EXAMINER BALCH: And then down plume to the
16 north -- I guess the plume actually goes a little bit
17 north, northwest, right?

18 THE WITNESS: It does. From what I have
19 seen on temperature data, there is a westward component
20 to it, but it's primarily to the north, northwest.

21 EXAMINER BALCH: Well, I guess I will shift
22 gears. You were talking a little bit about Exhibit 5,
23 page 6, paragraph E-3, that you didn't read into the
24 record.

25 THE WITNESS: Yes.

1 EXAMINER BALCH: But it appears, at least on
2 the surface, to protect the correlative rights of
3 AmeriCulture to the thermal energy that they need --

4 MS. HENRIE: The energy that they need to?

5 EXAMINER BALCH: -- the geothermal energy,
6 it appears to protect their correlative rights.

7 THE WITNESS: That is my understanding.

8 EXAMINER BALCH: I was wondering if I was
9 missing something there.

10 THE WITNESS: No. I think that is what it
11 was designed to do.

12 EXAMINER BALCH: Basically. If their heat
13 goes down, you have to give them more heat?

14 THE WITNESS: That's right.

15 EXAMINER BALCH: And then chemistry comes
16 in -- right? -- which I presume the next witness will
17 discuss.

18 THE WITNESS: Yes.

19 EXAMINER BALCH: I guess I don't have
20 anything else. Thank you.

21 EXAMINATION BY COMMISSIONER PADILLA

22 COMMISSIONER PADILLA: I'm just following up
23 on that point. How would more heat be provided? What
24 are we talking about? Heat for the farming operation?

25 THE WITNESS: Are you referring to the joint

1 facility operating agreement?

2 COMMISSIONER PADILLA: Yes.

3 THE WITNESS: I would guess in the form of a
4 pipeline bringing hot water to them. It would depend on
5 what form they wanted it in. Unfortunately, that
6 agreement is not definitive on how it would be supplied.
7 It just says if they lose heat, Lightning Dock would
8 supply it. Exactly in what format, I don't know.

9 COMMISSIONER PADILLA: I am having a little
10 bit of an issue with the boundaries being a moving
11 target because if it's a moving target, I don't know how
12 we are supposed to define correlative rights based on
13 something that's always shifting.

14 And I am wondering if you can pin that down
15 a little for us. Like maybe the greenhouse complex as
16 entering the kilometer all the way around is as close as
17 we're going to get to a boundary, in your opinion,
18 anyway for the...

19 THE WITNESS: It is difficult, and I base
20 mine on temperature data, basically, in addition to some
21 of the geophysical data.

22 I primarily first look at temperature data.
23 That is what we are dealing with. Geothermal is heat,
24 so I always look at the temperature data first and then
25 see if I can refine it using geophysical or geochemical

1 data.

2 And I can tell you that based on drilling
3 and based on temperature surveys from the wells, that
4 that thermal anomaly, as you go deeper, gets bigger. So
5 it's also a function of the depth, how deep do you want
6 to go? Some suggested we need to go to 10,000 feet.

7 It is a moving target, I understand. So to
8 decide on the size of it, again you really need to say
9 at what depth.

10 COMMISSIONER PADILLA: Getting to the issue
11 of correlative rights being assigned to the size of the
12 resource -- well, I guess that is more of a statement
13 than a question.

14 THE WITNESS: But I understand your concern
15 and I don't have a good answer for you on that. I know
16 that heat is moving at depth, so do you arbitrarily pick
17 a depth cut-off or do you arbitrarily pick a temperature
18 cut-off and say, Okay. This is the resource at a given
19 temperature, call it 250 Fahrenheit and draw your --

20 EXAMINER BALCH: Sorry to interrupt.

21 If you were doing this for oil, what can be
22 technologically and feasibly achieved with today's
23 technology so the resource boundary would be what you
24 can get to with what you have now?

25 THE WITNESS: Right, okay.

1 EXAMINER BALCH: And there may be more that
2 you can get to later on with some other technology, but
3 that hasn't been discovered yet or hasn't been applied.

4 THE WITNESS: In my experience I mentioned
5 Cove Fort, Utah, my direct experience with correlative
6 rights. It was defined as the potential resource
7 boundary. I didn't do it, but that's the way they
8 defined it, saying, Okay, we see this as the area of --

9 EXAMINER BALCH: I am not sure of the
10 technical, legal definition, but I know what I think of
11 as waste.

12 THE WITNESS: Yeah.

13 EXAMINER BALCH: When I'm thinking of waste,
14 I think what can you get to now with the technology we
15 have at hand? What is feasible with that technology?
16 That is the way I look at it.

17 THE WITNESS: Sorry?

18 EXAMINER BALCH: That's just the way I look
19 at it.

20 THE WITNESS: Understood.

21 COMMISSIONER PADILLA: Mr. Bowers, when you
22 testified earlier, you had several -- you mentioned
23 several different opinions going back through the years
24 on the reservoir capacity.

25 Was there no standard definition as far as

1 temperatures, heat movement, et cetera, as to what
2 constitutes a geothermal reservoir that we could apply
3 to something like this? There's no uniformity in the
4 industry definition of the term geothermal system or
5 reservoir capacity?

6 THE WITNESS: Very simply it's taking, based
7 on what you see as temperature, a volume of rock and
8 calculating or estimating how much heat is flowing
9 through that rock and then you can calculate out the
10 various parameters.

11 It's also given in megawatts thermal or
12 megawatts electricity. But it's basically simply an
13 estimated volume of the rock times the amount of heat
14 that's coming through it.

15 It takes into -- or should take into account
16 the thermal conductivities of the rock.

17 The difficult part comes in when you are
18 dealing with fractured reservoirs. When I started out,
19 we had petroleum engineers that were, you know, oil and
20 gas for years and years, and we threw in fracture
21 permeability and nobody knew what to do early on. But
22 there are some standard formulas that you can use to get
23 an estimate, but they're all just estimates.

24 COMMISSIONER PADILLA: I guess there is no
25 apples to apples comparison; every project differs

1 wildly, is that...

2 THE WITNESS: In many ways, yes, especially
3 geologically, even in the basin and range.

4 COMMISSIONER PADILLA: Based on rock
5 characteristics, et cetera?

6 THE WITNESS: Rock types. Like thermal
7 conductivity, you can estimate based on what type of
8 rock you have. Say you got limestone. You can take
9 published results of what the thermal conductivity of
10 that rock type is, but you'll find a wide range.

11 I have done hundreds if not thousands of --
12 or had thermal conductivities measurements made, and
13 there's a huge range of conductivities.

14 And just because it is limestone doesn't
15 mean it is going to be X value. Just because it's an
16 endosite, it's not necessarily X value.

17 So on these heat flow calculations, you
18 estimate a thermal conductivity, unless you've actually
19 got thermal conductivity measurements from the
20 laboratory. So there's a lot of play in there.

21 EXAMINER BALCH: I assume you've taken some
22 core samples or side wall into the lab and done that --
23 or somebody at Lightning Dock, right?

24 THE WITNESS: I haven't. But, ultimately,
25 yes, it should be done.

1 COMMISSIONER PADILLA: My last question is
2 just really curiosity. Why did Isor do a reservoir
3 capacity estimate on this?

4 THE WITNESS: I don't have a full answer to
5 that. To my knowledge and understanding, Cynq Energy at
6 the time -- I don't know if one of their investors was
7 from Iceland or had dealt with the Icelandic Company,
8 but I believe they were contracted to do so simply
9 because they had the expertise in geothermal and it was
10 another outside independent party, if you will, to take
11 a look at the injection source.

12 COMMISSIONER PADILLA: Thank you.

13 EXAMINATION BY CHAIRPERSON CATANACH

14 CHAIRPERSON CATANACH: Just a couple. I
15 know it is late.

16 With regards to the decision to drill
17 shallow injection wells as opposed to deep injection
18 wells, was there a geologic component to that decision?

19 THE WITNESS: Probably simply being that,
20 yes, in some of the other wells we had seen some
21 permeability in some of the shallower zones. So I am
22 sure that played into the decision.

23 CHAIRPERSON CATANACH: Is there some
24 evidence to suggest that the deep injection that there
25 may be some permeability barriers that would decrease

1 injectivity?

2 THE WITNESS: In the deeper zones?

3 CHAIRPERSON CATANACH: Yes, for instance,
4 like the 55-7.

5 THE WITNESS: In my opinion, it's all based
6 on proximity as to whether or not you've encountered the
7 fractures. We know there are fractures there. There is
8 no doubt about it. We've encountered fractures.

9 And at the same time we have had some deeper
10 zones give up some fluid. There was one zone in the
11 limestone at depth that actually produced some fluid,
12 some hot geothermal waters.

13 So it's not a matter of the type of rock per
14 se as much as it is, at least in my opinion, as to how
15 close or can you intersect one of those fractures, which
16 are probably nearly vertical.

17 So I do not see stratified, shall we say, or
18 flows, horizontal flows, based on lithology, like
19 limestone, sandstone, shale vs. that.

20 I see a very complex fractured system. And
21 if you don't have a fracture, you don't have water going
22 through it. But I know in my opinion that you can be
23 literally inches away from a fracture and it can mean
24 whether you've got a booming projection well or you've
25 got a dry hole.

1 This has happened all through geothermal,
2 especially in the western states, Nevada and California.
3 If you miss those fracture zones, you don't get
4 anything, but you know you're close, because you can
5 determine that from some of the geophysical logs and
6 from the temperatures.

7 I don't know if that answers your question.

8 CHAIRPERSON CATANACH: I am just trying to
9 figure out, I guess, why you guys have selected to drill
10 shallow wells instead of deeper injection wells.

11 THE WITNESS: I am sure part of it -- even
12 though I am not part of the company, I am sure part of
13 it was economic, part of it was practical. Deep wells
14 are very expensive. That had to be a component. But I
15 couldn't fully address that.

16 CHAIRPERSON CATANACH: Do you agree with
17 Dr. Shomaker that the shallow injection wells -- that
18 they are fractured enough that the shallow injection is
19 going to be transmitted down to the deeper zone?

20 THE WITNESS: I think eventually that's what
21 would happen, yes. Now, there may be a small component.
22 I guess in my opinion, you know, there is -- and, again,
23 in my opinion, there is no such thing as a totally
24 confined system. Mother Nature just doesn't work that
25 way.

1 But I think we see enough of a -- shall we
2 say, of a convection zone that, yes, eventually those
3 waters that are reinjected will work their way back down
4 again. I think that is the nature of some of these
5 fractured reservoirs like this.

6 But I don't have the firsthand experience on
7 the hydrology to guarantee it or anything like that. I
8 don't think anybody can. But I think it's a reasonable
9 expectation.

10 CHAIRPERSON CATANACH: That's all I have.
11 Anything else?

12 MS. HENRIE: Mr. Chairman, I forgot to move
13 Exhibits 5 and 6 into evidence.

14 CHAIRPERSON CATANACH: Exhibits 5 and 6 will
15 be admitted.

16 (Lightning Dock Geothermal Exhibits 5 and 6
17 were offered and admitted.)

18 MR. DOMENICI: I would like to follow up on
19 a couple of questions that came up from the
20 Commissioners, if that would be allowed.

21 CHAIRPERSON CATANACH: That will be allowed.
22 Be very brief, please.

23 RE-CROSS EXAMINATION

24 BY MR. DOMENICI:

25 Q. I think you answered that the boundaries have

1 been dynamic. And they're still dynamic?

2 A. Correct.

3 Q. And are they getting bigger or smaller or can you
4 characterize the dynamic nature at all?

5 A. Without a doubt, they're getting bigger.

6 Q. Are they going in any particular direction?

7 A. Based on the data I have seen lately, I would say
8 that they're basically following Elston, Deal and
9 Logsdon's suggestion that it comes from the southwest,
10 that there is an elongation to the southwest.

11 Q. Okay. And, then, just one other question. We
12 just briefly saw those logs and we saw the alluvium
13 through the logs, and the injection logs are targeting
14 the alluvium, at least to a large extent?

15 A. Probably, except 76-7, which I think the alluvium
16 there is probably less than 100 feet thick.

17 Q. Are there barriers in the alluvium itself?

18 A. In this area, not that I am aware of. But I will
19 say in some wells out to the west, there was a clay
20 layer; but it was down a few hundred feet and it's not
21 consistent.

22 Q. Are there barriers running horizontally, running
23 up and down in the alluvium?

24 A. Not that I'm aware of.

25 Q. So there would be nothing to prevent water from

1 moving laterally in the alluvium, correct?

2 A. That is correct.

3 MR. DOMENICI: Thank you.

4 MS. HENRIE: Mr. Chairman, I just want a
5 little clarification.

6 RE-DIRECT EXAMINATION

7 BY MS. HENRIE:

8 Q. When you said the boundaries are getting bigger,
9 do you mean the boundaries of the anomaly or do you mean
10 that our data -- we're getting more data, we are able to
11 recontour the boundaries in a different way?

12 A. Yeah, I can't say the natural resource is growing
13 or shrinking. I can say our knowledge of it is
14 expanding every time we do something new, get new data,
15 yeah, it's re-evaluated. Like I say, it is a dynamic
16 process. And that picture that we're getting is getting
17 bigger and not smaller. The resource itself has
18 probably been the same for thousands of years.

19 MS. HENRIE: Thank you.

20 CHAIRPERSON CATANACH: This witness may be
21 excused. What I would suggest is putting on your
22 witness (directed to Mr. Lakins), if that's okay with
23 Michelle. Is there any objection to that?

24 MS. HENRIE: No.

25 (Whereupon, Mr. Brancard left the hearing.)

1 CHAIRPERSON CATANACH: Commission Counsel
2 has departed. Please swear in the witness.

3 ---oOo---

4 AMERICULTURE CASE-IN-CHIEF

5 MR. LAKINS: There is sort of a procedural
6 question, because Mr. Jackson is here both as our
7 witness but he also signed in as himself to give a
8 statement, just a personal statement.

9 CHAIRPERSON CATANACH: He is going to
10 testify as a witness and give a statement?

11 MR. LAKINS: That's the procedural dilemma.

12 EXAMINER BALCH: I think once he's under
13 oath, he is now open to cross-examination. He can give
14 his opinion during --

15 MR. LAKINS: Very good.

16 EXAMINER BALCH: That is my impression of
17 Bill. We have other lawyers, though.

18 MR. LAKINS: Very good.

19 CHARLES JACKSON
20 having first been duly sworn, was examined and testified
21 as follows:

22 DIRECT EXAMINATION

23 BY MR. LAKINS

24 Q. Please tell us your name for the record.

25 A. My name is Charles Jackson.

1 Q. Tell us what you do.

2 A. Currently, I'm the Luna County Manager. From
3 1999 until May of last year, I was an employee in the
4 District 3 Office of the State Engineer in Deming.

5 Q. What did you do?

6 A. From 1999 to 2005, I was a water resource
7 specialist. And one of the responsibilities I had in
8 that position was to be basin supervisor for the Animas
9 Underground Water Basin. 2005 until May of last year, I
10 was the district supervisor.

11 Q. I would like you to turn to Exhibit T in the blue
12 binder, please. Are you familiar with that document?

13 A. Exhibit T, yes, I am.

14 Q. Can you tell us what that is?

15 A. This packet is a permit that was filed with the
16 State Engineer's Office, which was titled A45(A),
17 Enlarged, and all the supporting documentation that came
18 from OCD to go with that application.

19 Q. What was that application to the State Engineer
20 all about?

21 A. The purpose of application A45(A), Enlarged, was
22 a request for non-consumptive diversion of water from
23 well A45(A) -- S-6, if I remember right -- let me find
24 that real quick -- from A45(A-S) for a total amount of
25 water of 1,775 acre feet plus a little bit of change

1 for the beneficial uses of aquaculture, agriculture, and
2 non-consumptive geothermal power production.

3 Q. So that is a water right issued by the New Mexico
4 State Engineer that includes geothermal power
5 production?

6 A. As a non-consumptive application, it's a permit
7 until the full amount of that water is put to beneficial
8 use. But that document is the permit for that
9 beneficial use.

10 Q. Are you familiar with the history of the
11 documents that were processed by the OCD prior to the
12 State Engineer's action on that permit?

13 A. Yes. Actually, as the Animas Basin supervisor on
14 this application and the previous application that was
15 filed before it, which is Application A45(A), there was
16 a working relationship between the State Engineer's
17 Office and the Oil Conservation Division to make sure
18 that the water right -- if there was any impairment
19 requirement or any impairment possibility with the water
20 right, that that was addressed by us, but we would not
21 review those applications until they had already
22 received clearance from OCD to construct the well, to
23 put the wells in place and the other approvals they had
24 to get from OCD.

25 Q. Were all those approvals obtained from OCD?

1 A. Yes.

2 Q. And you talked about impairment possibility.

3 Could you explain what you meant by that?

4 A. Well, with the original application that was
5 filed, which was application A45(A), AmeriCulture
6 actually transferred in a valid water right on the
7 existing water right in the Animas Basin that was put to
8 beneficial use in the 1950s.

9 And they transferred that right into that water
10 source to be used for aquaculture purposes. This
11 permit, even though it's a non-consumptive permit under
12 state law it carries a priority date with it that by
13 having that permit in place, then any other permit that
14 came along behind it that asked for a diversion of any
15 kind couldn't impair that permit.

16 Q. Let me ask you, if the proposed injection were to
17 diminish the resource temperature of AmeriCulture's
18 water permit, which would reduce their power production
19 capability, would that constitute impairment?

20 A. My interpretation of the permit that was issued,
21 I would say yes. If you look at historically what has
22 happened in the state of New Mexico related to water
23 quality issues when it comes to having a valid existing
24 water right, you can look at the lower Rio Grande when
25 total dissolved solids went up, salt leaching happened

1 down there. That was addressed as a component of the
2 water right.

3 You can't have a water right for domestic use and
4 then something in the physical make-up of that water be
5 changed and that right not be impaired. You can't have
6 a water right for agriculture. The total amount of salt
7 that's intruded in the water by other diversions have
8 an impact on whether you can grow within that water and
9 it not be impaired.

10 So I think the agency, over the course of the
11 years I was there, started really looking at the other
12 components of water besides just the quantity as to what
13 constituted an impairment and what did not.

14 Q. So if the chemical nature of AmeriCulture's
15 domestic drinking water supply well would change so that
16 they exceeded drinking water standards, would that
17 constitute an impairment?

18 A. The decision would have to be made by a judge.
19 But my testimony, from everything I saw in the 15 years
20 I was there, it would be yes.

21 Q. You heard some testimony about the Joint
22 Facilities Operating Agreement?

23 A. I did.

24 Q. Had you read that document yourself before?

25 A. I remembered something about that a long time

1 ago. And I remember one time, when Mr. Seawright came
2 in to go over an application, us discussing it. But I
3 don't remember finding it impaired this agreement.

4 Q. If AmeriCulture's water rights or correlative
5 rights were impaired, is it possible for Lightning Dock
6 to actually replace their water considering that
7 Lightning Dock doesn't have a water right?

8 A. This permit addresses the physical actual water
9 right. It doesn't address the correlative right
10 associated with it. But if the permit was for the power
11 production, for power generation, for growing fish, for
12 whatever it was, and something changed in the nature of
13 the water right that impaired that, then, I guess, there
14 could be an attempt to replace that, but you would have
15 to have a valid water right to replace it with.

16 Q. During your time at the State Engineer's Office,
17 were you involved with any injection wells?

18 A. Yes. We permitted some of the injection wells
19 that AmeriCulture had and actually did some work on -- I
20 was at the office when Razer came in and did their
21 original permits.

22 Q. And you are familiar with the basic hydrology and
23 characteristics of the Lightning Dock Reservoir?

24 A. The basics, yes.

25 Q. In your opinion, would the proposed injection in

1 the shallow alluvial result in that water staying in the
2 reservoir or leaving the reservoir?

3 A. You know, with my staff members I used to have in
4 the office, we used to have kind of a basic example that
5 we would use for a clerk that was working on a domestic
6 well or something to try to understand the basic
7 hydrology of how water moves. And that basically was
8 looking at, if you have a sponge and a rock, which one
9 is the water going to move through fastest.

10 So you always looked at that when you were
11 permitting domestic wells beside of a river or something
12 where you had something constructed in an alluvial fill,
13 because that alluvial fill is basically a sponge. Stuff
14 moves through it really fast. With a rock, it doesn't
15 move through really fast.

16 So in my opinion as an administrator for 15 years
17 doing this, there would be a difference between
18 reinjecting at depths where you've already reached
19 hardened strata compared to depths where it was alluvial
20 fill that the water would flow through really fast.

21 Q. Are you familiar with the flow of that alluvial
22 area around the Lightning Dock --

23 A. That's always been considered. Animas is kind of
24 an interesting character, because your ground water and
25 your surface water there both have a tendency to flow

1 more south to north than they do north to south because
2 it's kind of shaped different. So everything there kind
3 of works backwards from what you would normally think.

4 Q. Are you familiar NMSA Section 71-5-21(B)?

5 A. That's a lot of numbers. If you'll refresh me --

6 Q. It was HB201.

7 A. Yes, I am.

8 Q. The Water Replacement Plan. Do you have an
9 opinion, can you elaborate about the prospect of a water
10 replacement plan?

11 A. To me that plan would still require the use of a
12 valid water right that would be senior to the water
13 right that Mr. Seawright owns at AmeriCulture. The
14 passage of HB201(B) was after his permits were issued.
15 So I don't know if it would even apply to his permits.
16 I don't know if those statutes are retroactive.

17 Q. I'm trying to kind of shift a little bit to go to
18 your personal opinion. Do you have concerns about this
19 proposed project?

20 A. I do. One of the reasons I switched jobs
21 actually -- and I will be very honest about it now where
22 I wasn't before. One of the reasons I switched jobs
23 from the State Engineer's Office, at the time that I
24 did, to the county was because three county
25 commissioners knew that I had a lot more knowledge than

1 I was being able to use, because as an administrator in
2 an agency you are told to stay out of things, not to
3 make comments, not to do things. So they basically told
4 me to come over here and say whatever you want to say.

5 So I think that was part of the reason, for not
6 only with water issues but with endangered species
7 issues, with a lot of stuff, that's part of the reason
8 that I changed jobs when I did.

9 We're involved, the County Commission was
10 involved in a water right application that was filed by
11 the Interstate Stream Commission. It's pending right
12 now. And it was an attempt to take a statute way beyond
13 what it was ever intended to be used. And that was the
14 Strategic Water Reserve. And that's another one of our
15 newer statutes. So my commission quickly protested that
16 and said don't get involved with that because we see big
17 problems with it.

18 One of the biggest issues going on in the
19 southwest corner of the state right now is the
20 development of what's called the New Mexico Cap Entity
21 and the movement forward for those four counties in the
22 southwest corner of the state to be able to utilize
23 provisions and benefits that were provided to the state
24 of New Mexico under the Arizona Water Settlement Act of
25 2004.

1 Part of that is the ability for the state of New
2 Mexico in the corner, in those four counties, to be able
3 to divert an additional 14,000 acre feet of water from
4 that river, those taken away from the state basically in
5 an adjudication by the Supreme Court in 1968.

6 You know, I look at alluvial fill. I've sat in
7 courtrooms with hydrologists that testified to the exact
8 opposite all the time as to what's going to happen in a
9 basin. And as an administrator in the State Engineer's
10 Office, the joke was always that hydrology was a black
11 science because it was whatever answer fit at the time.

12 But what I do know is when you're in an alluvial
13 fill basin, things move pretty fast. That alluvial fill
14 that comes out of that area of the Animas extends
15 towards the Gila River. And my commission has some
16 concerns that maybe at some point in this -- if
17 everybody is wrong -- and I have not heard once today, I
18 haven't heard one person sit here and I say, I guarantee
19 you that that fluoride, dissolved solids or anything
20 else won't get past point X to point Y. I haven't heard
21 that one time today.

22 What I've heard is, Maybe, maybe not. And if it
23 does and that gets into that alluvial fill and that
24 alluvial fill moves toward the Gila River, the impacts
25 to the state of New Mexico are gigantic. I mean, it's a

1 loss of \$180,000,000 possibly. And there's all kinds of
2 stuff that could happen from that.

3 So, you know, my commission watches down there
4 all the things that happen that can affect us locally.
5 My county is the tenth poorest county in the nation. So
6 the things that happen to us and the things that happen
7 to our neighbors, we have to watch those things very
8 close.

9 We have problems with economic development. We
10 have problems with all these things. We are not real
11 quick to go out and grab an economic development
12 opportunity if it's going to limit us having economic
13 development opportunities in the future. We take great
14 concern to what we actually do bring and bite off.

15 And I guess one of the things of concern is what
16 impact is this going to have five years down the road,
17 ten years down the road on the economic viability of
18 Hidalgo County and, as such, on the economic viability
19 of Luna County.

20 Q. Do you have specific current concerns about the
21 water injecting into the alluvial --

22 A. One of the things I printed out when I was
23 looking at this -- you know, in Title 19, Chapter 14,
24 Part 26, under the Setting Off of the Strata, Part B
25 says, All waters of present or of probable future value

1 for domestic, commercial, agricultural, or stock
2 purposes shall be confined to their respective strata
3 and shall be adequately protected by methods approved by
4 the Division.

5 I forgot to talk about strata today. And I
6 haven't heard any talk about that underground hard rock
7 being the same strata as the alluvium. So if the
8 water's being taken out of the underground hard rock
9 strata, how are we following that part of the statute
10 for putting it back into the alluvial fill. So I have
11 concerns about that.

12 I have concerns about the impacts on domestic
13 wells, about the impacts on stock wells. And until
14 somebody can sit there and say, Absolutely, without a
15 doubt, positively it will not move out of that little
16 box that we're trying to paint it into, I think my
17 concerns will last.

18 MR. LAKINS: I pass the witness.

19 CHAIRPERSON CATANACH: Ms. Henrie.

20 MS. HENRIE: To me?

21 CHAIRPERSON CATANACH: Yes, ma'am.

22 CROSS EXAMINATION

23 BY MS. HENRIE:

24 Q. I am looking at page 2 of T.

25 A. Okay.

1 Q. If I am reading this right, it's AmeriCulture's
2 injection well. I know it is not a State Engineer form.
3 What is the depth?

4 A. The proposed depth is 100 to 300 feet on this.

5 Q. Do you have concerns about this well?

6 A. At 100 to 300 feet -- I think part of what we
7 looked at on this with all the data that came in with
8 that application was the fact that this AmeriCulture
9 well was not right over the anomaly itself; it was
10 outside of that plume.

11 And so I think we looked at that, because he can
12 impair himself. On a water right application, as
13 everyone knows, the applicant can impair themselves.
14 All you look at is if they can impair somebody else.
15 And there was nobody else to impair out there past where
16 he was at.

17 Q. And your concern about fluoride getting into the
18 Gila River, I've never thought about that before. But
19 this injection that AmeriCulture proposes is kind of in
20 that gradient path on its way to the Gila River?

21 A. There was one other component that was part of
22 this application that I remember very clearly in my
23 conversations with the OCD when we did these, was at
24 that time every injection well that was permitted, the
25 waters -- if you were going to pump from that source and

1 you were going to reinject, that water had to be
2 returned to a location of like temperature and like
3 chemical content, because they wanted to protect the
4 heat in the water and they wanted to make sure that they
5 weren't doing that.

6 So we passed that responsibility off to the OCD.
7 They came back and said, This permit matches that. It
8 takes it back to where it's like chemical content and to
9 where it's like temperature and it won't affect the
10 resource.

11 So we accepted their professional view on this
12 and said if they say it's okay and it matches those
13 parameters, then we're going to say it's okay, because
14 that was their area of expertise.

15 Q. And then to go back to your strata concern,
16 wouldn't this also take geothermal water and put it
17 into -- I don't believe there is any strata out there,
18 but it feels like you felt that the alluvium was
19 different than --

20 A. I did feel that. I feel like the testimony
21 today -- I mean I don't hear anybody saying -- when you
22 do a well log, you change -- on a well log, when you
23 drill a water well, the stratas are listed on a well
24 log. Every time the type of material changes, that is
25 considered a different strata.

1 And so from the time you go through that alluvial
2 portion of the basin until you got down to whatever
3 depth it was -- and to finish this up before I forget, I
4 don't really remember off the top of my head what the
5 depth was of A45(A) either, because that would have had
6 something to do with how we reviewed this depth as well.

7 But every time you go through a different type of
8 material, it was considered a different strata, because
9 they all carry water in a different way. When you are
10 looking at impairment, you are looking at the
11 permeability of that rock type or that soil type,
12 whatever it is. So each one of those listed a different
13 strata.

14 So from a water rights standpoint, the alluvium
15 bedrock or a hard rock or whatever is definitely a
16 different strata when you're reviewing it from a water
17 right application process.

18 Q. Even if they are all water bearing?

19 A. Yes. Because the permeability of each one is
20 different. They are all considered a different strata,
21 because when you do your review for impairment, you are
22 looking at the speed at which that water is going to
23 move in that strata because that's how you determine how
24 quickly the impairment would happen. We look at a
25 40-year timeframe on the impairment, so you had to know

1 what the permeability was.

2 Q. The way I've always understood the geothermal
3 side is the strata with the confining layer between
4 geothermal hot water versus the cold or alluvial valley
5 fill -- and there was some sort of confining layer.

6 And that's what we're not seeing out there so we
7 may have different interpretations of strata.

8 A. We may have. All the training I have ever had,
9 alluvial fill and bedrock are different types of
10 formations. And there's a definite difference there.

11 MS. HENRIE: I pass the witness. Thank you.

12 CHAIRPERSON CATANACH: Mr. Domenici.

13 CROSS EXAMINATION

14 BY MR. DOMENICI:

15 Q. Did you ever go into the greenhouses that are out
16 here?

17 A. Yes, numerous times.

18 Q. Was anything growing there?

19 A. When I first started working at the office, I
20 went over there and met with Mr. Burgett. You're
21 talking about Burgett's greenhouses?

22 Q. Yes.

23 A. I met with him not too long after I started
24 working there. At that time he was not in full
25 production, but he did still have roses growing.

1 Q. What was the source of water for the roses?

2 A. For the growth of the roses or --

3 Q. For the growth.

4 A. He used cold water for the growth of the roses.

5 Q. And then the geothermal was --

6 A. Was used to keep the greenhouse at a steady
7 temperature.

8 Q. Where did he get the cold water, if you know?

9 A. He had numerous wells around he used, around that
10 facility, both for hot and for cold water.

11 Q. How close, if you can recall, was the closest
12 cold water?

13 A. The closest hot water well was right outside of
14 your door.

15 Q. No. Cold.

16 A. The closest cold water well, you know, it wasn't
17 too far away from there. Distance-wise, I don't know as
18 it's been so long since I have been on that -- it would
19 be a rough guess. I would say maybe 400 or 500 yards --
20 maybe not that far. Maybe 200 or 300 yards. That would
21 be the closest one.

22 His house was actually right outside the
23 facility, so he had a domestic well right beside the
24 house.

25 Q. Did you ever go in his house?

1 A. I did.

2 Q. Did you ever drink his water?

3 A. I actually did. I went into Mr. Burgett's house
4 one time to talk to him and he was taking a nap, so they
5 sat me at the table and I had a glass of water while I
6 waited for him to finish his nap.

7 MR. DOMENICI: Thank you.

8 CHAIRPERSON CATANACH: Do you have any
9 questions?

10 MS. MARKS: I do. Thank you.

11 CROSS EXAMINATION

12 BY MS. MARKS:

13 Q. Your testimony here today is as a fact witness,
14 correct?

15 A. On the water part of it, yes.

16 Q. You haven't been qualified as an expert witness,
17 correct?

18 A. Not here.

19 Q. I know the prehearing statement mentioned you may
20 testify as an expert witness, but all your testimony is
21 as a fact witness?

22 MR. LAKINS: I guess I forgot to move him as
23 an expert.

24 MS. MARKS: I am unsure as to what he is an
25 expert in. The testimony was very lengthy, and I am

1 confused as to which part of the testimony he was an
2 expert and which part he was testifying as perhaps
3 someone from Luna County -- it was very confusing to me.

4 CHAIRPERSON CATANACH: Do you want to
5 qualify him as --

6 MR. LAKINS: Mr. Jackson testified about his
7 experience with water rights at the Office of the State
8 Engineer and his experience with the Animas underground
9 basin and adjudication.

10 I tender Mr. Jackson as an expert in New
11 Mexico water rights, impairment, and as well as
12 information about the Animas Alluvial Water Basin.

13 EXAMINER BALCH: Is his resume somewhere in
14 your exhibits?

15 MR. LAKINS: No, we did not submit his
16 resume. We laid his foundation...

17 CHAIRPERSON CATANACH: And that is by virtue
18 of his work experience with the State Engineer's Office.

19 MR. LAKINS: Yes, sir. I can ask him some
20 more foundational questions about his education and more
21 about his experience, if necessary.

22 CHAIRPERSON CATANACH: Do you have any
23 objection to his being qualified as --

24 MS. HENRIE: Sorry. Go over that again.
25 In?

1 MR. LAKINS: In New Mexico water rights,
2 water rights impairment under New Mexico law, and his --
3 and information concerning the Animas underground water
4 basin which includes the area at issue and water law.

5 MS. HENRIE: I guess where I am
6 uncomfortable is I know, Tink, you were administrator
7 and you had a lot of hands-on. But the State Engineer's
8 Office as the hydrology bureau has lots of other
9 professionals who are the science guys. And that is
10 where I'm kind of getting hung up.

11 Knowledge of water rights, yes, absolutely.
12 But when we talk about hydrology, then I have a little
13 more trouble with that.

14 MR. LAKINS: As a fact witness concerning
15 the underground water basin from his experience with the
16 State Engineer, which not only qualifies him as an
17 expert in New Mexico water rights but water rights
18 impairment analysis.

19 EXAMINER BALCH: I would be comfortable with
20 him being an expert in those two areas, but I think the
21 rest of his testimony is more of as a fact witness.

22 CHAIRPERSON CATANACH: I agree. He's
23 testified on hydrology issues and movement of water and
24 we haven't qualified him in that regard.

25 We will qualify him as an expert in water

1 rights -- what was the other one?

2 MR. LAKINS: Water rights impairment.

3 CHAIRPERSON CATANACH: Okay. We will do
4 that.

5 MR. LAKINS: And I apologize. I was just
6 trying to get done very fast.

7 EXAMINATION BY MS. MARKS (resumed)

8 Q. Mr. Jackson, did you see this Exhibit T? Did you
9 see this letter and application while working for the
10 Office of the State Engineer?

11 A. I did.

12 Q. Did you review this or did a hydrologist or one
13 of the science people at the State Engineer's Office
14 review this in a system review?

15 A. When the application came in, the review on the
16 physical application itself was done by an employee who
17 worked for me who had a degree in engineering. He was
18 the one who did the impairment analysis on the
19 application.

20 The analysis as far as water right impairment or
21 how it would affect other water rights around it, I did
22 the analysis on that. And then it was signed off by a
23 licensed P.E.

24 Q. I believe at some point -- and I could be
25 wrong -- I have been sick all day -- you talked about a

1 priority right. The priority right -- I don't know
2 where that testimony came from -- that was for water or
3 a legal conclusion --

4 A. No. It's a priority date associated with the
5 water right. When an application for a water right --
6 for a transfer of water right is filed or for a
7 non-consumptive application, by state law that permit or
8 that right to that water gets a priority date of the
9 date it was filed if it finishes the process and the
10 permit is approved.

11 So that becomes senior to any appropriation that
12 comes after that, to any transfer that comes after that,
13 or to any diversion that comes after that.

14 Q. Your testimony is with respect to --

15 A. To the water right.

16 Q. So with respect to geothermal resources, you are
17 not making any assertion with respect to priority --

18 A. No. I'm talking about the physical water right
19 that is in the well.

20 Q. Okay. And Ms. Henry discussed that this --
21 discussed the application was for injection, correct?

22 A. This permit, the part that came from -- because
23 they already had the diversion well, they needed to be
24 able to reinject because OCD was going to require it to
25 be reinjected.

1 So this permit, A45(A) Enlarged, was for the
2 reinjection well. It was the increased diversion from
3 the primary well that they already had a permit for, but
4 that permit allowed them to drill the injection well up
5 to meet the requirements that OCD had under that permit
6 to be able to put that water back into -- for it to be
7 non-consumptive, it had to be put back into the source.

8 And so they had to get an injection well, so we
9 had AmeriCulture go to OCD to get the injection well
10 permit.

11 Q. Was this well drilled?

12 A. Yes.

13 Q. And they are injecting?

14 A. I assume so, but I haven't looked at -- I haven't
15 looked recently. I haven't been there for a year and a
16 half. I didn't keep track of the meter reports.

17 Q. So you don't know?

18 A. I don't know.

19 Q. And at this depth of 150 feet, you didn't have
20 any concerns of it affecting the reservoir?

21 A. It wasn't our responsibility to have that because
22 it was OCD review. They were the ones that said it had
23 to be put back in an area of like chemical content and
24 like temperature, and this was where they said that
25 applied.

1 So we allowed OCD to make that decision. And
2 once they said it met the requirements for them, then we
3 approved the permit for the water right process.

4 Q. Can I just draw your attention to 71-5-2.12(B2).

5 A. If you will show me where it's at.

6 MR. LAKINS: I can put it up on the screen.

7 MS. MARKS: The statute?

8 MR. LAKINS: Yes, I can do that.

9 Q. If you don't mind me getting close to you, I can
10 read it --

11 A. That's fine. You can bring it over here.

12 Q. This says a permit from the State Engineer --
13 I'll just jump down to 2: All diverted ground water
14 reinjecting as soon as practicable into the same ground
15 water source in which it was diverted, resulting in no
16 new net depletions to the source, provided that the
17 Division shall provide to the State Engineer all
18 information available to the Division regarding the
19 proposed diversion and reinjection and shall request the
20 opinion of the State Engineer as to whether existing
21 groundwater rights sharing the same groundwater source
22 may be impaired.

23 Does that seem to you as though the opinion of
24 the State Engineer and not the OCD is needed?

25 A. Well, that law was passed in 2012. This permit

1 was done in 2002. So this permit was done 10 years
2 before that law was passed.

3 Q. What you previously spoke of, was that a law or
4 was that just a policy?

5 A. That was the way we worked with the OCD back
6 then.

7 Q. Was there a policy?

8 A. It was the State Engineer's policy that if there
9 was going to be something done in a geothermal resource,
10 that we made sure that we had -- that the applicant had
11 the permit from OCD to do it before we worked on the
12 water right permit.

13 Now, what the internal policies were at OCD or
14 the rules at OCD, I have no idea.

15 Q. So we really don't have anything in writing to
16 substantiate --

17 A. We have the permit that they issue for the well.

18 Q. No, that OCD kind of dictated and the State
19 Engineer had no say other than --

20 A. In the approval of your permit?

21 Q. That OCD dictated what affected water, other than
22 your testimony here?

23 A. I don't think I understand your question.

24 Q. You are saying the law changed in 2012, and I
25 don't have an earlier copy of the law. But your

1 testimony is referring to State Engineer policies and
2 what OCD dictated. We don't have copies of any of these
3 policies or perhaps oral directions --

4 A. No.

5 Q. We just have your testimony.

6 A. No. I talked to -- maybe John Johnson was the
7 guy who I used to talk to up here. In the conversation
8 I had with him, because we used to have conversations
9 back and forth, the conversation I had with him was for
10 them to be able to do this, that OCD would require that
11 the injected water be returned to the same source in an
12 area were it was like chemical content.

13 Because at the State Engineer's Office an
14 injection well was always same source and it was always
15 as close to back to the same source as possible. But
16 because this water is different because it has different
17 chemical content and you have the heat component to it,
18 we allowed -- then we asked OCD, Then what would you do;
19 what are your requirements on this?

20 What I was told was same source, it had to be
21 like chemical content and like temperature. So then,
22 once you get the directions that were given to
23 AmeriCulture, once you get approval from OCD to do the
24 injection well, they're going to follow their
25 regulations to give you that. When you have it, then

1 come to us and we'll approve it based on your having
2 their permit.

3 And so that is the way this was done.

4 Q. So even though the State Engineer regulates
5 water, water quality, your testimony is that OCD made
6 that decision?

7 A. Made the decision on where the reinjection zone
8 was.

9 MS. MARKS: I have no further questions.

10 EXAMINATION BY EXAMINER BALCH

11 EXAMINER BALCH: So a water rights expert, I
12 have a water-rights related question. At paragraph 3
13 they were talking about in the Joint Facility Operating
14 Agreement, they were going to replace the heat using a
15 heat exchanger, and not circulating any of their water
16 to AmeriCulture; that would be okay?

17 THE WITNESS: I think the heat is one
18 component of the --

19 EXAMINER BALCH: So they are not taking any
20 of their water and giving it to AmeriCulture; they are
21 running a pipe over there with hot water in it, using
22 the heat exchanger to warm up their water, and then
23 their water comes back to them and they do whatever they
24 were going to do with it otherwise?

25 THE WITNESS: The diversion of the water to

1 do that --

2 EXAMINER BALCH: But it's in a closed loop;
3 there's no transfer of water.

4 THE WITNESS: I thought we heard all day
5 today there was no closed loop there.

6 EXAMINER BALCH: I think some people were
7 saying it's closed loop and some were saying it wasn't.

8 I am just talking about a pipe from a well
9 carrying hot water over there and not touching their
10 water directly; they put a heat exchanger on it,
11 transfer the heat to their water, and then the water in
12 the pipe goes back to their place. So they didn't give
13 any water away; all they gave was the heat from the
14 water.

15 A. So the heat is one component of that water right,
16 but there's also -- I mean whether it's aerated.
17 There's a bunch of other components to it as well.

18 The reality is that a final decision on a water
19 right impairment is left to the district court. As the
20 administrator before, if they felt that their water
21 right had been impaired and they explained, Well, the
22 heat's been diminished, there's increased chemicals and
23 there's increased solids, whatever, we think that that's
24 got to go, because our water right was for growing fish
25 and for doing these things, then my advice to them would

1 have been to take it to district court.

2 EXAMINER BALCH: What do you think district
3 court would do in that case?

4 THE WITNESS: I would hate to think what any
5 judge would do because judges these days have a tendency
6 to do lots of different things.

7 I think the fact that there's a pending
8 adjudication down there and that AmeriCulture has offer
9 of judgment for that water right would probably weigh
10 pretty heavy in that.

11 EXAMINER BALCH: So we are asked to judge
12 correlative rights. And there has been a little bit of
13 a focus today on the potential impairment of
14 AmeriCulture's correlative rights. I do think that
15 Lightning Dock also has a right to produce energy from
16 their resource. So there has to be a balance and
17 everybody getting their fair share.

18 I don't know -- this doesn't really
19 necessarily tie into water rights, but there may be some
20 parallels.

21 THE WITNESS: The balance that you are
22 trying to weigh is an interesting balance. And at some
23 point, you know, is the decision left before a district
24 court judge to decide which one of those two is
25 paramount; is production of energy and heat in the West

1 paramount or is water paramount in the West?

2 I think if it is put to a district court
3 judge that way in the west, I know which one wins.
4 Maybe that's what it comes down to.

5 EXAMINER BALCH: Maybe my opinion is it
6 would shoot all the way up to the Supreme Court.

7 THE WITNESS: There's always that
8 possibility, too.

9 EXAMINER BALCH: Sorry for bothering you.

10 THE WITNESS: You're not bothering me.

11 EXAMINATION BY EXAMINER PADILLA

12 COMMISSIONER PADILLA: You just talked about
13 a heat component of a water right in a closed loop
14 surface, closed loops in an area where hot water is
15 piped to a heat exchanger and comes back. Are you
16 talking about a water right tied to the geothermal
17 process that Lightning Dock is doing or water right tied
18 to AmeriCulture?

19 THE WITNESS: About a water right tied to
20 AmeriCulture, because they're the ones that transferred
21 in valid rights into that hot water source to be able to
22 extract the hot water for the purposes that they had on
23 their application.

24 COMMISSIONER PADILLA: I don't see the tie
25 then between Lightning Dock sending their geothermally-

1 regulated water through a closed loop and back, would
2 affect AmeriCulture's water right.

3 THE WITNESS: If it was truly a closed loop,
4 I think I might agree with you. But I don't know that
5 we've heard anything today that shows it is truly a
6 closed loop.

7 COMMISSIONER PADILLA: I think in this
8 scenario it is a closed loop because you've got a
9 surface pipe. Subsurface is, in my mind anyway, the big
10 debate as to what this really centers on.

11 But if they're pulling hot water and sending
12 it down a pipe and bringing it back -- I don't see the
13 connection to AmeriCulture's water right in that case.

14 THE WITNESS: We see the application of
15 water law in the west evolve a lot. If you look back to
16 1907 or you look back to 1912 or you look back to when
17 the original water -- things like aquaculture, a lot of
18 the beneficial uses that the State Engineer and the
19 Legislature recognize now, they weren't there. Those
20 are things that evolved over time as New Mexico was
21 evolving.

22 A prime example, talking about what
23 decisions a judge would make or whatever, as part of
24 this Arizona Water Settlement Act, the San Carlos Indian
25 tribe did not participate in that because they felt that

1 the quality of water that they were going to get in the
2 river was going to be diminished by the introduction of
3 additional total solids into that water by New Mexico
4 taking out the additional 14,000 acre feet here in New
5 Mexico.

6 So in the act, there was a provision put in
7 the act to drill a well in Arizona to pipe the water
8 straight to them. It's a higher quality water than they
9 ever received.

10 And the judge came back and said, No, that's
11 not applicable, because there are other components to
12 that water right, including traditional values,
13 historical values, ceremonial values. They put a lot of
14 other components on that water right.

15 It had nothing to do with just the total
16 dissolved solids or the quality of the water or the heat
17 in the water. It had to do with the intended use of the
18 water that was granted to them and the way that they
19 historically got it.

20 COMMISSIONER PADILLA: Let me kind of
21 rephrase. AmeriCulture's water right is separate in my
22 mind from Lightning Dock's geothermal rights under their
23 leases. And I don't see the tie there. Is there any
24 tie between AmeriCulture's water right and Lightning
25 Dock fulfilling that obligation as outlined in the joint

1 operating agreement or whatever that instrument is
2 called?

3 THE WITNESS: I don't think that the joint
4 operating agreement will have anything to do with that.

5 Their water right, that permit allows them
6 to divert from the source where they are an amount of
7 water each year to do all the things that are in their
8 permit.

9 The replacement portion that you are talking
10 about I think is provided in that 2012 Act. I don't
11 know if that's retroactive to that permit or not. I
12 don't know if you can pass a law that's retroactive to
13 anything.

14 But I think if you're looking at, the permit
15 was granted to them, the temperature of the water was a
16 certain temperature at that time when it was granted to
17 them, that's why they made the investment, to transfer
18 the water right, to protect that. The quality of the
19 water was a certain quality, whatever it was. I don't
20 know what the measurements were for fluoride or anything
21 else. But the measurements for the water at that time
22 were a certain amount.

23 And that water right was transferred in
24 based on those values, because they made the investment
25 to do that at that time. So if anything changes those

1 values and impacts their ability to do what they
2 transferred that right in to do, I think that a court
3 will view that as an impairment.

4 COMMISSIONER PADILLA: It would be up to
5 AmeriCulture to pursue that rather than transfer heat.

6 THE WITNESS: That would sure be an option
7 they would have.

8 COMMISSIONER PADILLA: I want to follow up
9 on the injection from 2002, 150-foot AmeriCulture
10 injection, and your objections to the current proposed
11 injection in light of your, I guess, suggestion that
12 that injection was OCD's responsibility to oversee --
13 was it 2002?

14 THE WITNESS: Yes, 2002.

15 COMMISSIONER PADILLA: In your mind,
16 something has changed with the current injections or
17 maybe it is your current position with the county that
18 has changed your opinion where an injection at that
19 depth in that area would now be considered a liability.

20 THE WITNESS: I think there's two things.
21 On my part of this application, there was an assumed
22 comfort in the fact that the conversation we had with
23 OCD said that the water that was being reinjected in
24 that area was the same chemical content as the water
25 that was already there, the same temperature as the

1 water that was already there. So it wasn't going to
2 change the resource.

3 COMMISSIONER PADILLA: So that's not the
4 case in the current application --

5 THE WITNESS: I haven't seen that in there.
6 And the current application is for a lot more water than
7 this application was.

8 COMMISSIONER PADILLA: But as far as the
9 constituents of the water --

10 THE WITNESS: I have not seen --

11 COMMISSIONER PADILLA: -- the water makeup,
12 I guess.

13 THE WITNESS: In the documents that I've
14 looked through related to the draft conditions of
15 approval, I don't see anything in there about like
16 chemical content, like temperature. I don't see that
17 stuff in there. In the draft conditions that you guys
18 put out, I didn't see that. I didn't see anything that
19 said, We are going to look at monitoring wells around
20 there --

21 EXAMINER PADILLA: That the OCD put out?

22 THE WITNESS: No. I am talking about the
23 proposed conditions that you have for this, for what you
24 are doing right now, I don't see anything there that
25 says like chemical content or like temperature.

1 COMMISSIONER PADILLA: By "you," you mean
2 OCD?

3 THE WITNESS: Yes, I do. I don't see
4 anything like that in there. And I keep hearing about
5 the percentage of fluoride and the percentage of this,
6 and it's like we are looking at one dot right in the
7 middle of this area and we are not looking at all that
8 stuff that's happening around it.

9 And I know for a fact that there's wells
10 over there -- that those numbers on the fluoride, that
11 is clean drinking water. It is potable standards for
12 drinking water. And I don't think we're looking at that
13 periphery stuff. And there's no provision in those
14 conditions that protects that periphery. What happens
15 if everybody is wrong and what happens if that plume
16 moves? There is no provisions to protect that.

17 COMMISSIONER PADILLA: Let me follow up
18 related to that. If that plume moves, you testified
19 that your county could have a \$180,000,000 impact.

20 THE WITNESS: There's the water settlements,
21 \$180,000,000 for the four counties. That allows the
22 counties to take extra water out of the Gila.

23 And so one of the other things you look at
24 when you are looking at the flow -- you start talking
25 about cause of depression and how that water is going to

1 move, you take -- Mr. Shomaker, he testified about those
2 pressures.

3 And you take the pressure off of an area, it
4 is kind of like electricity, that water moves path of
5 least resistance quicker than it's going to move just
6 because you want it to go a certain direction.

7 COMMISSIONER PADILLA: So the \$180,000,000
8 price tag is the entire Gila settlement package?

9 THE WITNESS: That's what the state of New
10 Mexico got out of it.

11 COMMISSIONER PADILLA: But it's not
12 something that the county has quantified as a result of
13 this project?

14 THE WITNESS: No. It is part of a federal
15 act that was done in 2004.

16 COMMISSIONER PADILLA: I am just saying the
17 county has not done a calculation based on fluoride --

18 THE WITNESS: No, no. It's a concern. I
19 can't just go higher hydraulics all the time. We expect
20 state agencies to protect us from --

21 COMMISSIONER PADILLA: Right. But you did
22 testify \$180,000,000 --

23 THE WITNESS: No. The \$180,000,000 was
24 given to the state of New Mexico by Congress to develop
25 the diversion on the Gila River. So if we develop the

1 diversion, we get the money. And if we don't develop
2 the diversion or something happens to the diversion,
3 then we don't have access to the money.

4 COMMISSIONER PADILLA: But it is not
5 specifically something that has been studied in relation
6 to projects?

7 THE WITNESS: No.

8 COMMISSIONER PADILLA: That's all I have.

9 CHAIRPERSON CATANACH: I have no questions.
10 Redirect?

11 MR. LAKINS: I have no questions on
12 redirect. I do move to admit Exhibit T.

13 CHAIRPERSON CATANACH: Any objections?

14 MS. HENRIE: No.

15 CHAIRPERSON CATANACH: Exhibit T will be
16 admitted.

17 (AmeriCulture Exhibit T was offered and
18 admitted.)

19 MS. HENRIE: I would like to call a rebuttal
20 witness to Mr. Jackson which would go faster than my
21 next real witness, my last witness.

22 CHAIRPERSON CATANACH: How long?

23 MS. HENRIE: I would say 5, 10 minutes max.

24 CHAIRPERSON CATANACH: Okay.

25 EXAMINER BALCH: Are you including

1 cross-examination on that?

2 MS. HENRIE: Okay, ten.

3 MS. MARKS: If Mr. Sanders is here, it's
4 really quick follow-up to Mr. Jackson's testimony and it
5 is short and I have a couple of questions as well in the
6 form of rebuttal.

7 CHAIRPERSON CATANACH: Off the record.

8 (Discussion off the record.)

9 MR. DOMENICI: If I may, I wanted to let the
10 Commission know I am going to need to excuse myself for
11 tomorrow. I didn't have two days set aside for this
12 hearing. I'm not going to ask it to be postponed or
13 anything. I think my client will be here in attendance.
14 And I don't expect her to necessarily participate unless
15 she really feels the need, but I just want to let you
16 know. So thank you for your time and for letting the
17 Soil and Water Conservation District participate.

18 CHAIRPERSON CATANACH: Thank you,
19 Mr. Domenici. We are going to hear a different case at
20 nine o'clock. So let's schedule this for 10:00 when we
21 will resume the hearing on this.

22

23 (Time noted 6:20 p.m.)

24

25

1 STATE OF NEW MEXICO)
 2) ss.
 3 COUNTY OF BERNALILLO)
 4
 5
 6

7 REPORTER'S CERTIFICATE

8
 9 I, ELLEN H. ALLANIC, New Mexico Reporter CCR
 10 No. 100, DO HEREBY CERTIFY that on Thursday, September
 11 10, 2015, the proceedings in the above-captioned matter
 12 were taken before me, that I did report in stenographic
 13 shorthand the proceedings set forth herein, and the
 14 foregoing pages are a true and correct transcription to
 15 the best of my ability and control.
 16

17
 18 I FURTHER CERTIFY that I am neither employed by
 19 nor related to nor contracted with (unless excepted by
 20 the rules) any of the parties or attorneys in this case,
 21 and that I have no interest whatsoever in the final
 22 disposition of this case in any court.
 23
 24
 25

ELLEN H. ALLANIC, CSR
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