BEFORE THE

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

CALIFORNIA WATERFIX WATER RIGHT CHANGE PETITION HEARING	)))

JOE SERNA, JR. BUILDING

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

COASTAL HEARING ROOM

1001 I STREET

SECOND FLOOR

SACRAMENTO, CALIFORNIA

PART 1 - SURREBUTTAL

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9:30 A.M.

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Reported By: Candace Yount, CSR No. 2737, RMR, CCRR
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APPEARANCES

CALIFORNIA WATER RESOURCES BOARD

Division of Water Rights

Board Members Present:

Tam Doduc, Co-Hearing Officer
Felicia Marcus, Chair & Co-Hearing Officer (Not present)
Dorene D'Adamo, Board Member

Staff Present:

Dana Heinrich, Senior Staff Attorney
Conny Mitterhofer, Supervising Water Resource Control Engineer
Kyle Ochenduszko, Senior Water Resources Control Engineer

PART I SURREBUTTAL

For Petitioners:

California Department of Water Resources:

James (Tripp) Mizell
Robin McGinnis

The U.S. Department of the Interior:

Amy L. Aufdemberge, Esq. (Not present)

INTERESTED PARTIES:

For Central Delta Water Agency, South Delta Water Agency (Delta Agencies), Lafayette Ranch, Heritage Lands Inc., Mark Bachetti Farms and Rudy Mussi Investments L.P.:

Dean Ruiz, Esq.

For The Environmental Justice Coalition for Water, Islands, Inc., Local Agencies of the North Delta, Bogle Vineyards/Delta Watershed Landowner Coalition, Diablo Vineyards and Brad Lange/Delta Watershed Landowner Coalition, Stillwater Orchards/Delta Watershed Landowner Coalition, Brett G. Baker and Daniel Wilson:

Osha Meserve

For County of San Joaquin, San Joaquin County Flood Control and Water Conservation District, and Mokelumne River Water and Power Authority:

Thomas H. Keeling

I N D E X

CENTRAL DELTA WATER AGENCY, SOUTH DELTA WATER AGENCY (DELTA AGENCIES), LAFAYETTE RANCH, HERITAGE LANDS INC., MARK BACHETTI FARMS AND RUDY MUSSI INVESTMENTS L.P.:

CENTRAL DELTA WATER AGENCY, SOUTH DELTA WATER AGENCY ("DELTA AGENCIES"), LAFAYETTE RANCH, HERITAGE LANDS, INC., MARK BACHETTI FARMS AND RUDY MUSSI INVESTMENTS L.P.'S

Friday, June 23, 2017 9:30 a.m.

PROCEEDINGS

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CO-HEARING OFFICER DODUC: Good morning everyone. It is 9:30 on Friday.

Welcome back to the Water Right Change Petition hearing for the California WaterFix Project.

I am Tam Doduc, and just joining us is Board Member Dee Dee D'Adamo. Chair Marcus and our Co-Hearing Officer Marcus is traveling to attend a funeral today so she won't be able to join us, but she is watching the Webcast -- listening to the audiocast right now and reviewing everything in its entirety.

Also on the dais this morning, Dana Heinrich, Conny Mitterhofer, and Kyle ocean -- Ochenduszko. Boy, I'm trouble -- having trouble talking this morning.

Also assisting us today are Mr. Hunt and Mr. Long.

Friday. All the faces look familiar. Does anyone need me to make the three general announcements?

(Pause in proceedings.)

CO-HEARING OFFICER DODUC: All right. If you here an alarm, leave. Speak into the microphone. Most importantly, do not make any noise during this hearing.

Just kidding. Turn off your phone and any

other noise-make -- noise-making devices to silent or vibrate, please.

All right. With that, are there any housekeeping matters we need to address before I turn this over to Mr. Ruiz and Miss Meserve?

All right. Not seeing any, please begin.

Do you have an opening statement?

MR. RUIZ: No, I don't have an opening statement this morning.

Dean Ruiz on behalf of the SDWA parties Group 21, and Miss Meserve also is here on behalf of Group 19 with respect to this panel as well.

We intend to present these two together. They have their own individual written surrebuttal testimony.

There are a couple of charts that Dr. Leinfelder-Miles will get into that she was -- she consulted with Mr. Prichard on, so in terms of cross, either one of them may be responsive to those charts but -- so I'll just begin.

First, with Mr. Prichard.

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MICHELLE LEINFELDER-MILES & TERRY PRICHARD

called as a witnesses by the Central Delta Water Agency, South Delta Water Agency (Delta Agencies), Lafayette Ranch, Heritage Lands Inc., Mark Bachetti Farms and Rudy Mussi Investments L.P., having been previously duly sworn, were examined and testified further as follows:

DIRECT EXAMINATION BY

MR. RUIZ: Mr. Prichard, you've testified in these proceedings before; correct?

WITNESS PRICHARD: Yes.

MR. RUIZ: And you've been sworn before?

WITNESS PRICHARD: Yes, I have.

MR. RUIZ: Did you prepare surrebuttal testimony on behalf of the SDWA parties in this matter?

WITNESS PRICHARD: Yes.

MR. RUIZ: And is SDWA-262 a true and correct copy of that testimony?

WITNESS PRICHARD: Yes, it is.

MR. RUIZ: Dr. Leinfelder-Miles, you've been sworn before in these proceedings; correct?

WITNESS LEINFELDER-MILES: Yes, I have.

MR. RUIZ: And did you prepare surrebuttal testimony?

WITNESS LEINFELDER-MILES: Yes.

MR. RUIZ: And is SDWA-263 a true and correct copy of that surrebuttal testimony?

WITNESS LEINFELDER-MILES: Yes, it is.

MR. RUIZ: I'd like to begin with Mr. Prichard.

Mr. Prichard, at this point, could you briefly summarize your surrebuttal testimony.

WITNESS PRICHARD: Yes.

I prepared this testimony in response to the rebuttal testimony of Dr. Kimmelshue and Dr. Thornberg.

I have seven points to discuss today. That is one less than is contained in my testimony, and Dr. Michael will be addressing that comment as it pertains to Dr. Thornberg's material.

Point one: Dr. Kimmelshue's rebuttal testimony attempted to respond to by my case in chief testimony as well as that of Dr. Leinfelder-Miles.

One of Dr. Kimmelshue's criticisms of Dr. Leinfelder-Miles' leaching study was that he could not determine if the salinity of the soil was the result of only salts in the applied water or also from those contained in groundwater or some other source.

This perceived lack of data led Dr. Kimmelshue to conclude that the leaching fractions calculated by Dr. Leinfelder-Miles were inaccurate.

In support of his conclusions, Dr. Kimmelshue

referenced the Hoffman Report which calculated much higher leaching fractions than in the Leinfelder-Miles report.

Dr. Kimmelshue was apparently unfamiliar with the Hoffman Report and gave it credence although it suffered from a more egregious error than that he accused Dr. Leinfelder-Miles of doing.

In the Hoffman Report, Dr. Hoffman clearly used an assumed applied water salinity instead of the actual water salinity of the applied water in the area.

This necessarily means that his calculations for leaching fractions are at best a guess and only reliable if actual applied water quality reflects the . . . the quality that was assumed.

Dr. Hoffman could easily have located data on water quality in the channels from which the diversions occurred, but he chose not to do that.

However, the greater error was done by Dr. Hoffman, and one of which Dr. Kimmelshue accuses Dr. Leinfelder-Miles of doing, is using the incorrect drainage salinity.

Dr. Hoffman used tile drainage data which was from many years before he wrote his report as the EC effluent data for the drainage water.

This approach might be useful if the tile

drainage water was only the excess -- was the result of only the excess water applied or the drainage water from that field.

However, the tile drain data used by Dr. Hoffman came from drains that were 8 to 9 feet deep, mostly intercepting ground water of unknown originals. And this was in personal communication with Jack Alvarez, who is the Director of the West Side Irrigation District, the farms in that area. The degree to which any of these drains are collecting excess applied water, therefore, is unknown.

The sworn testimony from Jack Alvarez, who farms in that area, about those tile drains confirm -- confirms that those drains mostly collect groundwater in the area and are not explicitly the excess water applied to any great degree. And that is in his declaration submitted in the Bay-Delta process.

Obviously, then, Dr. Hoffman used an assumed applied water EC and incorrectly used the drain water as an indication of the drainage water EC as leaching fractions, and basically it's simply an exercise in math and bear no relationship to what actually occurred on the lands from which the data was derived in the South Delta lands.

It is clear, however, that Dr. Kimmelshue's

reliance on the Hoffman Report as an indicator that the Leinfelder-Miles leaching fractions are incorrect is unsupportable.

Dr. Hoffman's leaching fraction calculation cannot be used as a scientific basis for determining leaching fractions in the Southern Delta. His data are simply wrong and unusable.

I will also note that the locations of the tile drains referenced by Dr. Hoffman are virtually all located in the very southern or the southwestern areas of the Southern Delta. Those areas have a much deeper groundwater table and do not, for the most part, receive water from the areas of the poor quality in the Southern Delta channels and do not experience salt impacts to the degree that these other areas do.

In sum, not only did Dr. Hoffman use the incorrect data, he also focused on areas in which were less prone to salt damage.

My second point is also directed at Dr. Kimmelshue's materials.

As previously recognized in cross-examination and redirect, my calculations of the crop yield reductions were incorrect due to my mistaken use of the salinity of the irrigation water instead of the salinity of the -- of the soil that results in zero yield of each

of the crops presented.

These EC -- These soil EC values were used to calculate the rate of decline per unit of soil salinity in the relative yield equation. The net effect was to correct -- The net effect was a correct determination of when yields begin to decline at a specific irrigation water quality and leaching fraction, but they overestimate the rate of decline after the threshold.

In Dr. Kimmelshue's rebuttal testimony, he attempted to produce a corrected version of the yield reduction calculations but also made an error by using the wrong yield reduction numbers in two of his three charts. The result was to under -- also underestimate the yield reduction per unit soil salinity having no impact on the threshold.

Obviously, we each made simple mistakes which I'm now correcting and an updated Figure 4 from my original testimony on Page 11 is on Page 5 of my surrebuttal testimony.

Could we bring up that page, Page 5?

MS. MESERVE: That's going to be SDWA-262, Page 5.

(Document displayed on screen.)

WITNESS PRICHARD: That's fine. That's the one I want to focus on right there. Thank you.

This table corrects my error and that of Dr. Kimmelshue's. Since the numbers are different, I think it is helpful for us to explain them once again.

Under the 5 percent leaching fraction scenario that we see on the top of our screen in the top chart -- and recall that Dr. Leinfelder-Miles' study found some leaching fractions below that 5 percent -- we exceed the crop tolerance threshold and yield reductions begin to occur at a specific water EC.

Those are highlighted in the pinkish color there.

And those are a water EC of -- for the first column, for bean, is 0.4, 0.6 for corn, 0.7 for alfalfa, 0.8 for tomato, 0.5 for almond and also for grape.

It's important to note that the point at which the decreased yields occur does not change from the original incorrect charts either for -- from my charts or Dr. Kimmelshue's; rather, the rate at which the crop yields decrease were affected.

The underlying point being that the damages to crop yields occur when the EC of the applied water taken from the southern chan -- Delta channels increases past the threshold.

Dr. Kimmelshue is incorrect when he dismisses such damages.

Point Number 4. Dr. Kimmelshue makes the point in his rebuttal testimony that I and Dr. Leinfelder-Miles are emphasizing study and modeling results to show adverse impacts while not taking into account times in which there were no expected impacts.

This misses the point of analysis being done by both Petitioners and Protestants.

It's my understanding that the purpose of the hearings is to determine if the Proposed Project will injure other legal users of water.

To determine if such injury occurs, one must examine those conditions and circumstances under which injury might or is expected to occur. To also look at any potential benefits derived from the Proposed Project is not, to my knowledge, a criterion by which the Board evaluates these adverse effects.

If, for example, a project causes no harm in one year but two years later cause -- excuse me.

For example, if a project causes harm in one year but two years later somehow causes no harm or, in fact, a benefit, the fact is there was a benefit does not in any manner undue the previous harm; thus, the notion of offsetting benefits with injury is, in fact, an attempt to average away impacts on third parties.

Dr. Kimmelshue's suggestion that it is more

appropriate to look at averages -- as done in the Hoffman Report also, I must point out -- is unrealistic when applied to farmers who are supposed to be protected against injury when the Board grants a Permit for Change in the Point of Diversion.

Point Number 5. Dr. Kimmelshue concludes that crop production has not been impacted by current irrigation water salinity levels and will not be impacted by anticipated future salinity levels.

There are two errors contained in his conclusion: The first ignores the testimony of other South Delta Water Agency farmer witnesses who unanimously stated, under the current conditions, they were either experiencing crop damage or due to salt -- due to salts or were undertaking additional management practices to prevent or lessen current salt damage.

There's no basis for the reliance on the Hoffman Report's calculated conclusion that no harm -- no harm when people actually are being harmed have presented testimony and evidence that they are indeed being harmed.

Excuse me for confusing that a little bit.

The second error in Dr. Kimmelshue's conclusion is that the Hoffman Report assumed a water quality of .7 EC. Once again, the record in this case provides us with facts instead of Dr. Hoffman's assumptions.

South Delta Water Agency Exhibits 18, 19 and 35 show data of measured water quality in certain South Delta locations. As can clearly be seen in these, the channel water quality's often worse than the .7 during the irrigation season.

The point being that Dr. Hoffman's calculations are based on the EC of .7 while the actual water quality is sometimes worse; thus, one cannot rely on the -- on Hoffman's conclusions about existing or future harm as Dr. Kimmelshue did because the calculations are not connected to reality.

Point Number 6. Dr. -- Dr. Kimmelshue criticizes my explanation of how model inputs can be modified to better reflect actual infield conditions by comparing it to a later comment by me that differences between model runs should not be understood to indicate what conditions will actually result.

His criticism has no basis.

My testimony includes a reference as to how models can and are adjusted to better reflect actual conditions when one is trying to analyze some specific set of conditions.

My later comment that model run differences should not be considered to reflect actual conditions is simply a truism regarding channel water quality modeled

and in no way contradicts my other observation about how Modelers adjust inputs to get better outputs.

Of course, models like the one used to calculate soil salinities or leaching fractions are only calculations which produce results from a set of inputs and cannot ever be thought of as ironclad predictors of what's going to happen in the real world.

However, we use models to try to understand how conditions might change because we simply can't do multiyear studies for thousands of acres every time we want to analyze how some change of condition might affect soil salinity, crop production, et cetera.

The point is that we -- The point is that although we use models to help us understand what might happen when certain conditions change, they're not expected to be precisely accurate.

In this case, Dr. Kimmelshue criticizes my description of how models work, their reliability, while at the same time choosing to rely on model runs in the Hoffman Report instead of relying on an actual survey of the area.

He can't have it both ways, especially when an examination of the Hoffman Report indicates it's undoubtedly unreliable in this respect.

Point Number 7. Dr. Leinfelder-Miles is

addressing numerous issues in her surrebuttal testimony, including the reliability of her data and conclusion.

I'd like to comment on one of those issues as it directly relates to my previous comments.

Dr. Kimmelshue believes it's more appropriate to rely on the Hoffman Report calculations than to rely on the work of Dr. Leinfelder-Miles.

It is true that Dr. Leinfelder-Miles' study was done over relatively short period of time and in dry conditions. However, that is no scientific basis for discounting the study and preferring calculations based on faulty numbers.

The Leinfelder-Miles alfalfa study is an accurate, sound and reliable study which showed how then-existing conditions included very poor leaching fraction of soils, the buildup of salts in the soil and the potential for decrease in crop production when certain local crop salinity thresholds are exceeded.

The data indicates that, in certain areas, salinity buildup in the soil is a real threat to crop production.

The Leinfelder-Miles study is strong evidence that any adverse change in applied water salinity resulting from the Proposed Project will likely adverse affect -- adversely affect Southern Delta crop

production.

When this evidence is compared to the lack of evidence provided by DWR on potential impacts to the Southern Delta farmers, it appears that only one conclusion can be made.

Dr. Kimmelshue's criticisms notwithstanding, the conclusion is that the Petitioners have not shown what will happen to the Southern Delta crop production if the Project is undertaken and that South Delta Water Agency, et al., have shown the likelihood of damage.

For my last point, Number 8, Dr. Kimmelshue criticized my assertion that on-site conditions can limit the ability of applied water to move through the soil profile and remove excess salts.

He further states (reading):

"If this were actually true, salinization of the ground would have already occurred and no agricultural production would be taking place."

Therefore, the leaching fraction must be of some significance to continue to allow for crop production to continue to occur.

These comments were made in reference to alfalfa culture and the leaching study conducted by Dr. Michelle Leinfelder-Miles.

The study clearly shows low leaching fractions

exist in the Delta and alfalfa culture.

In making this statement, Dr. Kimmelshue obviously does not consider the long-term effects of crop rotations to crops in which higher leaching fractions can be achieved, rainfall variability and other grower practices that might reduce salt buildup when making these comments.

Thank you. That concludes my comments.

MR. RUIZ: Dr. Leinfelder-Miles, will you please summarize your surrebuttal testimony at this point.

WITNESS LEINFELDER-MILES: Yes.

Could we please bring up SDWA-263. I'll be referring to it later on in my presentation.

(Document displayed on screen.)

WITNESS LEINFELDER-MILES: My name is Michelle Leinfelder-Miles and I'm the Delta Crops Resource Management Advisor with U.C. Cooperative Extension based in San Joaquin County.

I have prepared this surrebuttal testimony in response to the rebuttal testimony of Dr. Joel Kimmelshue.

Specifically, I will address his opinions on peer review, experimental methodology, sources of salinity in agricultural systems, precipitation and

leaching, and alfalfa varieties -- alfalfa variety salinity tolerance.

On the matter of peer review, Dr. Kimmelshue has been critical of my testimony because I rely on my Project work which has not yet been peer reviewed. However, when asked about the Hoffman Report, or DWR-580, he said that review by academic peers is a form of peer review.

Dr. Kimmelshue's statements obscure the meaning of "peer review" and apply different standards to Hoffman's work and my own.

It is my intention to have my work published in a referee journal. It is not typical for a scientist to release drafts of a manuscript, but I have done so for this hearing because the data are relevant to this discussion, particularly as the Petitioners have not provided any data on the matter of soil salinity in Delta agricultural systems. Rather, the Petitioners have relied on the Hoffman Report.

I'd like to point out that I, too, reference Hoffman in my work as it contains a comprehensive literature review and contextualizes the literature for the South Delta.

I, however, disagree with Hoffman's assumptions on water quality and leaching fractions and, hence,

conducted a study to measure applied water and soil salinity and calculate the leaching fractions using these data.

On experimental methodology, Dr. Kimmelshue was critical of the following: Sampling site locations, repeatability, and one time versus multiyear sampling.

On the matter of specifying sampling sites, as it relates to the scientific review of a work, the time and place cannot be repeated exactly and, thus, naming the specific location is unnecessary.

On the matter of repeatability, it is the methodology that must be repeatable, not the conclusions. I have provided clear description of my methods which would allow others to repeat what I have done.

Finally, on the matter of my one-time sampling on Ryer Island, I agree with Dr. Kimmelshue that I cannot speak on trends or changes over time, but I disagree that a one-time sampling somehow renders the data invalid.

The data from the Ryer Island study accurately characterizes soil salinity conditions in the vineyard and pear orchard at the end of Water Year 2015-16.

In cross-examination, Dr. Kimmelshue was asked what other sources of salinity may impact crops besides salinity from applied irrigation water, and he provided the following sources: Rainfall, soil mineral

weathering, and brackish shallow groundwater.

First, rainfall. In my review of scientific literature, I have not found any references that describe rainfall as a source of salinity. And the Hoffman Report describes how rainfall mediates soil salinity. Thus, we can dismiss rainfall as a source of salinity in the Delta.

Second, mineral weathering. Previous research indicates that mineral weathering may be a source of salinity when the irrigation water's salt content is low and when the leaching fraction is high.

In my field work, I have not found such conditions and, thus, contend that mineral weathering is not substantially contributing to soil salinity conditions in the Delta. Hoffman came to the same conclusion.

Finally regarding shallow groundwater. I agree with Dr. Kimmelshue that this point needs addressing. However, I disagree that the depth of groundwater in the Delta invalidates the use of a leaching fraction equation that relates applied water salinity and soil salinity.

To support this argument, Dr. Kimmelshue misquoted the Ayers and Westcot text and referenced a manuscript that determined a leaching requirement, not a leaching fraction, even after Dr. Kimmelshue emphasized

the importance of distinguishing these two terms.

For these reasons, Dr. Kimmelshue has failed to support his argument that shallow groundwater invalidates using the leaching fraction equation that compares applied water salinity and soil salinity.

Furthermore, I disagree with Dr. Kimmelshue's suggestion that groundwater salinity contributed to root zone soil salinity at my study sites or that salts in the groundwater are coming from a source other than applied water.

The literature is far from absolute on when groundwater may contribute to soil salinity and when it may not.

Ayers and Westcot describe a safe depth of 2 meters. However, Hoffman described it as 3 feet. In the alfalfa project, I never measured groundwater shallower than 1 meter, or about 3.3 feet.

For reasons described in my written testimony, the soil salinity profiles I observed in my work are as I would expect them to be for applied water via a flood-irrigated system.

On precipitation and leaching, I agree with Dr. Kimmelshue that the effect of precipitation on leaching should be addressed, and this has always been an explicit objective of my alfalfa leaching fraction study.

I have now calculated leaching fractions taking precipitation into account, and these are presented in Table 1.

If we could please bring up Table 1.

CO-HEARING OFFICER DODUC: Do you have a page number?

WITNESS LEINFELDER-MILES: It's Exhibit B at the very end. Toward the end, before the figures are all the tables.

(Document displayed on screen.)

WITNESS LEINFELDER-MILES: There we go, Table 1.

Factoring in precipitation results in a lower applied water EC and a lower leaching fraction. This is because the leaching fraction equation calculates the leaching fraction as the EC of the applied water divided by the EC of the soil.

Rainwater lowers the EC of the applied water but the measured soil salinity does not change in the equation; therefore, we calculate a lower leaching fraction.

We can visualize why precipitation is not contributing more to leaching by observing the daily water balance of the soil and the change in soil moisture from field capacity for the seven alfalfa sites.

I'm going to be going through Figures 1 through 4 now in Exhibit C.

(Document displayed on screen.)

WITNESS LEINFELDER-MILES: We'll start with Figure 1.

Figure 1 shows the daily water balance for Water Year 2012-13, a year when we received approximately 8.8 inches of rain.

This figure shows a closeup view of precipitation minus the ET for alfalfa, which I will call ETc.

When the blue line peaked above zero on the Y-Axis, rainfall exceeded crop water use on that day, and water stored in the soil was stored in the soil profile.

Let me be clear that when rainfall exceeds ETc, that excess water is not necessarily available for leaching.

First, the soil profile will absorb some of the water until it reaches a state called field capacity. We can think of field capacity as a deficit in soil moisture that must be overcome before leaching can occur.

Now let's look at Figure 2.

(Document displayed on screen.)

WITNESS LEINFELDER-MILES: This figure represents Water Year 2012-13 -- excuse me -- 2013-14, a

year when we received approximately 8.2 inches of rain.

This is a year for which we have soil moisture data from the alfalfa project for the fall and can consider the soil moisture deficit that needed to be overcome to achieve leaching.

In this water year, precipitation rarely exceeded ETc. That is the blue line at the top right around zero on the Y-Axis.

Precipitation rarely exceeded ETc and it was never high enough to fill the soil profiles, exceed the soil's field capacity, and leach salts; thus, in water year 2013-14, no leaching occurred from rainfall.

Moving to Figure 3.

(Document displayed on screen.)

WITNESS LEINFELDER-MILES: This graph represents water year 2014-15, a year when we received approximately 11.8 inches of rain.

As a point of comparison, data reported by Hoffman for the years 1952 to 2008 had average rainfall at 10.9 inches.

In this rainfall season, there was a period starting on December 11th where soil moisture exceeded field capacity for all sites except Site 5, which is in orange.

Soil moisture peaked on December 20th. The

amount of soil moisture in excess of field capacity, or the difference between the peak and zero on the Y-Axis, would be the water available for leaching.

For the seven alfalfa sites, this ranged from 0 inches at Site 5 -- because the soil at Site 5 never had soil moisture that exceeded field capacity -- to 3.1 inches at Site 2, which I believe is green on that graph.

As this water was available for leaching, we assume that this water drained from the soil profile and the lines dropped to zero on the Y-Axis, or field capacity.

After December 20th, the daily water balance was never enough to exceed field capacity, so no other rainfall was available for leaching over the remainder of the year.

To understand how this rainfall contribution could impact soil salinity, let's now look at Table 2. Going down to Exhibit C, Table 2.

(Scrolling down document.)

WITNESS LEINFELDER-MILES: Oh, sorry. Up.

(Scrolling up document.)

WITNESS LEINFELDER-MILES: Table 2 represents the depth of leaching water that would be required to bring the average root zone salinity of the seven alfalfa

sites to the alfalfa crop tolerance threshold of 2.0 decisiemens per liter. This table includes project data for initial average root zone salinity and soil moisture.

The column labeled "Dw" shows the amount of rainfall that would be required to leach these particular soils of salts to attain an average root zone salinity of 2.0.

We see that, with the exception of Site 3, where average root zone salinity was already below the threshold, the minimum amount of rainfall to bring any of the other six sites to the threshold would be 4.5 inches for Site 7.

To reiterate, the range of rainfall available for leaching during this water year was zero to 3.1 inches. These values illustrate that while there was rainfall available for leaching during the 2014-15 water year, the amounts were far less than what would be needed to bring the average root zone salinity of these soils to the alfalfa crop tolerance threshold.

Finally, while Dr. Kimmelshue speculated that we would see very different soil salinity after the rains we had received this year, we can actually model this with available data, and that is what Figure 4 represents.

If we could go to Figure 4, please.

(Document displayed on screen.)

WITNESS LEINFELDER-MILES: Exhibit C, yeah.

Up until June 6th of this year, we received approximately 18.5 inches of rain. I used the smallest soil moisture deficit for each of the seven sites across the 2013 and '14 fall seasons to provide a best-case scenario for leaching.

Peak moisture was reached at Feb -- on February 21st and ranged from 2.3 inches for Site 5 to 6.4 inches for Site 7.

Again, as this water was in exceedance of filling the soil profiles and, thus, available for leaching, we assume that the -- that this water drained from the profiles and the lines dropped to zero.

After February 21st, rainfall was never enough to fulfill ETc and fill the soil's profiles, so no other rainwater was available for leaching.

Now, if we look at Table 3.

(Document displayed on screen.)

WITNESS LEINFELDER-MILES: Using the most recent soil salinity data available from the alfalfa project, which was from spring 2015, and the depth of water available for leaching, again ranging from 2.3 to 6.4 inches, we can calculate the average root zone salinity we might be able to expect after a rainfall

season like we just had.

Notice these soil salinities are much lower, as Dr. Kimmelshue speculated they would be. However, four of the seven sites still have an average root zone salinity that exceeds the crop tolerance threshold of 2.0 for alfalfa.

What this means is that one heavy rainfall year will not eliminate our salinity concerns for Delta agricultural systems.

(Timer rings.)

WITNESS LEINFELDER-MILES: I have one more minute, one and a half?

Finally, Dr. Kimmelshue expressed some other opinions about my project work which I addressed in my written testimony.

Of those, I will point out that Dr. Kimmelshue has emphasized the importance of salt-tolerant alfalfa varieties, but he cited only one research report.

In that work, the researchers only tested non-dormant alfalfa varieties, which are appropriate for hotter climates like the Southern San Joaquin Valley, the Imperial Valley in Arizona, but are not appropriate for the Delta.

For that project, they reported irrigation water salinity at 6.5 decisiemens per meter but their

last soil sampling for the season was in June, well before the end of the growing season, and they only sampled soil down to 12 inches.

This study gives us insights into the genetic potential for alfalfa varieties but it falls short of collecting enough data to make any conclusions about the overall salt tolerance of the plant species on a whole.

In conclusion, my experiences evaluating Delta agricultural systems have given me an understanding of soil salinity and how water quality impacts the soil.

I have presented data that is pertinent to this discussion and the Petitioners have not provided any data to the contrary.

Thank you.

MR. RUIZ: These witnesses are now available for cross-examination.

CO-HEARING OFFICER DODUC: All right. Department of Water Resources.

MR. MIZELL: Good morning. Tripp Mizell and Robin McGinnis appearing on behalf of the Department of Water Resources.

I'll begin with some quick questions for Mr. Prichard and then Miss McGinnis will ask questions of Dr. Leinfelder-Miles.

I expect my questions to only go about five

minutes and they will focus on a critique of the Hoffman study.

So, Mr. Hunt, if we could bring up SDWA-262.

(Document displayed on screen.)

MR. MIZELL: I believe it's Page 3.

(Document displayed on screen.)

MR. MIZELL: And looking at Lines 3 through 9.

(Paragraph enlarged on screen.)

CROSS-EXAMINATION BY

MR. MIZELL: So, Mr. Prichard, I believe it's your written testimony, and then you confirmed in your verbal testimony this morning, that you criticize the Hoffman 2010 Report for being based upon tile drain data; is that correct?

WITNESS PRICHARD: Yes.

MR. MIZELL: Isn't it true that the Hoffman 2010 Report also relied upon Meyer, et al., from 1976, which was based upon actual measured data in the Southern Delta?

WITNESS PRICHARD: He does make reference to that, a non-peer-reviewed study.

MR. MIZELL: And isn't it true that Meyers, et al., 1976, found a range of leaching fractions from their measured data that were between 5 and 15 percent with the majority of the leaching fractions falling over

15 percent?

WITNESS PRICHARD: Yes. Yes, that's true.

MR. MIZELL: Thank you.

That concludes my questions for Mr. Prichard.

CROSS-EXAMINATION BY

MS. McGINNIS: Good morning, Dr. Leinfelder-Miles.

WITNESS LEINFELDER-MILES: Good morning.

MS. McGINNIS: In your peer review section of your surrebuttal testimony, you refer to SDWA-139, SDWA-140 and LAND-79 as versions of a manuscript, reports and a study; correct?

WITNESS LEINFELDER-MILES: Yes. They're my written work.

MS. McGINNIS: So I'm trying to figure out how to refer to them, the different versions.

WITNESS LEINFELDER-MILES: They're different versions of the same report in which I updated references to scientific literature but did not change any of the data from one report to the next.

MS. McGINNIS: Okay. So, then, is LAND-79 the current version so that you would consider SDWA-139 and SDWA-140 to be superseded?

WITNESS LEINFELDER-MILES: Not necessarily. I stated in my rebuttal testimony that the manuscript is

still under development, and I'll be making changes to the manuscript until it goes to publication.

MS. McGINNIS: So the manuscript is a document that will -- that you're -- well, that you'll submit later; is that right?

WITNESS LEINFELDER-MILES: Yes.

MS. McGINNIS: And these are -- Sorry. You call them versions of . . .

WITNESS LEINFELDER-MILES: Versions of the Project Report.

MS. McGINNIS: Versions of the report.

So, on Pages 11 to 15 of your surrebuttal testimony, you provide an analysis of the effect of precipitation on leaching fractions.

Is this analysis in any of the earlier reports?

WITNESS LEINFELDER-MILES: No, it is not. It's data that I worked specifically for the surrebuttal but it was data that I was planning to get worked on for the manuscript eventually.

MS. McGINNIS: So you testified that it is not typical for a scientist to release drafts of a manuscript; right?

WITNESS LEINFELDER-MILES: Yes.

MS. McGINNIS: Is that because it may be incomplete?

WITNESS LEINFELDER-MILES: It's because a scientist is generally updating a manuscript until and even after it has been reviewed by peers.

CO-HEARING OFFICER DODUC: Sort of like environmental documents, huh?

WITNESS LEINFELDER-MILES: I'm not going to speak on environmental documents.

MS. McGINNIS: So will you publish all versions of the report?

WITNESS LEINFELDER-MILES: No. I will publish one manuscript on this project.

MS. McGINNIS: So why, then, are those previous versions not superseded?

WITNESS LEINFELDER-MILES: Because I may be going back and reviewing things that I've stated in previous versions. It's my work. I can write -- I can write the final manuscript as I deem the best manuscript to be.

MS. McGINNIS: So SDWA-139, which I believe was dated December 2014, you would consider that to be current as of that time.

WITNESS LEINFELDER-MILES: That was the Project Report update to that time.

MS. McGINNIS: Okay. And the same thing for SDWA-140, which I believe was August 2016, and the same

for LAND-79, which I believe was December 2016.

WITNESS LEINFELDER-MILES: That was how I brought the report together for that time.

MS. McGINNIS: Okay. And that may be because your research is ongoing?

WITNESS LEINFELDER-MILES: The project is not ongoing. The -- The field work of that project has concluded, but I'm still analyzing the data and writing it up.

MS. McGINNIS: So do you expect, when the manuscript is peer reviewed, it will look exactly how it looks today?

WITNESS LEINFELDER-MILES: No, I do not expect it to look exactly how it looks today.

MS. McGINNIS: So would the peer review include review of all three of those versions or just the current one, or the -- sorry -- or just the most recent one?

WITNESS LEINFELDER-MILES: The peer review will probably be of a manuscript that is neither SDWA-139, SDWA-140 or LAND-79. It will probably be a newer version.

MS. McGINNIS: The future version of that one document.

WITNESS LEINFELDER-MILES: Correct.

MS. McGINNIS: Okay. So you said that you're

still analyzing the data; right?

WITNESS LEINFELDER-MILES: I was still analyzing precipitation data, and I presented that in my surrebuttal testimony.

MS. McGINNIS: And you stated you're just updating references.

WITNESS LEINFELDER-MILES: I -- I include references as I read them. I'm continually reading about salinity, and as I find papers that are relevant to the project, then I include them in the Project Report.

MS. McGINNIS: So you're going to add analysis, not just references in the future; is that correct?

WITNESS LEINFELDER-MILES: I will -- I will add to the discussion of the paper.

MS. McGINNIS: So I'll ask again: Are you going to add analysis or --

WITNESS LEINFELDER-MILES: I don't know what you mean by "analysis."

MS. McGINNIS: For example, the precipitation and leaching section in your surrebuttal testimony, Pages 11 to 15.

WITNESS LEINFELDER-MILES: Um-hmm.

MS. McGINNIS: Would you consider that analysis?

WITNESS LEINFELDER-MILES: Yes. I analyzed

data for that section of the surrebuttal testimony.

MS. McGINNIS: Is that something you'll later add to the manuscript?

WITNESS LEINFELDER-MILES: Yes, probably so.

MS. McGINNIS: So you will add analysis to the manuscript before you submit it for peer review.

WITNESS LEINFELDER-MILES: Yes.

MS. McGINNIS: Okay. So isn't it true that, in LAND-79, you added an entire section related to depth to root zones?

WITNESS LEINFELDER-MILES: No.

There is no new data in LAND-79 compared to SDWA-140 and SDWA-139.

MS. McGINNIS: So no new data. But what about analysis of depths to root zones?

WITNESS LEINFELDER-MILES: When I hear the word "analysis," I think of data. I think of analyzing data.

Did I add discussion on some of that data? Yes, I did add discussion on that data, on the results as it related to new scientific literature that I became aware of and read about.

MS. McGINNIS: So you earlier testified that the -- the data underlying the three reports that have been submitted as exhibits so far haven't changed.

WITNESS LEINFELDER-MILES: That is correct.

MS. McGINNIS: But the analysis is currently -- Or it has been updated and it will be updated in the future.

WITNESS LEINFELDER-MILES: The discussion of the paper has changed, and I will add data based on precipitation in a future version.

MS. McGINNIS: So in future versions, you'll add data, you'll add analysis, and you'll add references.

WITNESS LEINFELDER-MILES: Yes.

MS. McGINNIS: So since you'll be adding data analysis and references, should the Hearing Officers disregard the previous drafts of your report?

MR. RUIZ: I'm going to object: It calls for speculation as to what the Hearing Officers should or should not do. It's irrelevant, rather.

CO-HEARING OFFICER DODUC: Sustained.

MS. McGINNIS: Are you currently working on updating the manuscript?

WITNESS LEINFELDER-MILES: I am continually working on updating the manuscript.

CO-HEARING OFFICER DODUC: Even though there's no objection, asked and answered multiple times.

MS. McGINNIS: You previously testified you have the location of the study sites and sampling sites for the alfalfa study; correct?

WITNESS LEINFELDER-MILES: Yes.

MS. McGINNIS: And you testified just now that you will be publishing the study; correct?

WITNESS LEINFELDER-MILES: Yes.

MS. McGINNIS: So when you submit the alfalfa study for publication, will you include a map of the location of the monitoring and study sites?

WITNESS LEINFELDER-MILES: Not of the specific sampling locations, no.

And I've stated in my surrebuttal testimony that, for the scientific review of this work, because the location -- and the time for that matter -- cannot be repeated exactly by another scientist, it is unnecessary to provide those.

MS. McGINNIS: I understood your testimony earlier that not providing a location is sufficient for scientific review, but we have a different standard here, and we need to understand the foundation for your opinions.

So since many variables in your work are location-specific, I can't access your work without knowing -- I can't assess your work without knowing the locations.

CO-HEARING OFFICER DODUC: Is there a question on that?

MR. RUIZ: Yes. Objection: It's a narrative. I move to strike the question, or the narrative, and there's no question pending that I can determine.

CO-HEARING OFFICER DODUC: I -- I will view it as background leading up to a question, I hope.

MS. McGINNIS: How would you suggest I assess your work without knowing the locations?

WITNESS LEINFELDER-MILES: In what way do you want to assess my work?

MS. McGINNIS: To understand the basis for your conclusions.

WITNESS LEINFELDER-MILES: What -- I don't understand what you mean by the "basis for my conclusions."

MS. McGINNIS: We'd like the raw data that supports your conclusions.

WITNESS LEINFELDER-MILES: That's not a question.

MR. RUIZ: Hold on.

Objection: That's not a question; it's a statement.

CO-HEARING OFFICER DODUC: Sustained.

Question?

MS. McGINNIS: So where can we access the raw data that supports your conclusions?

WITNESS LEINFELDER-MILES: The raw data is not publicly available.

The project is mine. Until I publish the paper, allowing public access of my data could allow another scientist to come in and publish the paper before me. It is not typical for a scientist to release data before a manuscript is published.

MS. McGINNIS: So, Hearing Officer, DWR believes the studies that, you know, set forth the leaching fractions for these seven locations in the South Delta, that we need to understand the basis for the conclusions there and that the location of the sampling sites and study sites are critical to understand the data.

So, you know, already in this hearing, raw data has been provided even after we provided -- DWR provided charts that showed the data. So I'd like to request, under Government Code 11450.10(a), that a subpoena be issued for producing the locations.

CO-HEARING OFFICER DODUC: Miss Meserve? Mr. Ruiz?

MS. MESERVE: If you -- I think -- Well, I mean, if they want to request it, then they would need to describe why it's necessary.

She has said she would like to review the data.

I don't really think that's what we're talking about. Our witness is available for questioning and she's been questioned many times by you and tested by your expert as well in opposing testimony.

So I believe Miss Leinfelder-Miles -- Dr. Leinfelder-Miles has concerns about the proprietary nature of the data because of the fact that she's seeking publication.

It may be something that I think we're interested in being responsive in terms of making sure that the Hearing Officers have the information they need to assess the data, but in terms of this request, it's really not clear why the data that DWR is apparently seeking would be any different than what a peer review and the type of standards -- scientific standards that Dr. Leinfelder-Miles has been talking about, why there would be some different standard that would be applicable here is beyond me.

CO-HEARING OFFICER DODUC: Mr. Mizell.

MR. MIZELL: I'd like to point out that this is applying a much different and higher standard to the request for data than was applied for Mr. Leahigh and the data behind his exhibits.

Mr. Leahigh was also available for questioning and was questioned thoroughly and yet at the same time

there was this overwhelming need by Miss Spaletta to have the raw data in that circumstance.

What we are looking at here is a study based upon specific locations in the data. We have also seen or heard and read testimony from many parties about how locations in the data -- in the Delta are very particular to one another and not uniform, that soil types vary throughout the Delta, and, therefore, the locations are very important in assessing what the calculations were that went on behind this study.

Regardless of whether they are proprietary, the study itself was produced for this hearing and was intended to be relied upon, which means the data need to be investigated.

CO-HEARING OFFICER DODUC: Miss Meserve? Mr. Ruiz?

MS. MESERVE: I mean, I think that if DWR thinks they can put together a subpoena, then they should subpoena it and we will assess it and review it.

At this moment, I don't think we're able to make a decision one way or the other. I need to discuss with Dr. Leinfelder-Miles.

CO-HEARING OFFICER DODUC: Actually, thank you, because my counsel just reminded me that we don't issue subpoenas, parties do.

Mr. Keeling, your input?

MR. KEELING: Yes.

For clarification, I understand that the previous examples Mr. Mizell referred to were not scientific publications in process as this one is.

And my question would be whether the request to obtain the data, part of that is an offer to make it subject to a Protective Order of some sort that assures confidentiality and non-disclosure.

And I'm not suggesting that even if it were, that would be acceptable because I don't represent this witness, this panel.

But I wonder if the offer included that?

CO-HEARING OFFICER DODUC: Mr. Mizell, Miss McGinnis, I suggest you give it some thought, and if you still feel inclined to request this data, to issue the subpoena and we will take it from there.

MR. MIZELL: Thank you.

MS. McGINNIS: Okay. Dr. Leinfelder-Miles, you say that rainfall is not substantially contributing to leaching during low rainfall years; correct?

WITNESS LEINFELDER-MILES: Yes.

MS. McGINNIS: Isn't it true that, in normal and wet years, rainfall can contribute to leaching?

WITNESS LEINFELDER-MILES: I don't believe I

showed that at all in the figures that I presented.

MS. McGINNIS: But in -- In your opinion as an expert, is it true that, in normal and wet years, rainfall can contribute to leaching?

MR. RUIZ: I'm just going to object: The question is vague and overbroad.

Are you referring to her study or just in general, general location anywhere any time? Or what specifically are you referring to?

MS. McGINNIS: Well, since I don't know the locations, I guess I am referring to any location at any time.

So I'll move on.

MR. RUIZ: Okay. Then I'll object as overbroad, vague.

MS. McGINNIS: Oh, okay.

So, in your testimony --

CO-HEARING OFFICER DODUC: Sustained.

MS. McGINNIS: -- you say that, after the 2016 through June 2017 time period, there was a notable reduction in salinity; correct.

WITNESS LEINFELDER-MILES: I modeled that there could be a reduction in salinity in the soil.

MS. McGINNIS: That there could be or that there -- that there would be?

WITNESS LEINFELDER-MILES: I modeled it, so, as Mr. Prichard has talked about modeling, there could be a reduction in the soil salinity.

MS. McGINNIS: And in your testimony, I -- I quote Page 15, Lines 15 to 16 (reading):

"This is a notable reduction in salinity . . ."

Correct?

WITNESS LEINFELDER-MILES: What I modeled was a notable reduction in salinity.

MS. McGINNIS: Okay. Thank you.

If I could have a minute just to gather my thoughts.

And that's all. Thank you.

CO-HEARING OFFICER DODUC: All right. Thank you.

Any redirect?

MR. RUIZ: If you could just give us a minute.

CO-HEARING OFFICER DODUC: Actually, let me make sure.

No other cross-examination?

All right.

MR. RUIZ: If you could just give us a minute to confer to see if we need to take up your time in redirect.

CO-HEARING OFFICER DODUC: All right. As

you're doing that, you can multitask; right?

Mr. Mizell, please come back up, because your cross-examination of Dr. Leinfelder-Miles reminded me that you were supposed to give us an update today with respect to the status of the environmental documents.

MR. MIZELL: Certainly.

The update I received is that the environmental documents should receive certification within the next two weeks.

CO-HEARING OFFICER DODUC: Oh. BiOp.

MR. MIZELL: BiOp. We will receive the BiOps also within the next two weeks but before the certification takes place.

CO-HEARING OFFICER DODUC: Thank you very much.

(Pause in proceedings.)

MS. MESERVE: I just have one question on redirect for Dr. Leinfelder-Miles.

REDIRECT EXAMINATION BY

MS. MESERVE: In your study -- I'm sorry.

In your surrebuttal testimony, you do discuss some -- what you -- some findings regarding the effect of rainfall, and you do say that it can reduce salinity potentially; correct?

WITNESS LEINFELDER-MILES: Yes. I modeled that it could reduce the soil salinity. However, I showed

that four out of the seven alfalfa sites would still have a salinity that's higher than the crop tolerance threshold.

MS. MESERVE: In your experience, can a farmer depend on any particular amount of rainfall falling to reduce salinity in -- in crop years?

WITNESS LEINFELDER-MILES: A farmer cannot predict the weather.

MS. MESERVE: No further questions.

MR. RUIZ: No, we have no further redirect.

CO-HEARING OFFICER DODUC: All right. Any recross?

MR. MIZELL: No, thank you.

CO-HEARING OFFICER DODUC: All right. Thank you.

(Panel excused.)

CO-HEARING OFFICER DODUC: How are you doing, Candace? Do you need a short break?

THE REPORTER: No.

CO-HEARING OFFICER DODUC: You good?

THE REPORTER: Um-hmm.

CO-HEARING OFFICER DODUC: All right. Let's bring up Dr. Michael, I believe it is.

(Pause in proceedings.)

CO-HEARING OFFICER DODUC: Please begin.

MR. RUIZ: Thank you. Dean Ruiz again on behalf of the SDWA parties Group 21.

JEFFREY MICHAEL,

called as a witness by the Central Delta Water Agency, South Delta Water Agency (Delta Agencies), Lafayette Ranch, Heritage Lands Inc., Mark Bachetti Farms and Rudy Mussi Investments L.P., having been previously duly sworn, was examined and testified as follows:

DIRECT EXAMINATION BY

MR. RUIZ: Mr. Michael -- Dr. Michael, have you previously been sworn in this matter?

WITNESS MICHAEL: Yes, I have.

MR. RUIZ: And you previously submitted testimony in this matter; correct?

WITNESS MICHAEL: Yes, I did.

MR. RUIZ: And did you prepare surrebuttal testimony as part of your work in this matter?

WITNESS MICHAEL: Yes, I did.

MR. RUIZ: And is SDWA-264 a true and correct copy of your joint surrebuttal testimony?

WITNESS MICHAEL: Yes.

MR. RUIZ: And that's submitted on behalf of Group 21 as well as the County Protestants; correct?

WITNESS MICHAEL: Correct.

MR. RUIZ: At this time, Dr. Michael, can you

please summarize your surrebuttal testimony.

WITNESS MICHAEL: Sure. And I'll note that the testimony is SDWA-264 and I'm going to refer to a table in it.

(Document displayed on screen.)

WITNESS MICHAEL: And it rebuts Dr. Thornberg's testimony, DWR-84. And I will pull up one table from that as well, so you can be -- for efficiency.

So, my name is Dr. Jeffrey Michael. I'm an Executive Director and a professor at the Center for Business and Policy Research at the University of the Pacific.

Economic and policy issues in the Delta have been a major focus of my research and the Center's work since I came to Pacific in 2008, nine years ago. That's both because of its importance to the regional economy as well as its fit with my own educational research background which includes agricultural resource economics, economic development and my dissertation, which looked at the economics of the Endangered Species Act.

My Delta research experience includes being Principal Investigator of the Delta Protection Commission's Economic Sustainability Plan in 2011 and 2012, as well as benefit cost studies of the BDCP tunnels

in 2012 and the WaterFix in 2016, which are the only economic analysis of the tunnels that are consistent with the Project as described in the EIR and this Petition.

This surrebuttal testimony responds to the rebuttal testimony of Dr. Christopher Thornberg, DWR-84.

In general, I find Dr. Thornberg's testimony shows unfamiliarity with Delta agriculture and available data. He used an invalid approach to his empirical analysis and he misrepresents my testimony in multiple instances.

My comments summarize five key issues.

The first is just a review of basic information and concepts about Delta farming.

The second is a discussion of the Crop Choice Model utilized by me and Dr. David Sunding in reports for the Delta Protection Commission and the Department of Water Resources.

The third point is Dr. Thornberg's countywide empirical yield model.

The fourth is the Delta-specific theoretical yield model that's in my testimony.

And, lastly, a few comments on Delta levees and non-agricultural economic impacts.

So let's start with what's grown, basic information.

Dr. Thornberg's analysis is mostly based on aggregate county-wide data from the San Joaquin County Crop Report, and he uses this to make inferences about the Delta.

This only makes sense if the Delta is a large share of San Joaquin County and Delta agriculture is similar to other parts of the county. However, it's well known that there are huge differences.

And if you could pull up Page 6 of SDWA-264, Table 1 there illustrates some of these differences. So Page 6.

(Document displayed on screen.)

WITNESS MICHAEL: There it is.

So this table was compiled from data in the County Crop Report and the Economic Sustainability Plan of the Delta, which was RTD-301.

These are the two main sources that Dr. Thornberg used in his testimony, so this data was available to him from the documents he was reviewing.

It shows stark differences that should have been readily apparent between Delta agriculture and San Joaquin County agriculture.

So the two columns on the far right show acres for San Joaquin County Delta area in 2009; on the left shows acres in the county as a whole, as well as the

total County value, and it just orders those. So that the list isn't too long, we picked the 10 most-valuable crops in the county in 2009.

The Delta -- legal Delta share of San Joaquin County is about 30 percent of the irrigated crop area but only about 15 percent of the value because of the differences in what is grown.

So you'll see there that the -- the highest revenue crops, grapes, cherries, walnuts and almonds, or less than 10 percent of the acreage, is in the Delta. These are grown in very limited quantities in the legal Delta, whereas the legal Delta agriculture is dominated by corn and alfalfa. It just looks very different what is grown between the county as a whole and the -- and the legal Delta.

You'll see that the crops that are grown -- that are not grown much in the Delta are dominated by salt-sensitive woody crops. They're rarely grown there, and they -- and they can struggle when they are grown there. So that's almonds, grapes, walnuts and cherries. Inside the Delta, we see corn and alfalfa.

Now, this data is from 2009. The most recent Crop Report in 2015, you may be surprised to see almonds are fifth. Almonds are now number one. You know, like much of San Joaquin Valley, this has been increasing in

acreage.

And, so, in the county as a whole, there's been strong growth in acreage in grapes, walnuts and almonds since 2009, but there's no evidence that that's grown in the Delta.

Second overarching issue is the logical chain Dr. Thornberg referenced repeatedly that says -- that he said represented my analysis. But this misrepresents not only my testimony but the way the farmers make decisions about their crops.

He described the sequence as: First, salinity changes due to WaterFix, or something else; second, farmers suffer reduced yields in revenue in some crops from the damage; and, third, they would then shift to lower-value crops.

Dr. Thornberg's logic chain where crop choice is only made after damage is incurred does not accurately describe the logic in my analysis and testimony, nor does it accurately describe the way farmers make decisions.

Crop choice and planting decisions are made far before any salinity damage could be realized. Farmers have a good idea of growing season water quality before they make planting decisions.

So this distinction is really important, not only for his criticism of the Crop Choice Model, which is

the -- is the lead of the analysis in the testimony, but it also has implications for his own yield model that I'll discuss in a moment.

So now let me turn to the models.

First, I'm going to discuss this Crop Choice Model which was utilized by myself as well as Dr. Sunding in reports for the DPC and the Department of Water Resources.

In my view, this is by far the most important of the three agricultural economic models that are discussed in my testimony and surrebuttal as well as Dr. Thornberg's rebuttal.

This is because it utilizes a great deal of Delta-specific data. It's been peer reviewed, and it was developed by reputable experts in reports for both the Petitioners and the Protestants in this proceeding.

The content of Dr. Thornberg's criticism of the data and the model unfortunately requires me to review its origins a bit in these two published reports because he created a lot of confusion about these issues.

So, the original origin of the models in 2011 when I was working on the DPC Economic Sustainability Plan, I hired Dr. Sunding, an agricultural economist from U.C. Berkeley, to help me in developing the analysis of Delta agriculture.

The Crop Choice Model is based on some previous work that he had done for the Sacramento County of governments in Yolo and Sacramento County related to their urban rurals connection strategy, not related to the Delta, but he had actually started using this model and had put together a dataset for Yolo and Sacramento Counties.

So we extended that dataset to the legal Delta and applied the model to the issues of the Delta agriculture.

The data was compiled by analysts working under him. The report was positively peer reviewed in late 2011 by an expert panel assembled by the Delta Independent Science Board. It was finalized in early 2012.

In 2013, in August 2013, the same model was used independent of me in the Bay-Delta Conservation Plan Statewide Economic Impact Report, a report Dr. Sunding and ICF prepared for the Department of Water Resources. It was released with a news release and a press call to promote the tunnels.

My testimony primarily cited the 2013 Department of Water Resources report and used its estimate of crop damage rather than the Delta Protection Commission report. And there's a reason for that.

If you look at -- Actually, if you could be -- if you could pull up my testimony, Page 9, Lines 3 through 7, and put it -- I have a quote there.

(Document displayed on screen.)

WITNESS MICHAEL: This is a quote from the DWR report and why I cited it as my primary reference. It says (reading):

"The modeling methodology is consistent with that employed in the Economic Sustainability Plan . . ."

Moving on (reading):

"The model is implemented as outlined in the ESP, with the exception of the incorporation of estimated salinity data from the DSM-2."

Now, I used the DWR report as my primary reference because it closely followed the structure of this Petition. It used DSM-2 predictions of salinity changes and incorporated those into the model to make prediction.

Since the model and the findings are in a previous Petitioners' report from their consulting economists, implemented in a way consistent with this position, I assumed -- Petition, I assumed these findings were broadly accepted and non-controversial.

Dr. Thornberg's rebuttal testimony only

includes references to the first report, the Economic Sustainability Plan . . . , RTD-301 and 305, an appendix of it, not the DWR report that was my primary reference for damage estimates.

Dr. Thornberg stated under cross-examination that he had not personally read either one of these reports, which largely explains why his criticism of the model is inaccurate and misinformed.

For example, at one point, Dr. Thornberg claims my analysis is not credible because I supposedly deleted 2005 data from the model to produce a desired result.

This is a serious accusation of research misconduct. If true, it would be sufficient grounds for my termination from my job as well as disqualification of an expert witness.

Unfortunately, Dr. Thornberg's criticism is baseless and easily proven false with information readily available to him.

First of all, I'll point out that DWR's 2013 BDCP Statewide Economic Impact Report that I just discussed includes the same clear statement about the 2005 data as the 2011 DPC report. The direct reference is in my written testimony.

That means that Dr. Sunding omitted the same data in his analysis done for DWR in a report promoting

the tunnels, a fact that Dr. Thornberg should have noticed since my testimony, as I've stated, took its damage estimate from the DWR report.

If I'd intentionally removed the 2005 data from the DPC report to skew the analysis against the tunnels, Dr. Sunding would have put the data back in the report 18 months later in the report for the Petitioners.

So that should have raised a question in the eyes of Dr. Thornberg.

If Dr. Thornberg or even DWR's counsel had simply asked their consultant Dr. Sunding why the data was not in his report, they would have learned that the decision to exclude 2005 data was made by him and his analysts and not by me.

Finally, if this year's data was an intentional act to bias the results, the standard would have been to obtain the model, incorporate the missing data, and show how it affects the results.

Dr. Thornberg failed to do this, even though DWR has the data and the model, as I mentioned, has been used by their consultants.

Dr. Thornberg's other criticism of the Crop Choice Model is similarly misinformed. There are more details in my written testimony.

One example of this is him saying the crop

choice dataset is too thin for the model, ignoring that it contains over 6,000 field-level observations.

In contrast, he puts great stock in his regressions which are based on 26 data points from the County Crop Report. And that's my next topic, is Dr. Thornberg's empirical yield model.

Dr. Thornberg's rebuttal centers on new data analysis specifically prepared for his rebuttal testimony, has not been peer reviewed or presented in any other forum.

His approach is to use the aggregate annual county-wide yield estimates for individual crops and correlate them to water quality in a specific part of the South Delta.

I've already discussed the vast differences between Delta agriculture and overall San Joaquin County, the vast majority of which is not irrigated with water irrigated from the Delta. Thus, the use of aggregate county-wide data is objectively invalid.

However, we can go beyond that, because if Dr. Thornberg's approach of a simple time series aggression on aggregate data would be invalid even if he did have Delta-specific yield data.

For example, somebody might argue, well, you know, maybe the corn regression's valid because most of

the corn grown in San Joaquin County is grown in the Delta.

So, thus, I'm going to briefly explain why his analysis is invalid, even if he had that data.

First, if you'll pull up DWR 84, Page 23.

(Document displayed on screen.)

WITNESS MICHAEL: And we can take a look at the table and how he identified the salinity variable.

So right there, Lines 19 to 20, the top variable of interest.

Well, how did he define salinity? You'll see that it's the annual average, and this is the covariant of primary interest. And here's the key part. It's (reading):

". . . The average of the current" --

(Timer rings.)

WITNESS MICHAEL: (Reading):

-- "and previous year to take into account the additive impact of salt."

So he's not even using current year salinity. He's combining it with the previous year to mask the effects of current year salinity.

This is invalid. If you wanted to look at previous year's salinity and see if it had an effect, you would include it as separate variables.

Second, Dr. Thornberg's model does not control for strong and well-known positive train in crop yields overtime.

For example, corn yields in the U.S. at the beginning of this period in 1990 averaged 120 bushels an acre. In recent years, they've averaged 175 bushels an acre, about a 50 percent increase in corn yields.

This is especially important since, as he states, there's an clear increasing trend in Delta salinity over the same period. Thus, this positive effects of salinity on yields are just spurious correlation due to a failure to control for this technological growth that's increased yields. He could have controlled for it with several simple well-known empirical approaches but he did not.

Third, Dr. Thornberg's model does not count for additional costs farmers incur trying to reduce the effect of salinity on their crop yields. Those efforts might keep those crop yields up even though there's an impact.

And, fourth, the model has a sample selection bias problem because it doesn't control for the decision not to plant crops in years when salinity is expected to be high.

These are the primary flaws. There's

additional ones discussed in my written testimony.

The last two points in my testimony about the Delta-specific theoretical yield model.

This section is based on calculations of yield loss and leaching fractions that we've been hearing other experts talk about, so I'll be very brief since it's been covered thoroughly by others.

I'll just point out that Dr. Thornberg criticized this section for being theoretical rather than empirical, but it could not be empirical because there is no Delta-specific data on yields.

Second, Dr. Thornberg criticized my calculations for using nonrepresentative crops but, to Dr. Thornberg's credit, he did acknowledge in cross-examination that this was an overstatement after he admitted he didn't know which crops are most common in the Delta.

The final point is about flood risk and nonagricultural economic impacts.

Delta tunnel discussions often focus on the risk of a catastrophic flood. Since the economic consequences of such a flood on San Joaquin County would be so large, in fact, the losses would be greater than those due to disrupted water exports to the rest of the state, it's critically important to ensure that building

the tunnels will not increase flood risk in the Delta.

Dr. Thornberg misrepresented my testimony by stating that I argued paying for the WaterFix would take money away from Delta levees. However, my argument had nothing to do with what WaterFix costs or how it's paid for.

They made two simple arguments. One was about levee funding policy, moving to a beneficiary pay system, which is from the Governor's Water Plan to various Delta plans, a clear direction of policy.

The presence of such a system would -- the tunnels in such a system would result in lower benefits and lower payments made by the Water Contractors that support Delta levees. So it depends on the presence of the WaterFix but not how it's paid for.

Second, I showed evidence that, in their campaign for the tunnels, even in technical reports, Petitioners have provided inaccurate information about the benefits and the options of investing in levees to key funding and policy-making entities such as the California legislature.

Finally, Dr. Thornberg misrepresented my testimony on the potential effects of WaterFix on the transportation of people and goods between San Joaquin County and the Bay Area.

This is because he focused on the impacts during the construction period and focused on the impacts on single-industry logistics, instead of the more important point about Delta flood risk and the -- and the damage to the transportation system, an enormous economic loss across the entire Delta economy if such a flood were to disrupt or destroy key part of the transportation corridors as predicted in various reports.

So, in conclusion, Dr. Thornberg's rebuttal is a series of inaccurate facts, misrepresentations, and invalid analysis, should be disregarded in its entirety, in my view.

The evidence is clear that the WaterFix will have negative economic effects on water users in the Delta.

Thank you.

MR. RUIZ: Dr. Michael is now available for cross-examination.

CO-HEARING OFFICER DODUC: All right. Thank you.

I think at this time we'll take our 10-minute break, short break. Is that all right with you, Candace?

THE REPORTER: Um-hmm.

CO-HEARING OFFICER DODUC: Because I believe we will wrap up after this cross-examination, so we'll

return at 11 o'clock.

(Recess taken at 10:51 a.m.)

(Proceedings resumed at 11:00 a.m.:)

CO-HEARING OFFICER DODUC: All right. It's 11 o'clock. We are back in session.

Mr. Mizell, Miss McGinnis.

Please remind me again: How much time do you anticipate needing for this cross-examination?

MR. MIZELL: I believe yesterday we estimated 30 minutes and I believe I can shorten that to no more than 15.

CO-HEARING OFFICER DODUC: Oh, okay. Efficiency is always appreciated.

MR. MIZELL: My topics are going to be the use of the leaching fractions in -- in Dr. Michael's testimony, as well as revisiting a statement he just clarified on verbal with regard to levee funding.

CO-HEARING OFFICER DODUC: All right.

MR. MIZELL: Mr. Hunt, if we could bring up SDWA-264, please.

(Document displayed on screen.)

MR. MIZELL: And go to Page 17.

(Document displayed on screen.)

MR. MIZELL: And if we could scroll down so that the paragraph for Lines 12 through the end --

(Document displayed on screen.)

MR. MIZELL: Yeah, perfect.

CROSS-EXAMINATION BY

MR. MIZELL: So on Line 17 to 18, you make a point in your testimony that determining the leaching fraction of land in the Delta is important in order for you to calculate your assumed yield losses; correct.

WITNESS MICHAEL: Correct, yeah.

MR. MIZELL: And you focus, in particularly, on low leaching fractions; is that correct?

WITNESS MICHAEL: Yeah. I had to make an estimate of the share of land that has low leaching fractions.

MR. MIZELL: Perfect. Thank you.

And you acknowledge that Dr. Leinfelder-Miles' study was not sufficient to establish the distribution of low leaching fractions in the Delta; is that correct?

WITNESS MICHAEL: I don't believe there's any study that's sufficient to establish that distribution, including Dr. Leinfelder-Miles'.

MR. MIZELL: Thank you.

But your calculation of financial injury relies upon Dr. Leinfelder-Miles' leaching fraction of 5 percent; is that correct?

WITNESS MICHAEL: In that calculation, if

you'll see, there's a sentence there that says if only 30 percent of the sample had leaching fractions, the calculations would be -- would be different.

So I wouldn't focus on the -- the specific dollar value because there's a lot of uncertainty underneath those. And that's part of the reason why I put greater weight in the Crop Choice Model than in this model, because it is an empirical model that's based on a very large and representative dataset of the Delta.

MR. MIZELL: That's all very helpful. I wasn't necessarily thinking that you answered the specifics of my question, though.

Was the 5 percent based upon Dr. Leinfelder-Miles' study?

WITNESS MICHAEL: Well, the 5 percent was based on the leaching fractions. I would -- The tables I received from Dr. Prichard, and then assuming that about 50 percent of the acreage in the -- in the San Joaquin County share of the Delta was based on Dr. Leinfelder-Miles' study, yes.

MR. MIZELL: Okay. And I believe we established in previous cross-examination that Dr. Prichard relied upon Dr. Leinfelder-Miles' -- Mr. Prichard relied on Dr. Leinfelder-Miles.

Is that your recollection?

WITNESS MICHAEL: I don't -- I can't speak to what Dr. Prichard relied upon.

MR. MIZELL: Very good. I'll move on.

But what you did rely upon from Dr. Leinfelder-Miles, if I understand your previous answer, is the 50 percent number?

WITNESS MICHAEL: Yes.

MR. MIZELL: Okay. So you relied upon her insufficient study to apply the results to 50 percent of the lands in the Delta; is that correct?

CO-HEARING OFFICER DODUC: I hear an objection.

MR. RUIZ: Objection.

MR. KEELING: Objection: Mischaracterization.

CO-HEARING OFFICER DODUC: Sustained.

MR. MIZELL: I'll just his exact words, then.

So you rely upon a study which you characterize as not sufficient to apply your results to 50 percent of the lands in the Delta; is that correct?

WITNESS MICHAEL: I applied what I viewed as the best-available and most current data on leaching fractions in the Delta.

However, you know, a comprehensive study of leaching fractions at, you know, hundreds of sites within the Delta would be preferred but does not exist, to my knowledge.

MR. MIZELL: So the percentage of the lands in the Delta with low leaching fractions could be less than 50 percent.

WITNESS MICHAEL: Yes.

MR. MIZELL: Mr. Hunt, if we could bring up DWR-580, please.

(Document displayed on screen.)

MR. MIZELL: And so, for reference, this is the 2010 Hoffman Report. This is also listed as SRWCB Exhibit 101, I believe.

Are you aware, Dr. Michael, of what leaching fractions were used by Dr. Hoffman?

WITNESS MICHAEL: It's been a while since I read this report, but . . . so I don't -- As I recall, it's a lengthy report with many tables with leaching fractions in them, so could you be more specific?

MR. MIZELL: No. I think whether or not you recall, that's fine. I agree it is a lengthy report. It's very hard to recall the numbers in it, so I'll move on. I think that's probably not worth exploring anymore.

When you read the Hoffman Report, did you read his responses to questions and comments submitted from the South Delta Water Agency, who I believe is your -- who is employing you for this hearing?

MR. KEELING: This goes beyond the scope of

surrebuttal, and I would object on that basis.

CO-HEARING OFFICER DODUC: Mr. Mizell.

MR. MIZELL: Certainly.

Dr. Hoffman critiques the Hoffman Report in his surrebuttal testimony. He also critiques Dr. Thornberg for not having extensive review of the materials indicating salinity and crop relationships in the Delta.

Therefore, I think it's a fair question to ask if he is aware of the salinity studies and crop studies in the Delta since that was a critique he leveled at Dr. Thornberg.

WITNESS MICHAEL: Well, I --

CO-HEARING OFFICER DODUC: Hold on.

Dr. Michael -- Dr. Michael, did you wish to clarify something?

WITNESS MICHAEL: Oh, just to say I've read the report.

CO-HEARING OFFICER DODUC: All right. I'll allow you to ask your question but, obviously, Dr. Michael will only answer to the extent that he can.

MR. MIZELL: Perfect.

So I'll just repeat the question:

When you read the Hoffman Report, did you read his responses to the question and comments filed by the South Delta Water Agency?

WITNESS MICHAEL: I don't recall that. I read this report the first time several years ago and most recently in the past six months. I don't recall if I read those questions.

MR. MIZELL: Okay. Are you aware that Dr. Hoffman cites to and relies upon Meyers, et al., for some of his conclusions?

WITNESS MICHAEL: I do remember that, yes.

MR. MIZELL: Are you aware that Meyers, et al., sampled multiple locations in the Delta?

WITNESS MICHAEL: I'm -- Yes, I am aware of that.

MR. MIZELL: Thank you.

And that Meyers, et al., used a range of crops grown in the Delta with a range of salinity tolerances? Are you aware of that?

WITNESS MICHAEL: I don't remember that level of detail.

MR. MIZELL: I'd like to go to a statement that you just recently made on your verbal summary, because I think it was trying to clarify some of your previous testimony, and I'd like to be sure that I'm not misunderstanding you.

Did you indicate today that your case in chief and rebuttal testimony on levee funding is not related to

how or who pays for the California WaterFix?

WITNESS MICHAEL: The . . . The two main arguments that I made that I referred to is not related.

Now, if you recall, that case in chief funded -- testimony was about 20 pages long, and 10 pages of it was stricken, which was about financial feasibility and who paid for the WaterFix.

So it is possible that, in the discussion of levee funding, there may have also been a statement that slipped in there.

I have a feeling I'm about to find out.

MR. MIZELL: Yes. Thank you.

We would move to strike any testimony related to levee funding as the witness has just indicated it's not relevant to the California WaterFix but instead seeks to explain other processes beyond the California WaterFix and how they may or may not fund levees in the future.

And if it is clear, I can -- I can certainly file that in writing.

CO-HEARING OFFICER DODUC: Are you -- I wish to understand.

You're moving to strike the verbal portion of his testimony today that referred to this issue?

MR. MIZELL: No. I would move to strike any remaining testimony in his case in chief or rebuttal

testimony based upon the clarification of that work that it is not related -- and those are the witness' words -- to who and how pays for the California WaterFix and, therefore, it's beyond the scope of this hearing.

CO-HEARING OFFICER DODUC: Now I'm confused.

Dr. Michael, explain to me again what you meant.

WITNESS MICHAEL: It's related to the presence of WaterFix and whether or not it's been built and information that's been provided, you know, during the process of planning and promoting the WaterFix but does not -- the arguments don't depend critically on --

CO-HEARING OFFICER DODUC: Who funds --

WITNESS MICHAEL: -- how it's funded, yes.

CO-HEARING OFFICER DODUC: So you're not saying it's not relevant to the Petition that is before us.

WITNESS MICHAEL: That's not what I said, no.

MR. MIZELL: I withdraw my objection.

CO-HEARING OFFICER DODUC: Thank you.

MR. MIZELL: That concludes my cross-examination.

Thank you.

CO-HEARING OFFICER DODUC: Any other cross-examination?

Any redirect?

MR. RUIZ: I just have one -- one question on redirect.

REDIRECT EXAMINATION BY

MR. RUIZ: Dr. Michael, just so it's clear, how did you use the -- Could you further explain the relationship between your use of a 50 percent estimate of land in the South Delta that has a leaching fraction below 5 percent and how that correlates with Dr. Leinfelder-Miles' study.

WITNESS MICHAEL: Sure.

I received the information. I asked for what is the best-available data on leaching fractions in the Delta. I was given Dr. Leinfelder-Miles' studies, the most recent effort to measure leaching fractions in the Delta, and her data indicated a median around 5 percent, several sites below 5 percent, so that was the basis for the assumption that 50 percent of the acres could have a 5 percent leaching fraction.

MR. RUIZ: And that's because 50 percent or so of the sites that you study had that -- that level of leaching fractions.

WITNESS MICHAEL: That level or below. I didn't assume any below 5 percent.

MR. RUIZ: Thank you.

CO-HEARING OFFICER DODUC: Any recross?

MR. MIZELL: One question, please.

RECROSS-EXAMINATION

MR. MIZELL: So, in your answer just now, you indicated that, when you asked for the best-available science, you were given Dr. Leinfelder-Miles' study as the best-available information.

Who gave you that information?

WITNESS MICHAEL: Mr. Prichard did. And I may have said "most recent data." I don't recall from -- exactly how I worded that.

MR. MIZELL: So you either asked for the best-available information or you asked for the most recent information.

WITNESS MICHAEL: I don't --

MR. MIZELL: Do you recall which?

WITNESS MICHAEL: I don't recall which. I may have asked for both. But Mr. Prichard showed me her study.

MR. MIZELL: Thank you very much.

No questions.

CO-HEARING OFFICER DODUC: All right. Thank you, Dr. Michael.

(Witness excused.)

CO-HEARING OFFICER DODUC: Mr. Ruiz, at this time, I believe Group 21 is done with your surrebuttal.

Do you wish to move your exhibits that were used in surrebuttal.

MR. RUIZ: Yes, I do.

At this time, I would request to have moved in SDWA-261, 262 and -- 263 and 264 as our surrebuttal and joint surrebuttal exhibits.

CO-HEARING OFFICER DODUC: And without any outstanding objection, those exhibits are accepted into the record.

(Central Delta Water Agency, South Delta Water Agency (Delta Agencies), Lafayette Ranch, Heritage Lands Inc., Mark Bachetti Farms and Rudy Mussi Investments L.P.'s Exhibits 261-264 received into the record)

MR. RUIZ: Thank you.

CO-HEARING OFFICER DODUC: Thank you.

I think that concludes our portion today.

As a matter of planning purposes, our next time -- our next reconvening, I guess, is on July 11th in, oh, Byron Sher.

MR. OCHENDUSKO: Sorry.

CO-HEARING OFFICER DODUC: In Byron Sher!

And we will expect to hear from Mr. Brett,

Mr. Frink for Group 24, Miss Des Jardins 37, Miss Suard 41, and Miss Womack 43. All those parties should be prepared to go on Tuesday, the 11th.

MR. KEELING: For clarification, you know, Dr. Michael's testimony was also on behalf of the San Joaquin County Protestants Group 24.

We will also be presenting Dr. Brett and Mr. Frink. And I'm -- I'm correct, I hope, in understanding that we need not submit anything under our name until that entire Group 24 panel --

CO-HEARING OFFICER DODUC: That is correct.

MR. KEELING: Thank you.

CO-HEARING OFFICER DODUC: And the same goes for Miss Meserve.

MR. RUIZ: Right. For the LAND, Group 19.

CO-HEARING OFFICER DODUC: Correct.

MR. RUIZ: Right.

CO-HEARING OFFICER DODUC: All right. With that, have a good Fourth of July, everyone, and I'll see you on the 11th.

(Proceedings adjourned at 11:16 a.m.)

State of California)
)
County of Sacramento)

I, Candace L. Yount, Certified Shorthand Reporter for the State of California, County of Sacramento, do hereby certify:

That I was present at the time of the above proceedings;

That I took down in machine shorthand notes all proceedings had and testimony given;

That I thereafter transcribed said shorthand notes with the aid of a computer;

That the above and foregoing is a full, true, and correct transcription of said shorthand notes, and a full, true and correct transcript of all proceedings had and testimony taken;

That I am not a party to the action or related to a party or counsel;

That I have no financial or other interest in the outcome of the action.

Dated: June 29, 2017

_____
Candace L. Yount, CSR No. 2737