STATE OF CALIFORNIA

STATE WATER RESOURCES CONTROL BOARD

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Public Hearing on the Adequacy of the Draft Substitute Environmental Document in Support of the Potential Changes to the Water Quality Control Plan for the San Francisco Bay-Sacramento/San Joaquin Delta Estuary; San Joaquin River Flows and Southern Delta Water Quality
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JOE SERNA JR./CAL EPA HEADQUARTERS BUILDING

1001 I STREET

SACRAMENTO, CALIFORNIA

COASTAL ROOM/BYRON SHER AUDITORIUM

WEDNESDAY, MARCH 21, 2013

9:09 A.M.

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APPEARANCES

BOARD MEMBERS

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Vice Chairperson Frances Spivy-Weber

Board Member Tam M. Doduc

Board Member Steven Moore

Board Member Felicia Marcus

STAFF:

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THURSDAY, MARCH 21, 2013, SACRAMENTO, CALIFORNIA

9:10 A.M.

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CHAIRMAN HOPPIN: Welcome to second day of our hearing on the adequacy of the Substitute Environmental Document cornering the potential changes to Bay-Delta Water Quality Control Plan. I was very gratified after yesterday's hearing to realize that nobody liked what he we had proposed. I didn't hear anybody come out and say there was anything about it that they liked. I was pleased that I was only called a zealot once, and I say that a little tongue-in-cheek. But to all of you that aren't used to coming before us, it's very important that you do. No, not to call us zealots, but to come before us. That is the purpose of these hearings.

What we have in front of us is a draft, and drafts always change and the input that comes from people is important. Some people deliver their message well; others don't deliver their message well. But as I look back at my almost seven years of being here, one of the nice things about it is we don't just hand the public a piece of paper and say, "Guys that is the way the world is going to work. Hope you can live with it." We do things like this to try and make things work from both sides of the aisle. Very seldom do we just reach a moment where

Kumbaya is playing in the back of the room and everybody is hugging and smiling, but it's our attempt to get as close to that as we can. So I realize there are strong emotions on either side of it. This is an enormous effort and has potentially enormous consequences. And before I go on with my script, I just want to tell you all how important this is. So thank you so much.

In my last board meeting, our staff prepared a video of all the sarcastic remarks I made about the evacuation procedures, and I didn't really realize I had been that sarcastic. But they are very important, so you're going to have to bear with me. This is going to be the last evacuation procedure I am going to deliver, and I honestly don't have anything original or clever to say about it. I am just going to go through the evacuation because, quite honestly, if we did have a fire and you didn't know you were supposed to evacuate, all your heirs would sue us for everything that we have left. It would make our job even tougher.

So with that, if you look at the back of the room, there are two exit signs. I honestly don't know what the evacuation siren or horn sounds like, but I am sure it's very ominous and people are going to look at each other, and you're going to know you need to get the hell out of here. So if you hear that, in an orderly way if you'll head down the stairs and across the street to Chavez Park, which isn't really where you're supposed to go, but I don't know where this other J Dewey Duncan Park at "F" and 11th street are. The important thing is to get out of the building and get away, so I am sure you could follow the crowd and be fine.

We are broadcasting this hearing in the Internet and recording by both audio and video. The court reporter is also present to prepare a transcript of the proceedings. To assist the court reporter and to be sure those listening to the webcast can hear you, make sure you always speak in the microphone and identify yourself and whom it is you're representing. And I will say it again for those of you who are not here a lot, these microphones are very poor. So when you come to the podium, really center up on it or he's not going to be able to hear you. Your comments on the webcast and audio will be very mumbled. So I know it's a nuisance, but that's what we have to work with here.

We will begin the presentation by the Bureau of Reclamation followed by a joint presentation lead by the San Joaquin Tributaries Authority. We will then have an opportunity for three minute public comments to hear from people we missed yesterday. If you intend to present a three minute comment, please submit a blue speakers card to staff. What we did is Board Member Marcus yesterday went through the stack. I wasn't very organized quite frankly. I pulled out Mr. Erik and some of the time allotted folks that didn't speak yesterday but some of the public members that did not speak or were not here when I called them, I put their card back in the stack, which I shouldn't have done. I think Felicia has those pulled out, but if you were here yesterday for public comment and you did not hear when your name was called, it's probably a safe idea to submit another blue speaker card so we're sure we don't miss you.

I expect the three minute comment opportunities to start about 1:00 o'clock if the first two presentations are as long as we expected. And I guarantee with O'Laughlin, they'll be every bit as long as we expected. We will then hear from the remaining presentations in the following order: The California Department of Water Resources, joint presentation by the Bay Institute, Natural Resources Defense Council, American Rivers, and Trout Unlimited; South Delta Water Agency; joint presentation by California Sport Fishing Protection Alliance, California Water Impact Network, and Aqua Alliance. We do not need blue cards from the joint panels and participants that I just listed.

We have a very full agenda, so we will proceed without a lunch break today. Any breaks we have will be very short and just in the interest of the humanity and the court reporter. We will begin with the Bureau of Reclamation. Thank you for being prepared and ready to go.

Please identify yourself even though we know who you're.

MS. JOHANNIS: My name is Mary Johannis.

CHAIRMAN HOPPIN: And I forgot, if you would all of these. If you would turn them off, please.

MS. JOHANNIS: How about that? And let me see if my -- let me get back to the beginning of my slides here.

CHAIRMAN HOPPIN: We've got a really annoying background noise some place. So can you round whoever is in charge of that and try to.

MS. JOHANNIS: Can you get it back to the beginning? And I'll just say next slide.

CHAIRMAN HOPPIN: You've got another two minutes (laughter).

MS. JOHANNIS: Well, why don't I go ahead and introduce myself while we're waiting for the PowerPoint to come out. My name is Mary Johannis. I'm the deputy regional planning officer with the Bureau of Reclamation, and I am here to present our, I guess, our analysis. And I've had a lot of help in putting this together, and some of the folks that are helping with it are in the audience in case there are questions. So I also wanted to let you know I was the resource adequacy policy manager with Bonnieville Power Administration, and reason I say that is because part of my presentation has to do with electrical resource adequacy, an area that you did not touch upon in the environmental document. So I am considered a subject matter expert having testified to FERC, NERQ, and WECC, and having been on a number of their committees in my previous position.

So as you requested, Chairman Hoppin, and by the way, thank you so much for accommodating my request to be first today, and we really do appreciate the opportunity to present. We will be focusing on CEQA inadequacies of the document, and we've been collaborating closely in our modeling with your staff and have the highest appreciation for their modeling expertise. Just because our assumptions may be different doesn't mean that we are in any way denigrating their expertise.

We're going to be presenting on the San Joaquin River Flow Standard, talking about that we do appreciate having been heard because you have gone to the tributary approach. We will be talking about those differences in assumptions that we believe masks the impacts of the proposal, and we do believe there are some significant impacts. We're also going to be talking about our water rights analysis and why we feel that what is proposed doesn't really comport with at least water rights are operated today. And then finally, we're going to assert that because of all these issues, you don't really have enough information to do that balance of beneficial uses that is, you know, I guess, your mandate. And then we'll also being talking a little bit about the South Delta salinity standard and kind of the lack of alternatives that we see in that standard. So next slide.

As the agency that is now, I guess, on the hook for Vernalis Flow Standards, but I'll talk a little more about that later. We do appreciate that your new proposal apportions responsibility among all three tributaries of the Tuolumne, Merced and Stanislaus. It just seems to make sense from a fish standpoint that you'd need water on all three tributaries. Though we are a little puzzled by the continuation of a 1,000 cfs base flow standard at Vernalis because we just don't see how you're going to achieve that. If your compliance points are at the mouth of the tributaries, of the three tributaries, it's hard to understand how that would be implemented. And while I'm on the subject of implementation, today's presentation focuses on CEQA issues, but we want to say that our previous comments where we questioned how the standard would be implemented, those kinds of comments do carry forward. We still have some questions. Next slide.

So to start out with some of the areas of disagreement and some of the areas where we believe maybe CEQA even gets in the way of a good analysis. Neither the baseline nor the no project alternative reflects current operations. Now, we did have a meeting with your staff, and they informed us that they have to tie the baseline operation to, I believe, the year 2009 because that's when the notice of intent was issued. But that's not the way we operate anymore. We were still under VAMP during those times, so it just makes it very difficult if you're comparing your impacts to a baseline that is no longer in effect. But then we also disagree with your no project alternative, so why don't we get into that.

What we've done is we've done our own set of analyses, and then we'll compare with what you folks have done with what we've done and why we believe there are some CEQA inadequacies in your document. So first of all, as we have informed the Board on a number of occasions, we don't believe that the Bureau of Reclamation is legally or practically responsible for meeting full D-1641 table flows from New Melones.

CHAIRMAN HOPPIN: We'll talk about that later, Mary.

MS. JOHANNIS: Okay. Well, there are some legal arguments, but there's also some very, very practical arguments that we believe we cannot do it. So legally, we see that there's kind of a void after VAMP ends that there was really no condition in the permit that really applies after VAMP ended. And just in case folks don't know, the San Joaquin River Agreement expired in December of 2011, and so we don't see that Table 3 as the fallback position. Next slide.

But probably more importantly is we just don't believe we can operate New Melones in a sustainable fashion and meet Table 3. Your analysis in the 1995 Water Quality Control Plan, Alternative 2 was the alterative that placed all the responsibilities for D-1641 on New Melones. And as you can see, storage tanks. And that's really what our studies show. In a meeting with the Delta Water Master, we presented an analysis that indicates that if we had to operate New Melones to full Table 3 that we would have 42 months at minimum pool, which is 80,000 acre feet, and 84 months at 300,000 acre feet or less. In other words, you heard Rhonda Reed day of National Marine Service Fisheries yesterday talk about life cycle needs of fish and the flow and temperature needs, we certainly could not meet the temperature needs for the steelhead if we had to operate to full Table 3 flows. And in fact, in the 2009 biological opinion, that is stated in that biological opinion. The quote is on the slide up there. Next slide.

So we also -- your own studies show that you would have to reduce water supply from New Melones in 50 percent of the time, and in 50 percent of those cases, you would have to reduce water supply by over half. And you've lumped the senior water right holders their 600,000 acre-feet together with the CVP contractors of 155,000 acre-feet. The senior water right holders hold pre-1914 rights for diverting from the Stanislaus River. Their water rights are not conditioned to meet D-1641, and we have a 1988 stipulation agreement, which governs operation at New Melones, which provides that they get their up to 600,000 acre-feet for beneficial use in all the years expect when inflow to New Melones is less than 600,000 acre-feet. So your modeling is just not consistent with the 1988 stipulation agreement.

There's a number of other issues. I think that's the very major modeling issue. The other issues are that we do not specifically operate currently to meet the South Delta salinity objectives. Now, we do operate New Melones to meet the Vernalis salinity objective, and I think in most cases that then allows the South Delta salinity standards to be met, but it is a difference in the operation.

We also see the dissolved oxygen check isn't made, and we do have to operate New Melones for dissolved oxygen. And your prolonged drought operations are inconsistent with at least the way we read the NMFS Biological Opinion. Not to say there isn't some relaxation available, but we're not sure that it's to the point that you're modeling shows. Next slide.

So then we also have some fairly significant problems with the alternative analysis, and I think your staff noted it, that there's really no basis for not modeling the RPAs. So we know that we are bound by the RPA requirements. We don't think that those are going to go away, and so that in our opinion masks some of the impacts when you look at say the 35 percent preferred alternative to the baseline. So we'll be presenting some graphics to illustrate our point later on. Again, the modeling is inconsistent with the 1988 stipulation agreement. So why don't we go to the next slide.

So this is the slide that we really disagree with from the Substitute Environmental Document. The red line there shows, you know, that's the no project condition. And as we stated, if we operated that way, the senior water right holders would have us in court the next day. It's just not reflective of our 1988 stipulation agreement with them. And because of the modeling of the no project alternative, the other alternatives look like water supply is not impacted at all, and we would assert that that's not the case. Next slide.

So what we have done is we have done a set of modeling studies to compare your results to our results. So under your modeling, under no project, it's the D-1641, Table 3 is the Vernalis standard, and under the preferred alternative it's the 35 percent unimpaired inflows February through June. Under our modeling, we are modeling the way we operate currently, and that is we are modeling substantially to the VAMP standard, and we have an agreement with Merced Irrigation District to help us do that. We do not make incremental releases from New Melones to meet the Vernalis standard, but we do meet the full Table 3 -- Table E flows, I'm sorry -- that is in the RPA. And for the preferred alternative, it's the 35 percent. Now, under your modeling in the no project alternative, you do satisfy the Bi Op requirements, but you don't in the preferred alternative. We satisfy the Bi Op requirements under both sets of studies.

In terms of senior water right holder shortages, we abide by the 1988 stipulation agreement, and you use the New Melones index to short the water right holders. Dissolved oxygen check; no for you, yes for us. And prolonged drought relaxation; yes under your studies, no under our studies. Next slide.

So in terms of water supply impacts, you know, averaged over all the years, it doesn't seem to look that bad, but our results do show that the average contract amount or the average delivery to CVP water right -- excuse me, CVP contractors -- is use reduced from 115,000 acre-feet to 100,000 acre-feet. But then we need to remember that their contract amount is 155,000 acre-feet. So that's a pretty significant impact averaged over all years.

In the dry period, their delivery is reduced from 36.8 thousand acre-feet to 23.9 under the 35 percent, the preferred alternative, so that means they'd be getting 15 percent of their contract supply. And we disagree with your analysis that groundwater would not be impacted because we do believe that if surface deliveries are shorted, the districts would have to turn to groundwater to meet their water supply needs. Next slide

So this is really a major slide for us because this shows that storage is significantly impacted, especially in dry years with the preferred alternative. The preferred alternative is the orange lines for folks that are looking at the screen. And so because of these impacts -- the impact of the preferred alternative on storage, that means power, cold water pool, and recreation are significant impacted. Next slide

So I'd like to talk a little bit about power because I know that your Appendix J was intended to look at the impacts to the liability, but NERC and WECC -- NERQ is the -- under the 2005 Energy Policy Act, they are now the energy reliability organization. So they are responsible for implementing mandatory standards to assure reliability and adequacy of the bulk power system. California does have a mandated resource adequacy standard of 15 percent reserve margin. And you did not look at resource adequacy, and so for that reason we believe that this part of the document is inadequate from a CEQA standpoint. Next slide.

So here -- so it's actually the responsibility of the California Public Utility Commission to make sure that each of the entities that provide power in the state meet the mandate, and so they prepare periodic reports to that effect. If the you look at the slide, it's really the months of the July and August that are most important for meeting resource adequacy requirements. Next slide.

And so what happens then, on average storage is lowered in New Melones, but it would likely be lowered in the other reservoirs too, is that it just isn't about generation, but it's about the ability, the machine capability, to generate at peak. So when we look at the average reduction in storage at New Melones, we see that it goes down from -- I apologize, I forgot my glasses -- the capability is reduced from 310 megawatts to 280 megawatts. So even though -- like the last major heat wave that kind of stressed resource adequacy was in California July 2006. So what happens during those times is that you need -- you need that capability at the peak hours, and you know, certainly there's a little bit of over generation is possible at power plants, but on average you're reducing that capability by the hydro plants, and so you may -- you know, the reason for the 15 percent reserve margins is when load is more than you anticipate and maybe some machines are down. And wind certainly cannot help you during those times because in 2006, I think of the wind plants that were online, less than one percent were generating. So when it gets really hot, it get really wind still.

Now solar might be able to help here and it probably could, but if a thin vapor mist goes across the solar plants, they drop the capacity too. So hydro plants are just so important to being able to meet resource adequacy requirements. Next slide.

So what happens is that at New Melones on average, storage is reduced from 1.36 million acre-feet to

1.12 million acre-feet during the summer period. But then in the dry period, it's even more pronounced. If you remember the 2011 electricity crisis, part of the reason for that may be because of a failed market design, but part of it was not only was California in a drought situation, the Northwest was also in a drought situation. So it was also a resource adequacy issue at that time, and so this is going to -- the preferred alternative will impact resources adequacy, especially during drought periods.

Now in terms of generation going down in the summer time, under average conditions you lose about 10 gigawatt hours at New Melones. But under drought conditions, you go from 70 gigawatt hours to 52 gigawatt hours. So you lose 22 gigawatt hours during drought periods. So next slide.

So other impacts. As I mentioned before, the preferred -- our study show there are significant impacts to summer elevation, summer storage in New Melones, and the lesser volume in New Melones means that those temperatures get higher. And I remember there was a comment yesterday on climate change, and it's those cold water pools that are going to be even more important as climate change progresses. Next slide

There are also potentially fairly significant impacts to recreation. I was talking to your recreation manager at New Melones, and what he indicated was that when -- below elevation 975, which is equivalent to 1.2 million acre-feet, the Angel Creek boat ramp becomes unusable. But then between 900 and 975, so between 720,000 acre-feet storage and 1.25 million acre-feet storage, most of the other ramps become unusable. So there would be a significant impact to recreation because, as you see, in the baseline the storage in August is 1.28 million acre-feet on average over all years. Under the preferred alternative, it would be about just a little over a million acre-feet by the end of August averaged over all years. Next slide

So then this gets us to the other part of our analysis, and you know, the whole standard talks about a bypass of unimpaired inflow. So when we did our water rights analyses, which I believe was submitted to the Board and will certainly be part of our written comments, we found that in 26 percent of the times, less than full natural flow reaches New Melones during the February through June period. So upstream reservoirs, some of which are junior and have junior water rights to our water rights, impede -- you know, they store that water, and so that water doesn't even reach New Melones. And even though it's called a bypass of unimpaired inflow standard, it stresses the storage at New Melones significantly. So next slide

So you'd think that a reservoir that has 2.4 million acre-feet, which is the size of New Melones, would have quite a bit of flexibility, but the consumptive yield of New Melones is only 16 percent of its physical capacity. So what we have done -- I was involved in some studies in the past where we showed that New Melones had a 17-year refill cycle, so it's a much bigger reservoir than the flow on the river is basically what it ends up being

CHAIRMAN HOPPIN: Mary, when you submit your written comments, I think it will be very important to clarify the difference between the gross capacity and consumptive yield because it's not something that people intuitively understand. And I'll put myself on that list, but the capacity versus the yields are strikingly different numbers, not just here. So I think it would be good to make sure that you really expand on that point in your written comments.

MS. JOHANNIS: Yes. And the yield is an annual number, but yes, we will be clarifying that further in the written testimony. I just don't want to impinge on the next speakers time.

CHAIRMAN HOPPIN: No. Go ahead. It's not a problem at all. We'll take care of it.

MS. JOHANNIS: Next slide. So the next number of slides really make that point that what the average inflow and storage at New Melones is just an awful lot less than 2.4 million acre-feet. So these slide shows when we're storing and when we're depleting. And so generally we store in the very wet periods, and then we draw on the reservoir. And by the way, this is based on historical analysis. This is not looking at either the no project or the preferred alternative. This is just based on how we have operated New Melones since the 1980s. And so only 39 percent of time do we actually increase storage at New Melones. So the next slide.

This is kind of complicated, but what we're trying to show here is that if we -- this is again based on historical analysis, and it is -- so 28.3 percent of the time do we actually store water. The senior water right holders actually divert their water directly 42.3 percent of the time. But the CVP contractors on average only divert 1.2 percent of their water directly. So a lot more of their water depends on storage, and then the red is where we bypass flows for, it can be flood control reasons, or it can be to meet the environmental water needs of the river. Next slide.

So we're presenting similar information but in different ways to really bring home that New Melones is already an oversubscribed reservoir, and under the preferred alternative, it would just be more oversubscribed. So in this slide what you see is that this is use of New Melones storage. So the last slide looked at directly meeting needs, here we show that a lot less of the senior water rights are met by storage. And even if they are met by storage in New Melones, it's on a seasonal basis. And it is with accordance with the '88 stipulation agreement. Before the '88 stipulation agreement, there was the '72 one, which was a little bit less flexible in terms of storage. And then the green line is the use of stored water for environmental needs and other needs, you know, like flood control releases. And it's only the orange water that is for CVP contractors. So even though Reclamation is the reservoir operator, our CVP contractors really only get a very small portion of the total water supply from that reservoir. And then again, next slide.

More ways of looking at the various demands on New Melones. Up at the top left-hand graph is the nonconsumptive use and riparian demand graph. The top right-hand graph is the senior water right holders, and the bottom graph is carry over storage and CVP contractor use.   So next slide.

So what we're asserting here is because your no project analysis and your 35 percent preferred alternative analysis, that your assumptions did not comport with at least the way we see the world, that you really don't have enough information to balance beneficial uses. A member of fish agency had talked about the lack of the connection between 35 bypass unimpaired inflow standard and the viable native fish production objective. We also are puzzled why June is included in the pulse flow requirements because at least in our existing requirements, you know, we do have base flow requirements in June, but the pulse flow period ends in May. So we see that being a fairly significant water supply cost, and we don't really see what the environmental benefits are, or at least we don't see in the document a demonstration of those environmental benefits. And then finally, because of the difference in the analysis, we believe there are very significant impacts to storage which affects water supply, power, cold water storage, and recreation. So we don't see at this point that you can do that trade-off analysis that you need to do. Next slide.

So in terms of South Delta salinity standards we certainly applaud the Board for not including the interior standards anymore. We do believe that the deciSiemens per meter standard is more purportable based on some of the crop science reports that have come out, but we're puzzled because all of the alternatives still call for the .7 standard, at least during irrigation season, for Vernalis operations on New Melones and the temporary barriers. So there doesn't seem to be any differentiation in the alternative which is a major CEQA inadequacy, and we believe that that could result in releases from New Melones which don't really serve the purpose for which they are intended and so result in non-beneficial use of water. And we also note there is no analysis of impact of from dilution flows. So in concussion, next slide.

The major CEQA inadequacies we see are in the definitions of the baseline, the no project, and the alternative. We didn't get much into the baseline analysis because it seems like the way CEQA is set up to define a baseline year as when the NOI was issued, skews results, but I don't know if we have any ability to deal with that issue. But the unrealistic modeling assumptions result in a lack of the analysis of the impacts, and we believe that your next round of CEQA will need to evaluate those impacts.

And so because of that and the insufficient water rights analysis, we believe you still need more information to be able to balance beneficial uses in the San Joaquin River basin. And again, we think you need more alternatives for the South Delta water quality standard. And I appreciate the time to present. Are there any questions?

THE COURT: Mary, you always, including today, use your time very well and very concisely, so thank you for your presentation. I have always found them to be very credible. Today is certainly no exception.

BOARD MEMBER SPIVY-WEBER: I do have a question, and it's about more information. It's my understanding that the Bureau is currently doing an evaluation, assessment of down scaled climate information in this -- in your region. Is that -- are you familiar with what's going on?

MS. JOHANNIS: We do have a number of efforts underway to look at climate information. We have what are called our basin studies. The Secure Water Act provided funding for basin studies, and the main objective in those studies is too look at the gap between water supply water, water demand, and all of the associated needs but from a climate change perspective. So we have received some fairly significant funding to do a Sacramento-San Joaquin basin study, but it's just getting off the ground. There's a lot of analysis, both that's been done by the Department of Water Resources as well as our own folks, that can then fit into that basin study, but it's -- I think, we just initiated it this year.

BOARD MEMBER SPIVY-WEBER: No, I think you did too. But do you have some idea as to what the time frame is for gathering that information because this will be certainly important from a baseline perspective.

MS. JOHANNIS: Yeah. We're hoping to complete that work within a two-year period. So hopefully we can have some fairly substantive work then this year that we could work with your staff onto to get that into the next round of analysis.

P3: Thank you.

THE COURT: Thank you, Mary.

MS. JOHANNIS: Thank you.

THE COURT: Mr. Lot of you Lynn. I know you have a lot of fast of what you want to do. I am going to leave it to you. You're the ringleader.

MR. O'LAUGHLIN: Thank you very much. Just to let the Board know what we're planning on doing, we're going to start first and give you an insight into how the SED would be impacting the individual districts on the Merced, the Tuolumne, and the Stanislaus Rivers, and then in the afternoon, we're going to give a more high-level overview of the economics, the fishery, and the biology in the afternoon. So what we're going to do is start with Merced Irrigation District first today, and then we'll move to the Tuolumne River, and we'll have Modesto

Irrigation District after them. Then we'll have the Turlock Irrigation District after them, and even though they are not part of the current project plan, the City and County San Francisco will be making a presentation after those two entities. Then we are going to turn back to the Stanislaus River, which will be kind of interesting because you'll get a district perspective on the Stanislaus River from Oakdale Irrigation District, South San Joaquin Irrigation District and Stockton East Water District, which is a CVP contractor from the Bureau.

So that's the lineup for today, and we'll call up Merced Irrigation District first. Mr. Bryan Kelly?

MR. KELLEY: Good morning, Board. My name is Bryan Kelly, and I am the with Merced Irrigation District. I'm the deputy general manager for water resources. Today I am going to give you a brief presentation on the Merced irritation District and how we see the draft SED impacting our district. You heard a lot from the folks yesterday. You could tell there's a lot of fear out there. People are scared. They are very concerned, and I want to show why and bring you some numbers.

Can I control the PowerPoint from here?

Okay. So before I go into the presentation, I want to talk Merced Irrigation District a little bit. We do a lot. We do a lot more than deliver water to farmers, although I consider that my primary responsibility. That's why we exist. We do irritation. We have a retail electric system which provides retail electricity to the residents in are our district. It's for the urban areas. We actually provide competition against PG&E which is very beneficial to the businesses and the residents in our area. So they actually have a choice. We compete head-to-head with PG&E almost for every customer. It's a very friendly competition but it is a competition, and it benefits our area.

Of course where we run a you hydroelectric facility. We form a drainage district, not a flood control district. It's just a drainage district which helps the cities. Instead of having to build infrastructure and run storm drainage out nearest creeks and natural water bodies, we allow them to use our facilities under certain terms and conditions to convey that water to the nearest creek. It saves on a lot of duplicate infrastructure. And of course we run a large parks and recreation department. We have five recreation areas along Lake McClure and Lake McSwain.

Our watershed is the Yosemite National Park. We love that, and we are very proud of that. And basically the water flows down through the Merced River, and you can see the orange, the entire Merced River from the headwaters down to our lake is a wild and scenic designated river which provides some of the cleanest, purest water in the State. We love our water source, and we're very proud of it. It's very good.

From the lake, we take it down into our district, and we serve numerous folks, which I'll show in a second. But to give you some statistics, our district boundary is about 154,000 acres. We have about 115,000 acres irrigated in that, and that changes every year. A little bit up, a little bit down depending on the year. And we also serve surrounding communities, and you'll hear about this when I talk about conjunctive use of groundwater. And that's very important to the surrounding areas outside of our district.

We have about 2,200 water users, 700 miles canals, 140 miles of pipelines. We have a lot infrastructure. This is a district that's been around a long time since it was formed, you know, in the early '20s. But our predecessor build a lot of this, and were a private company. This is been around for a long time.

We serve, in addition to the all the rural communities and the ag, which includes the cities of Merced, Atwater, Livingston -- you all heard from the city manager of Livingston yesterday, and he's very concerned -- Cressey, Le Grand, Winton, Franklin-Beachwood, Planada, Tuttle, and El Nido areas.

So as I said, we have 115,000 acres of irrigated acres. Our average farm size is 49 acres. These truly are small family farms. Of course, this is an average. We have a big folks. We have Dole. We have Gallo Winery. We do have some big people, but the average farm size is 49 acres. The vast majority of our folks, this is what they do. A lot of them actually have full-time jobs, and then do this at nights and on the weekends. A lot of them can't sustain their farms with these small farms. But this is true family farming.

We have over 50 types of crops. Our predominant crops are almonds and what I would call dairy support, what I've called people call low value. Well, the dairy industry is huge in California. And as they said -- I loved the quote yesterday -- cows don't eat almonds. They eat the stuff we grow. The low value crops as folks would say. So that's very important to understand.

You heard a lot about the economy. There's a reason I'm pointing this out as you'll see in a few minutes. But basically the San Joaquin Valley, as you all know, is a poor area. It struggles economically, and it always has, and it probably will for the foreseeable future. Merced is, of course, tops in that. Our unemployment rate is in the top ten in the county, almost twice the rest of the State's poverty level. I wouldn't go on with that, but it's a fact.

The SED analysis, and this is your analysis kind of drilled down to Merced, we believe will have a devastating impact on the local economy. Approximately $23.5 million of annual loss in communities that depend on district. So a direct loss of 160 jobs, and of course as you heard, the indirect losses will be even higher. I actually think that's a huge understatement because of the nature of our district. Those numbers were developed with a theoretical economics model. I don't want to speak to the model, I am sure it's fine. But when you role it down to reality, you know, if you have 115,000 acres and you're going fallow 44,000 on an average annual basis, someone once -- I was discussing the other day, and I said, "This is not sustainable." I do not consider this a sustainable operation. In critical dry year fallowing, you're talk about 61 percent of our district. I can't fathom how that's sustainable.

So district-regional economics. The SED didn't even touch on this, but it's a real fact. Basically, you have got to be concerned about MID's economics. What's going to happen is we're going to lose revenue. Of course, we'll have less water to sell but also reduce hydropower revenue and reduce customer base because a lot these guys are going to go out of business. The ones that don't are going to drill wells. And what happens when folks drill wells, in addition to all the groundwater impacts. What they say is why would I want to order from MID and have to go through all through that when I can just push a button. You lose customers that way. It's just a fact. Some will stay with us and use their wells in dry years; other will just walk away and do their own thing, which will have huge impacts.

When you impact are our revenue, you impact operations and maintenance. I showed you the infrastructure we have. This is the old infrastructure. We struggle just to maintain it much less to improve it, which we've taken great strides too, and I'll show you a little bit of that. And of course, you have all the stranded capital costs. People have invested in these facilities for over a hundred years, and now we're taking a major resource away. Water removed has a value. The cities, the communities, they are going to have reinvest in their infrastructure. You heard one gentleman mention talking about -- I don't remember the city -- but they had groundwater problems and they went away. And then they are going to have to come back. That's what that bullet point is talking about. That's a real concern.

So I heard a little bit of yesterday about maybe the communities will have to consider some conjunctive use, or they'll figure out a way the balance this. I find those statements interesting because we are a conjunctive use district. We're basically -- we've been operating this way for a long time, and we have a 185 groundwater wells that MID owns and operates. We can pump anywhere from 7,000 to 100,000 acre-feet of groundwater.

And what is conjunctive use. Of course, you all know this, but just for those that don't, it is the coordinated use of surface water and groundwater. You use the underground aquifer as a bank. In other words, when it's good time in surface water, you try to distribute surface water as much as you possibly can. And in times when the surface water is not available, you make withdrawals from the bank, the groundwater. What you have got to understand about Merced ID, we're not connected to anybody else. We've three water supplies: the snow melt pack -- we have three reservoirs -- the snow pack, Lake McClure, and the groundwater aquifer. So they work together in a conjunctive fashion, and they always have. And you're going to see the regional cooperation that occurs with this.

So, this is one of my favorite pictures. If you stare at it long enough, a picture of a conjunctive use district emerges. And what this is showing is the blue line is our end of October storage. That is our Lake McClure reservoir, and don't worry about the numbers on the side. It's really the pattern that's important. You can see when there is sufficient surface water, groundwater pumping which is the red dashed line is low. When there's not sufficient surface water, groundwater pumping increases. This is how a conjunctive use district operates. It's actually the operational side of a conjunctive use district.

BOARD MEMBER SPIVY-WEBER: Are you planning to do more conjunctive use in the future? Is that something on you're --

MR. KELLEY: Oh yes, ma'am. I am going to tell you some of that stuff. We live and breath conjunctive use. That's what we do.

So in addition to the operations, there's a huge planning and management side of conjunctive use. And that's getting the entire region, all of the entities, working together to do these things. We have things called the Merced Water Supply Plan; SUGWOP, which I'm going to talk a little bit, my favorite. And MAGPI, the Merced Area Groundwater Pool Interests, which effects all the groundwater pool interests which effects all the groundwater purveyors within our groundwater basin come together and talk about groundwater issues. We do solute modeling. We're in the infancy of our program, that's a regional cooperative effort, and the cities counties you UC Merced, the local NGOs, everybody is involved in these things so we do regional cooperative planning on a regular basis. And of course, we're in the infancy of developing a very detailed surface groundwater model for the basin. And that's not just Merced ID, that's with our partners from the city, county, UC Merced, et cetera.

CHAIRMAN HOPPIN: As part of your conjunctive use program have to do with blending water to improve water quality, or is your groundwater of good enough quality that you don't need to bring that in.

MR. KELLEY: That's a perfect lead in. Thank you. So the Merced groundwater basin is a statewide strategic basin. It's an excellent groundwater basin, although you're going to see it's stressed and it has challenges, but our average TDS is 300 parts per million. Now, that's an average. On the next slide, you're going to see we do have challenges in the basin. DWR that bulletin called it one of the top five productive basins in the state, but that's not a given. It's based on conjunctive use and management.

Okay. One of the challenges with our groundwater basin, as you all know, is the levels are dropping. This is pretty much any groundwater basin you talk about. These are MID's static groundwater levels from 1970 to 2010. You can see the steady drop, and these are averages. So there are some areas in our basin where this is much deeper; there are some areas where it's not as bad. This is an average. We have wells, and I showed you on that map, kind of throughout our whole district. So this is an average of the groundwater throughout that area. But through the MAGPI -- I mean the Merced Water Supply Plan, which we started that a couple decades ago, I think. We started tracking these things and working together with the city, the UC, and planning things, which you'll see in a second.

Okay. This was the lead in. Thank you for that, by the way. So here is our groundwater basin, and here are some of our challenges. You can see we have a few local cones of depression. Down in the Le Grand area, they have to drop wells a thousand feet and, then their yields are really just not good. They are having some trouble down there. The natural recharge area is where you see circled because that's the sandy area. The rest of the area is clay so it doesn't naturally recharge that well. And you have some cones of depression up there.

Some of our biggest concerns are the saline water sink coming from the west of San Joaquin River. And so all know the saline sink has actually crossed the San Joaquin and is affecting in that area, the area of Stevinson. So it's coming our way, and it's nothing we're causing, but the more problems we have with our groundwater basin, the more those levels drop, the more it will come and the faster it will come. One of the major reasons of our conjunctive use activities is to try to hold that back.

And you maybe hearing from some folks over there about the subsidence that's happening. This is, kind of, to the west side I think a little bit, but they are having some significant subsidence issues do to the groundwater aquifer use. As you can see, that can easily push our way too. So we are very concerned about these things, and we watch them very closely.

So conjunctive use. It's not all about ag. The blue line is municipal groundwater pumping. Every community in our area depends on groundwater for drinking water. We do no have any surface water treatment plants. Every community depends on surface water, and as you know people have babies and communities grow, and you will see that line continue to increase. The red line is MID pumping, and that's very similar to the previous chart I showed you. In times of drought, you can see 2007 and 2008 our groundwater pumping goes up, but then we have a low level baseline pumping the remainder of the time, the nature of a conjunctive use operation.

MAGPI membership. Again, we work regionally and cooperatively with everybody. These are all the groundwater purveyors. You can see the two asterisks. These are the only two folks with surface water rights within our region. And that's very important from a conjunctive use because it takes two thing: groundwater and surface water.

The MAGPI vision, the Merced Area Groundwater Pool Interest, is to maximize conjunctive water -- this is not new to us; this is what we do -- for reliable local, regional, and statewide water supply, which means expanding use of surface water. So you can see why we would be distraught with the proposal on the table. Expanding groundwater production capability and continued our water conservation efforts which I'll talk about in a little, and of course monitor the groundwater. So these are thing we're already doing.

Surface groundwater optimization program. All of our capital projects are focused around two things: groundwater management or surface water conservation and quality. The groundwater management, we're putting in some intentional recharge basins. We have two. These are little bitty babies compared to some of the big ones that you all have heard about. One of them is ten acres, and other one is probably about that too. And we're new at that. We're learning how to operate them, and we're tracking how they work, and they are really doing well by the way. But you really got the find the right areas. Our entire district is big, so you can't have them all over. It's that recharge area I showed you on the map, that's what you can recharge. We're also replacing -- we have several high grounds where they've historically been supplied with MID well water because they are too high to take surface water from the canals. So we're slowing but surely putting low-head boosters to take water from the canals and deliver those farms so we don't have to drain the aquifer when there is surface water available, and we consider that in lieu recharge.

We also have incentive programs where farmers that maybe years ago drilled the wells as I told you all will happen coming up, and then they said, "Okay, the heck with MID. I am just going to push my button and irrigate myself." So we have monetary incentives. Come back to MID, we'll help you pay for the infrastructure that's required to take the surface water. We consider that as a in lieu recharge effort. So we are very active in looking at that.

Conversely, we have are very conservative with our surface water. Our big focus is on measurement. You can't really control your water unless you have good measurement throughout the system and, I am not talking about the to the field measurement, SBx7-7. That really doesn't help us at all. That's a statement of -- we've been doing that anyway, by the way. We didn't need a law to make us do that. But we measure the heads, the canals and, that allows you to track your water. If you don't have accrue measurement throughout your system, how do you conserve water? You can't.

We put in automation control. We have over 50 data sights. They look like little tin cans. You open them up, and there's high-tech fancy computer equipment in there. We've actually gotten to the point where we used to be proud of our central control room, we don't even that anymore. All of our DSOs have laptops. They can see what's happening throughout the field. We've invested heavily in infrastructure, IT infrastructure, and we're slowly investing in -- we've got most of our major canals, the measurements and the controls, and we're getting those up to speed too. But you saw the amount of infrastructure you have. You can't do that overnight. But IT was something we could do real quick, so all our DSOs have laptops. They can see data. They can see what's going on in the system. The more tools you give them, the better you can control your water and conserve.

We pipeline select open laterals. There are certain ones we will not pipeline because they give that passive recharge. The big ones that are in certain areas that can recharge the groundwater, we let them say open so they recharge the groundwater. That's how it's always been. The aquifer is not balanced but it depends on that. As you take more of our surface water away, I can guarantee you we'll be lining more on canals because we have to do that and conserve the water in the reservoir, which will hurt the groundwater conjunctive use operations.

We put in regulating basins. We have an efficiency programs, operational discharge recovery. Wherever we have operational discharges, spills, we're networking those canals to other canals, which is very expensive. But what it allows you to do is reuse that water elsewhere before it goes out to the river or creek. So we are very big on conservation and groundwater management. This is what conjunctive use areas do. So this is nothing we'll think about after you all implement this. We're already doing it.

So just to show you some numbers. The red line is basically what MID is withdrawn from the groundwater since 1993. The green line is what we've put in the groundwater, what we've deposited to the bank, and that's via direct and in lieu recharge efforts. And the purple line is the net effect of that, so you can see the net positive impact to the groundwater basin due to MID's conjunctive use activities, which is about 700,000 acre-feet over the period.

This what a point I wanted to make. The draft SED states MID can pump can 180,000 acre-feet. That was forty years ago. Do to the dropping groundwater levels and the reduction of yield, our capacity is about a hundred thousand acre-feet now, and reason I point that out, that impacts all the private folks, the municipalities. They are seeing the same thing. These are hidden water cost we're talk about. The aquifer is already stressed --

CHAIRPERSON HOPPINS: May I ask you a question?

MR. KELLEY: Yes, sir.

CHAIRPERSON HOPPINS: When you recirculate some of you water, at what TDS do you stop recirculating?

MR. KELLEY: When I say recirculate, I am talking about the nice, clear, pure Merced River water, the Lake McClure water. Instead of spilling out the end of the channel, we connect that to another canal that's going somewhere else. So it's the same water. It's just instead of spilling, we're networking the system.

CHAIRPERSON HOPPINS: Do you have the ability to recapture any of your drain water to a certain point? That's my main question.

MR. KELLEY: Well, we don't have drain water. We have operational discharge. We do not allow farmers to discharge drain water to our system.

CHAIRPERSON HOPPINS: You answered my question.

MR. KELLEY: Okay. Now, I will say there's probably some legacy drains out there, but we don't allow any new ones because. And as anything occurs or we get to them, we remove them.

CHAIRPERSON HOPPINS: But recirculating drain water is not --

MR. KELLEY: Not part of our operations.

THE COURT: You don't have a significant of drain water?

MR. KELLEY: No, sir.

CHAIRPERSON HOPPINS: Thank you.

THE WITNESS: In fact, part of your -- not to bring up another process, as part of your investigative order for our FERC process required us to submit some detailed water quality data to you. As you can see, even our operational discharges are of very high quality, so we don't have those issues in our district. And we watch them. We do watch them, and we make sure because every now and then you could have a spill or something that occurs. So we keep an eye on it.

But the key is the aquifer is already stressed, and we believe that your proposed action will drive more people to the aquifer further reducing its yield.

Is in summary on groundwater, we really believe you're going to unravel decades of regional water supply collaboration because as you take more surface water away from the area -- well, you hurt the conjunctive use nature. We already do conjunctive use. We're not perfect, and we're going to get better. But I'd say we are probably one of the best conjunctive use districts that I've ever seen from our operations. We've been doing it awhile. But if you don't have surface water, you've got to withdraw. You've got to pull back because you just can't do it. So we're very concerned about that. We believe it will result in over drafting of the basin, deterioration of groundwater quality, and I really need to point out, it's the only source of drinking water for residents in the cities of Merced, Atwater, Livingston as well as the disadvantaged rural communities.

So switching gears a little bit to water supply impact. I am not going to get into technicalities of challenging what your WESN said. I want to show you from our perspective what we're seeing and why we consider your impact analysis deficient and not really evaluating the true impacts you're going to see. Basically, this is what we're seeing. If we imposed the 35 percent unimpaired flow requirement, in wet or above normal years, sure it's not a problem. Once you start going to the below normal, dry, and critically dry years, these are significant water supply impacts: 70,000 acre-feet, critically dry years; 35,000 acre-feet in dry years.

And let's demonstrate that. This is again end of October storage in Lake McClure. The blue line is what it would be -- and I am very fortunate because we're in the FERC process, we have very good models that we can run these things with. They are stakeholder reviewed, and they are being use in these processes. So this is good data. The blue thick line is or maximum water surface elevation, a million acre-feet roughly. The blew up and down line is the end of October storage, and the red line is where end of October storage will be if we implement the proposed amendments.

And what you can see here, the small family farm issue, we can't survive this way. If you look in the beginning of the early part of the graph, you can that see we have tough years. It comes down, our guys kind suck it up, we get through, but then we bounce back. And it's kind of rough, but our reservoir can handle it as long as get some snow pack. But if you drop it down to those red bars for that consistent of a time, a guy with a 50 acre parcel cannot survive. He can't fallow for two or three years. You heard from Yosemite Farm Credit yesterday. He can't get financing for anything. It truly puts a lot of folks out of business, or they drill wells, which exacerbates the conjunctive use issues. This is just a fact.

And as you all said in your own SED, Lake McClure is a small tributary reservoir, basically goes up and down a lot as you can see. And you're going to exacerbate that problem, which has other problems that we'll talk about in a minute.

On recreational impacts. Recreation will be rendered high and dry. And of course, we've dry years now were we have that. I've run some numbers, and it looks like that's going to increase anywhere from two-and-a-half to three times what we observe today. And the fact is recreation is driven by lake levels. I had a picture, but I took it out. Nobody wants to stand on a 20-story building and look down at the water from the campsites, and that's what we are talking about. It's roughly 230 feet from maximum surface to the low water pool, and your proposal is going to exacerbate that which goes into those whole stranded capital cost. If we're not getting visitors to the lake, we're not get revenue, we can't maintain the facilities. These are significant problems, and they weren't even addressed in the SED. The were really just brushed over, but these things need to be evaluated.

And more importantly, toward yall's goal, which I understand why we're here. And as you all know we're working various other processes to try to look at the comprehensive things. We're in the middle of FERC relicensing. So we're looking at it. We understand what we're hearing. We're not blind to it.

But your proposal will basically reduce the cold water pool on reservoir on an average annual reduction of a hundred thousand acre-feet. That's very significant for the following reasons: Look at the -- and I hate to put these up. It's probability of expedience curves. You can see the times when Chinook salmon are spawning -- and the anadromous fish we have in the Merced River, the fall-run Chinook salmon. When they are spawning, you are making the water warmer. Basically, you're hurting spawning by your proposal because you're taking way the cold water pool. That's a fact.

And what does that mean? We've done recently some good studies in the river, and as one of your staffers was saying, you didn't want to do them, but the results came out pretty good for you. Which she's right, but we already know that our river is in good shape. We already know that we are not -- I've heard all the fisherman yesterday. We agree. We like Chinook salmon. We want the salmon runs, but we know this is not the problem. So now we've got some studies to back it up.

Spawning. Spawning time is as expected. Egg viability is high in the Merced River. We have just done some egg viability tests. They have come out higher than in two recent rivers in other areas. I forget what they are.

Rearing. Habitat viability generally exceeds 80 percent through May. I am told that, as fish and game guys will understand, that is important, and that's a good thing. Fry, pre-smolt, and smolt abundance consistent with escapement.

And as you all know, this is a fact. Out migration, they are just not getting out of the river. They are being eaten between where they are spawning and the San Joaquin, and then whatever does make it out of the Merced River, they've got to run that gauntlet between the San Joaquin and the Delta. This is a problem. It really is.

Now, your SED, the proposal, the 35 percent unimpaired flows here's the results on the cold water pool impacts. Spawn impacts: Temperatures during spawning will increase. That's given, which I'm told that will delay spawning time with subsequently life stages and decrease survival. The rearing impacts: Rearing and habitat availability will not increase and may potentially decrease with the water temperatures. And out-migration impacts: Timing of out-migration would be delayed which may decrease survival potential and production. So those are the facts.

Basically, a draft flow objectives can adversely affect the viability of Merced River Chinook salmon, which is complete opposite to your stated purpose. And we request that you look at these impacts, study them, and basically tell us why the spring outflows are more important than the spawning season for the Merced River. We're very particular to the Merced River. We're intimate with it. We work with California Fish and Wildlife now. They have the only salmon hatchery in the San Joaquin system on our river. We're good partners with them on that, and spawning is where it's at for us.

So in concussion, Merced ID voices strong opposition to the draft SED for the reasons I've pointed out. It's going to unravel decades of sustainable regional conjunctive use and regional water supply collaboration. It's going to result in overdrafting of the groundwater basin. It's going to cost jobs devastate an already struggling region, and we believe it presents unilateral demands without quantifying the benefits or goals to be achieved.

You saw the kind of emotions yesterday, these are the reasons why. If you're going to hurt this bad, show us it's going to do some good, which we don't believe you've adequately shown. In fact, I'm showing you it's probably going to hurt the situation.

So what we would request is pursue a comprehensive solution consistent with the co-equal goals. Prioritize non-flow measures before demanding flow increases that threaten our region. And basically, in conclusion, thank you for giving me the opportunity to talk to you and considering these issues. Questions?

MR. O'LAUGHLIN: Thank you Bryan. Up next is Modesto Irrigation District. Roger VanHoy will be presenting.

MR. VANHOY: Good morning. Thank you. My name is Roger VanHoy. I'm the interim general manager for Modesto Irrigation District, the other MID. I appreciate the opportunity to give you a few comments on how we see the SED draft and it's impacts on our irritation customers, electric customers, and municipal-industrial water customers. Just real quickly, the left arrow?

MID itself, we do integrated electric service, so we have generation, transmission, and distribution to retail customers. We have a little bit over a hundred thousand customers. We have about 3,000 irrigation customers, and to compare the average with --

BOARD MEMBER DODUC: Mr. VanHoy, can you get a little closer to the microphone?

MR. VANHOY: I'm sorry. I thought I was coming through.

BOARD MEMBER DODUC: Actually, what I was pointing was I thought you couldn't see the screen?

MR. VANHOY: Now I can.

BOARD MEMBER DODUC: Otherwise, I think that monitor will allow you to see.

MR. VANHOY: Now I am good. Thank you.

BOARD MEMBER DODUC: Just looking out for you.

MR. VANHOY: Okay. I appreciate that. We have about 3,000 irrigation folks, and the average farm size there is around 20 acres. So there's roughly 60,000 irrigated acres. We have one municipal-industrial water user, the city of Modesto. That was Rich Ulm that spoke yesterday, and that averages out to about 250 thousand retail water customers that we serve treated water to. So that's the operation. We're in the Central Valley, and most of the crops in our area are permanent.

We're the second irrigation district, right behind TID to form in the State, and hold senior water rights. And I just wanted to say again, I appreciate the chance to give some comments on the draft SED.

We see the break down in impacts from the proposal as falling in the farm water supply, ag related industry, and ag related jobs, and then drinking water supply, which for us is similar to Mr. Kelley, the conjunctive use program. And then impacts on commercial and industrial production jobs in our area. I came recently from the power side, so there are hydroelectric generation operations. And the two biggest impacts for us, and others, is the loss of the generation right at the time when you need it, and it's the most flexible and fastest generation around, much better than anything else. And in the State of California it also produces power that does not result the greenhouse gas emissions. So this proposal would take away from both those attributes of the hydro generation.

The 35 percent unimpaired flow impacts, first to large family farms and the city of Modesto as well as electric customers. We look at customer base and cannot see anyone in our region that will not be negatively impacted by this proposal. There is just no customer class or community group that won't be impacted or would be spared the impacts. The agriculture water supply and our drinking water are valuable portions of the economic activity in our area, and the flow proposals is going to go right at the heart of that economic activity.

The break down in crops, to separate MID from the generic analysis in the SED, is much more heavily weighted toward permanent crops. The proposal in the SED would require fallowing almost half of the irrigated acres. We think it would result in 100 jobs in the area being lost and about 800 family farms in the region being impacted. And again the MID average compared to the 250 is much smaller, 20 acres per farm.

So when we look at the SED proposal and try to scale what we would do in response to those orders in dry and drier years, we see that there is no choice but to fallow permanent crops. And maybe there's a way to survive one season, or one year, by extra pumping and infrastructure and maybe not. But a couple of years or an extended period like the seven-year drought, we can't see our area making it through that and being much the same. We think if would fundamentally change the character of our area.

There's a couple of other crops which are featured in the SED as low value, and we don't have many of those. There's some dairy related crops like the sudangrass and so forth, but there's not much in the way of row crops, temporary things that don't need water every year. So that's the MID perspective on the crop impact.

MID has been working and planning with everyone in the area, the city, and the county, anyone else impacted or involved in the groundwater, on implementing a conjunctive use program to take irrigation water formerly and convert it to drinking water. It's about a two decade effort. It produces 30 million gallons per day, so on a whole year, that's about half of what the area needs. And we're right in the middle of an expansion to roughly double that. It will take about two and a half more years, which is almost the time frame of this proposal. So while we're in the midst of the that, trying to balance improving the groundwater level, keep it up or growing, and then increasing the clarity or cleanliness of the water that the city was experiencing before that plant went in 1994 -- while we're working on that, we see this proposal as pushing just us in the opposite direction.

So we would end up with partially stranded capital facility that you see here. That's half of, it the other half is under construction. And no way to prevent the dropping of the water table, and no way for the city of Modesto to overcome some of the arsenic levels and things that they saw that pushed them to get into partnership with MID.

We have taken on the partnership with the city and with our farmers to come up with a groundwater management plan that respects the conjunctive use from the flood irrigation that in average and good years helps recharge that aquifer. And then also with the city, where there's just about a one-to-one change from on ag acreage flood irrigation to residential or municipal-industrial use. It's just about a one-to-one, so the arrangement and the underlying principles are whatever goes on with the farmers will also go on with the city folks, our customers. And if there's a cut, our approach to it which seems fair and has served us well for about 20 years, would be to have a pro-rata cut. So that was the reason for Rich Ulm to make his comment.

Of course, we all expect increased groundwater pumping in response, and we think that's going to cost more money. For the electric side, it will be more emissions, so the air quality is going to be just that much worse. And we think those things in combination are going to further depress the local economy.

And a couple of observations on hydroelectric. The hydro generators that were spoken of at New Melones, the Don Pedro Dam, and Merced's dams are the fastest, most flexibility support for the electric grid that's around.

And that's true of all generation on the western side of the Sierras. So it's the best that there is, and the proposal would take the generation out of that time frame and move it to a time frame when no one really needs it. And also, it would coincide with the time frame where there's the most variable energy production. So we have low loads, they are much more predictable in the winter.

We looked at a typical February or March day for us, so what is the need, how much flexibility do you need to follow your load, and compared it to a typically day in August. And we need about 30 percent more flexibility in the summer out of something, and that something for us has been Don Pedro. That's the first and best, so this would auger in the other direction and cut into that.

The other thing that hydro provides is the really large, heavy mass machines at New Melones, at Don Pedro, and everywhere, so that provides like a shock absorber or cushion to the stability of the grid. And I think you've gotten comments from the ISO and PG&E and others that that's the case. But for the folks like MID and Turlock and others that are responsible for reliability, balancing loads and resources, and the regulator in that case is FERC. They have a schedule of penalties. It ranges up to a million dollars a day. The best tool we all have is a high inertia physical mass hydroelectric generation.

It's the first response. It does not take any people to intervene. If the load drops off or comes up, the hydro generation inertia is the thing that takes up the slack first, and then people and control systems. So this would take away from some of the best, most flexibility generation that's around.

And again, the times when the flow would be highest under this order is the same time when there is solar production that's fairly high. It's actually reasonably high in the winter, but we don't have loads. And it's also when it's windiest. So those two generators aren't moving around, the loads don't need as much movement and, then we would have less hydro in the summer to offset it. So we'd be using hydro in the winter at the exact opposite time when it would be best to be used.

We also see if there's significant drops in surface water available to our customers that they will go out and do more pumping, and that will increase our electric loads. Just the fact that that would be unpredictable, who would respond, what capital would they put in, how long would it take would create additional problem for us in planning for resource adequacy which was mentioned before.

I wanted to bring up one other observation, just because I came from the power side, is that the aspects of the SED that are not in our minds integrated or comprehensive. When I put that side by side with the State process and your orders on the once-through cooling decision -- that was not quite as complicated but involved many parties -- it had a lot of electrical grid interaction aspects and quite a wide region. It applied all the way from Southern California to the Sacramento River and so forth.

So in my mind the better process for the SED to look at to try to integrate would be to point to more science. Because on once-through cooling, you could read the science on what problem they were trying to solve and the goals that they that had to solve it. And it seemed like the response maybe in the final document and the orders, did listen to the comments and it had staged implementation of the orders, and they seemed to be tailored to different areas or regions of the river or ocean. So that seemed to be more integrated approach, and it's not one -- I am a beginner, they aren't -- but it's not one that I could see in the SED documents. It seems to be shotgun, not integrated, and really not even speak to the other processes that are going on like FERC licensing, Bay-Delta, things like what's the impact on once-through cooling and increasing green power requirements, decreasing greenhouse gasses all at the same time. If there's a chapter in here, I didn't see it, that would address here's how the SED fits into those processes.

So we're -- as far as MID goes, we're doing okay, and we think fairly well, on keeping up and being a little bit ahead on getting green power. We're at about 28 percent green, and almost all of it is wind and solar photovoltaic. So it's the most fickle generation that there is. It's the most inexpensive. It's all operating and runs fine, but integrating it to serve moving load and losing something like Don Pedro's capability is a real challenge. It's not just us that sees that. It's a major topic by every grid operator or anyone that's responsible for smoothing load and could get fined for breaking reliability rules. They seem to be working in just opposite directions.

An example would be we have a coal plant. It's over 20 years of operation. The decision has been made to divest of it, so we're going to close our share of it in a couple of years. And the greenhouse gas costs just of that to serve our customers is about $7 million a year beginning this year when that program kicks in so. So the loss of some Don Pedro generation, or moving it to a period when you know you're going to have more emissions, to make up for it works just in the opposite direction of the State policy of reducing greenhouse gases. So we're trying, but there's conflicting State goals. And the SED does not seem to specifically touch on those point or come up with proposed mitigation or ways to reduce it.

Finally, we think the power supply loss, conservative measure is about a half million dollars per year for MID.

So just in conclusion, we look at the SED proposal as first and foremost impacting the ag water supply. We think that's the biggest problems and the impacts on your economy. I am sorry do this in the conclusions, but I'll divert just a little bit.

The electrical consumption is pretty good proxy for economic activity. We have had a decrease for five years. And just last year, our consumption went up. So we're seeing under 1 percent growth in our activity of electric consumption and economic activity. So we see that as very fragile, and it's not -- when you look at us, there's activity in Southern California. It's growing faster. In the Bay Area, that is seeing some growth return. But for us, it's not high-tech, it's is not blockbuster Hollywood movies, and it is not the return of millions of dollars of tourist money. It's mostly driven by ag. So we see that as a bright spot. It's carrying the day. And with that, without this of proposal, we only have under 1 percent growth for the next ten years in our forecast. We think it is going to be very modest, slow, and somewhat fragile.

So we think that's the biggest impact. The second is what will happen to our drinking water supply if the SED is implemented, and some of our comments aren't incorporated. Another ding against our efforts to do clean generation and meet state policy goals there. And we think overall it's fairly negative impact on the vitality of our community as far as coming out of the rescission.

So that concludes the presentation, and I'll answer any questions if you have any.

CHAIRPERSON HOPPINS: Not at this time.

MR. VANHOY: Thank you.

MR. O'LAUGHLIN: Thank you, Roger.

Next up is Turlock irrigation District. Irrigation. Mr. Steven Boyd will be leading the presentation

I think we're running on time too, just to let you know.

CHAIRMAN HOPPIN: You'll get a cookie.

MR. O'LAUGHLIN: Thank you.

MR. BOYD: Good morning, Chairman Hoppin, members of the Board. Thank you for your time, and I appreciate your comments about in the beginning about an open process and your willingness to listen to us about our concerns. Many irrigation districts are similar. You've heard a lot of comments over the last several days, so I'll try not to be redundant and try to keep you on time. We're also expecting one more will be joining us monetarily. All right.

My name is Steve Boyd with the Turlock Irrigation District. A little about where we are first of all. We're located in the heart of Central Valley. We're bounded to the north by the Tuolumne River, generally to the south by the Merced River, and the to the west by the San Joaquin River. We irrigate about 150,000 acres of some of the most productive farmland in the world, and our electric service territory covers about 660 square mile region from Tuolumne County clear to the Santa Clara County line.

A little history for context before we move on. TID was founded in 1887. We are the oldest irrigation district in the State, and we are one of only four today that provide irrigation water and retail electric services to those we serve. Shortly after we were reformed, as you heard from Mr. VanHoy, we partnered with the Modesto Irrigation District and developed senior pre-1914 water rights on the Tuolumne River. Today we divert a portion of the of the flows of the Tuolumne River through a 250 mile canal system that is entirely gravity fed to fuel the agriculture economy in the region.

TID today: 16 communities rely on TID for power, for water -- either surface water or groundwater, and we're going to touch on that in the conjunctive use portion in just a moment -- and we support a broad mix of agriculture, business, and recreational opportunities within TID.

Mr. Kelley did a very nice job talking about conjunctive use. I've got a very simplified model here, and I won't walk through all of the components. But I do want to point out a couple things that are true at least for the Turlock Irrigation District. When you look at inputs into the basin, we really only have two, and that's surface water and rainfall. And although there's really no such thing as an average year, if you were to average the numbers typically within the valley, we would get about 13 inches of rainfall, and if we had a normal year we can provide about 36 inches of surface water to the ground.

So those are really the only two inputs that go into the groundwater that we do use conjunctively, and when we published our ag water management plan late last year, when you look at how we use the water in our conjunctive use program over several years, we have an efficiency rating of over 90 percent. So we're making good use of that water conjunctively today.

When you look at the groundwater systems within TID, you'll notice on the east side what has become a cone of depression. Ag development on the east side relies completely on groundwater, and they have no surface water source. And as that ground has developed, they have actually created a cone of depression and are pulling groundwater out of the TID basin in order to meet their own needs. And Board Member Spivy-Weber asked Merced if they planned to do more conjunctive use in the future. Certainly, we would like to, but with the diminishing groundwater supply under the current conditions really limits something ability to do more going forward. So we're kind of hamstrung.

You are heard yesterday from the president of the Stanislaus County Farm Bureau recalling the drought of '76-'77. During that period, we were able to pump an additional 300,000 acre-feet approximately out of the ground to make up for lost surface water, and there was no appreciable impact to the groundwater. In the drought of 1988, we attempted to pump the same amount out of the ground, and we ended up drying up over 300 domestic wells. So the depleting groundwater is an issue and will continue be an issue with the loss of surface water.

And as I mentioned, we serve 16 communities, and we dried up 300 wells. There are about 5,000 domestic wells within TID. Those individual customers rely on groundwater for drinking water as well as all the communities within TID.

BOARD MEMBER SPIVY-WEBER: Can I interrupt you just a second? I am hearing -- this is not just from you, but from the others as well. It seems to me that a lot of what's being said is that you've got a really dire, perhaps unsustainable, overuse of your basins now. So you don't want additional pressure. But how are you dealing with the over -- unsustainable use, maybe not overuse, but unsustainable use. How are you going to deal with that in the future? Because if we disappear, you've got problems. So that's what I am puzzled by.

MR. BOYD: That's a great question. Within TID, we don't believe we necessarily have an issue. We believe with our conjunctive use and the way surface water is applied now, it would be sustainable. When you look at pressures cause by outside of region, they begin to impact us. We have a fairly limited ability to create solutions with agencies and entities and private parties outside of our irrigation district boundary. That said, we are working cooperatively with individual growers, with the

Turlock Groundwater Basin Association. We are looking for recharge options on the east side using surface water today.

As I mentioned, it's not just an agriculture problem. It's a domestic well problem. It's a drinking water problem for communities and individuals. The largest community we serve is the city of Turlock. I've asked the mayor of the city of Turlock, John Lazar, to talk about the potential impacts to the city particularly to recharge groundwater

MR. LAZAR: Thank you, Steve. Thank you, Chairman, members of the Commission. I am happy to be here with you today. I am here today to tell you how important water is to my city and region and more specifically, the water from the Tuolumne River. Turlock is a special community for a number of reasons. We have 70,000 residents, but we also are the home of California State University Stanislaus, Blue Diamond Growers, and Colin Kaepernick, the quarterback for the San Francisco 49ers.

CHAIRPERSON HOPPINS: And he's using excessive amounts of water?

MR. LAZAR: In addition to being in the center of California geographically, it's part of the Central Valley known as the bread basket of the world boasting over 240 agricultural commodities. It's population is very, very diverse, a cultural mix that makes the Central Valley much richer than its fertile soil, but our soils may in fact be thirsting for water if the proposal before you is considered and implemented. Our quality of life would become adversely impacted if the Commission does not balance this decision between fish and people.

Like most San Joaquin Valley communities, Turlock is entirely reliant on groundwater for its potable water supply. Our local economy is linked to agriculture, not only ag commodities grown and produced in the region, but food processors that are located within the city of Turlock. Food processors are a significant source of employment for my city's residents. Recharge of our existing water well system has become increasingly low do the adjacent agricultural pumping.

To comply with increasingly strict Federal and State groundwater environmental requirements, we decided to search for a surface water solution to our current groundwater use. And the city of Turlock has joined Stanislaus Regional Water Authority whose sole purpose is to obtain future surface water from the Tuolumne River in conjunctive use with the Turlock Irrigation District. This water would eventually supplant groundwater use in our city. And the city of Turlock has had productive discussions with TID to eventually treat water from the Tuolumne River for residential and industrial use. An agreement would include the cities of Turlock, Modesto, and Ceres.

Turlock has always understood that we must be proactive in providing for our communities basic needs and become less dependent on state and federal sources for solutions. We felt the surface water facility has been a step in the right direction. However, the Substitute Environmental Document proposing potential changes to the Water Quality Control Plan as it relates to the San Joaquin Tributary Authority, and specifically to the city of Turlock future surface water opportunity, is detrimental to my city's vitality. Specifically, it would affect my city's future drinking water needs.

Indeed, implementation of a recently updated Turlock general plan is contingent on obtaining water from the Tuolumne River. Unimpaired water flows released from the Tuolumne River will have adverse impacts on Turlock. I therefore encourage you to consider a more comprehensive and even scientific approach involving all stakeholders, including my city of Turlock.

So Mr. Chairman, I request the Commission consider my comments before adopting the SED. The Central Valley and its residents' water needs must be respected in your decision. Thank you for listening to me and for having us up here in Sacramento. Thank you.

MR. BOYD: Thank you, Mayor Lazar. You also heard from the past two presenters, sort of the original envisionment of the irrigation district model were small family farms. Certainly, it's no different in Turlock. If you look at the parcel break down, nearly -- over 4,000 of our 6,000 parcels are 20 acres or less. There is not really corporate farming as we think about within California within TID. And when you consider the SED is fallowing farmland, it's really difficulty to imagine people with 20 acre parcels being able to fallow a portion of it independent of whether their crops are permanent or temporary. And much like Modesto, many of our crops are permanent tree crops.

And it's also my personal belief that what has been called low-value crops, as was stated earlier, go to support the dairy industry. And I view those cows as permanent crops. Without the food, cows will die. And if they -- they will either have to be shipped away, or food brought in. And so I considered cows at you as permanent crops as I do trees.

It's interesting when you look at the aggregate of all of those 20 acre parcels and the remainder on the chart, they support a billion dollar local ag industry.

And when you aggregate that and combine that with the support industry, you see that they are sort of inextricably linked together. And I've asked Mike Brem from SubHerb Farms, a herb processing plant within Turlock, to sort of to talk about that link, and why it's important to him.

MR. BREM: Thank you, Steve. Thank you, Mr. Chairman, members of the Commission. Two disclaimers first of all. I can't claim in any way Colin Kaepernick. He doesn't work for us nor does his family, but he's a good kid and, he's from Turlock. And I have no fancy charts to put up for you either. I know that disappoints, particularly Mr. Chairman too but --

SupHerb farms is not a nut processor, and it's not a dairy. We're actually a culinary herb processor. We grow, harvest, process and sell frozen herbs to food processors and food service customers throughout the world. And you might say, "Well why are you in Turlock?" Well, we're in Turlock because that's the only place, that little geographic area within about a 40 mile radius, is the best place in the world to grow culinary herbs. And I don't know care where it's at in the world, that's the best. And we're there for another reason is because of TID. We get reasonably priced electricity and water from TID, and that's why he started this business here 21 years ago.

All of our raw material comes from about a 40-mile radius of our factory. Water is vital for our crops which have an economic ripple. As you know, farm suppliers, farm equipment, and most importantly jobs, jobs, jobs, which are vital in our area. SupHerp Farms is very committed to sustainability. We have recently been certified as GLOBALG.A.P, Good Agriculture Practices, which is quite an achievement in our business. All of our raw product is recycled.

We've partnered with TID in 2010 for a 165,000 kilowatt solar system. I still think it's one of the biggest ones in Turlock, and we have determined our carbon footprint over the years. We know what it is, and we are trying to reduce that carbon footprint. I think not only is SupHerb Farms a good steward of the environment, but TID has been a good steward of the environment as well. And we are always proud to be partnered with them in those situations.

Electricity is one of our largest cost components. We are one of the biggest electrical users in TID. We have been forced with rate increases, to fund a lot of sustainability projects that TID has taken on primarily because of AB 32. We're in a business where we can't pass costs along to our customers. Quite honestly, they don't care about what happens in TID and our electrical rates. They just don't care. We have competition from throughout the world, and we have to remain the competitive. It's a very difficulty situation for us, and we would hope that the Board really consider other alternatives than what's been proposed today. So thank you very much for your time.

CHAIRPERSON HOPPINS: Thank you.

MR. BOYD: And the final slide for you, you're going to hear this afternoon about a lot of stressors on salmon and the fisheries. And I just want to point out one sort of in setting the stage for others for Mr. O'Laughlin this afternoon. When you look at escapement related to outflow in the basin, New Don Pedro was completed and operational in 1971. And when you look at the chart on the left, it's a comparison or a relationship between outflow and salmon escapement. And when you look at that, you can see that there's about a 50 percent relationship between flow and escapement.

In 1997, we entered into a FERC settlement which, in rough terms, doubled the outflow requirements in the basin for New Don Pedro. The result is a 30 percent relationship in flow to escapement. You heard yesterday that the Tuolumne River is one of the most studied rivers in the sate. We've been doing salmon spawning surveys and escapement surveys since 1951, and I would encourage you and your staff to work with us. It's in all of our best interests for healthy fisheries, but flow is not always the answer. You're going to hear more on that later today. And with that, we would encourage you to take a look at the science and consider a more integrated approach to solving the State's issues. Thank you.

CHAIRMAN HOPPIN: Thank you. How are you doing over there?

MR. O'LAUGHLIN: Okay. Next up is the City and County of San Francisco, and Donn Furman will introduce the participants and lead the panel.

MR. FURMAN: Good morning, Chairman and Members of the Board. My name is Donn Furman. I'm the deputy city attorney with City Attorney's Office of San Francisco. I am here representing the County's utilities commission. First, we want to thank the Board for the opportunity to be here today and also allowing us some additional time with the panel. Our conversation -- or our discussion is basically going to in adequacies of the SED. We have thoughts about which of the alternatives you should choose, but we don't plan on sharing with you today. That will be the subject, I assume, of another hearing.

We had two main problems. The SED misrepresents how the water bank account works that San Francisco has with the Districts of Don Pedro. And the second issue, which is much more important, is it fails to disclose and analyze the impacts of your proposed lower San Joaquin River objectives on the Hetch Hetchy water supply on the economy of the Bay Area. We have other concerns, which we will give to the Board in written comments, but we're just going to focus on those two areas first.

We're going to cover the following areas, then we'll cover the -- summarize the San Francisco public utilities regional water system and the existing and planned water supplies. I think it's been well over 20 years since San Francisco has appeared in front of this board, so we thought it might be worthwhile to talk a little bit about who we are and who we serve and how we get our water. I am going to describe the Raker Act and our agreements Modesto and Turlock irrigation districts. Dan Steiner, who is a consultant to the city, will describe the water supply impacts to San Francisco of a 35 percent unimpaired flow requirement during February through June, and then David Sunding, who is also a consultant, will discuss the economic impacts of water shortages that we would experience from 35 unimpaired flow objective.

I now get to make the legal disclaimer -- I was going to make a joke here, but I'm not going to. My, counselor, my partner to my right, said it was in extremely. Well, if you have an erection that lasts longer than eight hours you should see a doctor. But anyway, that's the wrong disclaimer.

Consistent with the SED's purpose to bracket the worst case assumptions and scenarios, we're going present a view of the Raker Act in the Fourth Agreement which is basically held by the districts and has been evaluated by FERC both in the 1995 in an environmental impact statement, and also during 2009 in the ALJ. However, in presenting this, I want to make the case that this interpretation of the Raker Act and the Fourth Agreement doesn't mean we waive any arguments to argue something different in a future proceeding. It's one that's in the public. We wish to present it to you today. We believe it presents the worst case scenario. In that sense, it's consistent with your staff's approached to pry to analyze worst case scenarios in the SED. And with that I will turn it over to Ms. Levin.

MS. LEVIN: Thank you very much. I am Ellen Levin. I am the deputy manager for the water enterprise at the San Francisco Public Utilities Commission which is a department of the City and County of San Francisco.

We own and operate a regional water system that serves 2.6 million people in San Francisco, San Mateo, Alameda, Santa Clara, and Tuolumne counties. The system is currently delivering an annual average of 238 million gallons per day. 85 percent of the water delivered is from the Tuolumne River through the Hetch Hetchy reservoir, and 15 percent is from combined Alameda and Peninsula watersheds through five reservoirs, which is Calaveras, San Antonio, Crystal Springs, San Andreas, and Pilarcitos. Important to note, however, that during dry years, the Hetch Hetchy system can be responsible for providing up to 93 percent of water that is supplied to customer during droughts. So those local watersheds are not generally productive in dry years. The Hetch Hetchy system also generates a peeking capacity of 400 megawatts of hydroelectric.

Okay. The regional water system is operated under a water first policy which is codified in the water code, San Francisco's charter, and also San Francisco's water supply agreement with its wholesale customers. What this means is that we primarily serve and meet water supply. Our hydroelectric generation is a byproduct of that deliver.

The SFPUC has level of service goals. One of our level of service goals is in non-drought years through 2018 to meet a demand 265 MGD. But in drought years, we have an objective of 80 percent reliability, which means no greater than 20 percent rationing in any one year. This means that all of our water supply planning has us planning only to reach 80 percent reliability, not 100 percent reliability. This is a decision that our commission made in 2009.

In addition in meeting that reliability goal, the level of service goal is to improve the use of new water sources and drought management, including groundwater, recycled water, conservation, and water transfers. The water supply agreement that we have with our wholesale customers contains a water shortage allocation plan for shortages up to 20 percent, and I'll get into a little more detail of that later.

Here is a map of our water customers. We provide retail water service to the City and County of San Francisco, Lawrence Livermore Labs, the San Francisco International Airport, and various other small customers outside of San Francisco. Our wholesale customer service area includes 27 wholesale customers, and you see there in Alameda, San Mateo, and Santa Clara counties.

BOARD MEMBER MARCUS: The first order out of this is we get a new mouse for this room.

MS. LEVIN: San Francisco's retail demand in the last fiscal year was 78 million gallons per day, and that was 96 percent of which came from the regional water systems supplies, and 4 percent from groundwater. Our wholesale customer service area demand was 221 MGD, and 64 percent of that came from the regional water systems. Since 1970, San Francisco has provided about 65 percent of the wholesale customers demand. The remainder of the demand comes groundwater, recycled water, surface water, and from other sources, principally the State Water Project and the Santa Clara Valley Water District. To note, 14 of 27 wholesale customers get a hundred percent of their supply from San Francisco.

Here I just wanted to point out what our gross per capita. We do see water use in our service area as highly efficient. Here you see San Francisco's retail gross per capita use is 85.5 gross per capita per day, which is about half of the state average which is about 160.2 gross per capita per day. Our wholesale customers are slightly higher but still about 20 percent below the state average. Where the City of Sacramento is 20 percent above the state average. So again, highly efficient water use in our service area

Her again just to show you what our per capita water use in the context of SBx-7-7 and our peers. This is provided by the California Urban Water Agency Water Supply Reliability Report. And as you can see, San

Francisco is well below the average per capita use throughout the state. And we in fact don't have a water use target prescribed by SBx7-7 because we were below the 100 gallons per capita per day, but we have a goal of achieving another 22.1 MGD of conservation savings by 2035 despite where we are today, and that would be through passive and active conservation.

Despite our highly efficient use in the service area, we do experience shortages right now as a result of drought, and with future demand coming on anticipate shortages. So our water shortage allocation plan that we have with our wholesale customers allocates water between retail and wholesale customers. The allocation plan describes that allocation up to a 20 percent shortage. However, the wholesale customers have an allocation agreement amongst themselves and certain wholesale customers can experience up to 40 percent rationing when our regional water system has a shortage of 20 percent.

San Francisco is in embarking on, and has been embarking on, a program to develop water supplies to meet these shortages and to get us to 80 percent reliability. There is also future demand, both the retail and wholesale customers will have demand growth, and that requires the development of water supplies to meet that future demand.

As I said, the SFPUC has been embarking on several projects to meet the current water supply shortfalls during drought and future demand. We have recycled water projects under development. We've been investigating non-potable supply development in San Francisco including graywater reuse, rainwater harvesting, stormwater recapture, and foundation drainage. Our new headquarters building actually has a living machine, so in fact we are moving forward with many of these programs. We have a pretty good rate of participation in our rainwater harvesting program. We also have groundwater development in San Francisco. Moving forward, we just released our draft environmental impact report on a new groundwater program in San Francisco that would provide potable supply.

Obviously, water conservation continues to be a major program for meeting future demand and offsetting future needs. We have a conjunctive use project, which we hope our draft DIR comes out within the next couple of weeks, that looks at a conjunctive use project in the Westside basin. This will provide the ability for a dry year water supply during drought. And we're also investigating regional desal. Water transfers has been an important component of our portfolio. We attempted to negotiate a water transfer with Modesto Irrigation District in this last year, and were unable to reach acceptable terms between our commission and the board. So we're still looking, but it's an important element for just meeting really our drought needs now.

Our wholesale customers have also been very active in developing alternative supplies. Like I said, they have their own set of needs. Their shortages during droughts can often be, as I said, up to 40 percent when the regional system is at the 20 percent rationing. And they also have future demand. They are implementing and have been implementing recycled water and groundwater projects for many, many years. They are looking at new opportunities to expand those projects. Also local capture and reuse, including rainwater harvesting and stormwater capturing, graywater reuse. Lots of activity in their conservation programs. They have some desalination projects that they've been investigating that are both coastal, bay water, and brackish groundwater desal, and also looking at water transfers.

So hopefully that gives you a little bit of a background of who we are, and I am going turn it back over to Donn to now talk about the Raker Act and Fourth Agreement.

MR. FURMAN: Great. Thank you, Ellen. Just for those that don't know what the Raker Act is, the Raker Act was a federal law past in 1913 that allowed San

Francisco -- or granted to San Francisco rights-of-way to build the Hetch Hetchy project in Yosemite National Park and Stanislaus National Forest. When the act was past, it had many, many conditions attached to the right of those -- or conditions to those rights-of-way. One of the most important which is that San Francisco releases water to meet the prior water rights of both Modesto Irrigation District and Turlock Irrigation District whenever such water can be beneficially used by the districts.

San Francisco in addition releases an additional 66 cubic feet per second to satisfy other prior downstream water rights that are now included within the Districts water entitlements. The entitlement is determined on a daily basis. It's determined at La Grange Dam. It's determined by a calculation of natural daily flow. The natural daily flow defined as that flow which would exist in the river in absence of any dams. The release requirements that we currently have to meet the district entitlements is 2,416 cfs or natural flow, whichever is less at any time, or 4,066 cfs or natural flow, whichever is less, for 60 days from April 15 to June 13.

This is the graph that depicts how that works on the river. This is the period 1986 through 1987. The red solid line you see going across, the lower part of that line represents 2,046 cubic feet per second. The top end of the hat represents 4,066 cubic feet per second during the 60 days I previously discussed. Everything that you see under -- and the blue line is the daily hydrograph on the river or daily calculation of natural flow. Everything you see above the red line belongs to San Francisco, but everything below the red line belongs to the Districts themselves.

A couple things to note about that. If you can see, the City's entitlement -- and this is drought period of time. I chose this specifically to depict the effect in a drought period in 1987 through 1992. And as you can see, the blue line rarely goes above the red line during those periods of time. 1989 it did; 1991 it did. But it rarely goes above that line. And it also happens to be the period of time in which you are considering a 35 percent unimpaired flow requirement be applied to the lower part of the river from the Tuolumne.

The next slide depicts it the effect of that during that same period of time, 1987 to 1992. The solid blue column blue represent the total Tuolumne River runoff within that year. The green column directly next to it represents, the entitlement water available to San Francisco during that period of time. The green line going across represents the average during the drought, or roughly 151,000 acre-feet, which represents about one half of the water we divert to the City for serving those 2.6 million people. Vastly simplified, if the water bank were full -- and I'll discuss a little more about the water bank in a second -- we'd drain the water bank by the end of the drought, if not before.

This is slide four. We talk a little bit about the Don Pedro project. At the time the Hetch Hetchy project was being considered, there were several elements to the project including additional dams within the water shed. There's a long history between the irrigation districts and San Francisco. We have not always cooperated as well as we do today. We have a series of agreements that settled lawsuits that we had for 30, 40 years over how to deal with our respective water rights. Those are now embodied in four agreements that kind of define our relationship.

The most important of those agreements is the Fourth Agreement, which deals with Don Pedro. San Francisco paid well over half the construction cost of Don Pedro. That was in order to be able to have the ability to prerelease to the districts their Raker Act entitlements. That Fourth Agreement sets the obligation between the parties. The Districts own and exercise exclusive control of all the water released by Don Pedro reservoir. The City exercises no control. We don't have the ability to tell them release another 35 cfs on this day; don't release 35 cfs. The water in the reservoir belongs to them. They hold all the water rights at the reservoir. Many of those water rights were received from you when they applied for the rights to build the project and control water. San Francisco has neither the right nor the ability to physical divert water from Don Pedro reservoir nor Hetch Hetchy reservoir.

The most important benefit to the City out of the construction cost that we contributed and our agreement with the Districts was the ability to be able to establish the water bank. The City basically pre-releases water to the Districts that they then store in that reservoir and can draw and use as they see fit. The water bank allows San Francisco to deliver water to itself at a time when it otherwise would have to bypass flows. In the absence of the water bank, the Districts would be entitled to the Raker Act entitlements, and the City would either have to bypass it through its reservoir or release it.

I am going to give a brief description of the water bank because it's confusing. I'd be happy to explain in more detail later, but I just want to give an example to give you a flavor for how it's administered on a daily basis. We have the ability to get a credit in the water bank on a daily basis. The water doesn't belong to us, but we get credit against the Raker Act requirements.

So for example, if the river is flowing -- the calculated unimpaired flow at Le Grange, natural daily flow -- is calculated to be 2,000 cfs and there's 2,500 cfs coming into Don Pedro, the City gets during that day a 500 cubic feet per second credit into its water bank. If on the other hand only 1,500 cfs is flowing into Don Pedro and the calculated District entitlement is 2,000 cfs, the water bank is reduced by 500 cfs. Basically, that's how the water bank works on daily basis. The city's control of the water bank can be achieved through operation of its own project, but once the water is in the reservoir, it belongs to them. It's theirs to do with as they see fit.

One of the points that I want to make about that is we -- because of that graph that you saw, we're very heavily dependent on storage, system storage, including the water bank. Even though we don't have the right to store there, it allows to us take more water at Hetch Hetchy than we otherwise could to deliver to the Bay Area. Because we're so heavily on storage, when you hit a period of time like 1987 to 1992, the drought period, we draw very heavily on that storage over time because our entitlements are so low.

San Francisco may have a maximum water bank balance at any time of 570,000 acre-feet. It's quite a bit of water. We have a right to an additional credit of 170,000 acre-feet, but only during the period of time that Don Pedro can encroach into the flood control space. Generally, that's a period of time between April 27th and October 7th. And the reservoir has to physically encroach. So if the reservoir is down at 1 million acre-feet, and we go up from there until we actually get into the top 360,000 acre-feet -- I'm sorry, until we get into that top 340,000 acre-feet, we don't have a right to an additional credit.

We can't have a negative account in the water bank without the Districts' prior consistent. I should point out that we requested the right to do in 1990, and the Districts refused. They have good reasons for refusing when they do I'm sure, but it's not a wink wink, nudge nudge arrangement with the Districts that we can go negative whenever we choose to. We do have to ask for prior consent, and the Districts do have discretion to say no.

One of the reasons we're here today is that one of the issues that remains from our four agreement is that there was concern about what future fish flow requirements might be under FERC orders. And the City and the Districts agreed that if the Districts' water rights were being impacted to meet future fish flow requirements imposed by FERC, that there would be reallocation of storage credits in Don Pedro, 51.7 percent to the City and 48 percent to the Districts.

I want to point out a few statements that appear in your document that are a problem, and we'll giving you written comments to address them. One of the them, of course, is that San Francisco has the right to store 740 acre-feet in Don Pedro. That should be 740,000 acre-feet per year. We don't have the right to store 740,000 acre-feet per year in Don Pedro. We have a very brief period of time we're able to do that, and we're not able to carry it past October 7th. With our water first operation, we try to maintain our upper reservoirs as high as we possibly can at the beginning of the year.

Two other statements appear in your document.

CHAIRPERSON HOPPINS: Can I interrupt you a second? You're unable to carry any credit into the following year; is that correct?

MR. FURMAN: We can carry 570,00 acre-feet clear through the following year. At any time we have a maximum of 570,000 acre-feet, but we can't carry an additional 170,000.

CHAIRMAN HOPPIN: If there's excess there, it's surrendered.

MR. FURMAN: Right. It's surrendered by the time that flood control comes back into play.

There's two statements that appear in your document, and there may be analysis on these, but we haven't been able to find it. The first one that's a concern for us is that some portion -- and there's an acknowledgment that there can be a shared responsibility with San Francisco. "Some portion of the increased flows from Don Pedro could be shared by CCFS. This may require changing the water bank account but would not likely interfere with CCSF diversions because its share of water rights is usually greater than the aqueduct diversions." That's on pages so indicated.

The seconds statement is, "The water accounting for New Don Pedro Reservoir would likely modified by the Lower San Joaquin River alternative, but the upstream CCSF operations are excepted to be unchanged."

I am no going to turn this over to -- one more. Just to recap because you wanted us to do this. There are some misstatements about how the water bank account works, and we gave you some comments on that. And the second issue is a key issue for us where we think the SED is inadequate is because it fails to analyze the effects that reduced Hetch Hetchy water supplies would have on the Bay Area based on the proposed alternative to have 35 percent of unimpaired flows from Don Pedro. Again, our disclaimer is here, and I would like now to turnover to Mr. Steiner and Mr. Sunding to explain more.

MR. STEINER: Chairman and other members of the board, my name Dan Steiner. You'll being hearing from me later on behalf of Mr. O'Laughlin and the Tributary Authority. I also do work for the individual members, and in this case for San Francisco.

You have heard our explanations of -- these slides here just represent a recap of what Mr. Furman and Ms. Levin have been talking about. My role in this discussion is to try to explain how the implication of the additional flow requirements in the Tuolumne River could have a trickle up effect to the San Francisco water supply.

There has been explanation already regarding the reliability criteria. This has been talked about how there is a goal, objective for level of service of 80 percent reliability. That all trickles into my type of world where I do water modeling in trying to explain how much water is available to San Francisco for delivery throughout dry cycles and all other years. As Ms. Levin said, the water supply is originating for deliver is from their local watersheds and from the Tuolumne River.

During the planning process of trying to explain what reliability to San Francisco customers is, I go through my typical modeling efforts in trying to balance supplies with delivers and finally provide set of procedures and rules to try to define what is -- how will the water delivery look to San Francisco across their drought cycles, and then apply those procedures across the rest of their planning sequence, many years just like the SED does. These procedures essentially balance water supply of all water available to San Francisco and delivered out in a fashioned form that makes sense essentially to provide a sustainable, reduced sustainable but not essentially erratic, or horrible effecting type of supply to where you maybe you have a hundred percent delivery in one year while you're supplying a hundred percent supply in another. That's part of the process of developing a sense of procedures, how you manage your water supplies across drought.

As I've noted up here, part of that procedure is that they have adopted a planning -- a drought planning sequence, which encompasses the 1987 to 1992 drought, which is the worst sequential drought in the record history for San Francisco's water system. Essentially what it does is it looks at all the supplies that are available, and including their storage coming in out of 1986, which was a bumper years -- doles it all out on a fashioned, programmed type of sequence to try to levelize deliveries to the customers.

The point to be made is during that procedure, and the results of the studies, that second bullet kicks in. And that is I have accounted for all supplies available to San Francisco, the direct runoff that occurs in a year, how much the San Francisco system has as its supplied portion from the Tuolumne River, all of the storage it has available at the beginning of the drought which is full, and it draws it all the way down to zero by the end drought. So I've effectively doled out every drop available to them across the drought sequence, and the remaining result of how much delivery they have to their customers.

At the current level of demand, which is 238 MGD per year, that equates to during the six year draught, that you can get away with delivering essentially a hundred percent in the first year of the drought, 1987. But for the five remaining years, you have to have a 10 percent cut on your delivers.

CHAIRMAN HOPPIN: Just as a matter of curiosity, Ms. Levin explained that the outside customers, the commercial accounts, I think you referred to them to, had a contingency plan where in drought situations say a 20 percent cut, they would take a 40 percent cut. Does that mechanism absorb the impacts to the municipal component of your deliveries?

MS. LEVIN: So that's for our wholesale costumers, which serve commercial, industrial, and residential, and David Sunding will talk a little about how much of our water is used for those different purposes. But what happens is that when we have a 20 percent shortage on the regional water system, or a ten percent shortage, we allocate a share to the retail costumers and a share to the wholesale customers. Wholesale customers will deal with a pool of water from San Francisco. There's 27 of them. They then have to allocate that pool of water to all 27 of them. And in doing so, some of the customer end up having to take up to 40 percent shortages.

Their allocation is a little complex, but it's something they agreed to on their own. So they are developing additional water supplies to handle the shortages that they are going to experience as that pool of water that we've given them is allocated amongst them.

CHAIRMAN HOPPIN: Thank you.

MR. STEINER: How I proceed with trying to figure out what would a shared responsibility to San Francisco of an additional flow requirement on the Tuolumne River is explained in this slide. You'll hear later how I also evaluated that from a San Joaquin tributary for the other two tribs also, but this is effecting essentially the Tuolumne River portion of that later discussion.

What I've done is looked at a spot of the preferred alternative at this point, which was, I understand it's a range from 25 to up to 45. I've picked the preferred alternative that starts at 35 percent as my example here. And what I did was look at -- as Mr. Fermun explained, there is that clause in the Raker Act, the Fourth Agreement, that talks about shared responsibility potential and that San Francisco could be responsible for 52 percent of incremental --

BOARD MEMBER SPIVY-WEBER: Can I ask a question? Are you saying 35 percent would come out of the Tuolumne?

MR. STEINER: No. I am saying that the Tuolumne's -- the proposed, or the preferred alternative I should say, selects the 35 percent unimpaired flow requirement February to June be applied on the Tuolumne River.

BOARD MEMBER SPIVY-WEBER: Is that right? I thought it was a portion of the -- okay, thank you.

MR. STEINER: And what I've done is applied the totals requirement for the Tuolumne River to then an application to a shared responsibility of San Francisco. And how I do that math is that I am looking at the existing flow requirements on the Tuolumne River, which is explained by the FERC 1995 settlement agreement. And that is my baseline, as far as what is required on the Tuolumne River, then I apply the preferred alternative's 35 percent flow requirement as what does it take additionally to get

from the existing FERC to get to the preferred alternative flow requirement. That establishes the total flow increment needed from the Tuolumne River, and I am doing this during the 1987 to 1992 period because that's what plays into San Francisco reliability criteria at this point.

When you do the math, and the second bullet explains that incremental difference on the Tuolumne during that period to moving up to the preferred alternative, 35 percent selection, costs -- or it increases the flow requirement during those six years by an average of 216,000 acre-feet per year. The current number is somewhere around a 115,000 acre-feet for the current FERC requirement average during those six year. The preferred alternative raises that by 216,000 acre-feet per year, and that's during the February to June period.

Doing the math -- again, if we go along with the scenario. The third bullet explains that I then take that 216,000 acre-foot per year incremental requirement for releases, apply the 52 percent which is the potential exposure to San Francisco under the Fourth Agreement.

That results in then that shared responsibility, 111,700 acre-feet per year average out of San Francisco system during that dry period.

These are average numbers. I don't particularly like average numbers. It's always different from year to year, but during the drought time it's pretty even across the board for the six years. But what I have assumed at this point, the spread, deficiency, additional call on San Francisco's system across all six years of the drought.

To give you a little feel for the incremental flow requirements that are suggested by the 35 percent requirement, this slide shows for the six years I'm talking about. Years one through six relate to 1987 and 1992 in the drought year sequence. The blue bars are showing you the annual flow requirement under the current FERC requirements on the river, existing conditions essentially to say. The orange bars represent the application of the 35 percent unimpaired flow requirement to the Tuolumne River. These are relating to flows in the lower Tuolumne River. Again the difference between the bars are what I come up with, that 216,000 acre-foot number, and then I apply 52 percent of it to come up with the suggested San Francisco share.

Here's the math by myself. What you've got is just several rows of over -- again, I am expressing this as year one through year six. The top row expresses the current existing the demand on the San Francisco system, which is 238 MGD average during the year. The current existing shortage, as is explained previously. The 238 is full demand that's needed for delivery at this point. The existing shortage under the criteria expressed that the first year there would be zero shortage needed, and then ten percent per year thereafter for the following five years. The existing delivery then, if you would apply that shortage, is the next row, again 238 MGD. There is no shortage in year one. 214 MGD is what would be delivered in the next five years of the analysis. The next row does the conversion we need to move out of MGD and move it into acre-feet to make units compatible. It's really just expressing that 238 MGD is really a delivery of 266,600 acre-feet in a year. And so forth, 239,000 acre-feet per year thereafter. That's existing condition that's out there at this point.

The next does the math of the incremental analysis of the additional flow requirements. The additional reduction, as we went through before, is 111,700 acre-feet. Again, during this period, I've already had an existing system that was drained to zero at the end. If there's additional call for water, it can't go out the pipe. It has to go down the Districts to the river, and that's what the 111,000 acre-feet. It just can't be in two places at one time. It's going to go down the river rather than out the tube to San Francisco. That's what the 111,000 acre-feet represents is it has to come out of San Francisco's supply. There's still going to be broke at the end, and they just can't put as much water through the San Joaquin pipeline.

So all this is doing is doing the math and illustrating that the water is going to go down the river rather than to San Francisco. And the result is then all you have left for delivery is the 154,900 acre-feet in the first year, 128,000 acre-feet per year thereafter.

Which then comes into showing how much delivery as compared to original delivering 238 MGD the first year with no deficiencies, you're now down to delivering only 138 MGD, which is a 58 percent supply as compared to 100 percent supply, or reduction of 42 -- an incremental reduction of 42 percent reduction in deliveries in that year. After that, it's essentially a 52 percent reduction in deliveries as compared to full deliveries. It's quite a devastating reduction in supply.

Any questions on the math?

MS. RIDDLE: I do have one question. Ms. Levin indicated that in the drought period that they generally plan for a 20 percent reduction in deliveries. Have you modeled it showing the 20 percent rather than the 10 percent?

MR. STEINER: This analysis is a movement from -- Ms. Levin talked about the fact that the planning goals have a 20 percent reduction. That is associated with a 265 MGD base demand, which is what the planning documents that we worked on during the water supply improvement program occurred. We have a lesser demand, the 238 rather than 265 just as a matter of happenstance, what has happened with the economy in the past few years. So yes, I have an analysis. I don't have it here, but the same analysis goes. The level of resulting deficiency is comparable to that bottom row still. You're just changing the baseline from what you're evaluating. Either way it is the 111,700 acre-feet reduction, no matter what level of demand you're at right now.

MS. LEVIN: And I think that you are asking did he run the analysis at a demand of 265 MGD when we experienced 20 percent rationing. Was that your question?

MS. RIDDLE: I think he answered my question. The baseline was different for your 20 percent assumption versus what he's run here which was with the lower delivery baseline, so there's already some reduction in supply built in for his baseline.

MS. LEVIN: So I think -- so our commission adopted a reliability goal of 80 percent delivery during dry years regardless of the demand. At the time that they adopted that goal, we were looking at serving a demand of 265, which in serving the demand of 265 MGD during this drought period, we would have 20 percent rationing.

MS. RIDDLE: So I think what you're saying is given that current demand is maybe at 238, that perhaps this analysis could be redone at a 20 percent assumption and reduce deliveries per your commission's agreement; is that correct?

MS. LEVIN: So what you're saying is that you would want to see the baseline of 238 MGD reduction up to 20 percent?

MS. RIDDLE: If that's a correct assumption. I don't want to -- you know best what your --

MS. LEVIN: Based on our current supplies and this demand of 238 MGD, we do not incur greater than 10 percent rationing during this drought period.

BOARD MEMBER MARCUS: But you do have an agreement that plans for that; is that correct?

MS. LEVIN: Yeah. We are doing better than our reliability goal because our demand is so low.

MS. RIDDLE: Okay. Thanks.

MR. STEINER: Yes, I am done.

MR. SUNDING: Mr. Chairman and members, good morning. Nice to see you again. So I'd like to talk about some of the economic implications over a range of shortage that Mr. Steiner talked about. First for some context to understand a little bit about where these numbers come from. The SFPUC regional water system provides retail delivery to City and County of San Francisco and wholesale delivery to three other counties: Alameda, San Mateo, and Santa Clara.

So some basic numbers. In the City and County of San Francisco there are about 147,000 residential accounts and about 21,600 non-residential accounts. Looking at the wholesale customers, the 27 wholesale agencies, they serve a population of about 1.7 million people with about 30,000 commercial and industrial accounts. Now, the composition of demand on the regional water system is somewhat different than you see in other urban water utilities in California in the sense that the residential component of demand is somewhat lower. It's about 60 percent. You more normally, you see thing in the range of 70 to 80 percent. There is higher than average commercial, industrial, and government demands. Together those total about 40 percent.

Of course, San Francisco, the county served by the regional water system, is one of the largest centers of economic activity in the country. In the whole service territory there are firm with about 1.6 million people on the payroll. Those firms produce about $280 billion in goods and service every year. And of course, this is true for other cities in California as well, due to the semi-arid climate, economic activities in the San Francisco Bay Area is largely dependent on imported water supplies.

So how can one characterize the economic significance of the kind of shortages that Mr. Steiner just talked about? Well, the proper metric depends on the sector that we happen to be talking about. For the residential sector, water is a consumption good. The proper measure of the impact is what we economists call consumer surplus. It's not a term that we made up for this study. This is taught to every undergraduate student in economics in the country.

Consumer surplus is the difference between what a consumer is willing to pay for a commodity and what they actually pay. So in the example of water, it's the difference between the water rate and what the water is worth to someone. So it's the value that's created by the fact of consumption. You can think of consumer surplus change as being the amount of money that a consumer would pay to avoid an instance of rationing.

Similarly, on the producer side, so this would be a relevant metric commercial and industrial contracts. Producer surplus is basically akin to profit. It's the difference between revenue and the cost of producing goods and services. So producer and consumer surplus are sort of the theoretically correct welfare measures to use to measure economic impact. Now, there are other metrics that are important too. Jobs is really the currency these days. What would be the impact on employment of say something as dramatic as a 50 percent rationing scenario, but we could also look at impact on the amount of goods and services that are sold every year in the economy, so the amount of economy activity.

To get at these important questions, we developed a very large economic model of water demand and supply in the area that's served by the San Francisco regional water system. We tried to adopt a comprehensive accounting. We looked at retail customers within the City and County of San Francisco but then also the 27 wholesale customers, cities, and then a couple of investor owned investigator utilities. We broke down demand into sectors. We looked at residential, commercial, industrial and institutional demands. And we also incorporated assumptions about how the shortage would be allocated. In the first instance, between San Francisco's -- between the City and County of San Francisco and their wholesale customers, but then also across sectors within each of the retail agencies, even in the wholesale customers. And that's important because many water utilities have a policy to mediate most shortage through the residential sector. And the idea being, well there's some discretionary uses like say lawn watering and other kinds of outdoor use, so that would be the first thing you'd want to target.

Well again, it's important to have a little context here. Ms. Levin talked about gross per capita water use, so looking at all water use divided by the number of people that live in say the City and County of San Francisco. You know, something like in the range of like 85 gallons per capita per day. But that's much higher than the actual amount of residential water use. If you look at just consumption within the residential sector of the City and County of the San Francisco, consumption is more in the range of 50 to 52 gallons per capita per day, which is very, very low. There is very little outdoor water use in the City and County of San Francisco.

So what that means, by the way, is that half of all households in the city of San Francisco are consuming less than 50 gallons per capita per day. And to put that into context, the UN recommended minimums -- things rarely you come into play in California -- but UN recommend minimums for personal hygiene and sanitation are something in the range of 13 gallons per capita per day. So something like a 50 percent rationing scenario applied straight to the residential sector in the City and County of San Francisco would be essentially impossible.

So a little more detail about the model just to give a sense of where these numbers come from. We did a detailed statistical analysis of demand to get to estimates of these changes in consumer and producer surplus focusing on the residential sector. Again, that accounts for 60 percent of water use in San Francisco and the areas served by the regional water system. And even accord to assumptions that we've made despite what I've just told you, we still target the residential sector first. Particularly for the wholesale customers, there is more water use outdoors than there is in the City and County of San Francisco, but we did target this sect first.

We estimated detailed demand relationship for residential water use for the retail and wholesale customers, so essentially we looked at variations across cities. Cities have different levels of income and rates and climates. And then we looked variation over time to see what would happen in the city of Palo Alto when water rates have gone up in the past, what was the demand response. And this is all very important to get at the notion of demand elasticity or what would consumers pay to avoid a given level of shortage. And these are techniques, by the way, that are very common in all kinds of utilities. When PG&E or Southern California Edison do their reliability planning, they use methods that are very, very similar to this.

So in terms of the results, we have a range of shortages here that are assumed anything from 10 to 50 percent. Now, we're looking at the losses in consumer and producer surplus. I'll get to the employment and economic activity in a minute. But with something like a 10 percent shortage, these are losses per year, so the amount of money that consumers and businesses would pay to avoid a 10 percent shortage in the regional water system would be about $50 million just for one year. And that number goes up, of course, more than proportionally. When you get to 50 percent rationing, then the number is something like half a billion dollars per year.

And of course, what ends up occurring because you start to hit these sort of basic sanitation thresholds in the residential sector, particularly in the City and County of San Francisco, more and more of the shortage gets pushed into commercial and industrial uses. There's certain uses like hospitals, for example, that are very difficult and probably very unwise to cut. What that means is that more and more of the shortage spills over into sector that do have some flexibility. So a 50 percent rationing for a particular sector might understate the actual amount of the cut, which is why you get to numbers which are very dramatic here and consequences that are rarely seen in a state like California.

Another way of looking at economic impact is in the terms of employment, lost jobs, and changes in economic activity or sales of goods and services that are produced in the in this region. For something like a 10 percentage shortage, there would be a reduction in economic activity of about $1.8 billion. This is less than proportionally. Remember we're talking about roughly a $300 billion economy. So a 10 percent reduction in water availability doesn't reduce economic activity by 10 percent. It's much less than that because there are measures that can be taken short of curtailing output. But particularly when you get into higher shortage amounts, 20 percent, 40 percent, 50 percent, then it becomes tougher and tougher to keep certain kinds of business operating. It's very difficulty to run a shopping mall without air conditioning and bathrooms available. It's very difficult to run gas stations or little manufacturing facilities without adequate water supplies. So again, reduction is much less than proportional, but it does still get up to very, very significant numbers.

With a 50 percent shortage, you're looking at something like $50 billion in lost sales, and to put this in context, 188,000 jobs that go along with that economic activity. That would amount to about a 10 percent increase in the unemployment rate, roughly. So again, 50 percent shortage is very, very dramatic. We've probably never seen a retail water shortage anything like that in the State of California, but that's what's implied by Mr. Steiner's analysis. So that would translate to roughly a 10 percent increase in the unemployment rate in the area.

And I point out that the assumption here is that this just occurs for one year, but there's the possibility that these rationing levels would persist. If this were to keep up for a period of three, four, five years, I think it's very likely that you'd actually see some firms start to relocate to other areas. And there is some experience globally with that. For example, with the Kobe earthquake there was some long-term disruptions in water supplies and some very good ex post analysis that people have done in urban planning that suggests a certain number of firms picked up and moved to Osaka and other locations. So this is a real possibility, and I'll leave it there. Thank you.

MR. STEINER: So just so summarize, Obviously Dr. Sunding's analysis is a worst case of 40, 50, or 60 percent of unimpaired. Just to summarize our main concern with the SED is you miss the analysis entirely in your document. It's a defect in your document that we certainly suggest you fix. We're happy to work with your staff to do whatever we need to do to help model these impacts or share information on these impacts. And finally, I'd just like to thank you for your time.

BOARD MEMBER MARCUS: Question whenever your done. No, no. Part of the -- not that I don't say thank you. And it's nice to see you all after so long. I know you've missed us, so it's really nice to have the great City and County of San Francisco here.

Question. I am just trying to put this in context. Number one, part of the purpose of the SED which is as people are correctly noting is the focus of the hearing to make sure we get the basic background information right so that we can use that information as a basis to then make the decisions that we're going to be making down the line. And part of what happens, and you've done it in your assessment, part of it is to look what's your worst case scenario as well figuring out what part of the whole process. And you've given us a lot of information, and I appreciate the offer to sit down with our staff which is obviously what needs to happen.

I am just trying to place this in context, which is to say if you're saying we, the writers of the document, missed the nature of your relationship with the other irrigation districts and how the water would be allocated. And impact, let's just assume for a moment that it is correct. Just take it as a given, not saying it is, but just assuming for the moment. If the impacts on you are greater, does that then mean that the impacts on the other districts perceive on them based on our document are less?

MR. STEINER: I haven't done that analysis. You've looked at a worst case basis of no groundwater pumping in terms of impact on them, the level of fallowing. We haven't done the analysis to see how much their impact is lessened by us assuming that impact.

BOARD MEMBER MARCUS: So that's just math of what we need to figure out. Assuming that was our only assumption that was the wrong was the allocation of water between all of you, then by definition the impact on you being so great -- greater than we thought, would mean it would be less than we thought on them. That's just in gross.

The other thing is -- the thing that's interesting about it -- again, not taking the numbers as a given but taking the number as what comes out of this nature of the analysis -- is we will need to be thinking, not just in this but in the future, about the issue of what urbans can do vis-a-vis what ag can do because you do have more flexibility of tools to deal with water the shortages than ag does.

So I was pleased to hear about a lot of work that your doing. I have a date actually to talk with some folks about some of your far ranging sustainability efforts in the next few weeks. And I'm really pleased the bits about it that I've heard, and I am looking forward to a more full sense of it. So this was all very interesting. I am hoping as we move forward, what when we need to figure out is how are we getting our worst case analysis correct for one thing. But also how do we get a realistic analysis of what's likely to happen in the dialogue. And taking all of your information into account will us help do a better document which is the threshold we have to get to before we can even consider what we might do in balancing.

MS. LEVIN: If could just say one thing about alternative supplies though. What I shared with you today are pretty far-reaching actions that we're taking now to deal with our current problems under our current requirements and with future demand coming on. So as I am sure you appreciate, these sources in supply are not bottomless. You hit a bottom, and they get very, very expense and very difficult to implement.

BOARD MEMBER MARCUS: Oh, I've done it, so I know.

MS. LEVIN: I just wanted to make assure that that was in the record.

BOARD MEMBER SPIVY-WEBER: But there's a statewide, nationwide, international-wide reduction in water use particularly in urban areas. So it's a trend. I don't think how long that trend will last, but it is definitely a trend.

CHAIRMAN HOPPIN: Thank you all very much. Timmothy, to show I have a thread of humanity in me and that we do practice recycling, if you'd bring your panel up here. And we'll be back in five minutes.

(Whereupon a break was taken, with a change of reporters.)

CHAIRMAN HOPPIN: Yesterday, we had a few public commenters that were not here when I called them. I don't know if there are any others here than the two cards that I have, but I'm going to call the public ommenters up, and if there are any others of you, if you give your cards to Sonia in the front.
Jennifer Carlson, would you like to come up?
You've got Dean Ruiz, but he's going to follow up after Mr. Herrick on the South Delta group. So I believe, Dean; is that correct?

MR. JACKSON: That's correct. He's on his way. He was going to follow up.

CHAIRMAN HOPPIN: I love it when you agree with me, John, thank you.

MR. JACKSON: I always agree with you.

CHAIRMAN HOPPIN: Okay. Why don't you guys go ahead then and we'll try Jennifer Carlson again. Is that okay?

MR. O'LAUGHLIN: I'm Timothy O'Laughlin. I represent the San Joaquin Tributaries Authority. Our next panel, Chairman and Board, we have is Mr. Steve Knell, the general manager of Oakdale Irrigation District; Jeff Shields, the general manager of South San Joaquin Irrigation District, and Connie Hertzfeld for Stockton East Water District. These are the people who currently take and use water from the Stanislaus River.

MR. KNELL: Thank you, Mr. Chairman, Board. Special thank you to Board Members Moore and Marcus who came out to our watershed last summer on not too bad a day.

BOARD MEMBER MARCUS: It was great.

MR. KNELL: Appreciate the time that you took to come down and spend time on our river. The PE after my name says that -- limits me to only talking on those things that I'm experienced in practice in talking on.

CHAIRMAN HOPPIN: That's unusual around here.

MR. KNELL: Yeah, I was going to get to that. This is my joke working up on that. I will be talking to economic issues. I've been six years on the Oakdale Chamber of Commerce. I served last year as the board president for the chamber, and I'm the executive board member representing agriculture on that organization, but we'll be talking about economic issues in our area, and I found out after yesterday my degree in biology allows me to talk on any subject matter that I'm not well versed in.

I thought I'd throw that out.

CHAIRMAN HOPPIN: Just make sure Mike Osmundson has enough water in his kennel that I can keep getting his dogs.

BOARD MEMBER MARCUS: For the record, I want to note that Roger has left.

MR. KNELL: Oakdale was formed in 1909. Now, we're serving 62,000 acres of irrigated ag. We have 600 rural domestic water users. We are a hydropower wholesaler of South San Joaquin. We wholesale power. So we're not in the retail power business. Our facilities up in the Stanislaus Basin include Donnells, Beardsley and Tulloch. Our annual budget is about $15 million a year. 75 employees is our staffing limit. People talked about recession and its impacts. We are back down to 68 employees as a result of the recession. We have significantly slowed our construction business down. In a recession, when the lights go out and the factories shut down, power is not worth anything and it's really impacted our district substantially and we've had to lay people off as a result of that. And obviously we're a senior water right holder on the Stanislaus.

And Mary from the Bureau did an outstanding of identifying a lot of issues. So we're going to slam through some of this in the interest of your time and ours.

But really to reemphasize that both South San Joaquin and Oakdale are pre-1914 adjudicated water rights to first 1816.6 cfs -- that's a song in Oakdale, 1816.6 -- in the Stanislaus River.

As Mary pointed out and in your SED model, we are not a Bureau contractor. So that water is separate and distinct from that water that is showing up in your document.

One of the things that we obviously see, we've gathered almost 20 years of information on our river on our science, and none of it appears in the document. We find that a significant thing. We understand that there 11is the Web site for unsolicited comments. We appreciate that on the State's Web site, but we believe that a lot of the information we have specific on our river and the science that we're finding that now we're finding also on the Tuolumne bodes well for this document to reconsider some of the science that it has in there to support some of its decisions.

One of the things we see is a failure to focus on solutions that don't cost water. Habitat creation. That's where Board Members Moore and Marcus, this is what you saw last summer when you came out. They are saying this now.

This is a high flow channel. Water only got into this channel during high flows, and we have reconstructed that channel to make it much lower so that now water goes into that channel at lower flows in the river to offer channel habitat for nesting, and what you see in the background is the overflow from that going into the side channels which create rearing habitat for young salmon as a place to hang out until they get large enough to go downstream.

We believe we do a very good job, and as you see the picture this year of those little critters there, we do a very good job of producing salmon in our basin. As was alluded to earlier, though, we have a real problem in getting them out, and I believe our mortality rate -- and this will be talked about later -- is in 94, 95 percent mortality getting down to the confluence of the San Joaquin River.

Our signs in our river show that real problem is not flow related. It's predation issues. Now, I pay the guys and Jeff pays the guys on the right. I had to go find Russ. He's on the left. Russ works at Savemart and I had to go get his signature when we used his photo in our Save the Stan campaign. Like I said, I can use those guys. I'd pay their salary. Russ works at Savemart. Russ is a very interesting avid striper fisherman in our area. He thanks God the way we've started managing the river because he used to have to drive to the Delta to catch those things, and now they're just outside Oakdale. So he's very happy about how the river's going.

I didn't have the heart to tell him that they're eating all the salmon, but he didn't seem to care.

We're the poster child for 35 percent unimpaired. The NMFS biological opinion has already put our river at that standard.

That's next two graphs, keep in mind the blue, this is New Melones storage before the biological opinion under the 1987 interim plan of operations for New Melones. Lots of blue.

This is New Melones storage. This is end of September storage. So that's the benchmark. With the biological opinion in place, this is the storage end of September based on the RPA's currently in place.

From a management perspective, what is good management? I mean, this is what it's all about. This is about managing a very scarce resource, which is water, a little bit overboard, maybe a little bit too much conservativeness in reservoir storage, but surely ramping down for discharges is a problem.

Mary from the Bureau alluded to the fact we're already at the baseline. So essentially there are no impacts to our area because we're the baseline. In reality, though, we know that's a ruse. I call it a ruse. It really isn't. I mean, we are impacted, but apparently those impacts are taken up by the federal document. The San Joaquin restoration project is going to have an impact, the conservation plans are going to have impact, I mean, all of these cumulative impacts, while processing them through CEQA and doing the job that we're supposed to do, isolate those impacts, cumulatively our area suffers multiple impacts as a result of multiple processes that are going on in the basin.

Going back to those blue charts you saw earlier, Melones is essentially empty 18 percent of the time. The loss of the cold water pool, 45 percent of the time below the 500,000 acre-foot storage line. The recovery time between that reservoir gaining that cold water pool and then losing it again likely will end cold water fishing below Sonora permanently in our area.

As a result, the New Melones was established very healthy, robust for mykiss population downstream of New Melones. That will disappear. That was the very population of fish that the biological opinion was designed to protect. It's not protected.

As it goes for tourism in our area, as Melones goes up and down, all that does is put pressure on

Woodward and Tulloch to be operated as operational reservoirs, not recreation reservoirs. And we will use those as regulating facilities, have water fluctuations and essentially diminish their capacity to serve the recreational craft. Tourists don't recreate on empty lakes. I understand poor people do, but in our area boaters don't go to empty lakes to recreate. Our inns, hotels, restaurants all suffer from a loss of revenue.

In Oakdale -- I'll talk from the chamber -- our greatest revenue stream used to be before the recession was tax on car sales. One of the things I think that you miss as a collective is that in small communities when ag does well, everybody does well in our community. When ag's making money, farmers are buying vehicles, they're buying trucks, they're replacing their vehicles. It's very significant in our community.

As a result, like I said, car sales taxes are the number one revenue stream for our city's coffers. Behind them is gas sales taxes. Gas sales taxes is big in Oakdale because we're a gateway to Yosemite. We have tens of thousands of people that drive through our town. We always say Oakdale is the last clean restroom before you get to Yosemite unless you want to use the national forest for some of those reasons.

It is important that we have tourist traffic go through that community. The loss of sales tax would impact our area a lot. Now, recreational values, when you start draining lakes, really you're sacrificing recreational values to meet what we consider unachievable goals.

We talked about the impacts before. Just a reminder that one out of every seven jobs in our area is related to agriculture.

Remember the blue chart had a lot of blue and then it was a little bit of blue. The district back in '06 came up with an operations plan that split the baby, and that's what we do. I mean, we think we as irrigation districts -- we always find solutions. We think we do a very good job in solving problems. We believe that the operations plan we submitted in '06 has value. Unfortunately, when you start on these biological opinions you get on these other processes, your stuff falls to the side and our stuff has been sitting around for seven years without a review by the Bureau, and it's been very disheartening for us because we believe we have a solution that solves a lot of our contractor issues, a lot of our basin issues and makes for sustainability. Just look at it and give us some feedback. We could work with that.

The state, you know, everybody I heard

yesterday this has been an open and vetted process. You're the only staff I've ever talked to during the whole development of this process. And so there's a lot of blood on the carpet when they said that this was open back there. We were all biting our tongues and lamenting about the fact we haven't had --

CHAIRMAN HOPPIN: Did you ask to talk to someone that you were precluded from talking to?

MR. KNELL: A lot of times the real problem is with irrigation districts like ourselves and Jeff, besides being the general manager, I'm the HR guy, I'm the maintenance manager guy.

CHAIRMAN HOPPIN: I know where you're going, but don't lay that on my staff, okay?

MR. KNELL: Okay.

CHAIRMAN HOPPIN: Thanks.

MR. KNELL: But this lack of communication is even from us. When we have developed 20 years of information and it's not in your document, we just have to ask why. Is it really about the fish?

Yesterday's presentation put up by the wildlife agencies instead the focus is on water, and apparently in Appendix C they have habitat, predation, and water quality. Water in our business is our livelihood and our futures. It is priceless. There is a cost of habitat development. We understand that. But there is a cost of predation suppression, removing for the predation program, there is a cost to that. Water quality is just a cost.

We can deal with money. We can deal with cost issues. Those are just financial issues. We cannot deal with the loss of water.

What we believe the SED provides is all-in gamble on the water card and we don't think you're right and the problem is we're the losers. Thank you.

CHAIRMAN HOPPIN: Thank you very much.

MR. SHIELDS: My name is Jeff Shields. I'm general manager for South San Joaquin Irrigation District. I appreciate the opportunity to be able to come here and present some information relative to the SED and process you're going through.

I want to mention a couple of things first about the Bureau, Mary Johannis did an excellent job this morning and it's going to afford the opportunity for me to skip over quite a bit of the things that I wanted to present as well as Steve Knell just covered a lot of things.

You've heard from Turlock, you've heard from Merced, you've heard from Modesto. I could probably say me, too and be somewhat done with this, but there are a couple of things that I think are specific to us and unique. Of course, I don't have the cool accent that Brian Kelly has, so I won't command your attention probably the same.

I do want to ask just say one thing. There was a comment made that just kind of ate on me yesterday. I've got a broad experience, years dealing with Bonneville and the Columbia River fish issues. And there was a statement that predation efforts on the Columbia have been a waste of time, and I think whoever said that needs to do a lot more research. Those efforts have been extremely successful. There is great documentation of the benefits of those investments on the Columbia.

South San Joaquin Irrigation District formed in 1909. We have about 77,000 acres in our service territory, 55,952 is irrigated crops. Of that, one product alone, 28,000 acres of almonds. Much of the remainder of the trees are walnuts, cherries and vines, grapes and other permanent crops. As you've been told many times now, you can't fallow those particular crops.

The balance of the ground is dedicated to feed crops, including pasture, corns, oats, clover, things that help support the dairy business in our community, and it's not really possible for them to on a sustained basis go out and supplement that by purchasing feed because the prices just can't sustain the industry.

They're already struggling. There was a comment that there's a lot of new territory. Interestingly, South San Joaquin hasn't expanded our territory at all, but, in fact, a lot of growers were using groundwater and what we're seeing -- and I think Stockton East has some good slides that are going to demonstrate this -- we're seeing a lot of salt water intrusion. And, again, with permanent crops you can't use salt water from the groundwater on a sustained basis and be able to keep those crops growing.

So what's happened is growers that have been relying on groundwater are now coming back on to the district and wanting to use our surface water.

The next slide I want to show you compounds that problem, because the second thing largely, and again largely because of salt and other pollutants in the groundwater, the cities in our service territory came to us and wanted to work together to try to develop a water treatment plant. We did that, and in May 2005 we started meeting the domestic water needs for the City of Tracy , Lathrop, Manteca and Escalon. The cities are entitled to received a combined total of 43,090 acres. The City of Ripon elected not to participate in that project but, instead, take a 6,000 acre allocation that they're entitled and use that in recharge basins, and they continue to take water from their groundwater resources.

In fact, what's happened is the groundwater resources, now they're experiencing salt and other contaminants and the cost of treating that, they are now petitioning to join in our water treatment plant.

That treatment plant has a capacity of 40 million gallons a day with the ability without increasing -- well, with the ability to go up to 60 million gallons a day.

The treated water serves about 193,000 residents and, in addition, the industries and businesses in those communities that I mentioned. Tracy, as you heard from the mayor pro tem yesterday, is 17seeking to increase their allocation and wean themselves off of the groundwater in their service territory, and as I mentioned, Ripon is trying to come in and join our project.

The cities that receive water from SSJID -- oh, I'm sorry. Moving right along here. The cities that receive water from SSJID's groundwater treatment plant, as I said, also pump groundwater. And the way they're meeting the California Department of Health standards for that water is blending it with our surface water; and increasingly they're taking more and more surface water and less and less groundwater as those standards get tighter.

Another issue is PG&E is imposing time of use and, even worse, peak hour pricing on the cities and farms, and that's forcing these organizations more and more, both our growers and the cities, to stop pumping groundwater and spend more time on the surface water.

The Eastern San Joaquin County groundwater basin has got a 70,000 acre-foot overdraft, about two feet per year decline, some areas saw drops in 2012 as high as ten feet decline. So, again, if you're pumping and relying on that, your wells have to be either deepened or your pumps have to be increased in size and you pay higher costs.

Surface irrigation in our surface territory contributes a net of about 57,000 acre-feet per year to the groundwater basin. That's largely from flood irrigation.

SSEID contributes approximately 29,000 acre-feet annually through seepage at our Woodward Reservoir. That's a regulatory reservoir off-stream from the Stanislaus, and it hold about 35,000 acre-feet of water. The seepage of that makes a substantial contribution to the groundwater in the area, and we don't provide recreation. We allow Stanislaus County to provide all the recreation, boating and such on that lake. As a consequence, about 35 percent of the entire Stanislaus County budget for their recreation department comes off of the revenues from that reservoir.

If there is imposed limits upon our ability to divert water, we do have the option, as Steve Knell mentioned, basically running that as a stream, just running it straight, not operating the lake at its full capacity. That would have the benefit of reducing those seepage losses. Of course, it will also have the impact associated with lost revenues to the Stanislaus County Parks and Recreation and also losses to the groundwater.

We also own two small hydro generation facilities at Woodward, which is Woodward and Frankenheimer Powerhouses. If we operate it as a canal rather than a lake, we'll lose some power generation associated with those two generation facilities.

I just want to kind of wrap up with these last two slides. We do understand that we have a substantial water rate and that comes -- that's a privilege that comes with a responsibility. And there is a public interest in protecting the integrity -- the biological integrity of the Stanislaus River. We get that.

To that end, Oakdale and SSJID invest well over a million dollars a year just in biology on that river, and as Steve indicated, to have that historic record of science completely ignored in the SED gives us a lot of heartburn. And so we will be pressing to see that a lot of science gets included in the next draft.

BOARD MEMBER MARCUS: Can I ask a quick question? I don't mean to interrupt your train. I could have asked it of Steve earlier. Have you -- and I think it was kind of what Charlie was getting at. Have you all submitted that to the staff before? So we have it. Okay.

MR. SHIELDS: Over the years you've had access to that information I think in many forms, but certainly more recently in this particular forum.

SSJID and Oakdale also have invested millions of dollars in irrigation efficiency, and I could get into specific projects we've done in the last couple of years, as well as habitat improvements.

Lastly, I just want to go back to this issue of our responsibility for the biological integrity. We find that the deficiency of federal science really is lacking in the SED, and Steve used a term and my wife hates this term, but I'm going to repeat it -- hopefully she's not watching on the Web -- but splitting the baby in half. And that conjures up a really troubling image for her and should for you because you really don't benefit native species and you really don't benefit ag when you split the baby in half. I think both deserve better than what we see in the void of science in this document. So I'll close my comments with that, then. Thank you very much for your time.

MS. HERTZFELD: Good afternoon. Connie Hertzfeld on behalf of Stockton East Water District.

So I'll give you, as she's pulling up the PowerPoint, I'll give you a little bit of background Stockton East. We provide surface water to both agricultural customers and urban users. We encompass approximately 143,000 acres, roughly 95,000 acres are in agriculture 48,000 are urban uses. Our agricultural demand is approximately 170,000 acre-feet, and we supply treated water to the City of Stockton, Cal Water and San Joaquin County to the tune of about 50,000 acre-feet.

The provision of surface water to our customers supports San Joaquin County's $2.2 billion agricultural industry and we serve approximately 300,000 residents.

Up on the screen here is the Eastern San Joaquin County Groundwater Basin. It's split into three sub-basins. You will see that the eastern portion of it is bound by the Mokelumne to the north, the San Joaquin to the west and the Stanislaus River to the south. This groundwater basin was declared a state of critical overdraft in 1980. The historic groundwater overdraft has had dramatic effects on both water levels and water quality. As Jeff mentioned, we see groundwater levels declining, you know, on average about two feet per year. Some areas are 80 feet below sea level.

This graph shows -- the yellow mark is the saline brine that is underneath the Delta that's moving into the groundwater basin, and it destroys the basin as we move forward, as it moves forward.

Historically the groundwater overdraft was caused essentially by urban and ag pumping and is a direct result of a lack of surface water supplies. You saw the basin. We have the Mokelumne, the San Joaquin and the Stanislaus, but San Joaquin County is a very, very surface water or at least in the East San Joaquin Basin is very surface water deprived area.

So the water districts in the county didn't sit on their hands. We applied for water and sought water from the American River and the Mokelumne River, and unfortunately those water supplies did not materialize.

ust the one point, groundwater overdraft isn't caused by the urban development.

Stockton East began providing surface water from the Calaveras River to agricultural customers in the late '60's. In the 1970's, we saw dramatic overdraft within the city area, and we teamed up with the City of Stockton, Cal Water and the county to construct a treatment plant.

In addition to that, in 1983 we contracted with Reclamation for 75,000 acre-feet of water from the Stanislaus River. The other CVP contractor that isn't here today, but is Central San Joaquin, they are an agricultural only district and they contracted for 80,000 acre-feet. So the total CVP contractors from the Stanislaus River total 155,000 acre-feet.

In order for us to get the water from the Stanislaus, the district invests $55 million to construct improvements to bring the Stanislaus River water into our district. We purchased half of the Goodwin Dam from our -- from my people to the right and the left. We constructed a tunnel. We used the national waterways where we could. We have both an upper and lower canal that is unlined because we are in a critically overdrafted groundwater basin. So we want the water that we deliver from Stanislaus to perk into the groundwater basin as much as we can.

So the investment was significant. $65 million is a huge investment for our community.

Our original treatment plant was a 30 MGD plant. Over the -- through the 1990's and 2000 era, we were able to make some enhancements to the treatment plant, and currently the operational capacity is a 16 MGD plant and we supply 50,000 acre-feet to the City of Stockton, Cal Water and the county.

The one thing that we have noticed is the groundwater levels in the City of Stockton have improved dramatically by the provision of treated surface water.

I'm going to move on to the State Water Board's SED and why we believe it's fatally flawed. One thing -- and I concur with both Steve and Jeff, Mary Johannis did an excellent job, and I'm not going to dwell on the no project alternative, but the one glaring error that wasn't mentioned in the baseline conditions is the fact that the DWR reliability study was used.

This is a study, as your staff mentioned yesterday, it provides all of the inputs into your WSE model. And the problem with this DWR CALSim run is it limits the CVP contractors to 90,000 acre-feet. Our contractual amount is 155. The two districts since 2010 have received a full 155 allocation in 2010, 2011, 2012, and this year we received our full 155,000 acre-feet allocation.

So by using this flawed study, it, first of all, in your 20 percent analysis, it shows that we're getting a tremendous amount of water. I mean, it shows 73,000 acre-feet additional supply to the Stanislaus River water diversions. That's just nonsensical.

The baseline is misrepresented, and as a result, all of the impacts are misrepresented. And there were other issues that Reclamation raised, but the biggest one from our perspective is the fact that our contractual amount, the water to be delivered, was artificially limited by 65,000 acre-feet. So essentially taking away 65,000 acre-feet of our water supply from the get-go.

The other issue is the June 2009 BiOp. Part of the justification for excluding some things and including other things, for instance, VAMP, is the fact that the notice of preparation came out in February of 2009. Well, the biological opinion didn't come out until June 2009. So if you're only putting things in baseline that are from February 2009 to before, why would the RPAs be included in the baseline? I mean, there is certainly a cumulative effect, but I question whether it's appropriate to have it in the baseline.

Secondly, the San Joaquin River restoration flows, your staff elected to put those in the cumulative section, but those were in place, the settlement agreement and legislation was all done prior to that February 2009 date.

So essentially as a result of the erroneous assumptions in the baseline conditions, the entire analysis in the SED is -- it's flawed. It completely misrepresents impacts to my -- to the CVP contractors, and it's impossible to evaluate what the effects will be on the critically overdrafted groundwater basin. It's impossible to analyze the effects to our agricultural users and to our service providers of not having that water allocated.

Just by way of example, I mentioned this, it showed the Stanislaus River water diversions increased under the 20 percent hydrology, and under 40 percent unimpaired, we were only reduced by on average 8,000. And the Table 5-22b shows an average annual reduced deliveries of 181. That represents our entire contract. So I just really believe that the SED needs to, one, use appropriate models, have appropriate baseline and the analysis needs to be revised.

I want to turn now to the implementation plan for the salinity objectives. The preferred alternative proposes to modify the southern Delta salinity objectives to 1.0 at Vernalis and the three interior objectives.

Stockton East doesn't have a position on what the appropriate objective is. The objective needs to be protective of beneficial uses, but we do have a major issue with the program of implementation because the program of implementation contemplates conditioning the water rights of New Melones on meeting a .7 standard. We believe that this is, first, not permitted under the law. Clean Water Act prohibits the use of dilution flows.

Secondly, the Public Law 108-361 requires that Reclamation come up with a program to reduce the reliance on New Melones of meeting these water quality objectives. So the fact that the State Water Board would impose this condition not only not of 1.0, but of .7, effectively providing dilution flows, we think that that flies in the face of the congressional directive.

And the final point I'd like to make is we think the SED and the program of implementation violates CEQA because you have to consider in your program of implementation a reasonable range of alternatives, and that is not done here. The only alternative presented is for the Reclamation to meet this .7 when the objective is actually 1.0.

So with that, that concludes my presentation.

CHAIRMAN HOPPIN: Questions?

BOARD MEMBER MARCUS: Just a quick note that I 3need to which I mean with no disrespect because you know I like you guys a lot. In the slides and in some of the comment, I would say it's really helpful to focus on the impact and where we got things wrong, but impugning motives is not helpful. So it's just a suggestion not to do that because there is too much of that the water world in general.

Everybody is trying to do a good job. I need to suggest not at you in particular, some of it was yesterday, but it's not helpful.

BOARD MEMBER MOORE: Thanks for the presentations in our visits in the field, you know, and you brought up in your presentation, what's interesting about some of the work that you're doing in the Stanislaus River is we almost think of it as bringing the land to the water as opposed to more water to land in terms of the floodplain management issue.

It doesn't have to be precise, but, you know, there's a cost to either one, right? We heard a lot about the cost of water to communities and endeavors, but there's also cost to bringing the land down to the water.

Could you provide maybe a little perspective on what what's the relevant cost in terms of floodplain work in terms of getting more water to create that habitat?

MR. KNELL: That project that you came and looked at I think just ended up being just shy of a half million dollars of investment for about two and a half acres. There's other sites. In fact, we're working to have a Honolulu Bar 2 which is in addition to that with some grant funding that's been made available. Our board approved, I know Jeff's board approved at the last meeting to venture in again on these. We believe these are good projects.

You might asked Doug Demko later in the afternoon what the potential is in the Stanislaus Basin for doing these kinds of projects. Obviously there's low hanging fruit. They're very costly projects. I'd be remiss -- all I know is one project and the expense of that project, but there's lots of opportunities in our basin and we think they have value.

There again, we can produce the fish, I think. It's getting them out on the ocean is the challenge. We can get them out to our river and then, you know, frankly, we turn that back over to you to figure out how you're going to get them from our rivers through the Delta and out because there's a lot of problems that they're having.

BOARD MEMBER MOORE: It does provoke thought as far as what are the potentials in the other basins. You have a lot of experience in Stanislaus. That's part of our overall dialogue. Maybe Doug can have insight into that, too, in terms of the potential for Merced Tuolumne.

MR. KNELL: The project originally was going acres, but elderberry bushes and other things popped up in the river bottom that kept slugging the project smaller and smaller and smaller till we got down to the small project size that we have, but there's a lot of value in those projects.

CHAIRMAN HOPPIN: Thank you very much. Mr. Jackson, I know you're getting antsy and pensive back there. We reconciled our scheduling here and intend to keep everybody on their allocated time -- are you listening, Michael? You should be done between 4:30 and 4:45.

MR. JACKSON: We've been limited to 15 minutes?

CHAIRMAN HOPPIN: No, you've got more than 15 minutes. You've got 20 or a half hour. You have 30 minutes' allocation. So if you want 20, we'll give it to you.

MR. O'LAUGHLIN: Tim O'Laughlin again. I have with me Doug Demko, fishery biologist, and Dan Steiner, hydrology modeling. We're going to do the fishery side first. We're going to try to meet our deadline of 1:30. So I think we'll do the fishery first. Dan will hit the hydrology, and if we need to go to economics, we'll do it; but if we don't have time, we'll just submit those as further written comments for you to keep with the schedule at 1:30. Is that agreeable?

CHAIRMAN HOPPIN: Yes. Thank you.

MR. DEMKO: Good afternoon. Thank you. It's good to be here again. I appreciate the time and the opportunity to speak with you.

I'm Doug Demko. As you know, I've been working with the trib authority and many of the basin stakeholders for a number of years, and I'm going to discuss the SED and proposed flow alternatives relative to basin resources. I'm going to go try and go through as quickly as possible to give Dan a little bit of time here.

So you know the purpose and flow objectives provide reasonable protection to fish and wildlife. What I was going to focus in on is the measurable benefits of the proposed 35 percent unimpaired flows specifically as they relate to salmon in the San Joaquin Basin. And I figured I'd go through based on the functions that first appeared in the 2010 report you carried through. These are good parameters, and I think they're all important to fish.

Floodplain habitat, first and foremost, perhaps the most important, it's critical for rearing and food production for juvenile salmon. It's well recognized that physical changes over the last hundred years to shallow water habitat from our dams down to the Bay have really influenced our fisheries' productivity and fish in general.

This issue has been well studied and the SED correctly identified that the; referred flow alternative, 35 percent, will not make more floodplain habitat. So for 35 percent flow alternative, there is no real measurable benefits to the floodplain habitat or for salmon.

MR. O'LAUGHLIN: I just need to jump in for just a second when Doug goes ahead. Basically we went through our SED and we have citations for every one of those sites that you see up there. So we have notes down below and we'll supply them to you later so that you know that what we're citing to is in fact true and correct from our own document.

MR. DEMKO: And this table is actually from the SED, and it know the level of flow needed to create floodplain habitat, which I think demonstrates the need to focus on restoration, as Mr. Campbell was just discussing, to make floodplain rather than flow because the amount of flow required is substantial.

And as Steve just mentioned, OID and US Fish & Wildlife Services just recently completed a project Honolulu Bar. They spent a lot of money on that and not only created spawning habitat for fish, but floodplain habitat. It's important to keep in mind creating floodplain habitat alone isn't going to solve any problem because floodplain supports spawning habitat. You'll need floodplain habitat to have more habitat for spawners.

The result was new spawning habitat and rearing habitat that will be inundated and useful to fish in most water years rather than just the extreme flow years, and this is kind of what's important. When we pick these restoration sites, we can engineer the restoration sites down to contemporary flow levels that are useful in most years.

So geomorphology, again the SED correctly stated or concluded that the 35 percent alternative will not result in embedded mobilization in any of the tribs. This is important for maintaining the quality of our spawning habitat. So the result is there is no measurable benefits to salmon spawning from the preferred 35 percent flow alternative. It's not enough to get the geomorphic flows that we need.

And this table is also from your document that shows that the high geomorphic flows for all the tribs really highlight the need for restoration alternatives, such as constant groundwater replenishment and physical cleansing. Obviously significant amounts of gravel have been removed from the rivers and tributaries over the years, and the dams block new improvements of new gravel. So there is a need for constant gravel addition, and it's a viable form of channel maintenance and certainly more so than waiting for the occasional really high geomorphic flows of either 10,000 cfs that aren't going to be occurring that often anymore.

So the next function is nutrients in flow. SED didn't really identify food resources as a problem, and it also stated that it's unlikely that food productivity would be increased even with higher flows of 40 percent, and I agree that. And I also think from the sampling that the agencies and the water agencies have done on the tributaries over last years, over last 20 years on the Stanislaus, there is really no evidence that food is a limiting factor. We don't really think that's allthat important.

So, again, there is no measurable benefit to ood production or to salmon from the 35 percent flow alternatives.

Velocity and stage in the San Joaquin River was another one of the functions. The SED didn't have an analysis on the effects of flow on velocity or stage in the San Joaquin. As a result, we don't really know the extent of velocity and stage are increased at that 35 percent alternative. However, in 2001, Baker and Morhardt, two well-recognized scientists, analyzed years of CWT data for the San Joaquin, and they concluded that higher flows actually didn't decrease travel times. And that's the expectation is when you have higher flows, higher velocities, you're going to make fish move out quicker; but the evidence, we have at least in this one report, is contrary to that.

So, again, we're unsure of the measurable benefits of velocity and stage from the 35 percent flow alternative, and there's really probably no benefit for this one for fish.

The Delta, same thing, velocity and stage in the Delta. The SED didn't have any analysis on the impacts of impacts of flow on velocity and flow to the Delta, but in 2008 Paulsen determined that San Joaquin River flows have little influence on velocities or stage in the South Delta downstream of the Head of Old River Barrier, and this makes total sense when you talk about the volume of water in the Delta. It's really dominated by tidal inflow. The San Joaquin River is really a drop in the bucket. So, again, 35 percent alternative has no measurable benefit to velocity or stage, as determined by Paulsen from the Head of Old River Barrier and therefore no likely benefit to fish.

Contaminants. The SED infers higher flows may dilute suspended contaminants but also notes that the issue is not well understood and that higher flows can lead to increases in contaminants, and this is something discussed by McBain and Trush and others as well.

I can say from the literature and from the research that has been going on in the basin it really doesn't appear that contaminants appear to be a major problem for fall run Chinook survival at this point. This is one of those factors that's really difficult to assess.

There is also uncertainty whether high flows will increase or decrease suspended contaminants. So it could actually make the problem worse. We don't know at this point. So, again, the 35 percent alternative has no measurable benefit to contaminants and really is potentially detrimental at this point in time.

Dissolved oxygen. The SED did not identify the baseline oxygen concentrations that are harmful to juveniles, and this kind of made it difficult for us to assess this section. Or that they would benefit from increases in dissolved oxygen, and a lot of this report was more qualitative than quantitative and that was one of the challenges. So dissolved oxygen, from our experience, in the basin just don't appear to be a problem between February and June. We don't think it's a limiting factor.

So, again, the 35 percent alternative provides, I would say, no measurable benefit to dissolved oxygen for salmon, or at least the information which was acquired -- reported in the SED don't allow for adequate assessment.

To save time -- this is the long and complicated one, diseases. There is just a lot of significant unknowns about how diseases and their causative agents influence salmon health and survival in the basin. Some diseases, such as BKD, are actually more prevalent in cold water. Sometimes you can have a causative agent present, bacteria present in fish but they're not actually expressing signs of the disease, and it's really unknown how diseases can be mediated by changes in the environment such as hatchery practices, flow, temp. Obviously this is a section that needs more research in the future, but without a clearer understanding of the impacts, we really can't say the 35 percent alternative is going to have any major measurable benefits for disease or for salmon.

Turbidity. The SED concluded that the proposed flow objectives will not create turbidity. As you know, turbidity can be beneficial to juvenile salmon at times by decreasing predation, but we agree there is no major benefit from the 35 percent flow alternatives for increasing turbidity or benefiting salmon.

Water temperature. This one was another challenge to evaluate, and it is always is because it's a complicated issue. There's lot of criteria. In the SED and other reports people change criteria and they talk about the EPA or Fish & Wildlife or optimal, suboptimal, but it is difficult. The main challenge we have here, the question that should be asked is will proposed flow changes reduce temp and to what extent, and that question wasn't asked or answered. And obviously the next one will be what's the biological significance of the potential changes in water temperature. So is it going to change, and if it is, what would be the expected benefit on the fish. So without that we have to say the 35 percent alternative provides no evidence of measurable benefits for salmon through temperature reduction.

Predation. You know this is my favorite issue and, unfortunately, I got to get into this one a little bit. The SED indicated that there may be some benefits to you increase flows, you decrease temperatures, which is questionable because Central Valley water temperatures are driven really by air temperature much of the year, but you decrease temperature, you increase flow, you're moving the predators out, therefore, reducing predation.

But the question here was will proposed flow changes reduce predation and, if so, to what extent. And, again, that was not addressed at all in the SED. But my main problem with the predation issue was the magnitude of predation is really still not acknowledged. We've come a long ways in the last ten years and the trib authority has been really pounding the term last five or six. I think a lot of people recognize it. Fish and Game has stated this in writing. NMFPS has even said this is potential barrier to recovery or a hindrance to recovery.

So I want to talk about a study we did last year in 2012 in the Tuolumne River, and this has just been submitted to FERC. It hasn't been reviewed and accepted, and I'm sure the agencies will have some comments on it as well. So I'm presenting this, you know, as preliminary work that may be revised based on others' comments, but I think the timing is right. I'm confident enough in the results to share this with you.

So this was 2012. What we did was we looked at predator populations for FERC in the Tuolumne River, and the three main predators are the small mouth, large mouth and striped bass. And notice that small mouth and striped bass are river-wide, and this is one of things when you talk about temperature. Small mouth bass are pretty temperature tolerant. They can tolerate cold water. So thinking small changes in temperature is going to reduce predation I think is just incorrect.

And even striped bass in the Stanislaus River, we see them upstream as far as Knights Ferry and they live in the river year-round, and I think we'd see them all the way to the dam if it weren't for the canyon that I don't think they want to pass through. So the worst predators here, the most abundant, small mouth bass is river-wide, striped bass are, too.

One thing to note on the population for striped bass, I think it's an underestimate. They're the most difficult of the three to sample with electrofishing. So we are going to repeat the study and actually put more effort into it next year and address any issues that the agencies have or FERC may have. But the key here is when you look at the percent of the impact.

Small mouth bass, of the estimated 77,000 Chinook that we estimate are consumed, small mouth bass, surprising to me, consume the most, 44 percent, striped bass 25 and large mouth 31.

So 77,000. Some people may look at that, oh, yeah, we got hundreds of thousands of smolt, hundreds of thousands of juveniles moving out of these tributaries. 77,000 isn't really a shocking number, but the problem with that is what that works out to is total predation mortality in 2012 was potentially 96 percent. That's that 77,000 represents 96 percent of the total juvenile out migration in 2012.

Only 3,000 Chinook estimated to survive that 25 miles between the two rotary through tracts where these estimates are made. So 3,000 fish, when you think about production of fish in the Tuolumne River in 2012, you could fit 3,000 fish into a bucket, into a five-gallon bucket. It's kind of startling to think that 3,000 fish would be all the millions of dollars that we spend on managing the water and habitat restoration and gravel, and what are we getting out of the Tuolumne River, a bucketful of fish.

And actually that trap is five miles upstream from the mouth confluence with the San Joaquin. So 3,000 fish still have to go another five miles. So by the time you get to the confluence of the San Joaquin, you probably don't have too many fish left. Then they've got to go through the Lower San Joaquin. They VAMP studies in the last couple years have shed enormous light on the amount of predation there. The scour hole in front of Head of Old River, lots of predation there. Fish make the mistake and go left and go down Old River, they've got to go by the facility.

So how many fish from Tuolumne River in 2012 made it to the ocean? I think a good guess would be zero or close to zero. I can't really imagine it's that big of a deal. So when we prioritize actions and we talk about temperature and turbidity and contaminants and disease, we have zero survival out of the Tuolumne. I don't know zero for sure, but, you know, I'm looking at this going this is just not a good situation. Predation is much larger impact than people, I think, still recognize, and when you look at the trapping data from 2007 and '11, five years of data, which represents all flow year types, a wet year and I don't know about the current year, but it represented a wet year in there. The estimated mortality between those traps in all five of those years was 76 to 98 percent. So it's not like 2012 was an anomaly. We have a serious, serious predation problem in these tributaries and the Delta as well.

CHAIRMAN HOPPIN: To that point then, are you saying that all of the adults that are up migrating are strays from someplace else?

MR. O'LAUGHLIN: Yeah, pretty much so.

CHAIRMAN HOPPIN: The biologist.

MR. DEMKO: No, no, really he is. Trust me.

MR. O'LAUGHLIN: He can answer. Go ahead.

MR. DEMKO: Yeah, that's the thing about these weirs and that's the big thing that we've learned, what's coming back to the San Joaquin. This all goes back to the crummy management that we do in the ocean. We've been overharvesting these stocks for decades which results in us putting 30 to 40 million fish, hatchery fish, into system for the sole purpose of supplying the commercial fisheries, and because mortality is so crummy from predation, we release them in the Bay or in the Delta, which means they don't imprint properly, which means they come back to the San Joaquin Basin.

Last year or two years ago, the Stanislaus River 80 percent of the fish were adipose fin clipped, a really high percent. I think it was about 80 percent.

And when you expand that out, that means pretty much everything coming back to the Stanislaus is potentially a hatchery fish.

Tuolumne the last couple years had real high returns of adipose fin clipped as well. We also saw a lot of two-year-old fish, a lot of male fish. So the the smaller in size and the males don't -- it's just -- yeah, it's a problem.

MR. O'LAUGHLIN: We don't have a hatchery on the Stanislaus or the Tuolumne.

MR. DEMKO: And Merced doesn't put that many hatchery fish out. In fact, most of them are coming from the American.

CHAIRMAN HOPPIN: That was going to be my next question.

BOARD MEMBER SPIVEY-WEBER: How did we get there? If this many predator fish are in the system, they haven't been in the system the entire time, you know.

MR. DEMKO: Actually, I think -- I haven't looked at this graph. 71 or 82 or 81 -- we always think of nonnative being planted by fishermen or, you know. We planted these things historically intentionally. 77 or 81 percent, I believe -- don't quote me on that -- but a large percent of the fish were planted by our early Fish and Game and the feds. We planted predator fish because they were sport and they were food at that time, and then we planted bait fish because we thought that, you know, the predator fish needed something to eat. So we planted the bait fish.

I think at this point in time the bait fish are competing with our wild fish, outcompeting our wild fish for space, food, and habitat, and predator fish are actually eating -- you know, we planted -- the big predators that we planted were the ones that are the best predators. Even in the '80's where we already had large mouth bass in our system but we started planting Florida strain large mouth bass because they grew faster and bigger. So what do we have now, we've got the world class large mouth bass fishery in the Delta with world record size fish.

BOARD MEMBER SPIVEY-WEBER: So you're confident as a biologist that flow has no relationship to the management that has created this predator problem. It's absolutely not flow.

MR. DEMKO: You know, it's a matter of -- when I look at zero fish making it to the ocean from the Tuolumne River and you ask me how to solve that problem, what's the cheapest, most effective, quickest way of going about it, we know that predator eradication programs work. We got that from the Columbia. These are nonnative predators.

I wouldn't totally dismiss flow, but the other factor that goes into flow is habitat change. We've reduced -- we've eliminated -- I've been lucky enough to work a lot in Southeast Asia. And shallow water habitat, floodplain habitat is everything for productivity. It's everything for productivity. When you look at the Delta, there is no shallow water habitat left. So when the flow goes up and the flow goes down, it's like adding a foot of water to a swimming pool or decreasing. You're not making any habitat. You're just changing the elevation, whereas when you don't have levies and you've got floodplains, you change the flow of the water and the elevation of the water and it spreads out and makes channel water habitat, that's what native fish like, that what creates food, that what makes productivity.

So I don't want to say flow doesn't have any purpose or isn't significant, but if we had shallow water habitat at the flows we have now, I think we'd have a much more productive system and then you could also do something physically and cost effectively about the predator populations.

CHAIRMAN HOPPIN: Thank you. I know I ate in your time on little bit.

MR. O'LAUGHLIN: We're going to go to Mr. Steiner now.

MR. DEMKO: How come I never get to finish? And I got these notes up here. I wanted to summarize them.

BOARD MEMBER SPIVEY-WEBER: We do read.

MR. O'LAUGHLIN: Yes, they do.

MR. DEMKO: This is a really good one, too. This goes into our model and then this one -- this is -- are you --

MR. O'LAUGHLIN: You're done.

MR. STEINER: Thank you.

CHAIRMAN HOPPIN: It's my fault.

MR. O'LAUGHLIN: Dan, are you ready? Can we go until 1:35?

MR. STEINER: SJTA Steiner.

A little background. Again, my name is Dan Steiner. I'm a consultant for the Tributary Authority and most of its members and other entities within the San Joaquin Valley. A little way of background, I'm usually responsible for operational analysis, hydrologic analysis, however you want to label it, and that includes the entire San Joaquin Valley Basin. I have been personally responsible for the hydrology and operations analysis for several, if not many, either project development studies or for EIR/EIS's including ones that supported your decision before like the San Joaquin River Agreement.

Cut to the chase where I'm heading so there will be no doubt, my professional experience and background tells me that essentially the hydrologic analysis that at presented in the SED and supporting all the trickle down analysis for economics, for fishery, verything you saw yesterday with the dots, each one of those studies are major flawed and they do not inform you correctly on the impacts of the proposed preferred alternative at this point. There will be no doubt that's where I'm going.

Now, the rest of this analysis or display essentially illustrate to you the points that I pick out why I think the studies stink.

The environmental document as far as what the support of the hydrologic analysis has major model flaws. Let me categorize. Remember you've got essentially three general categories of studies out. One of them is baseline, which is crucial. It is establishing the CEQA basis of analysis. Mathematically we compare all the follow-on studies to that baseline numeric expression. Flows in the river , storage in the reservoirs, the impacts to the canals, all of them are established per baseline for CEQA purposes under the baseline scenario. I'm going to show you the flaws in that particular analysis.

We move on to the no project analysis because that's also a CEQA requirement, what would things look like continuation without action by the board. I'm going the illustrate to you under the WSC model that's been created by staff it is flawed also in its basic assumptions, inconsistencies with the baseline. Then we move on to the WSC model's estimation of all the, I call them, X percent analysis. That's the preferred alternatives, 35 percent, limited flow. It has a range of analysis in the SED ranging from 20 percent up to 60 percent. That model itself is flawed.

The issues become, as far as from my perspective when I look at doing EIR analysis or EIS analysis, I want to make sure that I can try to explain the proposed alternative, the proposed project through modeling in terms of what it means in terms of rivers and the projects themselves.

The structure of the proposed or preferred alternative, the proposed order and its implementation are very big, and you have to then look at how the modeling is done to try to figure out exactly what do you mean, what are the boundaries in terms of trying to explain what the preferred alternative, the order and amount of implementation will mean in terms of on-the-ground hydrology.

Since the order is very, very vague, you have to go to the modeling to figure out what was involved. Well, still that's just a set of assumptions.

Move on to such things to we're talking about the -day average. You heard about yesterday, well, some of it will not essentially provide the functionality required by the three-day average or some other thing. There is an issue of how we would actually operate the projects and put them in our model. When you're talking about a 14-day moving average or whatever, how are we supposed to forecast unimpaired flow? Are we supposed to have mad days within the lag by several days? You can't get that in a model without knowing what the answer is you want in a regulation.

The X percent requirements are real troublesome to me in the matter of CEQA formulation of the alternatives. All of the X percent alternatives essentially replace existing requirements during February to June. You heard it mentioned a little about the Stanislaus and the RPA. The actual alternatives that are presented replace the RPA on the Stanislaus with the X percent requirement. It doesn't even make sense to me in the formulation of alternatives. Your action is a proposed flow standard which, as far as I'm concerned, you'll be placing it on top of existing requirements. I don't see how an order replacing the existing requirements on the tributaries -- that would be the RPA on the Stanislaus, that would be the FERC orders and Davis orders on the Tuolumne and Merced River -- you're not getting a true measure or indication of what your order will do by itself, rather, that it's implying that you're going to replace another order or another requirement. That doesn't make sense to me in formulation of an alternative.

The downstream location, this is a little physical issue, and that is that the X percent alternative is being placed at a downstream location on the river because it physically is being modeled at Ripon, at Stevenson, at Modesto, which isn't the mouth, which is being portrayed as in this document at this point. These are downstream locations and these rivers are generally gaining.

If the point was to try and protect the entire river, I don't think you're going to put a requirement at a downstream location where it can be fed by accretions of other streams, groundwater accretions, being affected by depletions in the river, traditionally what's existing on the river below the control point such as Shaffer Bridge on the Merced, La Grange on the Tuolumne, Goodwin on the Stanislaus River.

In practical matters, mathematically what falls out of the model when you put the requirement down at Modesto on the Tuolumne River, that river gains enough water that at some times in some periods you could have negative flow at Goodwin because there is enough side flow coming into these river to satisfy the entire requirement downstream.

That doesn't make sense to me at all. I mean, this is a little mathematical problem. You know, if you're trying to say this modeling depicts a fair representation of the river system, it is not.

The model itself puts minimums and maximums you heard about yesterday. They capped as far as the minimum flows in the rivers or the maximum river inflow, try to avoid flood damage or not have zero flows. It's a detail in the model. You've heard about the -- I call it the ambiguity of what's really going on in the salinity objective. It isn't modeled in the X percent alternative ultimately. You've raised the standard up to 1.0 in interior stations. You're still saying implemented at .7, .10 against the Bureau at Melones or

Vernalis. That is not all captured in the modeling at this point.

Major problems with the WSE model comes in play with what they've done to depict canal diversions in reaction to alternative flow requirements in the rivers. I think we've said it before. I know I've done it and I know that we've written comments on it before. What's of major importance in these models is to depict the diversions by the districts correctly, and this is not being done with the WSE model.

They've -- essentially a rule. We call them rule curves. You know, if you've got so much water, how much will you put down the canal, manage the rest for reservoirs and for the rivers. It's a very simplistic rule that essentially looked at the end of January storage to determine how much water will go down the canals the ensuing year.

That rule doesn't apply. I've never modeled a rule like that because it is so undepictful of what the water supplies in the year, and it leads to all types of wigs and wags in the model that just are not a true 22symbol of what's going out there, representation of what's going on there. It needed to be including the runoff to come in the ensuing year because a project operator is going to look how much I have in storage, how much to come and then I'll decide how much I can dole out to my customers. This model is not that. It's relying on one spot in time in January, at the end of January, and saying it knows that's as good as it's going to get.

The result of this is you get anomalies in the modeling that's just unreasonable, unexplainable, such as a year like 1978 that's following 1977. Well, golly gee. The carry-over storage at the end of 1977 is the lowest it will ever be type a thing. It says don't give -- give out the minimum amount of water in 1978 even though the projects will refill and spill during 1978. That decision in the model totally misrepresents what the water down the canals will be in 1978, what it will be in other following recovery years. That leads to poor illustration of what happens in the reservoir which then affects what happens in the river.

Going through these quickly, there are baseline errors. Mary didn't want to discuss too much about the baseline errors. I take issue with the baseline. Yes, I know that CEQA, NOP requirements, but there's even a 22mixture of that if it was February of 2009. The RPA was not available at that time. However, 1641 and VAMP was. However, this is more, I believe, just a convenience of having a DWR study available that happened to be generated about December of 2009. That had most of the elements of 2009 in it, but still it's not, you know, pure CEQA, this isn't it. And even at that, what was in the DWR study is flawed, as far as I'm concerned, what was the real operations out there.

Considering DWR ran this study, it was not a Bureau of Reclamation study, they needed something to get out the reliability study. They're not that normally interested in the San Joaquin operations. They did try to incorporate some of the RPA's in there because it did affect pumping in their study, but they're not concerned about the San Joaquin River.

The result -- let's go to the graphics real quickly to look to see what this kind of means in the punch line. This happens to be a depiction of the SED baseline taken straight out of the DWR study which has been accepted by your staff as depicting the baseline condition. Here is the alternative. Since I run these studies myself through my own models, comparable to a CALSim run -- it's not using CALSim itself -- but this is the major difference. These are the identified differences of the studies in result.

This is a good example. The Stanislaus River for the period, these are annual flows. Generally you're going to see that the average is around 360,000.

You really need to look at year by year because it's very important, and what we're seeing is that the DWR study that has been accepted, the baseline run is significantly larger than what I depict in terms of a better representation of the baseline flow from the Stanislaus River.

And, again, I'm using the Stanislaus because it's the best poster child. This problem exists for the Tuolumne and for the Merced also in terms of what has been done in the baseline.

Significant differences. We're talking about 92 and 91. You know, we're talking about this is an 80-percent error if you want to call it. I don't like using the word error. But we're talking about the difference of 50 to 60 thousand acre-foot that might be in the river compared to what's depicted as 300,000 acre-feet in the river.

BOARD MEMBER MARCUS: Can I interrupt? Do you have a suggestion of a better model?

MR. STEINER: Yes, I would have adapted CALSim to do this analysis. I know it was said that there wasn't enough time. This is, what, 2010 we started this process.

MR. O'LAUGHLIN: Actually, we did meet in April and May of last year with your staff, provided them with this analysis and showed them that, you know, there were fundamental problems with some of the assumptions in the baseline and in the no action alternative. That didn't make it into the SED, though.

MR. STEINER: There's a basic fundamental problem I have as a modeler, and that's again the baseline was established by a CALSim run and then all the other alternatives, including no project, was done by the WSE model. I don't normally mix comparisons of results, absolute results between two models, because they just function differently. I don't think it's a fair comparison or very accurate one at all unless you have actually made your subsequent model very exact to the original model you're looking to, which is CALSim, the baseline. That did not happen here.

Again, the WSE, the major problem I have, it is water supply rule because it just skews the answer to everything in the entire model. If it's not reasonably depicting the canal operations, you can't get the reservoir right, you can't get the river right. So it's not giving you informed answers what the alternative would actually do.

Here's an example of using the WSE model. I'm comparing the SED no project which was run with a version of the WSE model against again what I would consider my using the alternative models to me up with a depiction that I feel is more reasonable, and a lot of this is due to the water supply rule. That single element alone skews the answer of what's carryover storage and what's in the river.

MR. O'LAUGHLIN: So when we met with your staff last year in regards to this issue in regards to the modeling, the way that the SED has been set up and the WSE model is run is it tries every year to get the end-of-month storage in September at roughly what had to occur in a baseline situation. So the model is always trying to maintain a surface elevation in the reservoirs.

What we pointed out is, well, wait a second, unless you're going to totally divest us of our ability to use our storage in our reservoirs, in certain years when you're showing cutbacks, we're not really going to cut back. We're going to go to the reservoir and take an extra 50, 100, 150,000 acre-feet. Well, the problem is when you have larger reservoirs and runoff systems like Tuolumne, you might be able to get away with it. The problem with New Melones, as the graph shows so well, is the reservoir will crash and burn on a normal basis.

So the question is then how do you model a run where you're trying to show a reality of diversions and what the reservoir will do because I think we can all agree that if you increase flows by 35 percent of unimpaired flow down the river, your reservoir isn't going to maintain a static level time in and time out.

I mean, it's a simple message. It affects itself in the model and it's a major point because if you don't hold storage at the same level then, then you have to go look at hydro impacts. Our analysis is they increase much more. You have to look at cold water temperature pools. I know your staff says, you know, they put it in the WSE model to maintain cold water temperature pools.

Great. You never notice cold water temperature pools. It's not part of your ongoing basin plan objective. So if you want it part of your objective, you should renotice, state that's a stated goal of what you're trying to do and model to try to reach that stated goal rather than just saying we're modeling to do this but you don't have an objective.

It's an important point, but I think it's a fundamental point to address in regards to how we move forward to get an accurate or realistic idea how we can operate the system and how it would look.

MR. STEINER: Just one more -- it was just again my job is modeling. I hope I know the answer before I run the model because I'm expecting a result. If not, I need to check out my model.

This particular example is just, okay, it's my modeling versus DWR's modeling. I should say staff's modeling of no project. If you were to put the baseline in here which staff has relied upon from DWR, even that storage analysis, this red line they say is a now magical green line that shows the baseline, it's lower than the red line.

It just doesn't make sense to me that a no project alternative which has been framed by the staff as being full compliance -- that means we had baseline, we're moving up to no project, which is, you know, not a continuation or there is no order, you know, the project is an order.

However, it is essentially saying that when you put more requirements on the system, like 1461 and all the gizmos that went with full compliance, you know, interior station compliance, extra water out of New Melones, how can the no project which has all that full compliance in it have better storage than the baseline when we essentially break all the rules and don't make all those requirements? It just doesn't make sense from modeling, from an operational sense.

Another example, you saw storage being higher in the no project. They've got flow in the Stanislaus River being higher than my type of modeling. I mean, we're talking significant differences. And this is essentially going with the full compliance framework of the nonproject or the no project, which included meeting Interior standards for dilution flows from New Melones, and we're talking 87 through 92 here peaking at half a million acre-feet in the river and storage going crashing. There is no question. That's how they tune the model.

But, you know, in the no project -- let me take you to the next step -- how they did that was they attached not only the Bureau's water to meeting that downstream flow compliance, they started attacking the senior water rights of OID and South San Joaquin to make that water because where does the extra storage come from, where does storage flow? It had to come from the diverters. I challenge you to not know where -- you know, where is the OID's and South San Joaquin's responsibility to meet the RPA flows and Interior salinity requirements? They made this water in the study.

MR. O'LAUGHLIN: So this is a point that's near and dear to me. So you're doing a no project alternative. So the no project alternative assumes what currently exists out there as we know. So there is no doubt that the Bureau has limitations on its permits. Under D 1641, it has to meet certain requirements. There is no doubt that the Bureau has no cap biological opinions and RPAs that they have to meet.

But what was done wrong in this analysis is when they put to do the reasonable and prudent alternative, I mean, the no project alternative, in order to make it work, they took roughly four to five hundred thousand acre-feet from the senior water right holders when in fact the senior water right holders would make no water available for either D 1641 or the no cap biological opinion.

And just so you know, we already have a ruling by Judge Wanger that OID and SSJID are specifically not responsible for the no cap deals. So when you've done your no project alternative, how is it that you in the state of the world have taken water from senior water right holders when in fact there is no such requirement?

MR. STEINER: Just to make sure I got to it before I run out of time, here's the answer again. My conclusion, again this is from a CEQA modeling basis which I've been responsible for in the past. These studies just don't cut it. And, you know, essentially when I watch people yesterday march up with results out of the SED showing your dots or Mary showing you dots, of course, she dispels the use of those dots. You know, those dots don't mean anything to me or they should not be relied upon because they're framed off of these studies which I'm challenging as being incorrect and not informative of the impacts of the occur under the 35 percent or any of the X percent alternatives.

MR. OLAFSON: Thank you.

CHAIRMAN HOPPIN: Thank you, gentlemen.

MR. OLAFSON: Thank you for the extra five minutes. I appreciate it.

BOARD MEMBER SPIVEY-WEBER: I only have two blue cards. Are there any blue cards from the public? If anyone from the public wants to fill out a blue card, now is the time. I do have a third blue card, but they want to come toward the end after South Delta.

Rhonda Lucas. And this is three minutes.

MS. LUCAS: Thank you. My name is Rhonda Lucas. I'm an attorney and I'm here today representing a host of ag and urban water uses in the MID and TID as well as Duarte families and the Duarte nursery.

We will be submitting detailed comments on this issue prior to your deadline, but the comment I'd like to make today is we've heard a lot about the very laudable goal of doubling the salmon population, and it is a very important goal. We need the salmon. We need a healthy ecosystem. But we also need to balance that, as your objectives require, against the realities that we're facing and water is a very scarce resource.

We have studies that demonstrate irrefutably, frankly, that flow will not necessarily get you where you need to go and that you need to deal with the degradation. At a minimum. And we are very baffled as to why you would run the risk of putting thousands of acres of land out of production, completely potentially destroying entire economic communities, including those that are made up of minorities and impoverished peoples for something that Fish & Wildlife can't even assure you will get your stated objective.

I'd like to point out that based on California Department of Fish and Game surveys and, for example, 1983, their estimate of Tuolumne River salmon run was -- and this is in the thousands -- 14.8. In 1985, it was 40.3. Fast forward to 1999, we're at 8.2. 2000 we're at 17.9. Fast forward again to where we had new regulatory requirements that increased our flows on these rivers to 2008, 2009, 2010, we're at .4, .3, and.8. The data doesn't support the thesis, and if this were a true scientific process, we'd take a look at these data and we'd reevaluate our hypothesis and we'd find a better way to reach our goal.

That's what we're asking you to do. We don't see any scientific basis to support the 35 percent preferred alternative, especially when taking into consideration your dual objectives, your CEQA requirements, and the impacts that this will have on the environment.

The other comment that I would like to make quickly, ag land in the State of California supports as much as -- represents as much as 80 percent of the designated critical habitat for federally listed species. Private ag land. When these thousands of acres of ag land are fallowed, it will absolutely have a devastating impact on federally listed species.

I will give you one example. Swainson's hawk. It is imperative to have nesting sites, which just happen to be our orchards, in close proximity to foraging grounds which happen to be sedan grass, corn and alfalfa. These species are being protected for and provided for by agriculture free of charge, and their very survival depends on it, and yet you're going to potentially put them at risk for no demonstrated benefit to salmon species.

It's very difficult to play God. I do not envy you the task that you have, but I beg you to take into consideration not just the economic realities, but also the environmental realities because fallowing this ag land will have a devastating impact economically and environmentally, and if you doubt that, I encourage you to just go back in your memory about ten years ago to what occurred on the west side as a result of biological opinions that Judge Wanger has subsequently thrown out and are now being redone.

Economies were devastated. You had a dustbowl. Minority communities with destroyed and there were severe environmental impacts, air quality as well as species impacts. Thank you.

BOARD MEMBER SPIVEY-WEBER: Thank you. Jennifer Carlson. And after Jennifer it will be the California Department of Water Resources.

MS. CARLSON: Good afternoon, Board Members. Thank you very much for this opportunity to comment. I know I was called a couple of times and I had to slip out. So I appreciate you having me back.

BOARD MEMBER SPIVEY-WEBER: Thank you for coming two days in a row.

MS. CARLSON: It's worth it. Again, my name is Jennifer Carlson. I'm the executive director for the Manufacturers Council of the Central Valley.

Just in case you're not familiar with us and as a way of quick organizational background, the Manufacturers Council is headquartered in Modesto, and we represent a variety of manufacturing interests located in California's San Joaquin Valley. The majority of our members are involved in food processing elated activities both year round and on a seasonal basis. Those members not involved in food processing manufacture containers and various other kind of vital parts and components distributed, locally, statewide, nationally, internationally, and several of our members also conduct business in energy production, warehousing and distribution.

The Manufacturers Council represents companies which directly employ thousands of San Joaquin Valley residents. And based on a regional impact multiplier, the number of valley residents indirectly employed as a result of our industries increase threefold. So for every one job in the food sector, there are an additional three jobs in the service and supply sectors.

One of our best kept secrets in this valley is that we are home to one of the largest, most efficient, most sophisticated manufacturing regions in the entire nation. According to a recent census of manufacturing, California's leading manufacturing sector is the food and beverage manufacturing industries. The value of shipments according to the data was in the range of 83 billion. And that's just to give you an example of the significance of these industries.

The majority of this food and beverage processing occurs in the San Joaquin Valley and a large segment in the areas serviced by the Merced, Stanislaus and Tuolumne Rivers. The other is a microcosm of the San Joaquin Valley food and technology cluster. It is the primary private sector industry and it has national and international impacts. It is also inextricably linked to agricultural production.

As you may know, many major food and beverage companies are located in the valley. Del Monte Foods, E & J Gallo Winery, Frito-Lay, Foster Farms, Bronco Winery, The Wine Group, several, and there are many others who distribute their products, locally, statewide nationally and again internationally.

Anything that impacts agricultural production impacts these vital industries and the families and the economies in the valley and abroad that are dependent upon them. The proposed changes to the water quality control plan will undoubtedly impact agriculture, will impact the food processing sector, which are the two largest economic drivers in the valley.

As you've heard many times during the hearings, San Joaquin Valley is plagued with high unemployment rates and oppressed by their unique economic circumstances that are incomparable to any other part of the state. As a representative of valley manufacturers and as a valley resident, I am deeply concerned about the economic impacts of the proposed changes and the SED being used to vet it.

Many of our member companies are located in the jurisdictions serviced by the irrigation districts of the San Joaquin Tributaries Authority. These irrigation districts play an enormous role in the economic success of our region, and they have done an excellent job in attracting a variety of manufacturing industries, and this is due in a large part to critical factors: the ability to supply reliable, competitively priced electrical service, and the ability to deliver affordable and adequate supplies of high quality water for agricultural and domestic use.

The proposed changes to the plan jeopardize these points, and that's why I'm here today. And just to take a quick side step, I recently Governor Brown's office commented on President Obama's State of the Union Address and his call for an expansion of manufacturing in the U.S. Governor Brown responded by enlisting his advisor Mike Rossi and convening a manufacturing summit which is actually taking place next week. The summit is the Governor's first step to compete for new manufacturing institutes.

And also to quote Mike Rossi he said, As the number one states for manufacturing jobs and output in the nation California will lead the next generation of advanced manufacturing America. We heard the President, his call, and California will respond.

Back to this proposal. The proposal to reduce water flow in the state's most productive manufacture area would make the Governor's hope to attract and expand manufacturers and build advanced manufacturing institutes extremely challenging.

The draft SED inadequately addresses two very important factors of the potential changes to the plan. These two factors are true economic impact, and also the equity of burden.

It is critical for manufacturing companies, especially those processing seasonal and perishable products, to have a reliable water supply, particularly with the intense competition in today's global marketplace. A change in the water supply can translate into irreparable losses of market share. Additionally, cost is an important consideration. Food processing is water-intensive. Even slight rate increases add up to huge additional expenses, and there are already a number of factors that play in contributing to the higher operational costs of these companies, and state regulatory mandates are just one of them.

Your board has acknowledged that the potential water cuts will be significant, especially to the valley. I mean, the documents you've indicated in your documents, you've heard from all of the commenters, I don't need to reiterate all of those numbers to you, but I would hope that you agree that a more complete and thorough analysis of a proposal such as this with such high impacts would -- a more thorough analysis would be prudent.

We urge you to recognize these impacts are devastating to a devastated area, not only to farmers, but also to industry and anyone and everyone connected to the ag chain.

BOARD MEMBER SPIVEY-WEBER: Thank you.

MS. LUCAS: Just to finish, the Manufacturers Council urges to you seriously weigh the adequacy of this SED.

BOARD MEMBER SPIVEY-WEBER: Thank you very much. Actually another card did come in. Joshua Stark. This is supposed to be three minutes. I'm channeling

Charlie, but try your best.

MR. STARK: Thank you for hearing me at such a short notie. I know that it's been kind of an interesting juggle the last couple of days and I appreciate the opportunity to be able to speak.

I have a chance -- I was asked to speak about 45 minutes ago by a friend of mine, colleague, when it was understood that there will be public comment. So I did my best to rush in.

My name is Joshua Stark. I am a board member of the Salmon Aid Foundation. I am also a salmon fisherman, a conservation environmental advocate for about ten years, an outdoor educator, worked for State Parks for a time, but most importantly, I am a lifelong resident of Isleton, California in the middle of the Delta. I don't know if you often run into people from Isleton. Occasionally it's nice, I think, for you all to hear from us.

The 35 percent flow recommendation actually came a quite a shock considering the board's own studies on what would be required for populations to maintain the threatened populations of salmon and steelhead within the San Joaquin River, and I wanted to note that.

I also wanted to note that if we -- related to the San Joaquin population's restorations are restorations of habitat in general and to recognize that higher flows will be needed to restore Delta habitats over time. And we know we'll be revisiting that every year and for years to come. And to recognize that the Delta is not a dying or a dead place. I hear report after report of folks who live in, you know, very urbanized areas in the Bay Area, in Sacramento and Los Angeles who talk about how dead the Delta is, but I also know as I drive out here, the myriad species that I pass of native species, you know, watching the snow geese and watching the white fronted geese flying home. Watching river otters return. Over my lifetime I've seen those happen. I've also seen tragedies that have occurred because of inappropriate flows. One example would the Jones Tract flooding and the amount of salinity that then rushed in.

So recognizing that the impact of flow regime can almost immediately be felt on the Delta and so returning flows will be felt just as well as flows that are removed.

Last, I wanted to point out that there is a real opportunity for real restoration on the Delta, real restoration of salmon populations. You know, over 90 percent of salmon habitat -- spawning habitat is locked behind dams. So any small amount into appropriate flows, any show by the Board of returning to appropriate flows will be felt with returning salmon. And related to that will be the return of habitat. Thank you.

(Reporter change.)

BOARD MEMBER SPIVY-WEBER: California Department of Water Resources. And you've asked for 20 minutes, so we'll need to set the clock accordingly. Following DWR, we'll have the joint presentation by the Bay Institute, NRDC, American Rivers, and Trout Unlimited.

MS. KELLY: All right. Good afternoon, Board Members. I am here on day two of a long process, and I admire your stamina and your focus. So my name is Kathy Kelly. I am with the Department of Water Resources. I am chief of the Bay-Delta office. And the department will be submitting written comments that address information related to fish behavior and habit, state water project and temporary barrier operations, and other subjects by the March 29th deadline. Today we're going on to focus on South Delta water quality and flows by presenting information on the effects of water project exports and operation of the temporary barriers, and by giving a very illustrative example of local salinity accumulation and discharge into the South Delta channels.

Our presentation includes information that should be incorporated into the Substitute Environmental Document. We expect that this information along with the additional information to be submitted by the Department would change the concussions put forth in the SED regarding DWR's responsibility for South Delta water quality. Our presentation will be given by Mark Holderman who is chief of our South Delta branch. Mark has been implementing the temporary barriers project for 13 years. Also with is us Narzheed Naditrani (phonetic), and he's an expert in the application our delta simulation models and also very familiar with the South Delta hydrodynamics. I want to thank you for this opportunity to present this information, and now I am going to turn it over to Mark.

MR. HOLDERMAN: Good afternoon, Board Members. I am Mark Holderman, chief of the South Delta branch. And as Kathy was saying, I've spent a lot of time putting in rock barriers, so I know them very well. I'll be describing the rock barriers, the agriculture barriers to be specific, how they are designed and how they are operated, what they can and what they cannot do. I'll describe circulation upstairs of barriers, what null zones are, and how exports and barrier can affect them. I'll give a general description about sources of water on Old River, and finally I'll spend some time showing how salinity on Old River changed during the high flows of 2011. And we'll provide some evidence of why salinity at the Old River at Tracy Road Bridge Compliance Station can be affected by salinity in South Delta channels.

Just a general map showing the South Delta , and I wanted to show you where the barriers were located if you didn't already know. We have a barrier, ag barrier, on Middle River here and on Old River down near Jones pumping plant, a barrier on Grant Line on the east side of Grant Line. There's also a head of river barrier we're not really discussion much, but that's for fish purposes not for ag.

We've been installing these barriers since 1987 starting with the Middle River barrier and later on going on the other two ag barriers. We install them generally from April to November. And if we install the Head of Old River, that would be true, if we don't install the Head of Old River in the spring, we don't install the ag barriers until May. And if we don't install the fall Head of Old River barrier, then we remove the barriers in October. So it's just a little narrow window of operation if we get the Head of Old River barrier isn't installed.

These barriers aren't real high-tech. They are a bunch of rocks. We put the rocks in the river. We create a weir to the best as we can at a certain level given that we're using 18-inch rock. And they contain either six to nine culverts. We have nine culverts at the Old River near Tracy barrier and six culverts at the other two. And these are four foot diameter culverts that have flap gates on the upstream side.

I'll talk about water level improvements that the barriers can do. We designed these barriers to help improve water levels for agriculture purposes and also improve circulation better than what the circulation would be absent the barriers. And that's again for the purposes of ag so they have adequate water levels and adequate circulation to help eliminate some stagnant zones that might occur during the irrigation season.

These plots are showing model data for a typical wet and a dry year. And I don't know if you can see this very well, you probably can't see the dates, but -- I don't think I can even see the dates without my glasses. It's July, which is a month that has the greatest -- typically has the greatest agricultural demand in the -- South Delta. But it shows you, if you look at the blue line, that's what the water levels would be if the projects weren't exporting and the barriers were not installed. Now, the red line, which is a little bit lower, shows what the levels would be with exports but no barriers, and that's where it shows that we've got about six to eight inch reduction in the low water levels when exports are operating and there's not barriers. But when we do install barriers with the green line, you can see that those low water levels are dramatically increased on the order of two to two-and-a-half feet. And that's the water level that we want to protect, the low water levels because the farmers don't problems diverting on the high tides the problems are on the low tides. So that's what the barriers do. They mitigate they for the impact on low tides.

And they do that by operating on the ebb and flow. When the tides are flooding, those culverts that I mentions before open up. And they allow that flow to go through the culverts, and also there's some weir flow over the top as well depending on strong the flood tide is. Now, when ebb tide occurs, those flap gates slam shut, and they hold the water levels higher upstream of the barriers because of that, higher than they would ordinarily be.

Sources of water in the South Delta. This is a plot that shows at the top in the blue -- shows the observed EC at the Old River at Tracy Road Bridge station for the years January '98 through January '05. And the plot below that in green is model data. That shows what the source of the water is at that station during those years. And if you look at the left side of that plot, it indicates that that water is 100 percent or most of the time San Joaquin River and ag discharge water. There are some times in those years the percentage drops, and those are times when we have the Head of Old River barrier installed. So we're basically blocking the San Joaquin water from coming down Old River, so then there is more water from Sacramento and east side streams that would be a greater percent of that water at the Old River compliance station.

So what I want on you to take away from this slide is that San Joaquin is the predominant source of the water for that station on Old River. And even on times when theres's a bigger contribution from other sources, potentially fresher sources, that it doesn't always make a difference in EC. If you look above in the blue, it doesn't make a significant change in EC at that station because there's something else going on

The operations of the barriers improve circulation upstream of the barriers by normally creating unidirectional flow up Old River and up Middle River and down Grant Line Canal. This is accomplished by the operations of those flap gates I mentioned that open in the flood tide and close on the ebb tide and keep the water levels higher. We also -- the weir heights are different at the different locations, so those have been designed to create a unidirectional flow by changing that gradient of water surface so water tends to flow down Grant Line from the other two rivers. And by doing that, we're trying to create unidirectional flows which hopefully gets rid of stagnant zones and makes sure the areas above the barriers don't act like a big lake. We don't want that.

We also do it this way so that we can try to eliminate potential null zones. You've heard of those, which we describe as areas, particular reaches of rivers, that have a net flow during the daily tidal cycle of zero. Now, those aren't easily measured out in the field because the water is always moving. It's either ebbing or flowing or briefly it might be at slack tide. And there's always water coming in the from the San Joaquin and ag diversions going on. So it's not easy to notice out in the field, but what we do is model it so we can tell reach by reach where a null zone might be occurring at any given time.

It's important to know these so-called null zones, they occur with without exports and barriers. The barriers, when they operate, they do increase circulation, but they do not guarantee that null zones are all going to disappear. And even with the barriers and the exports, we can change the location of the null zones. At least if we model it, we can see if they move around a little bit, but there's not a significant difference in the number of null zones if you look at reach by reach by reach on all these different rivers. But more important to know about all these null is it doesn't mean you have poor water quality. It all depends on the water quality existing in the river at the time. If it's good quality, a area or a reach in the river that is not moving very much that day, it's going to give you quality water.

Of the four South Delta compliance stations where water quality is monitored, the Old River at Tracy Road Bridge station is the most troublesome. There can salinity spikes at this station that exceed the salinity objectives. And DWR has for many, many years gathered water quality data in the South Delta. We've gathered flowed data, and all of this supports why we believe this is happen, and I'll talk about that in a moment.

Many people think that high salinity in the South Delta, particularly on Old River, is because of poor circulation and the creation of these null zones. We want to show you that there's evidence of a more likely cause of this problem. This slide show salinity at Old River at Tracy Road Bridge during the last high flow event in 2011. In June when we had over 10,000 cfs flowing at Vernalis, there was certainly plenty of water in the river to ensure good circulation and there wasn't any null zones under those conditions in. And yet we get these spike in June at the Old River near Tracy Road Bridge compliance station, significant spike. It's important to note that the salinity at other locations, compliance locations, Middle River and Old River station just upstream, were all in the 200, 250 EC range. And look what we got at Old River at Tracy Road Bridge.

So what caused this problem? We have field data that consistently confirms that water qualified degrades between the stations at Middle River at Old River and the Old River at Tracy Road Bridge station, which are these two stations here in red. In between these stations, we have two cuts, Paradise Cut and Sugar Cut. Both are dead-end sloughs with very poor circulation. We recently installed two more EC monitoring stations here on Paradise Cut near the downstream end and one Sugar Cut. Reading at these two stations are consistently higher than the readings at the Middle River station upstream. And both these sloughs are hydraulically connected to Old River, which means that on the ebb tide, these sloughs have the potential to discharge a substantial amount of high salinity water into Old River which would affect the salinity readings at Old River at Tracy Road Bridge compliance station.

We have some grab sample data that was measured in the field that is depicted here that we gathered in 2012 that confirms the salinity in Paradise Cut and Sugar Cut was consistently higher than Old River. The station that we installed in Paradise Cut is right about here. And the EC at that location was about 900 EC. And grab sample data taken at that time shows that as you go upstream on Paradise Cut, EC gets worse and worse all the way up until the very end of the slough where we see readings of above 2,000 EC.

The following slides that I will show you will hopefully show you that the high salinity water in Paradise Cut is what we believe is causing the salinity spikes Old River at the Tracy Road Bridge compliance station.

First I want to show you what happened in late March and throughout April in the South Delta. This is showing the Vernalis flow. And Vernalis flow was very high, above 10,000 during this time. But we had a particular high flow event that occurred here in late March that it got above 15,000 cfs. And when that happened, the weir at the upper end of Paradise Cut began to spill, and it continued to spill all during this time until flows in the San Joaquin came down enough where it to stop.

This is what it looked like. This is what the weir looks likes normally, and the San Joaquin is over on the left side of that slide. This is just basically a pond on the Paradise Cut side, and at that part of Paradise Cut, you don't always get a continuous slough. You'll get a chain of lakes, basically, until you get enough water or you get over topping like this to connect them. And when those flows got high enough, this is what you saw out there.

So what we're seeing here is a huge discharge of poor quality water out of Paradise Cut when that weir overtopped. There's a plume that's shown here in red. This is what's measured on the red part of the graph. This was measured on the downstream end of Paradise Cut where we put that new station in. This green plot is the reading at the Old River at Tracy Road Bridge compliance station, and this blue line is what the water quality us upstream on Old River at the Middle River at Old River compliance station. You can see it's very good further up on Old River, and then we get this plume that came out of Paradise Cut that reached up to 2,000 EC. And you can see very clearly that when that's going on, we see very similar pattern of spikes at Old River near Tracy Road Bridge compliance station. It's just delayed a little bit because it's a few miles downstream. And after that plume went by, then things returned back to good quality water just about everywhere. So essentially we're flush out Paradise Cut when that weir overtops.

So throughout the month of April, we had flushing flows in Paradise Cut, and they continued and salinity stayed low, and it was similar to the salinity at

Vernalis, so everything was looking good. But once those flows dropped at Vernalis below the weir and that stopped flushing Paradise Cut, we started to see this. We started to see the build up of salinity in Paradise Cut again. And you can see leading up to this, you know, while there was high flows and flowing coming down Paradise Cut, everything was good. And then it stopped, and EC started going up again. And a similar reaction was occurring on Old River at the Old River compliance station. Of course, not as dramatically high because obviously when that Paradise Cut flow comes into Old River, there's some dilution, but we still see spikes.

Now, this is moving along in time, and it's showing that the salinity is continuing to increase in Paradise Cut as you see in the red. And the green plot of Old River Tracy Road Bridge is moving along, you know, in step with what's going on in Paradise Cut. And the EC at Old River at that time got up to about 700 EC while what was at Paradise Cut was well above 1,200. All this was occurring still while flows at Vernalis were 10,000 cfs. And so we all that there's lot's of water, there's a lot of water come down Old River, and we're still getting this kind of condition. And we believe it's because of what's going on at Paradise Cut.

So last slide. We just want to hit the high points of all of this. We've had decades of monitoring and modeling data on the temporary barriers and exports that show the temporary barriers more than compensate for the impacts of the State Water Project on water level and circulation in the South Delta. These barriers were not designed and cannot be modified or operated differently to meet the water quality objectives at the Old River at Tracy Road Bridge compliance station. They are not cable of doing that.

The salinity problems in the South Delta are not caused by state water operations, and as we have shown result, from local accumulation of saline discharges that can spike measurements at the Old River at Tracy Road Bridge compliance station. And the board has a responsibility and obligation to properly assign the responsibility for meeting the water quality objectives proportionate to the parties whose actions cause the degradation. And that's all I have. Are there any questions?

BOARD MEMBER MARCUS: What would you suggest? What would be the appropriate thing to do?

MR. HOLDERMAN: If the goal was to make sure that the numbers at the Tracy Road Bridge station don't exceed the compliance objective, then you'd have to clean up Paradise Cut. Or the easier solution was make it a monitoring station instead of a compliance station, just recognizing that that's what going on in the South Delta and there's not a thing that the water projects can do about it.

BOARD MEMBER MOORE: It's an interesting case. Have you worked or talked with the Central Valley Regional Board at all about this potential source? Because I am familiar with salinity and circulation. I have done tidal marsh restoration in the Bay Area. It's interesting when you get an accumulation whether there is an ongoing source or if there are hypotheses about accumulation because of geometry of the water bodies.

MR. HOLDERMAN: Well, there are seven ag drainages on Paradise Cut, and there's also a waste treatment plant discharge from Deuel Vocational Institute there. And that's at the upstream end of Paradise Cut where we saw those chain of ponds. And EC -- for instance EC from Deuel is often exceeding their NPDES permit, and they are often being fined, and they have a CDO against them right now. The ag diversions, of course, we don't we don't have permits for, or they don't. And we don't know what other than measuring grab samples and getting out there when they are discharging and trying to measure the EC. We do do that. We do measure the EC. You know, we did that in June on those slides we showed you, June of last year.

So we know what the source is. It's ag and the point source discharge from Deuel. The problem is it's just building up. There's no flow. It's a dead end slough, and it builds up to a point where there's enough water in the slough. And when there's a low tide for instance on Old River, it draws that poor water quality into Old River where it mixes and sometimes doesn't mix well enough.

BOARD MEMBER SPIVY-WEBER: And what about Sugar Cut.

MR. HOLDERMAN: Sugar Cut has some poor water quality upstream. There's lot of sources of the water quality problem in Sugar Cut. There's not a big discharge. I mean, there's not a big flow in Sugar Cut. We saw in the other plots back here that Sugar Cut was plotted on there as well, but it didn't seem to have much of an impact at least downstream. This yellow line is Sugar Cut, and even though it was high, we didn't see a pattern changing at Old River Tracy Road Bridge compliance station.

I mean, to me the best thing to do is get some flow through Paradise Cut, if you want to freshen up Paradise Cut and try to reduce these exceedances at Tracy Road Bridge. We monitor water quality coming into Old

River from the head at the San Joaquin at the station at Middle River and Old River. And that gives you a fair reading of the water quality entering the South Delta. It's not a fair reading further downstream at that other compliance stations. And when the numbers get out of whack at Old River Tracy Road Bridge, it's not a good estimate of the water quality in the South Delta. It's just a reflection of what is happening in that local area

BOARD MEMBER SPIVY-WEBER: Thank you very much. Do you have something more you wanted to present? Okay. Well, thank you.

And now the joint presentation for the Bay Institute, Natural Resource Defense Council, American Rivers, and Trout Unlimited. And you've asked for two hours, so we will set the clock accordingly. And following this will be the South Delta Water Agency.

MR. OBEGI: Good afternoon. I am Doug Obegi with NRDC. I am going to kick things off very briefly, and then turn to John Rosenfield with the Bay Institute followed by John Cain of American Rivers, Rene Henery of Trout Unlimited, and then I'll close things at the end of the session.

I just wanted to kick things off a little bit by talking about salmon doubling. We kind of use it as shorthand, and I think it's important to remember why we're here.

The salmon doubling goal was first a creation of a state law back in 1988. It was recognition by the Legislature that were starting to lose our native salmon and steelhead populations. And we set in motion this goal, that we wanted to not only preserve the salmon that we had remaining, but we wanted to double those population in recent history knowing that was very achievable. In 1992, the Central Valley Improvement Act made this goal federal law that we would double the populations that exited from 1967 to 1991 so that we could provide meaningful expanded fishery opportunities for sport commercial fisherman. The goal was adopted for the first time into the 1995 water quality control plan by the board. And at that time, we adopted the Vernalis adaptive management plan in order to test and see how we could achieve it. Was it flows, was it exports, was habitat restoration, is it other stressors? How were we going to achieve this salmon doubling goal? It was continued in the 2006 plan, and it still part of our existing plan.

In 2001, the Anadromous Fish Restoration Program adopted a final restoration plan that set in place the flow targets -- sorry, the fishery targets, production targets -- as well a number of measures, flow and non-flow, to achieve those targets. On each of these rivers, the AFRP sets a salmon doubling target. The total is 78,000 fish, and as you'll hear more today, we've come woefully short of reaching that goal. But when we say salmon doubling, it's not just an abstract number. It's an actual achievable, meaningful, time bound number. We're supposed to achieve it back in the 2000s, and we haven't done so. And this gives us a new opportunity to renew that commitment.

I want to urge the board to explicitly reference the salmon doubling goal in the narrative objective for this proceeding for three specific reasons. One is that you already have a salmon doubling objective in the plan, and you need to have your objectives be consistent. The second is that the salmon doubling objective is the primary protection we have for the sport and commercial salmon fishery. Right now all to often we manage to the minimums required by the Endangered Species Act, and we make the ESA the hammer because we fail to protect things before they get some bad. Salmon doubling is our target to help avoid having further listings. And finally these AFRP production targets, the salmon doubling targets, we need them to guide adaptive management. Right now when we look at the narrative objective for this proceeding, it's really hard to say how many fish are we trying to create. What is a long term viable, sustainable population. We have those target, and those are the AFRP goals.

So I want to turn it over to John to talk about the science behind about flows and salmon production.

MR. ROSENFIELD: Thanks Doug, And thank you, Members of the Board, for sitting through these hearings. My name is John Rosenfield. I am a conservation biologist for The Bay Institute. I want to pick up a little bit on what Board Member Marcus said earlier in the hearings about continuing these motives because we all heard that yesterday, and I know you all have to sit through that.

I am a fish biologist, and I've dedicated my life to studying fish, enjoying them, and conserving them. If there were a way I could recommend that we protect fish in the delta and fish in the San Joaquin and the ecosystem without using water, I would definitely do that. I understand that this is a tough decision for you to make. If I thought that planting trees and removing predators with bounties and, you know, doing other fixes would work, I would be recommending that because I am not interested in the amount of water that flows downhill. I am not a rafter, no offence to the rafters in the room. So the amount of water is not a personal interest of mine. The fish are a personal interest and professional interest of mine. And I think that I probably speak for the biologists that are up here that that's why we're talking about the flows because they are necessary.

And I also wanted to take issue with a comment made earlier that things -- that alternatives to flow are working on the Colombia-Snake River system. I encourage board members to look at the record of NMFS's biological opinions on the Colombia-Snake River, which were willed with habitat restoration, filled with predator control. They have been implemented to the toons of hundreds of million of dollars, you know, billions over the course of the program, and it has not worked. And the courts found it has not worked to even achieve the no jeopardy standard of the ESA, much less restoring the fish populations. So with that I'll get to my presentation.

The overview is that obviously native fishes of the Bay-Delta and San Joaquin River are in poor health. I don't think anybody objects to that statement of fact. Freshwater flows in the San Joaquin river are severely diminished. Scientific evidence indicates that increased diversion of fresh water has driven the decline of the fish and wildlife species, and this scientific information is overwhelming. There are thing we don't know in science like what causes gravity or the exact relationship between cholesterol and heart disease. The relationship between fish and water, I think would be unassailable at this point. There's also a strong scientific support for flow thresholds that will support the restoration of salmon and other fisheries. And that's what I am going to focus on today.

The draft SED's preferred alternative, the 35 percent unimpaired flow with caps on the various rivers, 14-day running average February through June is clearly inadequate. And I wanted to thank Mr. DiCroce for making many of the points that I will make. The 35 percent is unimpaired flow inadequate, and if you measure predation during a number of dry years from 2007 through 2012, you'll find that low flows contribute to high predation rates as well.

Our preliminary analysis of flows needed to restore the fisheries in the San Joaquin River and the Bay-Delta are the flows greater than 50 percent of unimpaired flows will be necessary between February and June. That there should be minimum flows of 2,000 cfs at Vernalis year round, and that an improved fall pulse flow will be necessary over what's currently mandated.

So here's a graphic showing the decline of San Joaquin River fall-run Chinook salmon. And Y-axis here is production, and as Doug mentioned, production is different from escapement. Production as well available in the ocean, and it's measured related to escapement. Production is a measurable number, and it's measured.

These numbers are on the Web site of Cal Fish and Game, I believe. So I've heard people, again, wondering what salmon doubling is, and it's measured and measurable, and we can describe exactly how that's done.

BOARD MEMBER SPIVY-WEBER: But is it -- it's measured and measurable. I absolutely agree with that, but is it measured for native and for hatchery fish. Because that was really what was said earlier today was a lot of hatchery fish are put in, and you can count those as well.

MR. ROSENFIELD: Yes. I mean, there are means, there are statistical means for separating between hatchery production and native production. Any statistical effort has an error bound around it, but that's still a measurable quantity. A lot of things that we're talking about here as facts are actually based on statistical relationships. Numbers we present are based on statistical relationships for anybody, water flow, things we think of physical variables. So this is no different from that. It's a well-known relationship.

So this graphic just briefly shows three time periods of salmon production on the San Joaquin, and from the early '50s to the mid '60s, production was about 45,000 thousand. Then dropped to 38,000 during this period '67 to '91. And this is the period on which the doubling goals are based. So the doubling goals, I know the number don't add up perfectly, but again that's in the details of the report. 78,000 is our doubling goal, and since we set that doubling goal, populations have declined by about 50 percent on the San Joaquin.

But there are salmon in the San Joaquin, and we took a picture of them so you believe what we're talking about. But I want to make a point that the imperiled resources that influenced by San Joaquin River flows go beyond fall run Chinook salmon. Fall run Chinook salmon are a very important resource that we call care about for which we've a lot of good data, and that's why we and Department of Fish and Wildlife to varying degrees have relied on fall run Chinook salmon data to create our flow recommendations.

But it's important to remember there will also, as a result of the San Joaquin Settlement, be spring run Chinook salmon in the San Joaquin Basin. Green sturgeon and white sturgeon can spawn there. Steelhead did span there and still do. And then there are the resources of the Delta, the delta resident species: delta smelt, longfin smelt, and Sacramento splittail. And they are dependent from our flows from our rivers as well.

And finally there's food web productivity in and beyond the delta. And in phase two and hearing stuff on the delta portion of this is there a lot about the food web. Well, every drop of San Joaquin River water is probably worth a little bit more than other water sources in terms of producing and generating food production in the Delta. So there are other resources at stake here.

Increased San Joaquin freshwater flows are essential to restoring public trust fisheries. They may not be sufficient in and of themselves, but there will be no restoration without increased San Joaquin River flows. I have quotes here from Department of Fish and Wildlife from 2010, "That the restoration of salmon and steelhead in the San Joaquin primarily hinges on obtaining sufficient, magnitude, duration, and frequency of spring time flows." In a review of state board's 2010 report, a peer reviewer noted that "there are other stressors to fish." No one denies that. "A more natural flow regime is necessary if the fish are to recover," and this reviewer concluded that other stressors "such as contaminants and non-native fishes will be less consequential for salmon and steelhead in a more natural flow regime." Finally, your own 2010 report concluded that, "There is sufficient scientific evidence to support the need for increased flows to protect public trust resources."

The San Joaquin has provided an diminishing share of its flows to the delta over time. This graphic again we're dividing into three time periods: 1930 through 1955, 1956 through 1987, and then 1988 to the present. And the mean and the median of these different time periods has decreased, and you've heard the statistics already in other presentations about what the current percentages unimpaired flow is. But I want to make a point that fish and other wildlife don't live in the average year. They live in all the years, and they have to get through years with bad flows and prosper when they can with years with high flows.

So here I am going to show -- this box here kind of shades out years with below 35 percent flows, which would be years that might not have occurred under current proposal. But it won't do anything to increase -- your proposal won't do anything to increase the number of years in which unimpaired flows exceed 35 percent except within the adjustment that's allowed within your 25 percent to 45 percent boundaries. Historically half of the years have flows that were excess of 35 percent of the San Joaquin's flow. That was true even in a more recent period '56 to '87. Now, 35 percent of years flows greater than 35 percent. I know the percentages get confusing after awhile, but basically a third of years now -- two thirds of years have flows less than 35 percent, and it's really that we're losing these top level flows that are driving fish population declines.

I also need to make the point that, again, to have us thinking in the bigger picture here about the resources of the Bay-Delta. The San Joaquin River is disproportionately overdeveloped. So in this top row here, I am showing Vernalis unimpaired flow versus Delta unimpaired flow. So Delta outflow, divided -- or Vernalis flow without demands and diversion divided by Delta outflow without demands and diversion. So the historical relationship would have been that the San Joaquin River contributed between 22 and 25 percent to delta outflow, San Joaquin above Vernalis.

Under the current situation, you can see that it's contribution to Delta outflow is less than half, and sometimes less, in some years less than a third of that. So if all of the rivers in the Central Valley had been developed to the same extent and we developed them to the extend that we export water now, then the numbers in this bottom row would be the same as the numbers in the top row. But they are not, showing that more water is taken out of the San Joaquin than other rivers.

And it shouldn't be surprising at this point that we believe, and the data shows, that there's a strong relationship between San Joaquin River Chinook salmon production and flows in the San Joaquin River. These are -- the dotted line here is now superimposed on the production graph I showed you earlier, and the flows are flows that occurred when these fish, the green bar, were going out to the ocean. So that is the two-year lag thing, so these are the flows that I said, basically when the fish are migrating to the ocean compared to the number that return. And you can see that there's a very strong relationship in those two variables.

So I want to get into the scientific basis for particular levels of flow and remind people that flow in a river drives many variables that are related to fish success and productivity. As flows increase, the transport of juveniles and cues to migrating adults are improved. Water quality, in terms of in this case of dissolved oxygen, temperature and contaminants -- water quality improves as freshwater flow increase. Habitat volume and surface area increase, and that's what we're talking about when we're talking about floodplains. We're increasing the habit for these fish. The wetting of the backwater channels as well is increasing habitat for these fish. And increasing flows leads to do decreased predation. And I would have a lot to say except I know Rene also has a lot to say about that. So I'll leave that to him.

Getting into the analysis, I want to separate between two types of critical flows, two general categories because sometimes the number are the same but the functions are different. We've identified, and DFW has identified, average flows over the spring season, March through June, levels of 5,000 cfs and 10,000 cfs as being kind of critical levels for fish production. These flows are hard to shape by moving water from one week or one month to another because they are average flows. So if you take flows from one week in March and move them to April, the average is the same. So the achievement of these flows is largely determined by the percentage of unimpaired flow that you would allocate, and that's the watered budget you have to work with in a given year.

And then there are daily flows that produce in effect on a daily basis. And on here I'll address 2,000, 5,000 -- again, which is not the same as the effect of 5,000 above -- and 15,000 thousand cfs. The frequency and attainment of these flows is determined both by the percentage of unimpaired, your water budget, and by the 14-day averaging window or whatever daily averaging window that would use that recreates the shape of the hydrograph. These flows that occur on a daily basis have the potential to be engineered because you could borrow from a time when there's more flow and store that water and then release it at a time you need the flow.

Okay. One of the key daily flows is flows that produce floodplain inundation, and I am not going to spend a lot of time on this because John Cain will and I know that know the benefits of floodplain inundation. The point is that the greater the flow on this axis, the more -- or I'm sorry. The greater the flow on this axis, the more acres of floodplain inundation you get. And our 2010 presentation called for flows of about 20,000 cfs. New analysis that John will talk about leads us to believe that if you modify the floodplain, you could achieve that with lower flows. Again, you still the need the flows, but we could do a little habitat work and make that happen more frequently with less flow.

The next attribute that I want to talk about is population abundance on these AFRP reduction targets. The species of concern here, or of interest, is the fall run Chinook salmon. And I don't have a snazzy graphic for this, but I wanted to point out that Department of Fish and Wildlife in their 2010 report analyzed flows that led to Chinook salmon smult survival through the Delta. And we did a different analysis that was related to escapement of adult fish returning two years later. And both of us found in our two different approaches the result that 10,000 cfs was related to -- those are the flows you needed to produce the doubling target of the AFRP. And

State Board's report for 2010 seems to acknowledge this saying, "Available scientific information indicates that average March through June flows of 10,000 cfs may provide conditions necessary to achieve doubling of San Joaquin basin fall-run."

Okay, a different flow. Now, we're talking about the 10,000 cfs that I just mentioned that was an average seasonal flow. This too -- this analysis is an average seasonal flow, and now we're talking about population growth of fall run Chinook salmon. This is a graphic similar to the one we presented in 2010, and it shows the cohort return ration, which is the number of fish returning this year divided by the number of fish that produced this cohort of fish three years prior. So numbers above one are population growth. You have more fish this year than you did three years ago. Numbers below one are population decline. You have less fish this year than you did three years ago. And this ratio, which is just plotted on a log scale to help us see what's going on, is plotted against flow at Vernalis. And I've got to say that it's striking to me as a biologist that average flow measured in the lower river -- it does relate to flows in the upper river -- but that average flows measured in this smaller component of the fishes life history would produce a signal two and a half years, the years later, in adults returning is kind of remarkable. And the strength of this relationship is also remarkable.

What we see is that in years with less than 5,000 cfs flows, you get -- the result of that is 13 years of population growth. So some population growth does occur below 5,000 cfs average flows, but a lot more years are negative, 22 years are in decline. The really striking thing though is that when flows are above 5,000 cfs average, to the right of this vertical line, you only see three years of decline. This is over 54 years. And you see 16 years of population increase. So what this says to me, biologically speaking, is that flows below 5,000 cfs these fish are not doing as well. And either the ocean saves you, or the ocean, you know, is the coup de grace on a population of fish that's not doing that well. So you get some years of increase, probably related to ocean conditions, and you get some years of decrease that are also related to what is going on in the ocean and can these fish survive when they get there. But when you have flow of above 5,000 cfs on average March through June, it almost don't matter what the conditions are throughout the rest of their life cycle. The 16:3 is your ratio of years of growth to years of decline. That's pretty amazing to see that kind of relationship.

Okay other daily flows, and I am just identifying the flows and we'll go back and say what the different proposals do to those flows in a minute. Other flows that are important on a daily basis are those that allow the San Joaquin River to serve as a migratory corridor for fish -- we're talking abut sturgeon, salmon, steelhead splittail, et cetera -- and have water quality barrier to migration that occur in this year of San Joaquin upstream of Stockton and in that area. One of the flows that -- flow relationships that that's related to this migratory barrier is the relationship between temperature.

Daily water temperature here on the Y-axis, and daily stream flow measured here on the X-axis. And this is analysis done by John Cain. And this shows that is not until late May that you get flows over 5,000 cfs on a daily basis that you have temperatures, indicated by this horizontal line, that are conducive to the salmon survival. So when flows are low on a daily basis, these fish are going to experience temperatures that stress them out. And when flows are above 5,000 cfs on a daily basis, they are more likely to experience temperatures that they can handle and they can thrive in.

Another daily -- the final flow level that I want to talk about is a daily flow of 2,000 cfs at Vernalis. Here I am showing you daily minimum dissolved oxygen in the Stockton Deepwater Ship Channel, which is downstream from Vernalis, and flows also in Stockton Deepwater Ship Channel. And this is data after the 2006, which is after the Stockton did it's retrofit of its wastewater treatment plant. And the Y-axis is showing dissolved oxygen content in the water. The X-axis is the flow on a daily basis, the daily average. And the red line is the Clean Water Act threshold during most of the year for dissolved oxygen in this waterway. And I've dawn a vertical line at 1,000 cfs because you can see most of the violations that occur, occur at flows lower than 1,000 cfs.

Similarly, this is now at the fall. There are September through October dissolved oxygen data. The standard is different in the fall. It's higher, 6 milligrams per liter. And again, you see most, though not all, of the violations in dissolved oxygen standards occur at flows less than 1,000 cfs at the Stockton Deepwater Ship Channel, which is downstream of Vernalis.

This slide then shows the relationship between flows at Vernalis and flows at Garwood Bridge, which is the station nearest the Stockton Deepwater Ship Channel. The dotted blue line is the equivalence line. If flows were are equal, all the dots would fall on that dashed blue line. But the aqua points below that blue line are the actually flow relationships, and this dotted black line shows my estimate of the relationship between the two. And basically flows at Vernalis are more or less twice as what flows in the ship channel are. And that's because the Old and Middle River corridor distributes water out of the main channels between those two points. So, anyway, this is to show why we're talking about 2,000 cfs as a Vernalis standard to effect a 1,000 cfs flow recommendation in the ship channel.

The hydrograph data we recommended previously, DFW and the Bay Institute, present fully engineered hydrographs. The water flows at a certain level, and the next day it drops 10,000 cfs. And those were based on our analysis of these critical flows and the flows we thought would be necessary to produce benefits to the public trust. The Board in it's 2010 report, generated this notion of a percentage of unimpaired flow on a 14-day moving average to recreate the natural shape of the hydrograph. And we support that notion of a proportional hydrograph because it recreates the shape of the hydrograph in this year, and that shape of the hydrograph would then mimic natural cues and processes including those for which we don't have much data. But, you know, the river flowed in a certain way in the past, and the operating assumption is that pattern of flows in time is most beneficial to the fish that evolved in that system.

The percentage of unimpaired flow on a moving average is also simple to understand and plan around. It distributes the risk more evenly between the environment and humans. If it rains, then there will be water for people and fish. And if it doesn't rain, everybody shares that risk together. It does not require advanced forecasting which is a major advance. You don't have to know how much water is going to -- you know, we're in the end of March here, and we're tying to figure out what water year it is based on what's going to happen in April and May. A 14-day running average is all about what happened in the past 14 days, so it requires no forecasting. And that we think is an advantage.

And we're not religious about the 14-day running average. Fish And Wildlife proposed perhaps a shorter window. That might be supportable. That's something we should look at as we begin to implement. We don't think it's important that you be able to shape the hydrograph within narrow confines to achieve target flows, like floodplain inundation for instance, without worrying whether that would have happened on a 14-day average. There's some room to be flexibility to achieve the flow targets you want.

Again these example of the hydrograph that we presented in 2010. Our recommendations are in red. This is for a critical year with dates on the X-axis and flows at the Vernalis on the Y-axis. And the blue, for comparison, is what Department of Fish and Wildlife recommended. You look these graphs, you're going to say oh, there's differences between them. Mostly these are pretty much the same recommendations. They have slightly different flows for shorter times; we have flows for longer time. But we're working independently towards the same goal of producing minimum flows necessary, for instance for Chinook salmon, and came up with fairly similar numbers. But the point I want to make here is that these are engineered hydrographs. At this day, flows are at 2,000; the next day they are 5,000 thousand. That flow lasts exactly that level for a certain number of days and then drops.

This is another example of our below normal recommendations versus DFW's below normal flow recommendations. That structured, engineered hydrograph is very different from what you would get with a 14-day moving average, and this is an estimate of what flows would be in two below normal years: 2003 being the driest of the below normal years in our system, and 1975 being the wettest of the below normal years. And this is what the hydrograph would look like if you were at a percentage of unimpaired on a 14-day moving average. So we support the 14-day moving average concept and wanted to then see, under a 14-day moving average, or a different moving average, with given percentages of unimpaired, how often would you achieve the flow benefits that we were trying to achieve our engineered hydrograph. And that's what I am going to show you in a minute.

I want to take a short amount of time to talk about how I don't think -- I think the SED was confusing in its presentation of what its preferred alternative was. Because it discusses a percentage unimpaired on a 14-day moving average, but then in it's analysis of alternatives -- this is the presentation that was given -- and this shows February through June flows as a block of the water. And the discussion around this says you can take that block of water and allocate it however you like to achieve benefits. But that's not the same as a 14-day moving average.

And it leads to some misleading result. Here we have plotted -- you saw this plot yesterday. DFW's recommendation is this red plotted line. Again, an engineered hydrograph that changes with year types, certain amount of flows required for each year type versus the model amount of flow from each of the SED's three alternatives: 20 percent, 40 percent, 60 percent, and then this is hundred percent here for reference. And this is misleading, I think, in that it implies -- at least it's implied to some folks -- that between 20 and 40 percent, between the pink and the blue line, that's where this red line is for DFW. And somewhere between 20 and 40 percent, you have enough water to meet DFW's flow recommendations. And actually I don't think that's what this graph shows, if you understand how it's put together. I think it shows the opposite of that.

The reason is we don't have precise control over flows. The reservoirs release flows. They do their very best, but flows are coming in from different areas, sometimes a little more water shortage or a little less or it rains. And what this graph shows is that -- this red line is the exact amount of water necessary to meet flow recommendation by DFW. If on a given day you delivered less water, then you wouldn't be meeting DFW's recommendations. But if on a given day there was more water released for whatever reason, then this red line increases because the total volume of water increases. So unless you're omnipotent and can control the amount of water exactly and always meet the targets daily, it's going to require more water than is demonstrated on this red line.

The other thing is this forecasting problem in that operators don't have -- they are not omniscient. We don't know what's coming down the road. So we're at the end of March, and it seem like its dry, so we ought to release water more like the below normal recommendations. If it gets wet in May, that's nice. It would have changed our release patterns, but it's too late to actually to do anything about it because we already pretended it was below normal. On the flip side, if it were a wetter year and we behaved like it was a wet year but then things got dry and we didn't have that water, then no doubt we wouldn't continue to release water as if it was a wet year. We would pull back. So the environment would always get shorted in that scenario because of our inability to forecast, which is a problem we have haven't overcome yet.

Finally I just want to note that this axis here is February through June flow as a block of water, but the DFW recommendations are for a narrower time frame, April to May. So what this says to me is that the amount of flow that DFW needs in April and May can be provided for between February and June. So it's a little bit comparing apples to oranges here. The upshot is that I believe for those reasons, A, B, C and a few others, that the SED's evaluation demonstrates that flows needed to meet DFW alternatives depicted here, or the TDI alternatives, would be much greater than 30 percent of unimpaired flow.

So now to our modeling of different unimpaired flows. First I want to talk about those seasonal average flows that we talked about: 5,000 and 10,000 cfs as an average from March through June. Our model took -- we used daily flows to construct hydrographs. And the rules for that was that we applied a percentage of unimpaired only to the three tributaries and equally to the three tributaries, which is the way the Board's preferred alternative works. We also included Friant settlement flows reaching Vernalis that were just unhinging within a month because you had to make an assumption to get any of those flows or get none of those flows, and we assumed we would get some of those flows although we acknowledge that's not a requirement of the settlement and that may not happen.

And so the results I am going to show you are a rosy image of what might happen. We also included 100 percentage of miscellaneous and valley floor flows again because you have to make an assumption about what is going to happen there. We did not include caps on the tributary flows as indicated in the SED because frankly I don't understand how we can cap flows at the tributaries at the median of their unimpaired flow. I am just recommending that not be part of the preferred alternative because it doesn't make sense waterwise or biologically. And we used 1962 to 2011 for our project.

So here I have a variety of unimpaired flow levels, and I am looking at how often they exceed. The exceedance is plotted on the X-axis, and average flow March through June at Vernalis. So the red line is your 35 percent unimpaired line, and the black line for reference is 100 percent of unimpaired given the assumptions of your modeling which, again, they are assumption. And I've drawn for reference the 5,000 cfs average of March through June across these. Where that average line, the grey line, intersect one of these unimpaired flow lines, if you drop down, that's the frequency at which you're going to see those flow on an annual basis.

For 5,000 cfs, this is your status quo. This is how often we currently achieve averages of 5,000 cfs past Vernalis from March through June. And the 35 percent alternative is an increase in a that frequency, but that increase modeled against the data I showed you earlier about how frequently the population grows at above 5,000 cfs and below 5,000 cfs translates into about an extra year of growth in ten, population growth in ten. Unfortunately, that's not going to be nearly enough to recover this population. It perhaps would be enough to stabilize the population, but it's no where near enough to grow or restore the population.

In the 2010 report -- from the state board report, there was an indication there that flows -- from the limitations and caveats of that report -- that flows greater than 5,000 cfs should occur in more than 85 percent of years. Here I am setting a target of 80 percent of years, meaning all but the critically dry years there should be flows that support population growth. This level of flow which corresponds to about 55 percent of unimpaired flow -- it's over the 50 percent line and below the 60 percent line -- that would produce population growth in an additional growth in two years out of ten. And that level of population growth is what's needed to increase the population. The reason is that as you increase populations, you know, they go up a certain amount, but if you decrease them -- in the years that population are decreasing, they can address a lot or than they increase. So just achieving some balance of 50 percent years with population growth is not going to work. It's actually what we have now, and the population is declining.

So here's that other flow level, 10,000 cfs averaged March through June, same kind of analysis. Again, the vertical dashed line is the status quo. These years occur in one of five years, an average of 10,000 cfs. Meaning when it's wet, you average 10,000 cfs, and that's because we can't control the flow during those wet years. A 35 percent line interpreted, you know, under the way the SED works, would represent a decline in the frequency of 10,000 cfs years. It would be about one out of every six.

Our target for flows that support the AFR doubling goals is 50 percent of years. Because if you're able to support the AFRP targets in half of years and you're slightly below that on the other half of years, then on average you've achieved your target of doubling these populations.

Now, I want to get to the daily attainment of flows and remind you that we've recommended a certain number of days, indicated here in a wet year on this blue line, at which certainly river flows near 15,000 would occur. And getting that out of an engineered hydrograph is different from getting it out of the propositional hydrograph. So we're trying to figure out how many days that we recommended, given flow types and given year types, do you get those flows with an unimpaired 14-day averaging, or other averaging, time hydrograph.

A point that I want to make on this slide is to remember that in our 2010 presentation, and the Department of Fish and Wildlife's 2010 presentation, we reduced the magnitude of flows and the duration of those flows based on year type, so based availability of water. So in dry years, we're asking for a lot less flows than in wetter years where you can take advantage of high flows. So as look at the next slides, remember that we have already accounted for, or tried to account for, the decrease in the water availability in our previous recommendations.

This is just an effort to have an unimpaired 14-day average hydrograph. Our assumptions here are the same as for the seasonal flow analysis. We assume that daily flows for those days and these assumptions we do that daily ramifications translate directly to Vernalis flows. There's no accretion or loss between release point and Vernalis. Again, these are unimpaired flows.

Daily attainment of a key flow level was reflected as the number of days that the 14-day running average exceeded that flow target. And our modeling is capable of putting in a different running average if that's what we desire. Water year types that we're presenting here are 20 percent exceedance bands, so the wet years are the wettest 20 percent of years, above normal are next wettest 20 percent of years, critically dry years are the lowest 20 percent of years. And we're using a loose interpretation of flow duration here. Meaning that we recommend flows begin on a given date, and that they then end by a given date. But the unimpaired hydrograph doesn't necessarily behave that way, so this loose interpretation says we want to know how many days this flow is attained from the date we said it should begin all the way through June 15th. It doesn't matter it if occurs outside of our recommended period because we wanted to be a little bit more liberal. An unimpaired hydrograph has benefits that aren't captured by an engineered diagram.

And so this graphic shows our result boiled down. This is attainment of key daily flows at a 35 percent unimpaired flow with a 14-day running average. This reflects in the median year of these year types -- the above normal, below normal, dry, and critically dry -- in the median year, how many days of the recommended duration did you get as a percentage of what you recommended. So basically blue is good. You achieved most of the days you recommended. And black is bad. You achieved almost none or none of the days that you recommended of that key daily flow. And at 35 percent, you don't achieve that much.

At 45 percent, things begin to improve. So now this dry year at 5,000 cfs flow on a daily basis, instead of achieving it 20 to 50 percent of the time, you're achieving it 50 to 80 percent. And you begin to achieve 10,000 cfs daily flows in below normal years. So you're making progress. But as to your question the other day, Board Member Spivy-Weber, 45 percent is not going to cut it, doesn't work.

Here's 50 percent. You're now achieving the recommendations for 5,000 cfs in dry, below normal, and above normal years. You're achieving daily flows of 10,000 cfs in the below normal and above normal years. I haven't put wet years here because any percentage of unimpaired is below what you're going to actually achieve in wet years because most of a wet year is flood releases and runoff from the valley floor. So you achieve a lot of benefits in those years, but not due to anything based on state board rule making. It's based on the way nature allocates water.

And finally in a 60 percent scenario, you're still not achieving all of our daily recommendations for critical flows, but your achieving a lot more than you did under 35 percent. You're beginning to open up that migration barrier at that we talked about that's related to temperature on 20 to 50 percent of days, and you even begin to get some floodplain inundation as a result of the percentage of unimpaired approach.

And then this is my final slide where are I am summarizing the benefits that we see from various flow approaches. These are in terms of their biological purpose. So eliminating the dissolved oxygen barrier with the 2,000 cfs flow at Vernalis is something that can be achieved in most year types or all year types, depending on the percentage of unimpaired. It's not that hard to achieve this. And so they are recommending just be a minimum flow level to meet a Clean Water Act requirement of 5 point -- whatever it is, 5 milligrams per liter of dissolved oxygen and 6 milligrams per liter dissolved oxygen so that fish can migrate through this area.

Population growth rates. These are again the average. At 5,000 cfs flows, you achieve it much more frequently under a 50 percent of scenario 20 percent of years. An additional one out of five years more under a 50 percent scenario or 60 percent scenario, then you do under 35 percent. You eliminate the daily temperature barrier much better at 60 percent than you do at 35 percent. Again, this is showing that 60 percent of years are going to have very few days when fish can migrate through the river, fall run Chinook salmon based on the temperature barrier. And to achieve the AFRP production targets we achieve them in wet years and achieve in above normal years with 60 percent of unpaired flow. We're challenged to reach those levels under 50 percent, which is why I recommend the unimpaired flow level be set at above 50 percent and include 60 percent as part of it's adopted range. Again, wet years are not depicted here not because they don't matter but because the rules don't really control what happens in wet years.

So to conclude, there's strong evidence for flows thresholds that will meet the restoration salmon and other fisheries. The draft SED preferred alternative will not provide the flows necessary to achieve AFRP population targets and other ecosystem improvements that we've identified as necessary. They may not halt long-term ecosystem system decline.

Our preliminary analysis indicates that flows greater than 50 percent of unimpaired during February through June and minimum flow of 2,000 cfs at Vernalis year round are necessary to restore trust fisheries of the San Joaquin River and Bay-Delta. What I haven't mentioned here and gone into but I do want to put in the record is that the fall pulse flow, that's currently part of the SED as part of the earlier regulations, would need to be improved as well. There's not a sufficient amount of water to attract fall run Chinook salmon back to the San Joaquin basin. So those are our recommendation and analysis. Thank you.

MR. CAIN: Hello, Members of the Board. My name is John Cain. I am the conservation director with American Rivers for our Central Valley and Bay-Delta program. Thank you for sitting through these hearings. Yesterday was a very interesting day. There were a lot of strong emotions, and it just made me reflect on the kind of job you have to do and how you actually get through this.

I was impressed by Hal Candee's comments, particularly his advice to focus on the law and sciences and do the best you can. Because if you don't, you'll be having to redo it probably. I think it's doable, and I hope my presentation will help provide a framework for how to think about making decisions to balance the public trusts and beneficial uses as well as just the overall public interest, and I also hope to provide some observations and incites. Let me see if I can operate your projector here.

So what I'm suggesting is a four-step process for the public trust balancing, and the first step is really to figure out -- based on best available science, determine how much water the fish and public trust resources really need. And this is an easier questions in the San Joaquin River, i think, than it is in the Delta as a whole. It's not quite as complicated. The second step is to determine the real water supply and economic impacts and benefits, economic benefits, of meeting the true needs of the fish. The third step is if the water supply and economic impact are excessive, what measures could the Board or other parties take to mitigate the economic impacts. And lastly, if you can't mitigate the impact to an acceptable level -- the economic impact -- how might non-flow actions that the Board can require reduce the water supply cost on a time frame that will prevent further decline of the public trust resources.

My presentation is organized under these four steps, and I just wanted to make it clear that the advance two the American River, NRDC, and others have submitted science-based flow estimates to this question of how much water fish need in 2009. And from my reading in the SED, it does not demonstrate these previous flow recommendations are not necessary. We've heard and seen some compelling presentations of fish -- striped bass eating salmon. It's hard not to be impressed by those. I personally need to hear an alternate explanation for the graph that John showed which shows that two years after there is a high outflow, or high flows in the river, there's a large population of fish. Can people explain to us why that relationship doesn't work. It's not good enough to say there's a lot of predators; there's loot of other problems. There's a very strong correlation there, but not only is there a correlation, John described some of these mechanisms behind the correlation: Temperature, floodplain inundation, dissolved oxygen. So at a minimum, the SED really needs to -- if are they going to make flow recommendations less than what we have suggested, the SED really needs to demonstrate why our flow recommendations are not necessary.

I've spent a lot of time in the last few weeks going through the results of the model analysis that The Bay Institute put together and have come to the concussion that the 35 to 45 percent range is not sufficient to achieve the flow recommendations we've previously made. On top of that, there are these flow caps -- I'm hoping Dough Obegi will talk a little bit about this -- that limit high flow releases from the reservoirs to prevent seepage. And those flow caps are really problematic because there's a threshold we need to achieve. And if you're going to cap the releases from the reservoir, you're not going to achieve those kind of thresholds.

So this slide here shows that 50 percent of -- I won't spend a lot of time on it, but it's the same point that John was making. We see the recommendations we previously made, and then we see a black line shows the 60 percent unimpaired flow, the lowest of the dry year class. And it doesn't quite meet our flow recommendation, and maybe in the highest of the dry year classes you'd meet it. But that's with the 60 percent unimpaired.

So then we get into why aren't we meeting these flow requirements, and part of it has to do with the 14-day approach. And I wanted to stay by saying that the unimpaired hydrograph is generally the right approach, but not always, not in every case. There are needs to shape it. But the basic premise that we need to try to restore a more natural hydrograph absolutely is the right way for you to go. The 14-day average, however, significantly dampens important flow pulses. So some engineering and some real time operations will be necessary to achieve these threshold, but if your going to engineer the flow regime -- that is, if you're going to release from the reservoir in excess of 7 percent unimpaired, you need to have an adequate water budget to do that. And I am not convinced that 35 to 45 percent is going to be enough to do that.

This is just shows you a median above normal year, and it compares the 14-day and the 7-day. And I was just really amazed at how much spikier the 7-day outflow is. And when the river spikes up, those are important thresholds. The water gets on the floodplain, and then it drains back off the floodplain. Or it's carrying turbidity down river, or it's carrying species down the river. And when you smooth it out and have a 14-day average, you're not going to have those important thresholds

You've probably seen this graph before, but this is put together by McBain and Trush. This one is particularly from the San Joaquin River Background Report. Lots of science and thought has gone into this idea that the natural hydrograph, that fish have tied into different aspects of natural hydrograph. What we're showing there is in gray, or the bluish gray, is the natural hydrograph for 1970. And in red is the regulated water year 1970. This is actually the San Joaquin River below Friant. You can hardly see that there's any water in the river there.

And this is an analysis from a 2003 report that put together, and it shows on the left-hand side the hydrographs for the Merced, Tuolumne, and Stanislaus River in basically typical years. And you can see how much of the spring hydrograph has been cut off and how little of the variation there really is compared to the natural hydrograph. And on the right-hand side is changes in peak annual flow. There's been a lot of discussion -- excuse me, peak annual maximum flow. There's been a lot of discussion about senior water rights and that people have been using water on the river for a very long. Well, one thing that hasn't been on the river for a hundred years are the big dams. And after the big dams, the size of the peak flows diminished very substantially on all three of these rivers.

You can see on the bottom graph there New Melones post-1979, at least on the record I have here, there's no big flows. And these big flows are really necessary to rework channel habitat and cleanse spawning gravel. So it's the presence of the dams themselves, and your, I believe, permit that you granted to store water behind the dams that is part of the reason these thresholds are not being met. It's not simply a matter of the water rights that are being used for agriculture.

One thing that's probably desirable to think about is engineering the hydrograph within some sort of water budget. We may want to shift the timing of the peak flows earlier in the year because we don't have as much water to play with because perhaps the climate is getting warmer. Maybe it makes sense to be trying to create these high flow conditions in the April-May time period instead of the May-June time period. And that would be an example of the not going with the exact unimpaired but shifting it earlier.

We've done some of our own thinking about whether you need 15,000 cfs or 20,000 cfs to inundate floodplains. Our earlier recommendation was 20,000 cfs. We went and did it further analysis questioning our own assumptions about what we reported in the 2009, and based on hydraulic modeling, we came to the concussion that 15,000 cfs is much more -- is actually what you need to get water up on the floodplain, if you remove the levies downstream of Vernalis. But what we can see from these numbers here -- the blue line is for the wet years, the green line above normal years, and orange for below normal years -- is that we only achieve the desired number of inundated floodplain days once we got into the 60 to 75 percent unimpaired flows. This suggests that if that's not achievable, then we need to find some other way of getting water on to the floodplains. We need to rethink this.

So we do still think you want to have 45 days of inundated floodplain habitat, and you want to have it on a large scale in wet years. We might not be able to get 65 percent of the unimpaired flow. It might be possible in wet years because it's not under control but in the others. In any case, there definitely are opportunities for changing the channel in a way that could cause floodplain inundation, and I'll talk about that a little late in my presentation. But still we're going to have relatively large flows, and we're going to need to engineer the hydrograph beyond the 14-day average to be hitting these thresholds.

So my second step is how much water do we really need and what are the economic impacts and benefits of these increased flows. And I heard a lot yesterday that I want to study up more on these things, and there's different perspectives on this certainly. But from my perspective, the SED doesn't accurately estimate the water supply and economic impacts, and it doesn't consider the economic benefits of increased flows for recreation, fisheries, water quality, and the Delta.

And from my perspective, it under states what the economic impacts -- or overstates what the water supply impacts would be by assuming status quo reservoir levels. How did we operate in the past, and we'll assume we operate them exactly the same way in the future. And that assumes that the we've been operating the reservoirs is optimal, which given the condition of the fish doesn't seem credible to me. The reservoir are an asset, and I think even some of the presenters from the other side pointed this out. Why wouldn't use that asset to better balance the competing demands of fish and consumptive uses.

And the SED seem to ignore the potential for active conjunctive use of groundwater and surface water. Yes, when we irrigate fields, water percolates down. If there's unlined ditches, water percolates. But is there a potential to significantly ramp up conjunctive use in these basins, and how might that change the water supply impacts that the SED considered.

This slide here, and I assume most of you are aware of this, but this slide is figure 7-9. It shows how much the percent changes in New Melones Reservoir in different year types. And the reservoir levels at the end of September never change by more than 2 or 3 percent, and most of the time it's a zero change. So they have modeled all of the model impacts, assuming you're meeting fish flows, the new fish flows, but you're not -- the water supply users are cut off and can't dip into the reservoir because you have to operate the reservoir the way it was operating I historically. And I think even Tim O'Laughlin said they wouldn't operate that way. Maybe I misunderstand him.

Now, would operating the reservoirs more aggressively potentially cause problems for hydropower and cold water pool? Yes, potentially. But that would be a more realistic thing that you need to consider. In some ways it was clever that the staff set up the analysis to look at it this way because it creates, in my view, a worst case economic water supply impact. Now we need to go back and see how much could you push the boundaries of the reservoirs without pushing them too far for the cold water pool or hydropower beneficial uses.

So this just shows how much reservoir storage there is on the Stanislaus. They have somewhere around 230 percent of average annual run off that they can store. That's just enormous compared to the Feather River in Oroville or the Sacramento River in Shasta. The San Joaquin basins have very large reservoir capacity compared to the average annual runoff, much more so than the other rivers in the Central Valley. Perhaps less so than the Colorado River, or definitely less so than the Colorado River. But this is a really import asset, and it's not being considered in the SED.

Lots of storage. It's less so on the Merced. There they have about 100 percent of annual runoff they can store.

So I am not going to spend a lot of my time on my next point, how can the month economic impacts be mitigated. But I do think that things like groundwater banking, conversation, changing the crop mix didn't get enough consideration, and I think Doug Obegi is going to talk more about these points.

So if we conclude that there are -- if you conclude that there are very large economic impacts of meeting the needs -- the water supply needs of the fish, and you can't mitigate those impacts, then it seems like it would be reasonable to consider non-flow measures to reduce the water costs. But even then, I think you need to take a stepwise approach. You can't just sort of wave your hands and say it's not the water, it's the bath, and let's go off and solve that problem. You've got to identify where and when the water supply cost are unacceptable, and I assume that's going to be mostly in dry years.

You have to define what are the ecological impacts of reducing the fish flow in those year types. So if you can't meet the fish flows in the dry years because the economic impacts are so big, what are going to be the impacts to the fisheries. You need to identify that, and then you need to identify how a non-flow measure might address that impact. And you'd have to know how you would measure -- or whether that non-flow action was actually working. And if there's not a way if it's measuring it, it's probably not a very good action. So, there may be reasons to go to non, flow but you should do it in a very deliberate approach.

I know hard your job is, and we heard that everything else is about money but water is about livelihoods and family. And so I think that causes it's sort of a jump to let's figure out how the non-flow measures, that will solve our problems. It's not a panacea. First of all as you know, it's not clear you can require some of these non-flow measures. Even if you do some of the non-flow measures and they work really well, they are not going obviate the need for flows. And my current thinking on it that's not very well developed is that the non-flow measures are probably going necessary more in dry year types, and probably are going to have more benefit in dry year types. If you can create little bit of floodplain habitat by excavating floodplains in a dryer year type, you can get some floodplains without gig flows, that's going to be good. But it's not going to be thousands of acres.

Honolulu bar is two and a half acres. And I'll say that the OID is working on actually -- and the other districts, on trying to create floodplain habitat. American Rivers is partnering with OID to try do Honolulu bar number two. And we need to move these kind of things forward as quickly as possible, but it's another two and a half acres. And to really make the populations grow, we'd probably need to be having a hundred or a thousand acres of floodplain habitat. Maybe we're wrong about that, but I think in wet years you're probably going to need the flow and you can afford the flow. And been in dryer years, even if you can create fish on the floodplain, you still need to solve the dissolved oxygen problem. You've still got to solve the water temperature problem. You can't just not have flow. It may reduce your water supply costs, but it's not going to eliminate them.

Non-flow measures take time, and the most important measures can take a decade or more. I am not going to say several decades because I don't accept that it needs to take that long, but unfortunately that's how slow the bureaucracy moves sometimes. And I think I've already made the case that we can do can small scale things here. But they take a lot permits, and we've got to work a lot of things out with the flood board. And the large ones are really going to take a lot of money and a lot of time.

So if you do go down this non-flow path after this stepwise analysis, it's very essential that it be part of an adaptive management program that's aimed at advancing specific measurable, achievable, and time bound objectives. If you go to non-flow measures and you say, you know what, we can achieve the same thing with non-flow as we can achieve with flow. You need to prove it to us. You need to tell it what it is you are trying to achieve with flow, and then we need to measure whether your actually doing with non-flow measures. The program of implementation must have metrics. Any flow measures in the program of implementation must be meaningful commitments. As our lawyer Richard Roos-Collins says, it cannot be "woulda, coulda, shoulda." It has to bind somebody.

And I think you're going to be in a much better position to bind other parties if go through the stepwise process and methodically demonstrate this is what we think the fish need. This is why we think there is economic impacts that can't be mitigated gated. And I am not sure that is going to be the case, and I think you have a lot of work ahead of you on really clarifying what the economic impacts are. It's not obvious to me that everything we heard yesterday is true. Certainly the people that stated it believed it, but I haven't seen enough analysis to know whether there are economic impacts that need to be mitigated. And for that reason, we are not for jumping to non-flow objectives here as a solution in lieu of water until there is that demonstration.

Thank you very. Much and I'm sorry to say I am going to need to leave in a half hour for a family commitment, but I appreciate you staying and listening to everybody.

MR. HENERY: I am also impressed with your stamina, and I am disappointed that Charlie is not here, but maybe he's planning his next fishing trip. I am Rene Henery. I am the California science director for Trout

Unlimited, and we've just spent some time in the forest of the details of flow and percentage of flow necessary to achieve some change in the status of fisheries and floodplain restoration opportunities. And I am going to take us take us I think a little bit above. You could say we've been in the trees, we're going to forest. We've been in the forest, and now we're going to fly above it a little bit. But I want to just focus on some big picture stuff, and then also talk a little bit about adaptive management. I also want to just credit our colleagues at the fish agencies. I thought they did a really nice job yesterday at clearly laying out what a good adaptive management framework looks like, especially the folks from Fish and Wildlife. And today I want to talk a little bit about some specific examples of criteria that we would use for adaptive management, so I'll get there hitting on a few other key points.

I thought you said he was good. So overview of key points. Adequate flows are essential, and that's really -- I am just going to stress that. I also want to point out after yesterday I decided these slides really needed some sort of inspirational background because of the lack of natural light and inspirational background in this room, so that's there for your enjoyment to the extent you feel like using it.

Also multiple benefits are associated with more flow, so we've -- there's a popular trend in a lot of these discussion to break impacts to fish down into these component parts to make them sound like they are not associated: predation, disease. Flows is the base. It's everything. And just as it -- and I'll talk about as it can promote a lot of these negative impacts, it can also promote a lot of positive ones. It drives a lot of the a lot positives ones.

I also am going to talk about how salmon population targets -- and I didn't put doubling goal because I don't like that expression either. Salmon population targets having a bar are really essential for achieving success. You have to have something that you're working towards. You have to know how much habitat you're trying to create. So those population targets are really key. And to echo Doug's point, the narrative objective really needs to reference the CVPIA/AFRP salmon population targets. And like I said, I am also going to talk about physical and biological indicators can help with implementation or achieving those population targets.

Overall point I want to make this talk: If you don't build it, they won't come. You know, I heard the comments yesterday about the hope. We're doing all this for a hope we can recover. The if you build it, they will come perspective is a hope. And, you know, evidence like Jacob Katz's project on Knaggs Ranch that maybe some of have read about in the papers basically has juvenile salmon of the size that appeared in our glorious past wandering out of rice fields the same way that Kevin Costner's fictional baseball characters wandered out of corn fields. But I am not going to promise that if you build it, they will come. What I will promise is if you don't build it, they won't come.

And the one thing that we have not tested is higher flows. I mean, basically I really heard and made an effort to listen to yesterday the concerns that were expressed from the folks in the agriculture community. And in addition to digesting how real those concerns are for those folks, and should be for all of us, I came away with two other things. One of them is that in those areas agriculture has not been enough. Agriculture is on the rise, agriculture is doing well, and the yet the communities are still suffering. And maybe you guys saw the article, I think one of our constituency referenced it yesterday, about 85.4 billion in the recreation industry in California. So a we're talking about a very little, and I think perceived as much larger than it is, comprise on the part of other water use to promote an opportunity that will, I think, make the overall economy and the impacted regions more sustainable in the long term.

The other thing that I really came away with is just everybody's desire for assurance, you know, and the reality is there are no assurances in nature. And I'll use nature in the broadest sense. I certainly don't have any assurances of anything in my life, and I've never met anybody who does. We live in uncertain times. I also really appreciated Hal's comments yesterday that the best we can do is use the science and tools that are available to us -- and the law, the structure that we have created -- and do the best that we can. And so I encourage you to do that, and I know it's not an easy task.

So I won't harp on this but I'm going to say it because it bears repetition. Our salmon populations are hammered. The idea that they will collapse is kind of -- you know, it's all of these terms are relative and semantic. You can make the argument that they are already in collapse, and that what we're seeing right now is their swan song. I personally don't believe that's the case because they are an extremely resilient species, but they are beat up. And the status quo is rapid decline. So if we preserve the status quo, we preserve decline. It's going to take more than the status quo to get us to stabilization as John, I think, really specifically pointed out. And it's going to take even more than that to move us toward recovery.

I thought I'd keep the flowcharts simple and symmetrical with the background, but the point being flow is related to a lot of other things that people like to separate out as if they weren't related to flow. So earlier we are heard about how flow will change temperature and how temperature won't actually affect predation because the predators won't leave. And that was actually a mischaracterization of the way temperature affects predation. Fish, being cold blooded, do what their environment tells them to do. They respond to temperature. It affects their metabolic rate, and it affects their activity level. Most of our predatory fish are warm water species that have been introduced. So when you make temperatures colder, you actually lower the rate at which those predatory fish are consuming. It's not that they go away. Its that they just don't eat as much. And that's well documented. There's good science showing that.

The other thing that happens with increase flow is that you are able to inundate more floodplain areas. Certainly you can create floodplains, and I'll talk a little bit about that. I work on the San Joaquin restoration, and I'll talk a little bit about that in a few slides. But one of the things that has really come at that projective in looking at alternatives is that it's very, very, very expense to try to recreate floodplains. We have alternatives that very quickly got excluded because of the costs associated with moving that much dirt. There's also good new science. In my geeky quest to be up on floodplain literature, I just recently had a conversation with a grad student at UC Merced who's working on productive in the Merced basin and different floodplain habitat types. And she was talking about how much less productive she sees in floodplain habitats where the soil is missing. So you think about that too. When you're grading floodplains to create habitat, if you don't then replace the topsoil you could significant lower the value of that habitat in terms of the productivity that it's offering, and your cost goes up even more. That's not to say it's not a good solution and part of a portfolio of solutions that we will need in order to solve this problem in the long term, it's just to caution against looking at that as an alternative to providing more water.

The other thing that flow does is it improves out migration. Having salmon that go out on floodplains and little salmon that get blasted through the river in the same year is a good thing because it diversifies life history strategy. Having diverse life history strategies improves resilience. If all your kids ride to school on the same bus and the bus gets in a wreck, your kids are done to use an off color example. Done an off Court will come to order

BOARD MEMBER SPIVY-WEBER: It's like splitting the baby.

MR. HENERY: Absolutely. I went to boarding school and many of my classmates' parents used to send their kids on different planes because a few fear of this. Do I think if we only had two salmon we'd want to put all our eggs in the same basket? No. And we have essentially very, very few. So diversifying life history to improve resilience is a good thing.

BOARD MEMBER MARCUS: All right. I just have a request. And usually I just ban shooting metaphors. This one is hurting babies. I think from now on, only sports metaphors. You were off on a really good start.

MR. HENERY: I think that's totally legitimate. And so I will move away from that when I talk about predation, which I was going to do next and go to sports and say the other thing about floodplain habitats versus our current scenario is it's like taking Pee Wee footballers and throwing them into NFL against the San Francisco defensive line.

BOARD MEMBER DODUC: Can I change that request from sports metaphors to Kevin Costner metaphors?

MR. HENERY: I mean, I'll see what I can do. Something with Water World maybe.

But the point being that if your kids aren't doing well in the NFL, and they are Pee Wee-ers, you don't say we need to go out there and reduce the number of defensive linemen on the other team. You say we just need to grow our kids big and send them there when they are open prepared to play. So the predator reduction is a great thing, but if your kids aren't prepared to play in that league, it's only going to get you so far.

Levity is a good thing in the afternoon. So with those things in mind, I want to talk about using criteria to measure progress towards the target. If we get more water and we use the targets that we have, how do we then track our progress towards those targets. How do we take those targets and ground them in something that everybody can pay attention to that's real, that's transparent, that will tell us whether we're making progress. And I really feel like echoing the comments of the agencies yesterday. This needs to be included in the SED. We want to see what the adoptive management framework looks like, and we want to see what the criteria are so we can engage on that because it matters. And it means you can meet the targets more effectively.

So physical and biological criteria provide you concrete milestones. They highlight what is and isn't happening, so you can also use more flow to incentivize other things. You can say hey, the water is here and we're not seeing fish response. But we also are inundating all the floodplain habitat we need. We also aren't hitting or temperature targets. So it really drills down on to what is being taken care of and what isn't. And it allows flow to be adaptively managed and ratcheted back. If we just have one pie in the sky target, then even when we increase flows and do the tests we need to do, we won't know if we are succeeding or not. If we have scaled targets for fish, for habitat, over years that we're adaptively managing against, if we are hitting those targets consistently, we can think about ratcheting flow levels back. I think John did a good job of pointing out that it's not just about take, take, take water. It's about let's come up with a solution that works and a process for managing towards it that's transparent, and work together to implement that in an effective way.

BOARD MEMBER MOORE: On that point. It rings a bell in terms of a lot the information we received in terms of hitting targets. One of the targets that the biologist for the San Joaquin Tributary Authority was looking at was smelt production. The idea that within these water sheds we don't manage, what kind of biological end points do we feel we have more control over. Is that a good example of something that could be used as a target?

MR. HENERY: That's a great example.

BOARD MEMBER MOORE: In the adaptive management framework.

MR. HENERY: That's wonderful example. And I have a side coming up. And this one, this is just highlighting the points from John's presentation and also just an opportunity to say that I think that we should really thank TBI for the attention they have given this. They have put a lot of energy into thinking really carefully about the science. And so, you know, it frees us up to have conversation around these other things. So urge you to really just look carefully at written comments that they have when they submit them, and the ones they submitted in the past.

To your question, I have here some examples of bio-criteria and productivity down there on the bottom productivity. Productivity, abundance these are great criteria. And with juvenile out-migrants you can also have the ones that have to do with life history diversity. So in a system where you don't much floodplain habitat in a high flow year, you'll see your fish move out really fast, really small. So you can establish -- you can approximate life history diversity in different years by looking at the relationship between size, flow, temperature, and timing of out-migration, and size relative to out-migration as an example. So in our written comments, we'll provide these and other specific suggestion about things that you can include in an adaptive management framework like the ones that the agencies talked about yesterday. But, yeah, that's the great example.

The other thing you can do is have physical criteria to complement the biological ones. Yesterday we heard some, and today also, about how you would quantify floodplain habitat. What I haven't heard so far that I wanted to talk about is how you connected in floodplain habitat with the biological targets. And we've done some of that in the upper San Joaquin, and in my next slide I'll talk about that. But in general, you can have specific floodplain habitat targets for your target number of out-migrants. You can have temperature thresholds for your predation during specific key windows. You can have temperature thresholds for optimal growth for the fish. So all of these things should and can be -- in the opposite order -- be included in the adaptive management framework.

So on the San Joaquin restoration we have had this exact question. So we want to figure out how much and what type of habitat do we need to build to reach our salmon targets. It's in the settlement that we have to address floodplain habitats specifically. So using that as an example, we took three different approaches. The main approach was a fish-driven approach. So we used the model that Cramer Fish Sciences developed that uses habitat size -- or territory size needs for individual fish as a function of their size and how much food is available and how much cover is available, which research shows affects how big of a territory fish need. And then we took space -- we modeled spacial and temporal distributions of fish as they are out-migrating and dying off though a river and calculated on any given day at any one spot, how much floodplain habitat do you actually need to meet those targets. So that gave us a number. Then we -- it gave us an overall number, and it also gave us a number for each individual fish.

Then to sanity check that, we said let's do a habitat driven approach. Let's take the estimate total habitat area that used to be in the Central Valley and divide it by the estimate of total salmon adult returns in the

Central Valley and come up with a ratio. And then if we assume a certain number of juveniles for every male and female salmon, that gives us a ratio of habitat to juvenile needs for total fish, total area. And that interestingly, we got a number from that was almost the same.

And then we also went to the Yolo Bypass, which is still, even though it is limited, our best study floodplain in the Central Valley. And we asked Ted Sommer what has your research shown on the amount of habitat area needed for a fish based on your density estimates, and we got a number from that.

BOARD MEMBER SPIVY-WEBER: And how did it compare?

MR. HENERY: All of the numbers we got were between 0 and 4 square meters per individual juvenile. This plot is a graph of territory curves that we used in the modeling that Cramer Fish Sciences did. And the curve that we use is the one in the middle there, and you see that you have size on the bottom and territory size on the Y-axis. And as fish get larger, they need a bigger territory. But you can see that basically, if you look at that green middle curve, most of the fish shake out between 0 and 6 square meters. I think the Yolo one was two square meters per fish, the historic floodplain estimate was somewhere around 3, and the Eshee (phonetic) model one varied by fish size, but it was between 0 and 6.

This is not to say use those numbers. This is to say we have done a lot of this research already in other places, and it's not leading us to wildly different conclusion. It's actually aiming us toward the same place, and towards the place that allows to develop floodplain habitat estimates to meet our targets.

And I wanted to contextualize that by saying that this is the same approach that the waterfowl folks have done a fantastic job at managing birds back almost from the brink with. They created a target based on their current target which was impacted at that time, developed habitat needs based on those targets, and then just managed the population and those habitats back. And it's the same approach that the Central Valley Joint Venture uses to establish their bird targets. It's a function of historic populations -- or historic habitat area, and their population basically like the salmon doubling target. They took I think it's like the 75 percentile based on their current, you know, population estimate.

All of the approaches that we're talking about to manage ourselves back to healthy fishery are out there. They are not new. They are agreed on. They are tried.

And a lot of the science that's necessary to put them into effect is happening right now. And so like I said, we'll include our suggestions about what that framework looks like and what some of those specific criteria are in our written comments, but I think that there is a lot of hope for doing this in a very transparent and straightforward way.

So just want to conclude by summarizing recommendations. First one, please include the salmon population targets in the narrative objective. They belong there. They are what will allow us to manage toward specific goals. Increase flows to a minimum of 50 percent based on the work that TBI and others have done. But again, I think 50 percent should be the bottom end of the range, and the range should extend higher. And we should start with flows that are greater than 50 percent and then ratchet them back. It's a lot harder to increase them down the road, especially given everything we're going through now, than to decrease them once we show success. And we have not tried water, which is the most intuitive and obvious thing for a scientific standpoint to try for fish. I would encourage that the range begin at 50 percent.

Continue to expand enhancement actions to complement flow. Flow by itself will not do it. We need floodplain restoration for sure. We need targets for floodplain restoration. We need temperature targets. We need predator management once we already have kids that are big enough to play in the NFL. So all of those things need to happen, but they need more water as a baseline. And then establish biological and physical criteria that will allow us to make specific steps toward achieving those fish targets and make those steps transparent and allow everybody to understand how we're going to manage flow adaptively in the future. Thank you.

(Reporter change.)

MEMBER BOARD SPIVEY-WEBER: Thank you for coming.

MR. OBEGI: I've already proven I can't manage the mouse. So I get to bat cleanup. I also batted leadoff. So I'm not what the right baseline report is there.

Doug Obegi. I love doing science and I love getting to work with these guys who work on flows, but today I really want to talk about law. You know, I think the fish agencies and the biologists to my left have really done a good job on the science, and I want to talk about your job because it's really hard. I recognize it's a lot easier on my side of the dais than it is on yours, but I think your predecessors have laid a good path for you to follow. With some tinkering with the SED, I think you can get that.

Three main topics I want to cover in the next 20 minutes and hopefully ten. First is just a basic premise of law from the Supreme Court that the board must protect public trust fishery resources to the extent feasible. We recognize that you're not going to be able to do that all the time and not everywhere, but you have to try and do it to the extent feasible, and that requires some certain steps that we'll talk about. Second main point is that when you are balancing beneficial uses, you have to consider not just those economic impacts, but the economic benefits of reduced diversions, and you have to consider alternative water supplies and other alternatives that are available to folks who do divert water because fish don't have a choice of alternatives, and we all have been able to improve how we use water. And there is a tremendous track record for both agriculture and urban users, a real success story we all too often don't tell because it may lead to concerns that we're going to lose water in the future.

The last point is, as I read it, the substitute environmental document really underestimates the aquatic resource impacts at baseline or 35 percent of unimpaired flows and overestimates the agricultural effects. I want to explore that because I think it sets up a bad

dichotomy, a really unfair balancing.

Next slide.

So, first, ever since the Mono Lake decision, the courts have made clear that you have to protect the public trust to the extent feasible. And in determining what's feasible, you have to consider alternative water supplies. That's been clear from the board's decision in Mono Lake, it's clear from some of the court decisions, it's also clear from the Yuba County -- the

Yuba decision. And we have a number of other decisions that we'll send to you in writing, but ultimately there are alternative water supplies that can reduce the impacts to diverters, and we need to also include in that program of implementation not just the flow measures, but the nonflow measures, because they do work together and it shouldn't be an either/or choice, but it's an and choice, and the Board has substantial authority to require those measures in the program of implementation.

Third point here with respect to the public trust is that the legislature has constrained your balancing obligations to some extent. The section 5937 of the Fish and Game Code has been held by the courts to be an expression of the public trust, and the courts have said that the Board can't balance away that obligation.

The same is true with the state and federal Endangered Species Act. The legislature has spoken and said this is a minimum that we have to do. And I would argue that the salmon doubling, be the CDPIA goals and the AFRP goals -- we won't say salmon doubling. We'll say the salmon production targets -- are another expression by the legislature of the public trust and the obligations that we owe to future generations with respect to salmon, steelhead and other anadromous fish, and we don't get to just balance those goals away. Ultimately the Board has to demonstrate that its program of implementation and record will achieve its objectives and will protect the public trust to the extent feasible, and that means achieving the scenario of salmon doubling objective that exists in the current plan, that means achieving the language of whatever narrative objective will be which should include, in our view, both the AFRP salmon targets as well as protecting viable populations of other fish.

Next slide.

And when you balance beneficial uses, the legislature explicitly talks about considering alternative water supplies, including water recycling, but you also need to consider the economic and social benefits of reduced diversions, and that things like sport and commercial fisheries, that's nonmarket valuations as which was made clear in the Mono Lake decision and improved downstream water quality. There are potential benefits there. And right now the SED doesn't include a lot of that information.

Next slide.

Right now, as currently drafted, the SED really doesn't -- it assumes no impacts to aquatic fishery resources under baseline conditions. It's a traditional CEQA analysis. We look at the changes and see does it make things worse. And as far as CEQA goes, I think you can do that. But you also have to recognize, and I think SED in particularly in the technical report recognizes that under baseline conditions we are seeing continuing declines and we are putting our salmon population at grave risk. And that's why the scientific peer reviews of the technical report all recommended the higher end of the range or even higher, found that there was a real strong scientific basis for what the board was trying to do but that our fisheries really were at risk under baseline conditions.

And I think you also need to find a way, whether it's using the forthcoming salmon production model from California Department of Fish and Wildlife or the thresholds that TDI, et al., have worked out to assess whether you're actually going to achieve the AFRP targets and whether you are going to be able to sustain salmon through both the flow and nonflow measures, and right now we're not doing that.

In contrast to that analysis on aquatic resources, the SED assumes significant impacts to agriculture under baseline conditions. So you're already setting up a situation where under the baseline the SED makes it sound like things are fine for fish, but they're bad for agricultural diverters; and the truth is under the baseline things are tough for all of us, both for fishery resources and for agriculture, and I really think you need to find a more consistent way to level that playing field.

As expected, the majority of effects occur in drought and dry years, and as the SED recognizes but doesn't quantify, improved water use efficiency can reduce those impacts.

The SED does include the IMPLAN model to look at how reduced diversions would change cropping patterns. It's a very well-respected model as far as it goes, but there's a couple refinements we think really need to take place.

First the Chapter 11 does acknowledge that improved irrigation efficiency and other improved agricultural water use practices can replace or augment some of the lost surface water supply and contribute to reduced groundwater pumping. Doesn't quantify those. We decided to do so working with the Pacific Institute.

The SED identifies three potential water use efficiency tools, increased use of irrigation management services like CIMIS, the California Irrigation Management Information Service. It's a highly technical methodology that uses satellites and remote sensing and local weather stations to give you precise irrigation management ability.

Second tool the SED identifies is a conversion to more efficient irrigation systems, moving from flood irrigation to sprinklers and from sprinklers to drip and micro, and third is increased delivery flexibility.

The SED looks at the existing types of irrigation practices. This is a slide, a graphic from the SED itself. Farmers in the basin and in these groups have made tremendous improvements in irrigation practices. That's why we can produce twice as much crop per drop as we did 30 years throughout the state, but as you can see, there is still a lot of flood irrigation that's remaining in these counties and a real potential to continue to improve our irrigation efficiency so that we're managing the water delivered to meet the crop needs.

Pacific Institute did a report for us that we'll be submitting next Friday looking at three particular scenarios, two of which come directly from what the SED called for. One was improved irrigation efficiency, the second was expanded use of regulated deficit irrigation, and the third was expanded use of CIMIS.

And it's important to recognize that these scenarios are not additive. It's not like you can add these three numbers together that I'll show you and say, hey, we can save, you know, X million of acre-feet and there are tradeoffs. Flood irrigation does cause some groundwater recharge. There is no question about it, but it also loses water through evaporation, through transpiration of nonintended crops, weeds. You also have a lot of losses and you're recharging the groundwater potentially in a dry year, not necessarily when water is most scarce.

The report looks at the costs and the economic benefits of developing these three tools because there are upfront costs, particularly with respect to irrigation efficiency, and there can be losses in terms of yield with regulated deficit irrigation. Over time a lot of those costs actually do balance out.

So with respect to regulated deficit irrigation, California has a great track record actually of seeing that we can improve our yields or maintain our yields as compared to the amount of water we use. For some --

BOARD MEMBER MARCUS: What's the geography of this? Is it the geography of this or is it a bigger geography?

MR. OBEGI: It's just the ten DAU's. It's actually smaller than the area examined in the SED. But it's primarily just the ten DAU's within these three counties. So we asked them to look at just this information and rely, whenever they could, only on the information in the SED.

Deficit irrigation is saying basically instead of providing the exact amount of crop transpiration needs, you apply less water, but your yields go down less than the percentage reduction in water application. And for some crops, like orchard crops, we're seeing that you can do regulated deficit irrigation with minimal or no productivity losses. That particularly true with orchard crops. There's a recent study from 2011 from Sac Valley that saw that kind of results.

For alfalfa and other crops, you do reduction in yields, but if you reduce water use by 25 percent you might see a ten percent reduction in yield. So there is a savings there and a cost.

So this scenario assumed that applied RDI to 25 percent of the irrigated alfalfa, almond, pistachio crops and vineyard acreage within the boundaries of DAU 205 to 215, and on average you can save up to a hundred thousand acre-feet, obviously less in the wetter years and potentially a little bit more in some of the dryer years. There are costs associated with that, as much as, you know, five or ten million dollars in lost revenue, but compared to some of the costs of completely fallowing fields, there are real tradeoffs there.

Improving irrigation efficiency, likewise, we looked -- the Pacific Institute looked at transitioning from flood to sprinkler for some crops and from sprinkler to drip for orchards in particular. And we saw that they ran a couple scenarios looking at a ten percent -- transitioning ten percent, 15 percent or 20 percent of the acreage of particular crops within these DAU's, and you could see water savings of 60,000 to 170,000 plus acre-feet per year.

And, finally, expanded use of CIMIS, which was a real hard one for them because the only -- CIMIS is well respected and a lot of people like the tool, but there's not a lot of recent information about how much it's being used and potential water savings. So this one has a real big uncertainty bound to it.

They looked at using it. They assumed that about 25 percent of farms use CIMIS and they looked at expanding it to another 25 percent, came up with this number, but obviously this one is one where I think we have a lot less comfort in finding the precision of the answer, but the general point remains, that improved efficiency with these tools can minimize some of those impacts or reduce them.

BOARD MEMBER SPIVEY-WEBER: And CIMIS is a particular approach, but there are others -- there are other approaches that are very similar and those are being used probably more than CIMIS in that region.

MR. OBEGI: Potentially true, and there's definitely a lot of folks that have dramatically improved their efficiency over time. There no question about it. But the notion we don't have any more gains to make is just as false as to say that no one has ever improved efficiency.

You know, we talked about the Board, the staff did a really nice job of talking about how the SED has taken a worst case scenario approach to the agricultural effects, and it explicitly acknowledges that the IMPLAN model usually overestimates the indirect job and income losses and should be seen as sort of the upper boundary on job and income losses, and there's a number of reasons for that, you know.

Over time, you know, particularly in the short run, it's probably better than it is in the long run because over time people do adapt, businesses come in. It doesn't account for things like improving efficiency, water transfers, water substitution, et cetera.

But, again, we're setting up a model where the SED sort of looks at the aquatic resources and says there's no impact under baseline conditions and things might get a little bit better but you're not sure you actually meet. And I think the testimony from the scientists and from the fishery agencies have said that 35 percent won't achieve your goals and your requirements. But you don't have that information in the SED. And so it sets up this unequal playing field.

SED does provide some estimates about the loss of acreage, the reductions in income and reductions in jobs, and there will be people who are affected by your decision. There will be fishermen, there will be farmers, there will be exporters. A lot of people will be affected. But I think it's important to recognize that the impacts are -- the impacts may not be as big as any of us fear, and we hope that we can minimize them through both improving efficiency in some other tools including transfers.

You know, the 40 percent alternative talks about a 1.5 percent reduction in agriculturally related jobs in these counties and regions, and a 1.5 percent reduction in crop revenues, and I can tell you that the fishing industry would love to have had only a 1.5 percent reduction in jobs and revenues over the last

20 to 30 to 40 years.

Agriculture has been improving and has been doing really well in some of these counties. Obviously revenue is not the same as income. But there is a dramatic growth in revenue over time. I think we have to recognize that as we think about how we balance all the different interests that we're trying to protect.

This one I just wanted to put up there to draw your attention to the fact that the impacts at different alternatives may not be linear, and you can see here -- this is from the SED from Appendix G and it's one of the few places where I could see a 50 percent alternative analyzed. That the impacts -- the marginal revenue loss per acre-foot is dramatically less than it is at 60 percent, similar to what it is at 45 percent, and I do think it's worth thinking about should the Board run a 50 percent alternative.

You know, you had a lot of that information in your earlier version of the technical report on agricultural effects and some of that got taken out in the version that was included in the SED. So I didn't want to rely on those numbers because they had changed somewhat, but even just providing this kind of information I think gives you a better ability to fine tune where within the range you fall.

So there's a couple refinements to the water supply and agricultural effects analysis that we recommend. One is that you should quantify some potential improvements in agricultural water use. You know, whether you want to use the results that we'll present to you, whether you want to talk with DWR, get some information from them, but I think you really should include some of that information.

The second, and this is one where I think Board staff, I think, candidly acknowledged that these things can't happen at the same time, that we have some internal consistency about groundwater pumping. Right now, the SED says that we're going to -- go to the next slide -- we're going to not have any additional pumping with respect to agricultural effects, but we're going to completely offset the reduction of surface supplies with respect to groundwater effects.

And that may work as sort of a worst case scenario, but it doesn't give you an accurate assessment of what things are going to do, and it just feeds sort of fear on all parties that the worst case is what's going to happen. I think taking an internally consistent approach is a much better way of presenting that information to the public because ultimately this is not just for you guys, but for members of the public to understand what really is going to happen both on the fishery side and on the agricultural side.

A couple other points I wanted to make very briefly. One is that the SED also ignores water transfers, and historically that's included water transfers for the environment like the Vernalis Adaptive Management Plan where water users throughout the basin were contributing to that, and I think, you know, we're now in a situation where the Bureau is -- has a difference of opinion with the Board and ourselves with respect to what flow requirements do exist under Decision 1641 and a position where they probably can't meet them certainly in every year.

So what it does by omitting those transfers is that we're -- as compared to the historic past, the baseline says that there's actually going to be more agricultural production because it doesn't account for the fact that people are transferring water and understates how much water was flowing in the Tuolumne and Merced because those rivers were contributing to meeting.

Likewise, there have been a number of water transfers outside of the basin, whether to the Los Angeles Water District, to other water users, and when we ignore those, we ignore the potential to -- we again may overstate the effects.

I also want to raise one point with respect to transfers that I have made with the trib guys and the exporters -- exporters hate me anyways, but they really don't like this point. The SED assumes that increased flows may result in increased exports because exports are a function of how much water is flowing down the river in terms of meeting your hold and middle river flow requirements.

That's fine as far as it goes, but it's also important to recognize that the trib guys can protect that flow and prevent it from being exported because it is ultimately their water, their water rights, and so they could dedicate that to instream flows under Section 1725 and that there is the potential through the implementation to reach transfer agreements and other agreements so that the exporters could export some of that water and contribute some money to the water users to fund irrigation improvements, to fund conjunctive use programs, to fund habitat restoration and the like.

The last point I want to make is with respect to flow caps. It is one place where I think the SED may understate the water supply impacts, at least one. Right now, the SED puts in place some flow caps that are dramatically lower on each of the tributaries than the flood control requirements, and there is not a really good explanation for that. But it has really problematic effects because right now with those flow caps in place, you could never achieve a monthly average of 10,000 cfs at Vernalis because the flow caps are less than that.

And there isn't a really good legal justification for that. You're putting water that's dramatically less than the flood control requirements and dramatically less than what would be there in a state of nature, and I think the Board may have been a little overly -- staff may have been a little overly conservative in setting some of those thresholds, and I'd urge the Board to really take a hard look at that and eliminate those and recognize that there is an obligation to maintaining flood control capacity in the system. And if that obligation isn't being maintained, we need to find out about it and remedy it, but the solution is not to cut back flows and harm the ability to meet any floodplain inundation or the salmon doubling flows. And I see my time is up. Thank you.

BOARD MEMBER SPIVEY-WEBER: Thank you. Any questions?

BOARD MEMBER MOORE: One thing as I try to synthesize here, one of the common themes. June. You know, we saw in your presentations, gee, there is kind of this April-May sweet spot and then 50 percent versus 35 and all those points and then June being problematic for other beneficial uses like hydropower.

Do we have some ability to sort of balance, if you will, the fishery needs and the other beneficial use needs by dealing with the calendar month proposals? Do you see any opportunities there?

MR. OBEGI: I think there is some -- I think it's worth exploring, but you also have to think back to those flow -- the flow/fishery relationships are based on monthly averages that included the month of June. And flows in June are important both for that life history diversity, the late migrants, as well as getting flows into the Delta and protecting water temperatures.

So I think it's -- it's something that we've talked about internally, but I think there is also some real countervailing arguments as well.

UNIDENTIFIED SPEAKER: Just following on what Doug was saying, once you get into the weeds on that, too, this is where temperature and flow relationships are really helpful. Again, as an example, on the Upper San Joaquin where we're designing our template hydrographs, we're just making up what the shape should be with the water we have available which is essentially the same charge, you know, that is put to you all. Looking at the temperature model gives us good information about when in what water year types a pulse flow is getting us where we need to be and where it's not.

So that's just an addendum to say if on top of your hydrograph you also have the temperature curves and the lines that show you the important thresholds for predator reduction at a given time, for optimal growth, for just survival of juvenile salmon then you, you know, can make some smarter decisions about how much gaming latitude you have.

BOARD MEMBER SPIVEY-WEBER: Thank you very much. Next up is South Delta Water Agency and following South Delta Water Agency, we have the Cal Spa, the California Water Network and Aqua Alliance.

MR. HERRICK: I'll go as quickly as possible.

Thank you, Board Members. John Herrick for the South Delta Water Agency. I would just briefly like to say I didn't realize this hearing would include discussions on responsibilities for salt. Rather, it was supposed to focus on what's needed to protect agriculture. So I'll address DWR's issues later. They have some good points, but it's not all the story. I would like to say in brief, though, that comments yesterday that six- to eight-inch decrease in water levels is not significant in South Delta is incorrect. I mean, it's a function of channel depth, of four-foot-high tide and the fact you can't put siphons or pumps on the bottom of the channel to suck water up because it doesn't work that way. Anyway, with that said, I'll move on.

Now, as you may guess, South Delta opposes the proposed changes in the standards, and I tried to make this presentation as simple as possible. Doesn't have anything to do with the Board Members' understanding. It has to do with trying to convey a very, very basic set of ideas which I think preclude you from relaxing the standard. And as you all know the current standards are .7 April, August, September, March and proposed is the one all year with the implementation plan which tries to keep the downstream situations the same.

Now, as you've seen before South Delta -- I like to put the maps up just to give you a frame of reference. There's an arrow here somewhere. The easiest way to look at the South Delta is that straight line there is Grant Line Canal and the dip there is Old River. So we have three barriers, we have water quality monitoring stations, there's Vernalis. That's the framework.

Now, the other thing I wanted to say which is almost on point, not really, is this is the -- these are the reports from the Department of Water Resources on monthly EC. And if you quickly look at the Old River near Tracy, you can see that in February we had a stretch of exceedances of the 1.0. So I just want you to understand that perpetuation of the current situation will still result in these sort of exceedances.

Now, in a year like this when it's turning out to be dry, that becomes important. If it's a wet year, there's a lot of flow and you have a spike, maybe that's not so important.

Anyway, the proposed changes suggest that the South Delta will be protected even if the salinity standards are relaxed. This conclusion is based upon Dr. Hoffman's report that calculates a range of leaching fractions and from those leaching fractions Dr. Hoffman concludes a worse water quality still protects South Delta.

Now, leaching is a basic issue here. There are a lot of ways to put it, but leaching means how much water of a certain quality do you have to pass through the root zone or out of the area in order to not adversely impact the crop that's growing or the plant that's growing. So it's a function of how much salt in and what concentrations results in an acceptable amount of salt out and not salt building up in between. That's just the basic method.

BOARD MEMBER MARCUS: So you're protecting the soil over time, not that individual plant.

MR. HERRICK: Correct. It's the soil profile. I apologize for being colorblind. So if this looks horrible, that's because I don't see things. Whatever the color of the big rectangle thing is, say, that's soil profile. So you have the plants on top.

BOARD MEMBER MARCUS: That would be Tam's favorite color.

MR. HERRICK: Really, I don't know what color that is, but it's bright.

Anyway, if you're going to determine a leaching fraction in a lab, you look at the EC water in and then EC water out and sometimes you look at the soil. You dry it out, but you determine how much salt that went in goes out.

Now, in the real world, and I don't mean that pejoratively, but if you go out in the field, you can't do it that simply. You can't just measure one thing and another thing and come to a conclusion because when you apply the water in the field, the EC changes and it changes significantly in South Delta. The soil may already contain salt, it's difficult to measure the amount applied. Mostly they make estimations. It's impossible to measure the amount of water that went through the soils, though, because you have to have a big pan under the root zone to catch the drips so to speak. There is no method that takes only the water that passed through the soil profile. And, of course, it's difficult to measure other things, too.

Now, the way you would determine a leaching fraction in the field -- sorry about the colors again -- but you would start by measuring the soil salinity. So you know what you start with. And the way you do that are the little squares in the left. That's what we're undertaking right now in the South Delta in cooperation with the UC Delta Cooperative Extension Service. We take soil samples at various heights at the beginning of the season, and, you know, I can't explain everything, but they dry them out, they check the soil, they get averages and then do a number of those in one field and another place in the field. Then they measure the EC, the salt that's going onto it in each irrigation. That allows them to calculate how much has been applied.

Now, there's a lot of calculations. I don't want to say estimation. But it's not specific necessarily, but that's how they do it. And then at the end of the year after they're done irrigating, they know how much salt was applied, they know how much salt started in the root zone and then check the root zone and see how much salt was left. Then they can say, aha, we added X amount of salt and some percentage of that made its way through and/or stayed in the soil.

So in the lab you control everything, salt that went in, what salt left, you calculate your leaching fraction. In the field you have to do a different approach, use how much salt was already in the soil because you didn't control that to begin with, and you measure how much salt you put on and then how much was in the soil at the end.

Now, Dr. Hoffman calculated the leaching fraction by looking at an assumed applied water EC. So he made an assumption as to the salt that was applied and then he looked at the drain water EC.

Now, the problem with that is, I don't want to overestimate, but the assumed water that's an assumption. You don't have any idea where the range or what the extreme was of the salt applied, and I'll show you why that's important.

But the big problem and the reason that there is no evidence to support changing the standard is the tidal drain water is not the water that leaked through the root zone. That's the accretions into the tile drain from the groundwater. So he's not measuring or didn't have any data on salt out. You can't make a calculation -- you can make a calculation, but the data is not indicative of the salt that passed through the root zone.

So there is no -- the leaching fractions are meaningless because you looked at a salty groundwater sample, compared it to the water you applied and calculated a leaching fraction. That calculation has nothing to do with what happened in between, which is what you're looking for, the leaching.

So, now, here are just the pages from Dr. Hoffman's report, and the reason I put those up which is the description which nobody can read. The description says what he did. Here is the assumed water quality, and in the final report there is different assumptions how about if it was this assumption rather than that one. That's fine. But each one of these, the three different reports, what he compares to the applied water is tile drain water, not the water that made it through the soil.

Now, the tile drain water may include some amount, may not, it may include some amount, but it also includes all of that horrible groundwater that we have in the area.

Now, I'm just overemphasizing this. So when Dr. Hoffman calculated leaching fractions, he didn't know how much salt was in the soil to begin with, he didn't know the amount of salt applied, he doesn't know and nobody knows the amount of salt that passed through the root zone. There is no data on that anywhere. He doesn't know the amount of salt that was left in the root zone. He doesn't know the amount of groundwater that was in this sample. I think it was mostly all, but we'll have to address that later, and he doesn't know what ended up in the root zone.

Now, if you don't know any of those things, and there isn't any doubt that he doesn't know any of those things -- I don't mean that nasty. I just mean that what he did doesn't include any data for any of those things -- then you can't calculate a leaching fraction and say, fine, we can grow crops there. It don't work. I mean, it's that clear.

Now, I apologize. I'm just trying to explain a tile drain. People ask me what the hell's a tile drain. Sorry. A tile drain is they dig down in the field some trenches, they put a big feeder line in, and then they put these little lines in or may drain little feeder lines, and the dots are just, you know, holes in the pipe, they could be slots, so that as the groundwater rises or is already there, it leaks into the pipe, that pipe drains in the big pipe, and the big pipe is then pumped out somewhere and it, I'll say, artificially holds down the soil, the water, the groundwater, the shallow groundwater.

Tile drains can be deep, they can be shallow. They can certainly collect excess water that moves in the soil, but their purpose generally is to take the water out of the ground, not to intercept every drop that goes to the root zone.

Now, this just explanation of tile drains. I'm not trying to be overly stupid here, but I want to point out I'll be submitting declarations with my final comments, but I talked to the New Jerusalem district manager, and New Jerusalem district is one of the districts of which data was derived in the reports that Dr. Hoffman relied on. There was an examination of tile draining from New Jerusalem.

So I called them up and I said, yeah, I don't want to sound like an idiot but, you know, don't your tile drains get groundwater and not just surface water drain, you know, that seeps through? And he said, Our tile drains don't get any surface water. So, you know, you'll have to see what the declaration said. If he changes his mind, I'll have to deal with it. So there is no surface water in some of the calculations that Dr. Hoffman made. There wasn't any indication of what passes through the soil, none.

So he assumed applied water and data that has nothing to do with how much salt leaches through the soil, then he made a leaching fractions. Well, I submit to you, eventually in another forum probably, there isn't any data. It's not like it is unreliable. There is no data.

Now, in South Delta the good water quality is in various places, there's medium water quality in various places, there's bad water quality in various places. You know, the export projects pull good water across the system. We have some null zones. Some of those null zones aren't bad. Some of them are horrible. But it depends on where the water comes from, and this addresses Dr. Hoffman's assumption of the water quality applied and I'm just trying to get that.

As you can see, this is similar to DWR's map about where null zones can be. Depends on flows. But I want to highlight to you with arrows here if you can get arrows to your screen, too, this part between these arrows is the worst water quality we have right there at the bottom.

Now, the area that Dr. Hoffman looked at gets water from the Delta Mendota Canal, which is good water quality here. But across the barriers it also gets water from here somewhere. Right there is the Westside Irrigation District. So we don't know when the data for his applied water he assumed .7 and he assumed .1, we don't know if it was .4, we don't know if it was 2.0. So his assumed applied water is -- I don't think you can rely on it. Other places in the South Delta is fine, but those other places are not where the data came from, not at all.

Now, these are Dr. Hoffman's locations of tile drains that he used data for. There are three different reports. This is one of them. The rest of them aren't on the map here, but they're down lower down southeaster. Now, I don't know all the farmers, I don't know all the drains here. This one over here is on Pescadero Tract. That tile drains in the groundwater.

I just want to try to assure you that I'm not making this up. The drain is to keep the shallow bad groundwater out of the soil profile. It's not the excess applied surface water that leached through the soil that leached salt. It's not. So if this groundwater is 2,000 or 2,500, that makes a big difference if the water that leached through the soil was 800 or 12,000. He's getting data that doesn't mean anything.

Now, that's not his fault maybe. He got the data he could, but there wasn't any sampling of leaching because you can't put a cup under a field and say, here's the water that leached through the soil. You can do that in a lab, but you can't do it in a field. You can only do what I was describing earlier.

Now, here's the map of the points of all the locations of tile drains he looked at superimposed upon the South Delta, and the reason I want to bring this up is, as you can see, most of these points are over here I keep describing as west, I guess, west, northwest of Tracy and then these New Jerusalem over here. This is the area I'm circling. This is the area of the water quality issue. It's not the west side of Tracy.

Now, that doesn't mean they don't want good water quality, but they're getting Delta Mendota Canal water, some of it mixed with Old River water, and we don't know what quality that is because it's not anywhere in the data, and some of it's directly from Old River not mixed. There is differing rights of people within Westside Irrigation District.

But it's tile drain water. It's not the excess applied surface water which would give you an answer, but the area of concern is Fabian Tract and Stewart Tract and Pescadero and Union Island and Roberts Island. It's not west side of Tracy that gets CVP water. Even if his numbers are correct, there is no way they would apply to the rest of the area that has a problem.

Now, I wanted to show you this real quickly -- you can yell at me this is off point. I don't think it is, but you can yell at me. This is a chart from -- you've had way to many charts -- from a 1980 report -- yeah, it's an old report -- this was an estimate of the water quality in the Delta and pre -- it's different decades, and the brief was look at pre-CVP.

So I want to highlight. Here's February. And I just showed you those violations of the 1.0 standard in February. In February in the '40's and '30's and even the '50's, which is before the CVP got going, the water quality is down here at 200 TDS. Now, I put the two lines in for the EC, although the one EC line is a little too low. But, you know, we got 200 TDS and we're now violating the 1.0, you know, that's three times.

Now, everybody is going to argue you're not entitled to that fresh water quality. Fine. But I want you to understand the magnitude of the impact that's going on here is that in winter when it was the best water you could imagine just before the spring, you know, we're now hoping that the three times worst water quality concentrations will be protected, and we see that they're not. You know, we have water quality violations, right, and what do the projects do? They send you a letter and say, It's not our fault. Literally. That's the system we have.

Now, varying soil types in the South Delta. The reason I put this in, if you can get located again, here's Grant Line Canal, so the City of Tracy is over here-ish. You see the different soil types. Well, look at where all the samples were taken. Over here west of Tracy and down here. That's not South Delta that we have a problem with. You know, I'm not arguing for good water quality on Tracy Boulevard in the middle of town. That's not the issue. And these samples are all taken out here in areas that don't have anything to do with the problem area. The problem area is up here with these different soil types.

Now, Dr. Hoffman many, many years ago along with Terry Pritchard and some guy named Meyer who I don't know, but I know his name, they did work on in the original development of the standards, and I want you to see what they said, including Dr. Hoffman, about the permeability of the soils in the South Delta. They're horrible, some of them. As you can see, 40 percent are slow and the permeability is, and this sounds like a nonsensical lie, but this is their data, .2 inches per hour.

Now, if it's your intent to leach salts through a soil column where the root zone is and the root zone could be two feet, four feet, six feet, how long does it take to move that water through that soil? It takes a long time. And so the roots which have to wait for the moisture to come down have grown down into the bad water quality groundwater and are unfortunately forced to use some of that because some places you simply can't force enough water down fast enough.

Now, why can't you force the water down fast enough? You can't put two feet of water on your field and wait for three weeks. That's not how it works. You know, crops, you get root damage and rotting and all sorts of things and you can't put more water on and wait, especially a crop like alfalfa where you harvest it regularly, you know. Alfalfa does an irrigation, then they let it dry out so you can drive on the field and they cut the alfalfa, they rake it into a row, and then they bale it and then they irrigate it. So if you have to make seven cuttings a year or something, and that's what you do because that's how you make money, we can't say, well, just leave the water on for three months and forego, because you wouldn't grow the crop. It doesn't work. You can't get the water through the soil, and it's my assertion that Dr. Hoffman didn't address that well enough.

He has a section on the movement of water through expansive soils. Well, you can speculate all you want, but if water goes through 40 percent of the soil at that slow rate, you're not getting any leaching because you can't move the salt because the water is not moving.

Now, we explained this to Dr. Hoffman, especially the example I gave you about the alfalfa. There are certain things involved that prevent you from simply putting water on and forcing it through. There wasn't enough time to leach. This sounds petty. This sounds like the old John Herrick, and I apologize to Member Doduc. We said this to Dr. Hoffman.

BOARD MEMBER DODUC: I'm sorry. You've been polite today?

MR. HERRICK: This is my fast. I'm trying to be fast for you. It's almost polite. I can be nasty. I'd like to impugn the integrity of your staff, no.

BOARD MEMBER MARCUS: Just don't say you hate salmon.

MR. HERRICK: Love salmon. And I'm not going to make any horrible metaphors like were made before.

This was stated by Dr. Hoffman. No offense. Alex was there. He was the one who said it to him and Dr. Hoffman's response to these limitations on the ability to leach was, "I can't help if it you have bad management practices."

Now, I'm not going to put anybody on the spot and ask them to confirm this on your staff, but that is what Dr. Hoffman said. So when Dr. Hoffman was confronted with an ongoing normal agricultural practice that impeded the ability to leach and thus brought into question some of his conclusions his response was, well, I can't help it if you don't know how to farm.

Cutting, raking and baling hay is a bad management? What are we supposed to go find hover craft with laser beams or something? Anyway, that's -- that's an indication of the lack of field practice understanding that underlies the report.

You look like you want to yell at me. I don't mind.

BOARD MEMBER DODUC: No, I was going to point out that now you've gotten it in record staff will have to respond to it.

MR. HERRICK: Oh, it's been submitted before. Anyway, the local groundwater. I've told you about the poor groundwater. That's not my estimation. I've dug a few holes, had the farmers dig and sampled the water. We're going to submit those to you in a little bit. The two studies cited by -- there's actually four -- but two of the studies cited by Dr. Hoffman include estimations of the various water qualities from various samplings. It's a huge range. Look at the 9400 EC. That's just, you know, put your finger and it melts off or something. You know, that's bad quality. We have bad groundwater quality.

If I were petty, I would say, hmm, that might be a function of 50 percent of CVP salts applied to the soils, but I wouldn't say that because that would be a cheap shot.

Now, the other study was a Montoya study. That included some surface drain water, but I can't find the data, there's references here, and the problem with the surface drain water is that a surface drain water is probably in the South Delta mostly just excess applied that didn't go through the soil, just ran it into the field and down the drain. But, anyway, you still have to know what it consists of in order to make it leaching. Anyway, I just wanted to make sure I didn't ignore the Montoya report which I would excoriate in other forums.

The mouth of the South Delta is low. We're not the Central Delta. We're not below sea level. Okay. Some of it is at and just below sea level, but most of our lands are above sea level. So a good range for the ag purposes is that what I have up here minus five to plus ten feet. That's a good range. It's not exact for the whole area.

And, of course, as I explained earlier if you have that bad shallow groundwater, when the tide goes up, unfortunately the groundwater goes up. It's not quite the same magnitude, but it's in sync the whole time.

And so when any salt is leached through our soil profile, it goes down into the groundwater three feet down, and next tide it's pushed back up a certain amount of inches. So even if we're leaching, which we're probably not a lot of times, the salt's not going anywhere. It's not exiting the system. It's pushed back up the root zone twice the next day.

Now, any particular spot would have to be examined to see how much that affects something, but when I went out and had a farmer dig a hole in the ground and we measured EC this last week -- we'll be giving declarations -- he was shocked. I mean, he's a good farmer. He said, holy mackerel, my groundwater is three feet down with 2,000 EC groundwater.

Now, for anybody familiar with agriculture, that shouldn't work. Who knows if we'll ever have comprehensive studies that look at all that, but it's that big of a problem when you have that shallow groundwater.

I put this slide back up again just to remind you where those locations were that the samples that support the document come from or these dots, and here are the elevations of those various sites. Those elevations are taken off of Google Earth. I don't submit that they are down to the, you know, inch. But if you put a Google Earth cursor on the dot, it tells you the latitude, longitude and altitude, or elevation.

So you can see from areas that are minus five to plus ten feet, we have samples from, you know, some three feet, we have all these samples from '30's and 40's and '70's, they're 109 foot above sea level. Now, if anybody thinks that anybody above 30 feet the groundwater is affected by tides, you know, I would submit that that's not true. So that means that again the data used doesn't bear any resemblance to the problem we have in the area.

This is my summary real quick. Six minutes? Is that six minutes on 20 minutes or a half hour?

BOARD MEMBER SPIVEY-WEBER: Half hour.

MR. HERRICK: You want me to end then? I was going to touch on couple other things. Beans. We hear about beans. Any time you here somebody talk about beans can live with regard to salinity, they're approaching this all backwards. It's not a question of what a bean can put up with. It's a question of what happened in that soil, you know, so you find out what leaches and what's there, and then you say, okay, we've got X amount of salt, now what plant will live there or not, you know, have a decrease. So you don't say what do beans need. You say, well, what's the salinity of area of the water they have.

And the reason I say that is when you do the analysis, which we think is correct, then you see the poor leaching and you see the buildup of salt in the soil and you say it doesn't matter if it's beans or kelp. It's collecting salts. That's what our soils do. They collect CVP salts until somebody tries to flush them out. Some places there might be good leaching. I don't know. Our tests will show you that. I would recommend that before you adopt a change you wait for our tests and then you have actual data. We're going to get different elevations, different water qualities, different soil types so we have some good data. Whether that's enough for you I don't know, but that's when you should make a decision.

I won't go to the modeling. One of the things I do want to say is, you know, we're struggling here to assign responsibilities for both salt and -- excuse me. We're struggling to find out what it takes to protect beneficial uses for salt or fish without having determined who caused the problem. I know nobody wants to do that, right, but it's one thing to say a polluter who adds millions of tons to salt over the years, that's a tough impact on him. I'm not going to make him clean up his pollution because the impact is the South Delta. That's not the balancing we're doing. Your job is a lot easier if your enforcement was directed to address these issues.

In other words, if we quantified who impacted the fisheries, you may not have to squeeze water out of the tributaries to make up somebody else's killing of fish. If somebody were forced to stop putting salt in the river, you may not even need a standard in my area. But we're approaching it from after the harm's already been done without ascribing the responsibility for making up for that harm first instead of -- or last instead of first.

That's all I'm saying. I appreciate the time.

I hope I didn't take too much. I just want to reiterate real quickly because the thrust of my discussion is the calculation of leaching fractions that was done has information for one of the calculations and it doesn't have information for the other part. It used tile drain, but tile drain is not the indication of how much leached through the soil. That's the question. Not how bad the groundwater is. Groundwater is horrible. So if you take a groundwater sample of 9,000 EC, right, he would have said there is not one drop of salt anywhere, they leached all that all that salt. There's no problem.

Well, that's not the case. That's not the case. Anyway, that's South Delta's time. I apologize for being fast, rude and late in the day and, of course, I'll answer any questions you want.

BOARD MEMBER SPIVEY-WEBER: Thank you very much.

Now, we'll move to Cal Spa, California Water Impact Network and Aqua Alliance. They also have a half hour.

MR. JACKSON: I'm Michael Jackson. I'm representing three organizations you just mentioned. Mr. Jennings was going to do half of this presentation. He's got a medical problem basically that doesn't enable him to come today. So Mr. Schutes is going to take a couple of the things that Mr. Jennings would have told you, and I'm going to try to take the rest, and finish within the time period.

Generally when somebody makes a mistake you call that an inadequacy, and the way CEQA is designed and the way your regulations are designed, a CEQA equivalent would take a look at mistakes that were made in an environmental document. And there are many in this document and you've heard about them all pretty much with all of the people who talked in front of me.

So we would like to shorten our presentation by simply incorporating what the Bay Institute and NRDC did. We have the same kinds of comments. What I would like to add to that is in reviewing the SED, there is a missing document that I don't see as an inadequacy. I see it more as a category of intentional actions, and I know you're not going to like it if I ascribe this intentional nature to your staff. So I'll do it the straight way and I'll ascribe it to the Board itself.

BOARD MEMBER MARCUS: That's an improvement but hardly necessary. If you think this will make an effective point, go ahead.

MR. JACKSON: I actually do.

BOARD MEMBER MARCUS. We'll be the judge of that.

MR. JACKSON: I actually do because as we're going now, the courts are the only place that I can go because this isn't getting it done. So I need to be fairly straightforward, and let me describe what I see as the original sin of this whole project.

This is supposed to be about salinity in the Delta and the degradation of standards under the Clean Water Act, and as I understand the Clean Water Act, it contains something called an anti-degradation statute, element, and the State Board deals with anti-degradation on all kinds of different water quality cases and you have a standard which I didn't find -- I find it referred to vaguely in the document that is the SED.

You want to change the water quality from .7 to 1.0, and you want to do that based upon, as I see it from my experience, the fact that the Bureau of Reclamation refuses to obey it.

Some of you were here when your staff bravely tried to take on that aspect in a CDO hearing in 2006. You gave -- you found the Bureau was violating the agricultural standard and you gave the Bureau three years to clean it up. At the end of three years the Bureau told you they couldn't do it because they couldn't get permission to build barriers.

You then told them, well, there are other ways you can do it, and some of those would have to do with flow in the San Joaquin River. The Bureau even did a flow study about how much flow it would take to meet the agricultural standards that you're talking about degrading in this hearing. It wasn't that much flow. It isn't in the SED. And I think it would be fair for that to be in the SED.

As was pointed out earlier, the baseline on both flow and salinity assumes that everything is fine today and that the law is being enforced today, and that's not happening in regard to these agricultural standards. Basically what we are talking about doing at this point is because the Bureau says they can't meet them, they have contractual obligations that make them money, and your permit conditions don't seem to -- don't seem to be applicable to them -- maybe it's like banks and they're too big to fail -- but the idea here is that there is no anti-degradation analysis in the SED to deal with what your history here indicates you've known for years.

I can't see that as an inadequacy in the SED. I can see it only as a decision by very smart people not to open up a can of worms.

In the CEQA language, that would be an

incorrect project description, an incorrect environmental setting, an incorrect impact analysis, an incorrect cumulative analysis, and would keep every other part of that document from operating as a fair disclosure to the public and to the Board members who are going to make this decision. I think that's a terminal mistake, and I would encourage you to fix that.

Now, the whole of the project has some other problems here. The San Joaquin River flow which does have some influence on salinity in the South Delta regards a river that is 250 miles long from Devils Postpile or thereabouts in the High Sierra with the best water quality in the world. It is magnificent above an export diversion at Friant Reservoir where heretofore 90 to a hundred percent of that fresh water has been exported out of the San Joaquin Basin.

The river is not considered until it gets to the tributaries, the first one going downstream being Merced, and then is only considered for 47 miles until it reaches Vernalis and is not considered through the Delta. That kind of piecemealing of your project seems to me to be a fatal flaw if you truly are trying to do a CEQA equivalent.

Now, I've been here 25 years and have gone through three sets of State Water Board hearings on the

Delta. The evidence has been pretty much the same, in my opinion, each time, and that evidence includes three parties who are never really present in these hearings in regard to the San Joaquin River, and there is a reason for it, I believe, and I'm going to assert that here today and I'm going to assert it in the written information that you're going to get.

And the reason is that there is a salt cycle on the San Joaquin River system. Each time that salt cycle has been looked at in the past, the Bureau of Reclamation has been found responsible for it; and, therefore, the Bureau of Reclamation has been responsible for meeting the agricultural standard, the Vernalis standard, and none of the other senior water rights holders have ever been, after evidentiary hearings, cross-examination, you know, real live court kind of stuff, they've never found anyone else to be responsible, just the Bureau, and there's a reason for that.

The Bureau begins the salt cycle every morning and in the evenings, too, because it's a 24-hour operation in Tracy by taking water out of the South Delta that is salty, delivering it down the Delta Mendota Canal to contractors who pay them for the salty water and put it on salty land, selenium-laden land, boron-laden land, arsenic-laden land, and that water is redelivered through the ground and through some surface facilities, tile drains, to a place called Salt Slough. It was named long before the Bureau operation because that land is quite salty. Comes out the west side of the San Joaquin, water supplied by the Bureau under the Central Valley contracts and permits that you regulate.

The water at Salt Slough as it enters the San Joaquin River violates your agricultural standard in the Delta at Salt Slough. There is nothing in your SED about that because Salt Slough is not part of your 47-mile piecemealing of the San Joaquin River in terms of salt and flow.

The purpose of this hearing in some regard is to increase flows in tributaries that amongst themselves only contribute a minor portion of the salt load into the San Joaquin River, to take that fresh water from the senior water right holders and deliver it to the San Joaquin River through the tributaries.

Now, you're going to find that we agree completely with the 60 percent flow, and I'll get to that part, but the point is that we are delivering senior water rights water to help solve a problem that isn't theirs that is coming from the Bureau's west side operations and we're not looking at that in the SED.

Now, one of the reasons that we may not be looking at that is because above Salt Slough southerly but uphill there is an export facility at Friant that delivers pure San Joaquin water to Kern County, to Kern Friant Canal, a group of farmers who are not here because they're not part of the San Joaquin River problem evidently.

So I don't understand how we missed the San Joaquin River portion of the San Joaquin River. If you looked at the SED, this is not the San Joaquin River. It's the Merced/Tuolumne/Stanislaus River. And in that regard I don't understand why the farmers in that area are so willing to take flow from fishery restoration and not call down the water that is approximately 30 percent of the unimpaired flow of the San Joaquin River system.

Now, this combination of the upper river being absent, the salt load coming from the absent west side and the inexplicable absence for flow for fish and for salt for anything between Vernalis and the sea. Now, I understand that in this bifurcated set of hearings we may get to that. We may not. This SED says, and, you know, the kind of thing that could drive me crazy, is that there is no significant impact from the exclusion of the projects from this hearing because there's going to be no decline in their export water. None. We're going to try to determine what the salinity should be in the South Delta with the largest export operation that I know of in America operating within that boundary and completely, since it's the start of the salt cycle, since the Bureau controls the fresh water upstream, and since the Bureau puts the salty water from the Delta regularly on their own contractors -- allows the placing on their own contractors' land, then provides the loading at Salt Slough, I do not understand how this document could possibly withstand any sort of judicial review when the only 47 miles of this whole salt cycle of this whole fresh water diversion is controlled by the Bureau except this 47 miles. And in that regard I honor the work done by the tributary agencies even know I disagree with their fish stuff.

Next, the 2010 document was ordered by the state legislature because they needed to know finally after the 25 years or so that we've already worked on this -- well, actually it's more than that since Racanelli wrote his decision, since the State Board got beat in 1978, since EPA threatened to take away the State Board's jurisdiction, in all of those years we did not, could have, but did not get an idea of what flows would be required in the State Board's opinion. The legislature ordered it and you did, and you did it by having multitalented group of experts from all of the agencies, from all of the academics, all of the information that was put on by the agriculturalists was put on in that set of hearings. Same stuff. Same stuff by us. Same stuff by the environmental groups that testified here earlier today, and you reached a conclusion and that conclusion was 60 percent of unimpaired flow.

Now, it was made clear in that document that that was what the public trust would require before it was balanced. I may be wrong. I have not read every word of the 6,000 pages that are in your document. I found one reference to that report. It's not -- it should be the starting place. This 35 percent is absolutely unfounded if you know about the 2010 report.

I was wondering until Bill evidently talked to Mark Gowdy recently whether or not that was even going to be part of your record or whether I had to go get the 2010 report and put that and everybody's testimony into this record.

That document is excellent justification which leads me to my third major flaw. I've never been as proud of the State Water Board as I was the day they came out with the Mono Lake decision. The principles, the process, the solution, the success was absolutely astounding. I've gone up and down the east side of the -- from Quincy to Mammoth, from Quincy to Yosemite, and I love stopping there and I love seeing the improvement and I love the fact that you all -- you worked it out and did it together.

I looked through the SED to try to find -- they use the word "balance" many times. You know, we're coming down from 60 because we're going to balance. I didn't see any of the level of effort that was in Mono Lake. The conclusion that I could come to is that Mono Lake was successful because there was only one enlightened or was made to be enlightened water exporter, and that the Delta is either not important enough as Mono Lake or too complicated for the principles and processes of Mono Lake.

The Loomis report on Mono Lake was just astounding. I hired -- have hired -- you will get some of that information next Friday -- one of the top economics firms in the country to take a look at your document. We'll have those comments on economics. But the first thing that they reported back was how can the same agency that did Mono Lake turn in this kind of work economically?

Because in Mono Lake there was a value established for the lake. I can look through that SED in the economic section and I can't find any value to a healthy Delta. I can't find any indication of benefits to increased flow. I can't find any comparison of Delta agriculture and agriculture in the trib areas or actually in the areas that I think are junior to the trib areas and less valuable long term than either the trib area agriculture or the Delta agriculture because the salt cycle isn't there.

So we're going to be commenting on the fact that if you came down from 60 based upon an economic balance, you haven't established that it's not feasible to protect the trust, and you have not done a fair, impartial economic analysis of costs and benefits for the people of California, and the Delta deserves it just like Mono Lake deserved it.

Okay. There are many impact analysis failures in the document, failure of flow in regard to fish, riparian habitat, analysis of groundwater, what will happen when they have to shift if they do from surface water to groundwater.

One of the ones that Bill Jennings wanted me to make sure I pointed out is that the agricultural standard in the Delta of .7, there was talk about beans and beans and beans and beans. On the levees adjacent to the farm land are endangered plants that are salt --

that can be salt impaired. No examination at all of what such a change would do to the native ecosystem endangered species.

All of this, in particular the salt cycle's effects, are cumulative impacts. Well, if you don't have the direct impacts in there, you can't do the cumulative impacts. And so this 47-mile segmentation is a problem.

Now, I want to have Chris finish for me. My conclusion before I do that is everyone in the audience, everyone who testified was right about this document. We will all have to sue. My advice for you is please collapse this hearing into your comprehensive review, put this information into it, it's not bad information, and look at the Delta as the whole ecosystem it is.

BOARD MEMBER DODUC: You have three minutes.

MR. SCHUTES: I'll do my best to get it done. These are more specific comments. A lot of it goes back to the way that the modeling was set up and the objectives set for storage. Basically looking at the document and the modeling, reviewing both of those, the objectives in the narrative form do not set a rule for storage, but the rule for reservoir operation is set as a modeling artifact.

So you basically have a backdoor policy or objective that's embedded into your modeling exercise, and as the tributary group suggested earlier, either you need to explicitly make rules that define reservoir storage or you need to change your modeling.

A way to approach this would be to have different operational scenarios under which different storage approaches were taken and to model those explicitly. But, instead, what happens in the SED is you push the whole question off to an implementation work group.

So the problem with that, though, is that you're going to ask that implementation work group that's going to consist in part of tributary association folks to come up with operating rules, and the first thing they're going to say is, well, we can't operate this way. In fact, they already said that today. But your absence of fisheries impacts is dependent on existing storage -- carry-over storage from year to year. So either your -- either your storage requirement has to change or your modeling group has to be given something, but then you're going to have to go back and say, look, if we operate differently, then we have to go back and analyze all these fisheries impacts.

What you heard from most of the tributaries folks today was almost exclusively based on impacts that stem from changes to carry-over storage. They just basically ignored the rule curve that's set up in the SED as something that's impractical, and then they went ahead and modeled it as they think they would operate.

This is -- and I won't go so much in the technical part of this, but just sort of in the process way, in the process of doing this, you needed to establish what the operations were and the operational scenarios might be before you released the SED. You can't suggest on the one hand that we're going to have this same carry-over storage and then tell folks on the other hand to go out and figure out how to operate. That doesn't make sense.

Something that Bill was particularly concerned about is the range and the way that in the narrative's objectives that you set up compliance. Compliance is defined extremely loosely. It's defined, first of all, as being between 25 and 45 percent, and then it says you may authorize the -- the Board may authorize modifications at its own discretion, and then it says if a plan that is developed by coordinated operations group or the implementation work group, whichever one it happens to be at that point in time, is designed to fall within that range, then it will be within compliance. So there's basically no real standard for compliance in this document. Granted that goes to the rules, not to the -- and to the objectives, not to the SED as such, but if you don't know what the rules are and how you're going to comply with them, you can't analyze the impacts.

Finally, a couple of other things. Sorry. I didn't plan to do this. So going forward, I guess, what you need to do is put together realistic operation scenarios and figure out what they're going to be and then come back and model them and see what the impacts, and you may end up with very much greater fisheries impacts than those that you've analyzed. Although I agree with a lot of what Dan Steiner said, I wouldn't necessarily agree that you have to do it exactly like he said.

And, finally, the comments from the City of San Francisco were similar to comments and testimony they presented in the 2009 special FERC proceedings, and I would say that that needs to be modeled as an alternative, not as simply something that's going to happen or not going to happen. Because the caveat at the beginning of their presentation and at the end was we don't necessarily agree with this, but this is the worst possible scenario. I am sure that Mr. Fermin will be arguing that perhaps the city's obligation to meet a

Board requirement is not the same as the city's obligation to meet a FERC requirement, but I think that you can navigate the city's issues by setting up as an alternative, and frankly as far as alternatives go, I think that different carry-over storage requirements might also be set up as alternatives and that would be a way to navigate that particular problem.

We'll have a lot of other comments relating to downstream effects and fisheries. We agree with a lot of what was said. We have some biology -- biological testimony that we'll be submitting, but we'll do all that in a written form and now I'll be quiet and hopefully everyone can go home.

BOARD MEMBER SPIVEY-WEBER: I have one blue card of Dean Ruiz.

Do the Board members have any comments?

BOARD MEMBER MARCUS: I do. Thank you to you hardy folks, some of whom have been here both days. I may have an iron butt, but I found it helpful to sit in a focused way and listen to so many different points of view and so many -- I take them as suggestions for how we could improve the document so that it gives us a basis to make a decision of some kind.

And obviously we had an ample expression of potential and real pain at both ends of the farm to fish spectrum and other things, energy included. Our trick is going to be to figure out how to balance all of this, and that is our job, and it is going to require a clarity of purpose and options and information and a realistic assessment of impacts.

So I thank you for the time that you spent trying to help point us in the right direction on this, including talking about worst cases, but also talking about varieties of cases in between that and no pain.

So I do actually -- I always like getting the ways in which we can improve and I hope the staff doesn't take any of it personally. The only time I got irritated was when people were starting to be personal. Otherwise, it's not a personal thing. So hopefully you've taken it all in and will be talking about the things we heard in addition to the things that you were writing down so that we can do our job however we do it, which is to do it in the best way possible.

So that's all I'll say for now. Just that I really appreciate all the time that people put into it, not just sitting here, but in preparing to be here and the work they're going to be doing between now and when the comments come in on the 29th, and I can assure you we will take it all very, very seriously.

BOARD MEMBER DODUC: I definitely second

Felicia's comments and thanks to all you and the Board will receive the written comments, and while Felicia alluded to it, I will just go straight out and thank the staff. We all know how incredibly hard you worked to get the draft SED document out there and it's not easy, it's never easy I've been in your shoes, actually, once working for Tom doing Bay Delta work, and it's never easy to sit there and listen to your work being criticized and dissected and all those other things, and I think everyone in this room and everyone who left recognized the hard work that you all put into this, and I think most of us recognize that the true and pure motives that all of us, especially you, given the blood, sweat, and tears that you've put into this in terms of producing a document that will go towards accomplishing the goals and objectives that we all want to accomplish.

So really from the bottom of my heart, thank you for the the work that you've done and the work that you will continue to do because judging from these two days, hopefully you're not planning any vacation or any time off any time soon.

BOARD MEMBER SPIVEY-WEBER: I second both of my colleagues and the silent second of Steve, but I also have some written statement I have to read at the end or the staff will kill me.

The Board will --

BOARD MEMBER DODUC: We'll protect you.

BOARD MEMBER SPIVEY-WEBER: No, you can't leave. It won't take long.

The Board will take your comments and consider them in preparation of the final SED. If you have further comments, you may submit them by noon, noon, noon on Friday, March 29th. Once we have the certified transcript from the court reporter, we will post it on our Web site. You may continue to follow this project on our Web site and all future notifications will continue to be sent to our Bay Delta e-mail distribution list. Please ask staff if you have any questions about signing up for that e-mail notice.

The next steps in this process are for us to prepare the final SED based on comments received and a draft of the revised Bay Delta Water Quality Control Plan. Both will be released to the public for comment, but there is no date by which this will happen. So that's for our internal discussion, and if anyone has any further questions?

Hearing none, the hearing is over.

(Whereupon the Hearing concluded at 5:34 p.m.)

CERTIFICATE OF CERTIFIED SHORTHAND REPORTER

I, WENDY E. ARLEN, hereby certify that I am a Certified Shorthand Reporter; that I reported in shorthand writing the foregoing matter at the time and place therein stated; that the foregoing pages are a full, true and complete transcript of my said shorthand notes and is a full, true and correct record of the proceedings had in said matter at said time and place.

Dated:____________________________

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WENDY E. ARLEN

Certified Shorthand Reporter

California License #4355