

**M & T / Llano Seco Fish Screen Facility
Short-Term/Long-Term Protection Project**

**Workshop #5
Technical Team Recommended Alternatives**

September 30, 2008
Llano Seco Ranch Headquarters
Chico, CA

MINUTES

The meeting was held at the Llano Seco Ranch Headquarters, Chico, CA

Attendees:

Beverly Anderson-Abbs, Executive Director, Sacramento Conservation Area Forum
Koll Buer, Consultant to the California Department of Water Resources
Howard Brown, Fishery Biologist, National Marine Fisheries Service
Josh Brown, Administrative Associate, Sacramento Conservation Area Forum
Stacy Cepello, Environmental Scientist, California Dept. of Water Resources
Amada Cox, Hydraulic Engineer, Colorado State University
Yantao Cui, Research Scientist, Hydrology/Geomorphology
Dennis Dorratcague, Principal Engineer, MWH Global
Sandy Dunn, Attorney, Somach, Simmons & Dunn
Howard Elman, Esq., Attorney, representing Dick Thieriot, Llano Seco Rancho
Woody Elliott, District Resource Ecologist, Calif. Dept. of Parks & Recreation-Northern Buttes District
Kevin Foerster, Project Leader, Sacramento National Wildlife Refuge Complex
Jim Gaumer, Engineer, M&T Chico Ranch
Greg Golet, Project Ecologist, The Nature Conservancy
Quene Hansen, Engineer, City of Chico
Michael Harvey, Principal Geomorphologist, Mussetter Engineering, Inc.
Les Heringer, Manager, M&T Chico Ranch
Mike Hoover, Deputy Assistant Field Supervisor, Ecosystem Restoration Program, U.S. Fish & Wildlife Service
Eric Larsen, Research Scientist, Geology, U.C. Davis
Chris Leininger, Project Development Consultant, Ducks Unlimited, Inc.
Tracy McReynolds, Assoc. Fishery Biologist, Region 2, Calif. Dept. of Fish & Game
Tamara Miller, Principal Engineer, MPM/Engineering, for the City of Chico
Kelley Moroney, Refuge Manager, Sacramento Valley National Wildlife Refuge Complex
Robert Mussetter, Principal Engineer, Mussetter Engineering, Inc.
Bruce Ross, Engineering Geologist, California Dept. of Water Resources
Neil Schild, Principal Engineer, MWH Americas
David Sieperda, Manager, Rancho Llano Seco
Richard Thieriot, Shareholder, Rancho Llano Seco
Chris Thornton, Hydraulic Engineer, Colorado State University
Paul Ward, Retired, Associate Fishery Biologist, Region 2, Calif. Dept. of Fish and Game
Gregg Werner, Project Director, The Nature Conservancy
Carl Wilcox, Chief-Water Branch, Bay Delta Conservation Plan, Calif. Dept. of Fish and Game
Kathy Wood, Assistant Field Supervisor, Ecosystem Restoration Program, U.S. Fish & Wildlife Service
Dave Zezulak, Environ. Program Mgr. I, Water Branch-Bay Delta Conservation Plan, Calif. Dept. of Fish & Game

Welcome and Introductions. Workshop Facilitator – Jim Well, Mgr., Conservation Programs, Ducks Unlimited, Inc.

Jim Well opened the meeting welcoming everyone and thanking Richard Thieriot, owner, and Dave Sieperda, ranch manager, at Llano Seco Rancho for once again hosting the workshop. He also thanked Les Heringer, ranch manager, M&T Chico Ranch for working with Llano Seco Rancho for providing the refreshments and buffet luncheon for the workshop.

Jim explained that he has replaced Olen Zirkle, who started this project in 2002 as Project Manager, and just recently retired. He also informed the Steering Committee that he has an engineering background and had been a principal with Ducks Unlimited during the time of the original pumping plant relocation from Big Chico Creek to the Sacramento River along with Neil Shield, MWH Americas and M&T Chico Ranch.

Jim explained that he would facilitate moving through the heavy workshop agenda and that it was important that the group comprehensively move through each presentation and answer all questions to make sure everyone has an understanding of the information. He explained that the goal for the workshop was to make recommendations to CALFED concerning a possible long-term solutions for the project.

He asked everyone to speak clearly and loudly so everyone is able to hear because there was no speaker system. He explained housekeeping items and that the meeting was scheduled for all day with a one-hour lunch break in-between. Jim proceeded by adding the following item to the agenda after the 1:00 p.m. presentation by preliminary design presentation Dennis Dorratcaque, MWH Global:

Presentation by the City of Chico regarding the status of their wastewater treatment plant outfall relocation.
Tamara Miller, PE.

He asked everyone to introduce themselves and recognize their affiliations. He requested that all participants be sure to initial the sign-in sheet or add name and signature. Jim proceeded by moving to the first agenda item presented by Les Heringer.

Project Background

Les Heringer, Manager, M&T Chico Ranch

Les began his presentation by thanking everyone for working on this process that started in 1991 when U.S. Fish and Wildlife Service and California Department of Fish & Game together with The Nature Conservancy who bought part of the Llano Seco Ranch. I've been working on this process because after that happened the unscreened diversion on Big Chico Creek became a big problem for the agencies and we had some real proactive people working for the agencies and one of them is here today, Paul Ward, California Department of Fish and Game, and then Ramon Vega and Harry Kramer. They were real proactive and we all sat down to solve problems, they were real problem solvers. First thing they did was we went up to Butte Creek, we had an unscreened diversion and we put a screen on it in 1992-93 and then we said we had a bigger problem on the Big Chico Creek. Let's solve that and so that leads me into my timeline. I know that there are some of you that have not been here before and I wanted to be detailed.

In 1861 the Llano Seco Ranch enterprise began. In the early 1900's, I'm not sure of the exact year, but somewhere between 1910 and 1915, the pumping plant was built on Big Chico Creek. And, of course it used river water by drawing the water back up the creek from the Sacramento River to the plant. That was the safest place at the time to put the plant to divert water from the river. It survived and pumped water every year until it was we shut it down in 1997.

In 1935, the M&T ranch began prior to that the owner Phelan worked with the Llano Seco Ranch people, the Parrot family, in putting all this irrigation infrastructure in place. In the 1980s the creek diversion was identified as potentially impacting fisheries. In 1986, the California Legislature enacted Senate Bill 1086 which urged the development of the Sacramento River Management Plan. In 1989, the Sacramento Conservation Area Forum Handbook was adopted as part of the Senate Bill 1086 process and in it, it called for restricting river meander where studies indicated where the river meander would impact public and private facilities including our coarse our pumping plant and the sanitation outfall for the City of Chico. In 1991, U.S. Fish & Wildlife Service, California Department of Fish & Game and The Nature Conservancy purchased through fee most of the easement of three quarters of the Llano Seco Ranch.

In 1994, we contracted with CH2MHILL to do a feasibility study on how to solve the problem we were creating on Big Chico Creek. The best site for river intake was identified as being on the east bank of Sacramento River immediately south of Big Chico Creek. I mentioned that CH2MHILL had done the feasibility study and I want to just quickly read the notes of a meeting we had in DWR on November 3 and John Crow who was an engineer with CH2MHILL was the engineer in charge with that feasibility study. "This meeting was held to discuss and evaluate of potential locations along the Sacramento River for M&T and Llano Seco's pump station. A geomorphologist, Stacy Cepello and Kohl Buer presented exhibits that showed the various river channel locations for the last 100 years. The most stable area was the east bank immediately south of the mouth of Big Chico Creek. Migration of the river channel to the east is blocked by both rip rap and by a cemented sedimentary deposit that establishes geologic control and channel migration to the west is possible but both Cepello and Buer considered it very unlikely that the site is as the downstream end of a long-straight run of the river which has been stable throughout the recorded period. The influence of Big Chico Creek on the rip rap will both tend to keep the deepest part of the channel along the east bank." We all know that history, that's all that we really did for the study to relocate that plant right there. Of course, this has been a five year process that we have been involved in now. Hopefully, we come up with something that is more secure than what we came up with through that study.

In 1996, we began construction on the new pumping plant and it took 1 year to build it. In 1997, the M&T Chico Ranch and Llano Seco Ranch pump station relocated – fishery benefits included increased flows in Big Chico Creek, eliminated reversed flows in Big Chico Creek, reduced entrainment, dedication of water in Butte Creek by ranches in exchange for ---- reliable supply. And, of course a screen and reliable water source for the state and federal wildlife refuges on the Llano Seco Ranch.

In June of 1997, the plant was dedicated by over 100 attendees and I know a lot of you were at that meeting. State Resources Secretary, Doug Wheeler, Fish & Wildlife Regional Director, Michael Spear and many others all spoke of the unique partnership of state and federal agencies, private landowners, conservation organizations and unveiling a project that significant environmental benefits and set an example for others in similar situations up and down the Sacramento River and other rivers throughout the state.

In the year 2000, we knew we had a problem out there. The gravel bar had moved about 1200 ft downriver. We had a serious of very wet winters in the late 90s and the gravel bar reacted significantly by moving 1200 downriver and then at that time we could see that river was starting to erode the west bank of river on Fish & Wildlife Service property. We contracted Stillwater Sciences to give us an idea and decision on what the best short-term alternative was and that was to remove the gravel bar which we did in 2001. We moved over 200,000 tons of gravel and piled it on the M&T Ranch. In 2002, we worked with CALFED to seek funds to start a study on the best long-term solution. In 2003, the study began and a panel of experts was convened, three engineers and a geologist and all agencies were included in that study and of course you all know Ducks Unlimited has very ably led this study for all those years.

In 2004, the experts concluded that additional modeling was required before reaching a recommendation. A study continuous, with a multitude of other major studies. The experts conclude that other short-term active measures are required; and, one of reasons for that is because without the interim measure the long-term solution may not be possible because the river kept moving to the west at that location. What happened is the river moved to the west

and it was creating a wider channel and creating a greater deposition area for sand and gravel. As the river moved west the gravel bar followed it over and was creating a big belly there on FWS property.

In 2005, the environmental review for the short-term project began. No consensus was reached and the study continued of course with this process right here. The Sacramento Conservation Area Forum (SCARF) unanimously voted then to support the short-term project rock and I have a letter here that I just want to read an excerpt for you from the SCARF addressed to each individual in the agencies that is involved with this process, "The Sacramento Area Conservation Forum was one of the early activists of this CALFED funded project and has helped to provided local review to our Technical Advisory Committee. After our meeting on October 20, 2005, the SCARF Board voted unanimously to support an interim measure to prevent further migration of the west bank of the river away from the pumping plant. Both the TAC and the Board felt that this project as outlined is consistent with the goals and principals in the SCARF Handbook."

In 2006, our panel of experts required an additional physical model for recommending a long-term solution. High river flows accelerated the bank erosion of the west bank and the plan up until then was to put in a 700 foot rock toe. Our panel of experts said that would no longer and increased it to 1500 feet. We had done an environmental review for the 700 foot project and we had to go back and put that aside and do a review for the 1500 foot project. The gravel bar had returned and in 2007 and we realized we had to remove the gravel bar again.

In 2007, last fall a 100,000 tons of gravel was again moved out of the river. You can see where we piled the gravel. We now have 300,000 tons of gravel there and that area is just about full, we can no longer put much more gravel there. We are stuck there if we have to move gravel again.

We also put a 1500 foot rock toe in on the FWS property starting up here down to this point (Les pointed to the aerial). We put that in last fall to keep the river from moving any further west. There was an old channel right down through here that the whole river was 1200 feet away in the mid 30s. There is a low swale where it's pretty obvious the river was at one time. It appeared that the river was trying to go this way so with that toe we at least held our position until we can finish this process here.

In 2008, the City of Chico makes final plans to move their outfall 1200 feet downriver. Here's our pumping plant and the City's outfall. It's been there since 1961. They are going to move down just about here next year. They realized they cannot risk being covered by gravel so they have about a \$5 million project. Their engineers have told them (Ayers and Carollo) that that will buy them maybe 15 maybe 20 years before the gravel bar continues to move down river and again creates a problem for their outfall.

Just to finish up, the gravel bar continues to moves south. The point of it is now in front of the pumping plant now, so it's all the way down at this point now. Right now it's covered by water, you can see the riffle over but you cannot actually see the gravel bar. Probably in another month or so, there will be signs of it. So that brings us to where we are today. Thank you for bearing with me and thank you for helping us to work our way through this issue that is very important to not only this ranch but I know the Llano Seco Ranch, and I know it's also a very important issue to the City of Chico. We've been partners with the City of Chico now since 2000, they helped us fund the first removal of that gravel bar because they have diffusers out in the river. They have seven diffusers in the river right at this point right here and three are already buried with gravel when we moved that gravel bar for the first time. So we've been partnered up here and we suffer a similar fate. Thank you very much.

Question: Dick Thieriot?: Let me ask you or anyone at the table, how long do you think we have before ____ (we're shut off couldn't hear.)

Answer: Les Heringer: That's probably a question for the engineers here.

Answer: Mike Harvey: The answer will come up later because it is a central question with respect to a couple of the alternatives, it will come out and there will be some discussion about it.

Jim passed the sign-in sheet once more and asked for further questions. No questions, Jim moved on to the next agenda item.

Review of Steering Committee Charge, Project Goals and Objectives, Conceptual Model and Decision Matrix

Michael Harvey, Principal Geomorphologist, Mussetter Engineering, Inc.

[Conversation transcribed in context with power point presentation. Please refer to Attachment A]

I guess I drew the short straw to go back and revisit where we've been on this process. What the issues are and what really we have been doing over the last five years. Jim felt that since I've been here right from the start it was more probably appropriate that I dredge my memory banks as to what we have and have not discussed. At the risk of being a little repetitive, I would like to go over some of the stuff that Les has done with respect to how we viewed it or discussed it and addressed it with the panel. Just for our own context and for anybody who is not sure what we are talking about, here is the pumping plant as it exists today. Big Chico Creek comes in through here. The plant was relocated from Big Chico out to the Sacramento River. For reference sake, these are the river miles and there will be some discussion of our studies and results that are referenced by river miles. Roughly, the mouth of Big Chico Creek is about at river mile 193. Other features that we will discuss, on the opposite side of the river from the pumping plant is the U.S. Fish and Wildlife Service (FWS) Refuge. There is the Shaw property in here with a Nature Conservancy (TNC) easement on it. This is the Phelan Levee (private levee). The Golden State Island revetment has been discussed in here and as has the existing revetment on Phelan Island as well. These locations will be part of the upcoming presentations as we go through the day

What is the problem? Basically it's a fish screen problem and intake burial problem and it all turns basically to the downstream migration of a large gravel bar. In big broad terms, a solution could be, and it has been discussed, relaxation of fish screen criteria has been suggested and also to evaluate a range of solutions that are in-channel or out of channel. So that's our essential problem.

Eric Larsen put together some timelines on the river as part of our early work and what you here see is from about 1896 through a sequence to the present and I'll get to that in the next slide. What you see essential, here's the existing pump site on each one of these and you see the downward migration of a bend. Les was referring to it being out here to the east in the 1940s. The river straightened out somewhat since then and by 1997 this is what the river looked like. This is where that long straight reach that was selected as a potential long-term solution for the relocation from Big Chico Creek.

To zero in a little bit now to the information we have, on the left is a 1979 aerial photo, the yellow lines are the banks, out here is the line that the DWR (the Department of Water Resources) surveyed of the bank in 2003. We put that on the 2003 photo and as sort of the inverse of this, there is the old 1979 bank lines. The river has shifted over, the channel has shifted to the west but of more probable import is this feature here which is the gravel bar. The gravel bar has moved downstream through time.

Now what is the problem? Now, as part of our almost first work on this project, Bob and Yantao did some basic, if you like, back of the envelope sediment transport calculations. It was driven off of a One-Dimensional HEC RAS model and these are the cross sections and the two points that I would like you to just remember are river mile 193 here and 193.25. The upstream end of the bar and the downstream end of the bar. Now what we were looking for, is there actually a causative mechanism for what was going on at the location. If you look at the calculations of bed load and transport then there are two locations on here. Here is the top end of bar at 193.25 about 43,000 tons a year roughly. At the downstream end of the bar, which is just above the pumping plant, we virtually have zero transport capacity for the bed material load. So in other words, what is happening is the river is transporting material in and we have a very wide section and it dumps out and it's a self reinforcing process. It's no great mystery but at least we can say this is what's basically going on.

In 2007, this is what it pretty much looked like. The pump station, the gravel bar and the bank out on the west side. Basically as this grows down and out, this retreats and as the bank retreats, the transport capacity in here goes down and it's a self-reinforcing loop.

The data sources, the Corps of Engineers (COE) surveyed the river after the 1997 floods, Ayres Associates did it for the Sacramento Division. We have the resulting topo. During the course of this project we have gone in and done at least two hydro surveys on the river to provide more up-to-date bathometric information. All the modeling and everything else has been based on the overbank topo with the new bathymetry folded into it.

The basic problem is this. The blue line there is the 1996 west bank of the river. Back here is the 2003 and it has gone further. When the alignment was like this, essentially the pumping plant functioned. There were required velocities for the fish screens, things weren't getting buried. As this relaxes, and these are DWR measurements and so we are back here with the 2003 line it has gone back and continues to go back to the total westward displacement of somewhere between about 350 and 400 feet over about a 10-year period. That's roughly about one-channel width that the channel has moved over. Here's the eroding bank over on the west side on FWS property.

Based on some of the work we've done, and this now the results of the initial 2-D modeling that was done by Mussetter Engineering, we have two situations here. On the left with the conditions of the 1996 topography and over on the right the 2006 topography. These are just velocity color gradient plots. The thing to look at is right in this location here, here's the pumping plant on this side and the pumping plant is here on this one and what you see is the wedge of blue that moves down with time. That's the basic problem we're dealing which is low velocity down around the pumping plant and that translates into sedimentation around the plant and that impacts the fish screens and the ability to in fact pump.

To put some numbers on what's going on—downstream bar migration, somebody ask the question, there are some estimates out there. Stillwater Sciences in 2001 reported a downstream migration of that gravel bar of 850 feet in 6 years. Well, the math is about 140 feet per year. Now, there was a period that Les said where there were in the late 90's some pretty high flows so that probably a pretty active period and it may represent an upper end of what's happening with the bar migration.

Eric Larsen and I believe DWR have an estimate of somewhere round about 60 feet per year and not sure where that number comes from, I'm sure Eric (Larsen) can tell us and maybe Bruce (Ross). I just haven't seen it in writing anywhere.

Question: Bruce Ross: --- 1980 and 2007

Mike: And then Corolla Engineers, working for the City of Chico, made an estimate of 1200 feet displacement of their outfall, 15 to 20 year life for that calculate and you end up with 60 to 80 feet per year of downstream migration of the gravel bar.

Answer: Mike Harvey: 60 feet to 140 feet, that's a big swing I realize that but that seems to be the data that we have.

One of the things we have to bear in mind, is that twice now, we've dredged the gravel bar and have taken out during events 2001 – 2007, we have taken out 300,000 tons of sand and gravel from that gravel bar. Pretty obviously, if we extract it, the migration downstream of the feature itself the rates etc. must slow up.

The other consequence of the problem is the bank erosion and the lateral migration of the river and we are somewhere between 350 feet and 400 feet of bank erosion at the widest point, the belly of the bank Les referred to it.

Hopefully for those of you who have been with us the longest for the five-year period and for those of you who are new to it gives you a refresher course or brings you up to speed of what we as a technical panel have been dealing with over the last five years.

When we were first pulled together on this project as part of the CALFED process there were a number of objectives put forward for this particular project. Basically, these are Olen Zirkle's highlights, and I've used them, wanting an unbiased description of the state of scientific knowledge related to the Sacramento River and the site dynamics, provide an opportunity to test and refine an understanding of what is going on at this location and at the broader sense, exhaustive literature search, fill and identify data gaps, and conduct modeling to try to address the issue. Develop some performance measures or indicators in other words some criteria to meet, and then to fully document that process.

Well, let's just start at the back end of that one – fully document. There are on the billiard table behind there, all the reports that have been generated over the last five years by this process. They are also on the Ducks website. If anybody wants to get eye strain, you could have many, many hours of enjoyable reading going through this whole process. It has been exhaustive.

However, if you want the short version, what I suggest is the Workshop #4 Technical Summary. What we tried to do there was after Workshop #4 was to pull together everything that we had addressed into one document and these were the results of Workshop #1, #2 and #3 through #4 and then the recommendations out of #4. It was always recognized that there would be a 5th workshop. That's where we are today. Some of the actions that were recommended at the end of Workshop #4 in this document were implemented and they will be reported by Eric (Larsen), Bob Mussetter and Amanda (Cox) and Chris (Thornton) Colorado State University (CSU) and then Dennis Dorratcaque will also present some of the engineering and costs data associated with those actions.

This is the conceptual model that we we're working with. Basically, our group is a technical panel that has to provide information for the Steering Committee to make some decisions. Our job is not to make the decisions, it is to provide the Steering Committee with the best information we can to allow them to come up with a solution. Ideally, we have three main criteria, we have preservation of the river meander, we have pumping requirements, and meeting the fisheries / fish screen criteria. Those are our primary ones. But, like any other project the project has to be engineeringly feasible and economics must come into the process. Ideally, if we could do it we would trot right around the outside of this system, come up with a preferred alternative that would meet all the criteria, go to final economic and engineering feasibility, make a recommendation to the Steering Committee, and the job is done. We move on.

When you look at these requirements here, there are obviously some inherent conflicts in the criteria and so there was always recognized a possibility that we would not be able to just whip around the outside of this matrix, we may have to go back in and ultimately, we may end up with a non-goal alternative. And a non-goal alternative is defined as not meeting all three criteria. So, this was recognized in the CALFED process.

Part of the process, and I'll expand on this in a couple of minutes, is brainstorming. And that's basically what we were doing initially. What sort of alternatives and solutions were available. Nobody was constrained in their thinking, but obviously any alternative has to meet some criteria and based on the charge we have to have a reliable water supply, that's 150 cfs pumping rate and about 40,000 ac/ft total a year.

We would like to be able to let the river meander, to keep the meander process going. The ability to meet the existing fish screen criteria. Engineering feasibility, in other words, can we build it, will it work. Capital costs, O&M costs, as these effect the costs of the water, and then as Les pointed out, compatibility, if possible, with the City of Chico's Wastewater Outfall. Can we get a solution that solves both problems or are they going to have to be independent.

This is the cast of characters for the Technical Panel. They have introduced themselves, but let me quickly go through it, Yantao, hydrology, geomorphology, myself, geomorphology, Eric Larsen, he put geology down there but he is a Geomorphologist, and Bob Mussetter, hydraulic engineer. Now, I have added a name at the bottom of the list even though Dennis (Dorratcaque) is not a member of the Technical Panel. Dennis worked with us through this whole process. He, essentially, is our engineering check. He has provided the engineering analysis through some solutions and has been very strongly involved in developing costs for implementation. We feel, I do and I don't think anyone disagrees, that Dennis is an integral part of this process. We have the stakeholders, M&T Ranch, Llano Seco Ranch, FWS Complex, the Department of Fish and Game (DFG) and the City of Chico.

Let me try and take you through how we got you to where we are at the moment and the ground we've covered over the five years. In workshop 1 we started to look at alternatives. We looked at alternative water supplies, was there some way to provide water to the stakeholders without having to use the pumping plant. We looked at ground water wells, Ranney collectors. We even looked at using the City of Chico's wastewater. And, also the possibility of diverting flow from Butte Creek through the Parrot-Phelan diversion. We looked again at changing the point of diversion upstream and possibly back up into Big Chico Creek again. We looked at the option of changing the fish screens from the current cylinders into T-screens and moving them across stream and upstream as well. We also looked at the idea of stabilizing the west bank. One of the things, I think that is really important to realize, is that, as we are at the moment, bank stabilization of the west bank on its own is not a solution. Things have changed to the point where the hydraulics and the sedimentation characteristics at the intakes have gone beyond that. So it's not just a question of holding the bank, if it had been back maybe 5, 6 7 years ago to hold the bank then, that would have fixed the hydraulics at the intakes and fish screens. The important point to realize is that just holding the west bank at its current location does not provide a solution to the existing pumping plant and fish screens.

At the end of Workshop #1, obviously, a lot of ideas were out on the table but there was not a lot of information and so a number of follow on studies were identified; the feasibility of using groundwater wells; cost for various alternatives; feasibility of T-screens; there were economic and legal issues, and a legal issue related to the existing riparian right and would that translate into a groundwater right, if there were ground water wells; evaluation of water supply and demand, how much water was needed, do we really need 150 cfs and 40,000 ac ft; are there other ways of getting to it; are there impacts on the City of Chico's Wastewater Treatment outfall; and, then in terms of additional studies, Eric Larsen's river meander model and some sediment transport modeling, and you saw some of the results of the sediment transport modeling before.

Workshop #2, about one year later. The alternatives that were investigated were an infiltration gallery out in the river, extending the intake from the existing plant across stream and downstream, the possibility of putting in in-conduit fish screens, the possibility of dredging with modified fish screens, rock dikes over on the west bank, multiple production wells, and Ranney collectors.

Based on our discussion during Workshop #2, this was essentially the outcome. For various reasons the intakes being extended were rejected, in-conduit screens were rejected, infiltration galleries were rejected as were multiple production wells. We carried forward dredging with modified screens, spur dikes on the west bank and Ranney collectors.

Question. Greg Golet: For those rejected alternatives, I looked through some of the literature and tried to come up with an understanding to why the particular alternatives were rejected and there is limited information on the web but is there additional information that we could be provided with. Basically, the table that is in the summary, that has the uncertainties and the flaws, that is some of the information but is there the exact information available.

Answer: Mike Harvey: Yes. That information is available. A number of the economic and technical were addressed specifically. Montgomery Watson produced a number of tech memoranda addressing specific issues with those.

Answer: Chris Leininger: If I may add to that answer, there are minutes for each workshop that are detailed and documented per verbatim and if you would review those minutes it would be helpful.

Mike Harvey: So at the end of the workshop, we felt as a group, that additional information was needed. We needed a 2-Dimensional Model, up to this stage we had been working on a 1-Dimensional HEC-RAS Model. We needed a 2-Dimensional hydrodynamic model. We needed additional meander modeling from Eric Larsen and there were a number of questions concerning the groundwater. And so, a number of wells were drilled and tested to provide that information. All this information was required to inform moving forward on the alternatives that we carried forward.

Workshop #3, about one year later. The options that we started to look at were 3 to 4 Ranney wells, dredging with fish screen modifications, and the spur dikes. They all hung in there through the discussion process. But, we also decided we needed a lot more information before we could actually make a recommendation. We had feasibility studies. Eric was asked to run his model for a fifty-year period into the future. We agreed that environmental documentation would be needed to address the gravel bar dredging. So, there was not going to be a solution in time so another gravel bar dredge would be needed. And then we also, specifically because the dikes are time sensitive, in other words, the longer you leave it, the more the bank erodes to the west, the less likely you will be able to have an alternative that actually returns the hydraulics to the 1996 condition. The dikes start to get pretty long and pretty big and you start to wonder whether it will actually be feasible to return hydraulics to 1996 condition.

Question: Woody Elliott: What happened to the alternatives that called for dredging a channel next to the riparian area on the state park land and the gravel bar? To maintain a channel past the pumps to maintain the velocities past the fish screens.

Answer: Mike Harvey: We came back to that in Workshop #4, it never went away, it was a matter of how we were going to do it. Was it going to be a dead-end, basically do interim dredging until the bar moved far enough where you would have to do a dead-end dredge or were there alternatives where we would cut channels in and try to route flows around that's the one you are referring to to get bypass flows with existing screen. It never went away, it just got put into the three-dredge alternatives.

Answer: Bob Mussetter: You will hear more about that this morning. We have done some physical modeling with that alternative in mind.

Mike Harvey: So basically, in Workshop #4 in April, 2006, we ended up with some alternatives. There was obviously a no action, that was considered by all to be unacceptable, but we needed a no action alternative. Three to four Ranney wells, and I'm just putting these numbers on the side here, the next slide has the matrix but I'm afraid it may not be easy to read so I want to give you the numbers just to start with. 3-4 Ranney wells was estimated to be about \$20 to \$26 million in capital costs to be able to produce the 40,000 ac ft that we needed and the O & M cost on the water, taking the water cost up to somewhere around \$30 ac-ft from the existing \$8 ac-ft. for water.

This was the one alternative that solved the basic three criteria, river meander, provided a reliable water supply and because it was out of the river, we did not have a fish screen or fish problem. That would have been our best alternative. Our problem was really in these numbers here and when we got into the economics of it. As an alternative, we looked at a lesser number of Ranney wells. But, the problem is that the Ranney wells have a limited amount of production capability and so one to two was not going to do it. We couldn't supply 30,000 ac ft or more with just one or two wells. We looked at a range of alternatives for dikes, an 8-dike scenario, a 9-dike scenario and a 9-dike extended scenario which raised the height of the dikes. And for the dikes, and this is sort of a cumulative number, the range was somewhere between \$7.5 to \$12 million as capital costs, and about \$13 ac-ft for the water. The one thing that is not in here and very explicitly not included are mitigation costs. We did not have them. We recognized that the mitigation costs were probably pretty high but they are not in these numbers here.

Then we had three dredge alternatives that were looked at. The dredge costs were somewhere on the order of about \$8.5 million and a unit cost for the water of \$15 ac-ft.

Question: Dave Zezulak: You may be getting to it later, but what was the assumed project life.

Answer: Mike Harvey: One of the criteria we were working with was an assumption of a 30-year project life because that was basically the presumed life of the fish screens. And so, yes, that was factored in there. If it wouldn't make it for that then it wasn't a viable alternative.

Question: Dave Zezulak: Using the wells as an example.....

Question: Howard Brown: About the dredge alternative, was that cost a one-time cost or the cost for dredging over the 30 years a number of years and did it include the modified fish screen installation also.

Answer: Mike Harvey: It was the cost of over a 30-year project life and the installed fish screens. Mike explained that the full details are difficult to display on the power point and that the hard copy is available and is handed out (Decision Matrix).

The decision matrix we used as a panel included all the alternatives described on the previous slide down this side here. Here is the fish screen criteria, yes, no, or maybe, pumping requirements yes, no, or maybe, river meander, yes, no, or maybe, engineering feasibility, economic feasibility, the capital and O&M costs, and then we added a column in here, the benefits to the City of Chico, yes or no. We had uncertain things and qualifications of those and then we had the O&M costs per acre foot for the water. So this is the process we moved through. With all the information we were able to gather, we filled this out, looked at it, at the end of it all, we ended up with additional information needs. We didn't feel as a group that we could make that decision. There were enough uncertainties that we needed additional information. This was based on questions that members of the Steering Committee asked and the Technical Panel asked -- we didn't have answers. We needed some additional 2-D modeling and the reason we needed the additional 2-D modeling was that the 2-D model that had been originally constructed was built to evaluate this local site. Off-site impacts were needed to be evaluated. Fortunately, the COE has a Butte Basin 2-D model and it was provided to us. We meshed in the detail model to the Butte Basin model and ran that to look at upstream and downstream impacts. Then, one of the issues, that we had been discussing as a group, was if we are going to put protection on the banks with the dikes, then as mitigation for that, do we take existing rock off the river. We could identify a number of sites where there is rock; there is rock at the refuge; the Phelan Island rock; there is rock on the M&T Ranch at Golden State Island; and, there are other locations up and down the river where existing revetments are in place and, could they be removed as mitigation?

Well, Eric's (Larsen) model was tasked with developing ideas of what sort of benefit there would be as defined by changes in meander patterns. Pull my chain if I'm wrong. [Eric agreed] for removing rock and using it, if we harden up here and remove rock down here do we get benefit? These two had to link together because one of the concerns that were expressed was if you take out existing revetments, do you have offsite hydraulic impacts?

Most of you are probably aware, the Butte Basin has three natural overflow weirs in it that are integral to the Sacramento River Flood Control Project. Bottom line somewhere around 300,000 cfs for a 100-year event gets to Ord Ferry. The head of the levee is a few miles downstream only has a capacity of about 150,000 and so on the order of about 150,000 has to go overbank before the head of the levees. One of those sites is on the M&T Ranch, the M&T Weir section. So one of the concerns was, if we move, take existing rock out and the river starts to move does that affect the stage discharge relationship at the weirs. In other words, would we be putting more flow over the weirs that occurs now and what would the impacts of that be or would there be less. We didn't know and that's why we had to couple the meander modeling with the 2-D modeling. The meander modeling would inform us where the channel would likely to be in a 50-year period, would the bend migrate and then we would alter the geometry of the 2-D model and look at the impacts of the flow over the weirs.

Additionally, everybody came to the conclusion that the numerical modeling that had been done to date could not answer with specificity some of the questions that had been posed about dredging and the dikes and so a scaled physical model was built a Colorado State University. Chris (Thornton) and Amanda (Cox) will give you the results of that and they also have their detailed report that is out here to address those issues and so that is another piece of the information that will be provided today. Additionally we talked about the interim bank stabilization and further removal of the gravel bar.

Jim (Well) asked me to put together a summary of where we have been to where we are today. Let's look at some of the costs that have brought us here today

1997, new pumping plant and screens was a \$5 million investment. Since then in 2001 the cost of the dredging and permitting, etc. is about \$400,000. The 2007 gravel dredging was roughly the same at \$409,000. The interim bank stabilization was about \$620,000. These studies that I've documented have been about \$1.4 million. Basically, at the moment we have invested or CALFED has invested somewhere around \$8.3, \$8.5 million. So, this is not a trivial effort. A lot of effort has gone into trying to find a solution for the M&T/Llano Seco intakes and fish screens.

Just to bring everybody up to speed, so you know what we are talking about, the interim stabilization that Les initially mentioned, was extended on out. That's what it looks like on the ground (slide) it's gone through the winter, it's a toe revetment looking downstream (pointed to FWS property and the Shaw property) built into the toe rock was woody vegetation.

2007 dredging was within that perimeter (slide) because the flows were high couldn't get down river so you could actually see the flows shoaling out. You can see how the flows are splitting at the buoys. At low flow the gravel bar has actually extended down river and as Les said is outboard of the pumps now. The downstream part of the bar was not able to be captured by the dredging.

Existing revetments, again so everybody understands where we are—there's the pump station, the east bank of the river is rock down through here, there's the Golden State, there's the Phelan Island, river road revetment up here.

Eric (Larsen) looked at the impacts of various alternatives and here, these were analyses with the existing revetments and without and he will present this in detail. It was the removal of the Phelan Island and the Golden State Island revetments that allowed him to look at the environmental benefit of removal. But it also allowed us to build in where the bank of the river was going to be for subsequent impacts on M&T Weir. Tied into this over all model of this which Bob (Musetter) will discuss, just so everybody knows, here's the plant, here's the M&T Weir down here, Golden State Island revetment, Golden State Island revetment.

The physical modeling that was done that Chris (Thornton) and Amanda (Cox) are going to talk about is 1 to 75 full-scale model at CSU that you are looking at there (slide) and this picture (slide) shows the dikes in the modeling.

Current status: We have a no action alternative. It appears though, you will see this as we go along, that we eliminated the dredging alternatives. We have a dike alternative and because of that, and the uncertainty about the ability to implement the dike alternative, we had to think about some other alternatives. In a more recent time, these alternatives were centered on preserving the existing pumping plant, if we possible could, and they may not be possible. So then we have to look at the possibility of moving the pumping plant. We've looked at two options. This is what Dennis (Dorratcaque) will talk about – about 2200 feet downstream and about 3500 feet downstream.

So that's basically where we are and how we got here after five years. What will come next are the detailed reports of the information that has been done since the last workshop. Any questions?

Question: Who??

Answer: Mike Harvey : Basically it's moving the plant. Dennis (Dorratcaque) looked at the possibilities of ----- beyond 600 feet. Probably can't use the existing plant and there are some problems moving about 600 feet because we believe that the gravel bar will be there rather quickly.

Question: Who??.....

Answer: Mike Harvey: That came in because of the water quality standards. Jim (Well) did some research on water quality standards. So long as we get 200 to 300 feet downstream of the outfall, we can pump the water. So the City of Chico is going 1200 feet and we have to go at least 200 feet to 300 feet beyond that.

Question: Dave Zezulak: So the City's plans are in motion and in place?

Answer: Tamara Miller: We are on the agenda after 1:00 to give details.

Question: Kevin Foerster: Mike I missed the presentation that you gave at the beginning_____. I want to compliment you on the overview that you gave on the whole process and how you treated each workshop. That was very fair how you addressed each one to get the big picture without going into the specifics. I thought it was very informative.

Answer: Mike Harvey: If there are any background questions during the day, I will try to point you to the document. We tried very hard to document this process so that it is transparent and there is a record.

Answer: Chris Leininger: All the minutes of all the workshops are on the pool table in the back of the room. table

Jim Well asked for further questions. No further questions

Jim proceeded with the next item on the agenda.

Meander Modeling – Modeling Revetment Removal and Implications for Meander Migration of Selected Bends River Miles 222 to 179 of the Sacramento River

Eric Larsen, Research Scientist Geology

Eric began his presentation with a power point presentation (See Attachment B).

I am a little unclear about this one, but I was told that there was a little piece of revetment here and I modeled removing that. But since there is a hard point in here, there is very little gain. There is some pattern movement here but it is different than that, and that's just downstream from Pine Creek.

To get close to the area, that Mike shows in his presentation that I believe was the main concern to them as a result of the 2-D modeling, this may have been the slide. The revetment on the right bank here, when that is removed, this area migrates more than with the revetment in place. Down here, this revetment in here being removed allows this to occur and that's it. Just downstream from the previous one, we recognize that. We went around this bend here. Revetment in this area on the left bank being altered and removed allows significant migration and down here at the bottom of this.

These were sites again that were chosen and if you want to know how the sites were chosen I believe, Olen really didn't come to the meeting, wow, that's great, he really did retire. Well maybe Kelly and Kevin did and DWR. If there is a question about that, I think maybe for time sake we'll just keep moving on. If there is a question about that how the sites were chosen we'll probably asking Kevin and Kelly and DWR folks, too.

Now, this is one where there was the revetment removed on this side of the bend and this is one that is interesting because the channel was moving this direction at least the model shows it moving in this direction so removing that revetment had really no effect in this particular case.

And then finally, we get down to river mile 179. Some of you are familiar with this project. We have been working this separately but there's some old rock in here that is getting scoured and there is some ideas about removing this rock. And, we feel that we'll probably cut off and I do have an algorithm for allowing things to cut off and the cut off and the channel movement would be something like this. There are some different assumptions that you can use for this and these are the same assumptions that I used for the whole river and give a comparable value of the other sites on the river and comparable magnitudes of movement with this kind of modeling.

That really was the main thrust of this particular modeling. Just to sort of summarize, of the nine sites that we chose, two sites have very limited movement and one site experiences cutoff, that means six sites have significant movement and, if we are going to look at getting "more bang for your buck" when you're getting mitigation and we also have some information on the influence it has on the downstream when you do things like that.

This gives us a way to in a quantitative way to assess the results of removing revetment giving us a way to compare a long reach of the river at sites that are quite different from each other and separate from each and gives us a way to compare them with each other and can be used for any purposes for putting in mitigation that really was the thrust of that report.

Eric asked if there were any questions. No Questions

Chris Leininger provided copies of each report that had produced for the Workshop #4 and noted that there were two reports.

Channel Migration 2007-2057 Final Technical Memorandum – Simulated Channel Migration (2007-2057) Near River Miles 197 to 191 of the Sacramento River

Eric Larsen, Research Scientist Geology

See Attachment B for power point presentation.

Eric Larsen: When we started to consider moving the pumps, I believe a couple of months ago, we started to ask ourselves what kind of information do we have about moving the pumps and, what can we figure out with the data we have. We were on a conference call and I said I could get the 2007 centerline locations. all my modeling was done starting with 2004 centerlines and modeling forward. The modeling that you just saw was based on 2004 centerlines, modeled forward in time. The previous modeling was 1997 forward for the first report and 2004 forward for the other on, and, I said I could get a 2007 center line. We could model from 2007 and see if there is any difference. We had a strong hunch that there wouldn't be any difference and to jump to my punch line, that my wife says I should never do, there wasn't any difference. So, we explored it anyway and so I took the 2007 centerline that I was able to get from Chuck Nelson, at the Geographic Center of Information at Chico State, digitized that and immediately when I digitized that centerline I tried to digitize it according to certain rules so that the digitizing doesn't take in all kinds of certain things.

One of the things about modeling, I like to say about modeling with all modeling, actually modeling is best used to help you think about what's going on. If someone takes a model and says that this model says this will happen and therefore it will happen, that is you hope that model will tell you what will happen, but its often best used to say, "what can I learn from this model?" So always pass the thinking through your head. So, all I did here really was to take the 2004 centerline and the 2007 centerline and to compare them. By looking at the nature of my model, its strengths and its weaknesses, I could pretty readily see that there wasn't going to be any difference in the modeling. So, I took a model run from I believe my 2006 work and took the Hamilton City section, which I know fairly well, and I ran 50-year simulations using both the 2004 centerlines and 2007 centerlines trying to make the models to use

as much as possible the same rules, I'm not sure that I got the same ones but I did the best I could to use the same rules. And that's the reach you all are familiar with. Probably from back there you can't even tell the difference in the centerlines so it was pretty clear that it was not going to get us much information particularly about migration in here where it's so straight. Yantao and I have discussed this a lot. The model is set up so that it is really giving you big scale migration of bends like this and it's very hard to get any information in a straight reach using this particular meander migration model. So to satisfy the CALFED thing, I did write a report, I did go ahead and do the modeling in 5-year increments. If you run it 50 years into the future, you get some differences because of some site specific differences. Essentially, we came to the conclusion that it is (the difference between the 204 modeling and the 2007 modeling) wasn't going to help us answer any questions about moving the pumps.

Question: Jim Well: So here's the gravel bar that we're talking about, there's the pumping plant, go back one slide, there's the 2004 centerline, the dashed line in the 2007 centerline, which Eric (Larsen) modeled recently, so there is no difference in that stretch, there is a little bulge. To summarize what's happening in this area.

Eric Larsen: Thank you

Eric: Again, I think I have convinced myself that there wouldn't be much gained by using the 2007 centerline and revisiting some of the things we have we might be able to learn some things from that for the question that was asked at that time, that's it.

Question: Greg Golet: Just so I understand, is that centerline just midpoint between the banks or (pause)

Answer: Eric Larsen: It's generally the midpoint between the flow channels you use the aerial photos and you use the water flow. There are some areas where you have to be a little smarter than that if the flow goes around a corner then I take a 1/2 of a channel width from the outside bank inward. Some little details that I've gotten, it turned out it gives better modeling in the long run for the most part now.

Question: Paul Ward: Did you take into account the affects of something like Chico Creek coming into that system is that accounted for in your model.

Answer: Eric Larsen: It is not.

No more questions. Jim moved forward to the next agenda item.

Phase II 2-D Model

Robert Mussetter, Principal Engineer, Mussetter Engineering, Inc.

[Please see Attachment C for power point presentation.]

Bob Mussetter: The next step is talk about some additional 2-Dimensional modeling we did subsequent to the last workshop. As Mike mentioned, there were some issues that we identified associated with the larger flood events and sort of the bigger picture behavior of the river in this area and because of the scale we were working with we were not able to adequately address that so we took our existing detailed model of the site and integrated that into the Butte Basin model did some additional analysis on that and we also addressed an issue that came up during the last workshop: there was some concern expressed that for our local detailed model the downstream boundary might be a bit too close to the actual site that we were concerned about and so we did some sensitivity analysis to figure out whether or not that boundary was in an appropriate location and whether that was influencing the results so I will show you the details of that as well. I want to remind everyone of the objectives of the original 2-Dimensional Modeling that lead us to where we are at this point. The numerical modeling specifically had three objectives: 1. To evaluate the effects of the proposed dike field as Mike described there were three alternatives 8 dike 9 dike configuration and after we evaluated those two we realized that because of the migration of the bend that had occurred we needed to extend the lengths of the 9 dike configuration to actually make that effective in meeting our

objectives so the idea was to get us some information that would help us assess whether or not those dike fields would be effective in preventing further erosion of the west bank that we talked about this morning, whether that dike field would also stop the downstream migration of the gravel bar that is creating the problem at the pumps. We were also interested in getting some detailed hydraulic information around the pump intake to help us figure out whether sand deposition around the intake would be a problem during the lower flows that occur most of the time when the pump is operating and we then used the model results, we had some initial configurations we put out to refine the dike design, to find the configuration that would be the most effective in meeting those three objectives. In the original study we developed an adaptive mgmt plan to help us deal with future uncertainty in how the system would behave and then because of a number of detailed questions that we can't really answer adequately with the numerical models we developed a work plan for the physical model that Chris (Thorton) and Amanda (Cox) will talk about in a few minutes.

What did we conclude from the original model? We did a detailed presentation at the last workshop and there is a detailed report that is available back on the table. There were four key conclusions from that study. All three dike alternatives would stop further erosion of the west bank if the dikes were designed properly and even the 8-dike option would most likely stop the continued downstream migration of the gravel bar. The issue was because of the configuration of the dikes and the amount of the erosion that has occurred during the low flow periods in range of 4 to 14,000 cfs when the pumps are operating neither the 8 dike configuration or shorter 9 dike alternative would constrict the flow enough around the pumping plant to keep the velocities high enough to keep the sand from building up in that area. But if we extend the dikes out, one of the dikes unfortunately needs to be down on the Shaw property where there is the TNC easement. With that configuration we can actually get the velocities up high enough in that area to move the sands on through and avoid significant problems at the intake associated with that and then again just to reiterate we definitely concluded that there were some issues we could not adequately address and we needed to move on to the physical modeling.

So the modeling that was done specifically for the Phase II study that you haven't seen the details for yet had three objectives:

1. Simply look at the downstream boundary condition and make sure that we're OK with the location we had in the original model and that it wasn't influencing the results
2. Integrate that data into the bigger Butte Basin model and put the extended 9 dike alternative that meets the technical objectives of the project into the bigger model and see how that alternative would affect the 100-yr flood flow distribution both at the M&T Weir and water surface elevations upstream from our site
3. And the final objective was to take the results from Eric's (Larsen) meander modeling that he just showed you by letting the river erode over 50 years with various alternatives of either removing the Phelan Island or Golden State Island levees and seeing how that migration would impact the flow distribution over the M&T Weir into the Butte Basin.

First of all with respect to the downstream boundary condition. The blue line that you see around the outside is the limits of the mesh that we used for the original modeling for the Phase I studies. Here's the M&T Pumps, the gravel bar is at this location, Big Chico Creek and the downstream boundary is about 2000 ft downstream from the pump intake so the first step of this Phase II study was to extend that mesh farther downstream the reason we stopped it there originally was we wanted to avoid having to deal with uncertainty of flow going over the other side of that island. The 1-Dimensional model at least showed that we wouldn't have in the range of flows that we were looking at about up to about 90,000 cfs we wouldn't have flow cutting across there so we should be in pretty good shape in putting the boundary there, In this study we moved it on down roughly one mile and then we ran some simulations to see how that impacted the results within our study reach

Just very quickly, the information in the model includes the roughness characteristics we're using, basically the same from the boundary of the original model upstream its identical to what we had in the Phase I modeling and then we used the same criteria to lay out the roughness characteristics in the extended portion

We also ran the extended model at a discharge of about 6300 cfs because we had a very detailed water surface profile we had collected when we did the surveys in December 2005. We wanted to make sure at least that we were calibrating to that water surface profile and so you can see it does do very well. The water surface profile along the station line of the channel from the model is the yellow line and then the measured values are all the reddish plus marks. The calibration at least at that discharge is very good.

Question: Dennis Dorratcaque: What station is the pump at?

Answer: Bob Mussetter: The pump is about station 110,000, so it is right in that flat spot.

Bob Mussetter: The first issue in running the extended model at the 90,000 cfs is again to determine what the downstream boundary condition needs to be. We have to tell the model what the surface water elevation is at the downstream end and then it computes what's happening upstream from there. We established that boundary condition based on the bigger scale 1-Dimensional HEC-RAS model and that's the same procedure we used in the Phase I Model. So when we did the Phase I Modeling the HEC-RAS model predicts an elevation of 130. ft even at the downstream boundary of that model, I'm sorry 130.6 ft. That same model actually predicts a water surface elevation of about 129.5 at the downstream end of the extended model and so when we run the extended model up through the longer reach it predicts a water surface elevation that's about 6/10th higher than our original assumption for the Phase I modeling. So we said that could be a little bit of an issue. If you average the difference along here it averages about 3 ½ tenths or so high by using the downstream boundary conditions

The reason the HEC-RAS model does that is we are missing some resolution in this portion of it and so it is under-predicting the energy losses in that reach, so the extended model should do a better job of figuring out what's happening along that portion of the reach.

The differences then if you look at the overall picture of the both the depths and the velocities within the detailed reach that we used for the Phase I model you're seeing the difference in depths of the two models. On the left-hand side the dark blue indicates the differences in the 4/10ths to ½ ft range and then of course if you get farther and farther away from that boundary it dissipates so that there is no difference at the upstream end. Because of the fairly small increases in the water surface elevation the velocities tend to decrease in the lower portion of the model it creates lower velocities. There are some higher velocity areas mainly because the water surface is higher and so we get water shoaling over the top on the inside of that point bar. We can look at the details of that across the cross sections by cutting continuity lines. We have in the report 4 different lines: one about half way between the pump intake and the downstream boundary of the original model one right at the intake and then a couple across the gravel bar upstream near Big Chico Creek.

I am only going to show you the one at the pump intake and the one at the upstream end that cuts across the middle of the gravel bar. If you are interested in the other lines too please refer to the report.

The first line here is the depth profile across the channel looking downstream so the deeper part is on the left-hand side and there where its shoaling over the bar on the right hand side this is with the original downstream control that we used in the Phase I modeling and then at the depth profile that you have with the lower control. I'm sorry I said that backwards.

The green line is the new extended model that predicts slightly higher water surface elevations and so slightly higher depth, and the yellow line is what we get from the original phase I modeling with the lower control

Essentially at this scale you see almost no difference. We can look at the velocities at the same location. We are looking downstream: this is profiles of the velocities. At the middle of the channel velocities are up around 7 ft per sec and with lower downstream control from the original model we have velocities in the middle of the channel that are just maybe one-half foot, or 2 /10ths ft/sec higher than they were with the extended model

And if go up along the gravel bar again this is the extended model there's the original lower downstream control and these are the velocities. So when the water surface goes up a bit, the velocities decrease as you would expect but again the patterns are almost identical and the differences I would argue are probably within the error bands of the model.

So we also integrated into the model what happens if you start the original Phase I model at the higher surface water elevation that is predicted by the extended model and so we can look at the results of that here. These are the two lines that I already showed you and then there is the third line for the depth if we start at the higher elevation. It pushes the water elevation up ever so slightly and here's the velocity, so again in either case it really doesn't make a whole lot of difference.

In the subsequent modeling that we've done in using the higher water surface we've done some additional modeling with the original Phase I model but we use that higher water surface elevation just to make it as consistent as we can with the bigger picture model.

So our conclusion was that the downstream boundary condition was fine.

The next thing then was to look at the impacts of the dike fields on flood levels, flow distributions at the 50 and the 100 year flood peaks. This figure shows the mesh for the COE bigger picture Butte Basin model and so we've meshed our more detailed model into this bigger picture model and then run it for both the 50 and 100 year flood peaks to figure out what the flow distributions would be. The main issue is how much water actually goes over that M&T Overflow Weir into the Butte Basin under the various configurations. The red line is the overflow weir and this is the Phelan levee that goes along channel that connects into that and our site is right up here at the top of the figure.

014754

We need to look at the COE comprehensive study published discharges for the 50 and 100 year flood flows. Upstream of Big Chico Creek, the 50 year was about 289,000 cfs and the 100 year was about 355,000 cfs. We have 9000 cfs coming in from Big Chico Creek, 2000 cfs from Stoney Creek for the 50 yr and 6000 for the 100 year, so when we get down in the area of the M&T Overflow Weir the 50-yr discharge is about 300,000 cfs and the 100-yr is about 370,000 cfs.

Just for comparison: In our original studies we redid the frequency analysis for the Hamilton city gauge based on a longer period of record up through to 2005. In that particular analysis, the analysis showed that the 50-year discharges were like 170,000 cfs and 100 yr is slightly higher. These are comparable to the flows at the head of the reach 355,000 cfs and we said it was about 370,000 cfs based on a statistical analysis of the annual flood peaks.

We've run our analysis using the COE numbers for consistency for what I'm going to show you at the moment.

So the first thing we needed to do is to make sure that within the domain of our detailed model when we patched that into the bigger picture Butte Basin model we are getting consistent results. And so this is a comparison of the water surface profiles at that bank full discharge of 90,000 cfs and you can see they are virtually identical results meaning that we have properly meshed in there and we've got the model boundaries to behave in a consistent way.

The original extended model does not have the extended 9 dike configuration. We made a separate version of the bigger picture model that has the 9 dikes incorporated into it and we ran that and again compared the water surface elevations and the differences are very subtle at the scale were looking at here.

So the first question then is how when we take the bigger picture model and we run it without the dikes, we run it with the dikes, how does that effect the results. Well the first thing is without the dikes in place you can see the

flow distributions -- almost everything you see in the picture (slide) with the exception with this little piece here is underwater with fairly shallow flooding out in the over banks. The flow depths in the vicinity of weir are on the order of 2.5 to 3 maybe 4 ft in places at this configuration and as you can see because of those shallow depths and the roughness in the overbank we have fairly low velocities in the overbanks as well. The specific question we addressed is how much water is going over that weir out into the Butte Basin area.

When the COE did the original comprehensive study they based the flow over that weir basically on some weir calculation that they fixed in the model and didn't let it vary. We had an interest here in figuring out what the impact of the project would be so we had to let the model actually do the calculation and so we modified the configuration geometry so that it could do that correctly.

I'm just showing you here the comparisons between the flows the COE used in their studies versus what our modeling showed. The COE said at the 50 yr peak there would be about 108,000 cfs going over the weir and at the 100-yr about 120,000 cfs. In the modeling I'm showing you now it looks like a bit more flow will actually go over the weir even under existing conditions. About 138,000 cfs for the 50-year flow, an increase of about 30,000cfs and then 150,000 cfs for the 100 yr flow so all of our comparisons that I'm going to show you are based on these two numbers for existing conditions.

So when we put the 9 dike configuration into the model and rerun, we were able to overlay the two meshes and take differences at the various nodes and see how the depth change and how does the velocity change. Here's the pump intake and here's the gravel bar.

Essentially it indicates that there is a slight increase in the water surface elevations between the models that really show they are almost identical. That light green area here is basically zero contour. The differences occur up around the head of the dike field and if you looked at the details in this particular area we have increases that are on the order of about 15/100ths of a foot.

So there is a slight increase the 100 yr water surface elevation right at the head of the dike field above the gravel bar and then those changes cause consistent changes in the velocity if the water surface goes up the velocities drop.

The main impact is in this particular area along and just upstream from maybe 6/10ths of a mile or so upstream from that upper dike. A slight increase, we're talking maybe this much (holding his two fingers together).

Question: Dennis Dorratcaque: Did this modeling have built into the COE's Hamilton City Flood Control Project that will change the situation.

Answer: Bob Mussetter: Farther upstream?

Question: Dennis Dorratcaque: Well the levee would extend down to almost to the pumping plant on west side.

Answer: Bob Mussetter: The configuration we used here it, help me out Mike (Harvey) I don't believe is was in the original modeling that used for the comprehensive study. It does not. Mike Harvey agreed.

Answer: Les Heringer: In a big flood it overtops that levee in a 10 year flood --in a big flood that you're talking about here there is going to be water everywhere anyway

??In a 75-year flood up above and the 25-year flood below it's also moving a lot of water in addition to the overflow

Answer: Les Heringer: Yes, you are just building a training levee as part of the Hamilton city project that is going to contain a nuisance flood but in a big flood like they are talking about here its

Question: Gregg Werner: It's much more than a 10-year flood. It's a 70-year levee in the north and it is 35 year in the middle section. I'm just suggesting that the levees will redirect a lot of flow and that should be considered to know how things would change with the proposed dikes.

Question: Mike Harvey: Gregg can you get that model, do you have that model?

Answer: Gregg Werner: We don't the COE has everything.

Mike Harvey: I guess it's a work in progress.

Gregg Werner: I think the configuration of that levee is there at 60% plans now so they've finished that so that's going to be available and you can add that to your model. They have elevations and location and all those things

Bob Mussetter: My sense from the results that we are seeing here that the impacts of the dikes are very localized and so I'm pretty sure if you built that in and I'm not familiar with the specific details of it I think the relative changes would be relatively the same as what you're seeing here but again that could be done

So the bottom line is the impacts right around and just upstream from the dike fields are a slight increase in the water surface elevation, almost no change over the weir and not even enough to worry at looking at the numbers.

So then the third objective here was to take Eric's (Larsen) meander modeling and see how allowing both bends to migrate would affect flow the distribution over the M&T Weir and potential behavior up into the project area. The two specific revetments we are looking at here are the Golden State Island revetment and the Phelan Island revetment that are just down around the bend from our sight.

The thought here is that the removal of those two revetments could potentially provide mitigation for bank protection we might put in associated with our project.

So this is just a summary of the alignments that Eric (Larsen) showed if you look at the details of it. Here's the pumping plant, the existing center line (red line) scenario 1 (green line) is the removed Golden State Island Revetment and so you can see that the bank does not do very much along Phelan Island. It stays along that revetment but it does move 1000 to 1200 ft over a 50-year period in a southerly direction when we removed the Golden State Island levee.

Scenario 2 is to leave that revetment in place that's the blue line, remove the Phelan Island revetment and as you can see we get some deformation of that bend. This bend becomes somewhat tighter because it can't erode along that bank and the third scenario was take both of them out and see what happens -- you see with the black line that both of the bends migrate.

Essentially what happens with the bend migration scenario is the channel becomes longer so you get more energy loss through the bend

So we took the 2-D model mesh and we modified the channel portion of it to reflect that longer length that proceeded with each of those three bend migration scenarios and used the model results then to recalculate how much flow and what would the water surface elevation be at the M&T Weir and how much water would actually be going over the weir.

So if we just focus on the 100-yr peak flows for example under existing conditions that I showed before for about 151,000 cfs the water surface elevation is about 130.4. With that first scenario where we're allowing the downstream one of the two revetments (the golden state revetment) to be removed and that bend to migrate we increased water surface elevations at the weir by about 9/100ths of a foot and that increases the discharges over it by a little less than 4000 and then the 2nd scenario removing the other revetment (Phelan Island) and keeping that

one in place it increases the flow by about 2700 cfs and then if we take both revetments out it has a longer channel and more energy loss and kicks the flow up about 8300 cfs going over the M&T Weir.

So it does have an impact on a percentage basis but it is relatively small impact.

So that's the bottom line of the Phase II modeling that we did subsequent to the last workshop are there any questions or issues.

Question: Gregg Werner: What is the expected response to that kind of change at the weir from the Flood Protection Board-- are you considering this as a big thing or a little thing?

Answer: Bob Mussetter: In my own view that's pretty small pretty subtle and probably within the error bands of the model and so I would not make a big deal about this

Yantao Cui: About 2 to 6% is well within the range of error bands for this kind of modeling. As a matter of fact, the increase in water discharge is probably not that important. What is really important is the increase in water surface elevation, and it shouldn't be much if there is a less than 10% increase in discharge.

Answer: Bob Mussetter: The difference in the surface water elevation is around $1/10^{\text{th}}$ – $2/10^{\text{ths}}$ is not very much, how they would respond to this I have no idea.

No more questions.

Jim proceeded with the next item on the agenda.

020259

Physical Modeling

Chris Thornton, Colorado State University

Amanda Cox, Colorado State University

Chris Thornton: My cover has been blown, I don't work for a living I just play in bigger sandboxes. This has been an exciting process. Eric made a good point about models and how we interpret them. It's easier to run a numerical model and to build a physical model to get a number or to visualize something. The trick is then how is you interpret that and you put these pieces together. I think that the project is a perfect example of the whole being greater than the sum of the parts. At least the physical piece that came out of CSU and the numerical work that Bob did and the modeling Eric's done I think are all fitting together very very well to show us what this process is and how changes may or may not have an effect within the reach were looking at upstream and downstream.

A number of things you can get out of a physical model. You can certainly quantify the information you can get qualitatively information and sometimes quite honestly you need to prove the obvious. We had all three components in this. With all the different stakeholders that you have here everybody has a little different perspective and a little different agenda if you will as to what this project will do. So I think there is a piece here from all the groups and all the entities to pull the information out. I strongly encourage you to ask any questions that you have. And finally I would like to just really extend my appreciation to the technical committee. Every time I worked with Bob and Mike I learned something so I really appreciated that. Yantao (Cui) and Eric (Larsen) and Dennis (Dorratecague) provided very good insight and guidance to us throughout this process and Amanda is our laboratory manager and has done a good job in managing but also leading this project from CSU side and so I really do appreciate everybody's input in making our job easier.

We'll give you the numbers and the qualification and then you have the hard part of making a decision with it a lot of hard work with this group so thank you.

Jim Well: This is the printed results of the physical model. It's quite impressive. I was able to go out and see it set up at the University. They have an ideal situation set up, that have a dam at a higher elevation near their lab and they have all this gravity water coming down through. The Technical Advisory Team was there and some of the stakeholders. I'll pass the report around and it will be up on the billiard table for perusal.

Chris Thornton: We can certainly make that available electronically. It's not something you want to put in your suitcase and take back with you. The report can be accessed on the DU website.

000353 002

[See Attachment D for the power point presentation.]

Amanda Cox: I would like to introduce myself as the manager of the CSU Hydraulics Laboratory and we were asked to come here and present some of the results from this co-modeling testing that we did as Mike described about how that fits into the big scheme of what they've been looking at

I don't need to do too much background information here, essentially it was the pump location was moved back in 1997 down here to it's the current location (slide), and some resulting channel morphology the lateral migration of the west bank resulting in the gravel bar formation upstream of the pump intake and is jeopardizing the facility operation.

The physical model looked at three different alternatives. A couple of them specifically for gravel bar stabilization and mitigation control

The objectives of the research program were to construct the physical model of the Sacramento River reach to quantify the velocity and sedimentation patterns and three to make some options

The first option that was looked at were the structural solutions specifically the spur dike options

The second option that we were looking at were maintenance type solution of the dredge channel option

And the third option that we looked at was the pump relocation, a different site for the pump relocation

So the physical model was a 1 to 75 undistorted full- scale model of approximately 7000 ft long section of the Sacramento River so this is the extent of our physical model in this white box

We scaled sediment for the gravel bar and the bed material but specifically the gravel bar and also the similar erodible section and erodible section of the west bank. During the testing we actually went back and put revetment on that section as that is what was being done in the field at the same time so when we initially designed the model it did have erodible material in the channel but by the time we finished up we had put revetment on that as well.

We looked at three different discharges 10,000 cfs representing a low-flow condition the 90,000 cfs essentially the bank full condition and the 145,000 cfs discharge larger than the bank full

At the bottom line here it will give you idea of some of the similitude relationships of our model that links the scale of 1 ft in the model to 75 ft in the channel; the velocity for example if you have 1 ft per sec in the model then you would have 8.6 ft / sec in the channel

The discharge of about 1 cfs in our model approximates 50,000 cfs in the channel

So model construction started in the summer of 2007. We constructed 26 cross sections and we used sand material to model the gravel bar and two different types of erodible material to model the west bank. Also some other

details we have a meshed baffle in the upstream section to help control the approach conditions to the model, and also used the downstream gate to control backwater conditions

Again some more variables to get an idea of the scaling: 90,000 cfs in the model is about 1.85 cfs in our model just to give you an idea of the scale of our model

Also on the slide it shows the sediment sections that we installed had the gravel bar, this is the extent of the gravel bar and the erodible sections as well. I'll go a little into more detail about how we formed the gravel bar.

Some of the instrumentation we used in the model. We used full bore magnetic flow meter to measure the discharge and for the velocity data we used two different pieces of equipment, the acoustic doppler velocity meter or the ADV which is 3 dimensional velocity meter to take velocity measurements at the 90,000 cfs and at the 10,000 cfs we used the marsh McBernio electromagnetic probe just because we did not have sufficient flow depth to use the ADV probe

So also for instrumentation to look at the erosion sedimentation patterns we used the LiDAR equipment that can get very accurate topography data that we use in GIS to evaluate erosion and sedimentation patterns and we also we used a point gage to set water surface elevations and to collect additional topographical data.

Back to the hydraulic modeling, once we have these constructed, we looked at three different options

- The flow control structures
- The dredge channel options
- The relocation of the pump intake

This is a visual summary of the four different spur dike options that we investigated.
The 8 dike I think you heard some of these terms before with the 8-dike option.
A modified 8 dike
An extended 8 dike configuration
And the 9 dike configuration that Bob had talked about with his modeling

This is photograph of dikes that we installed in our model

You can see that we had mobile bed material here: this is the gravel bar; all the dikes were installed on the west bank. This also shows the erodible sections of west bank that we initially had in the model

So the second option, the dredge channel options we looked at two options you can see this first option that shows the dredge channel starting upstream of the gravel bar and extending through the gravel bar exiting out at the pump intake

And the second option essentially the concept behind this was this whole area would migrate down in front of the pump intake and at that point this channel would be dredged. So you can consider all of this superimposed down here in front of the pump intake and that dredge channel right in front of the pump intake.

This is the first dredge channel option that starts at the upstream section of the gravel bar that comes down in front of the pump intake and this is that perpendicular second dredge channel option.

The last option that we looked at was the pump relocation. The site we looked at here was close to the present site

Initially, when we were developing the baseline conditions we let the model run 99 hours with no structures present to allow the system to come to its equilibrium and did it at the larger flow rate of 145,000 cfs because that's really

one of the discharges that's going to mobilize the material to get to an initial equilibrium point—constant sediment input.

Once we did get the baseline conditions developed we recorded velocity and took topographic data for both the 10,000 and the 90,000 cfs with the live bed conditions.

Question: Bruce Ross: Was that sediment input scaled for the gravel bar sediment?

Question: Amanda Cox: What?

Question: Bruce Ross: The sediment input at the gravel bar size scale sediment?

Answer: Amanda Cox: Yes. We actually have the gravel bar material and the bed material was composed of the same material in our model and that was fed into the upstream section of the river

Questions: Jim Well: Just for everybody. How long was your model verified? The length of your model?

Answer: Amanda Cox: It was 7,000 feet in real world divided by 75 feet it was like 100 feet, not quite a 100 feet and about 25 feet wide.

Amanda Cox: So what these images are showing here is the velocity distribution for the 90,000 cfs the baseline condition. What you want to note here, the high velocities as you would expect, are coming along the west bank and crossing over the channel right past the pump intake down here. You can follow this line of high velocities and the low velocities that were causing the sedimentation are located right here over the gravel bar. No surprises there

Next slide shows the elevations. The dark are the low spots and the red are the higher elevations which compliment the velocity data where you have the lower elevations you're seeing higher velocities that is where the flow is being channelized and then where you have the higher elevations you're seeing the lower elevations

Question: Bob Mussetter: Just to clarify the right side picture is the topography after the 99 hours of getting the model to equilibrate. Right?

Answer: Amanda Cox: Yes. We do not have a slide in here but we did go back and compare that to initial topography data that they had given us and they matched very well but one of the initial concerns was that there might be some inherent equilibrium that we would want to reach after the model has been running for a long period of time and so that is after 99 hours.

I'm going to briefly go through each of the 8 dike configurations and talk in more detail about the 9 dike but I do want to show you the different configurations that we looked at

The 8-dike configuration—all the dikes have the same general design where you have a 5ft top width and they are all set at elevation meeting river bank at $\frac{2}{3}$ the water surface elevation of the bank full water surface elevation so the slide slope is 2 to 1 on the side slope center to the nose and the lengths of the dikes range from about 200 to 150 feet in the prototype in our world its about 2 feet to 2.7 ft

So what we determined from this configuration specifically to the velocity at the pump intake was about 5.6 ft / sec for the 90k cfs or essentially a 17% increase from the baseline at the pump intake

So once we finished looking at the 8 dike we installed what we called the modified 8 dike where we shortened the first two upstream dikes we weren't sure how significantly those dikes where contributing to the solution went from about 200 ft to 100 ft in length and that resulted in velocities at the pump intake going to 4.6 ft/sec essentially negligible increase from the baseline conditions.

Question: Jim Gaumer: When you ran those 8 dike configuration what impact did that have on the upstream side on the gravel bar on the east side if you had deposition if you have erosion on the upstream side of the gravel bar on the east side?

Answer: Amanda Cox: I would have to go back and look at that specifically there wasn't noticeable erosion at that position but I would have to go back and look at the topography it wasn't something that we looked at specifically but we have the data in our work.

Answer: Chris Thornton: We did see it start to chew into the side of that gravel bar on the upstream edge.

Question: Gregg Werner: When you say upstream, how far are we talking about?

Answer: Amanda Cox: You're talking about this right here. (All agreed.)

Amanda Cox: So then we tried to come up with a dike configuration where we extended the bottom three dikes out to the 1996 bank line in an attempt to keep all the dikes above the property line. Even the first of the 8 dikes and the modified 8 dike still had one dike close to the property line. We tried to ---- the configuration ---- all the dikes above the property line.

Again it was based on the 1996 bank line. The results from that the velocities 5.04 ft/sec and that's a 4% increase from the baseline and effectively negligible.

So the final one that we looked at was the 9 dike configuration and we maintained the same layout as the modified 8 dike design so they have the shortened first two dikes and we added a downstream dike the 9th dike

The results from this indicated that the velocity would increase 17% from the baseline. Let me go into a little bit more detail on the data for this configuration –the reason that I'm focusing on this was that this one was identified as meeting all the objectives after having all the data

What this is showing is the higher velocity distribution for the 10,000 cfs has kicked it over from the west bank lower velocities on the west bank so compared to the baseline conditions the velocity difference shown here you have increases in velocities across the gravel bar shown in blue and also in this area near the pump intake and you have reduction in velocity on the west bank

Question: Gregg Werner: If one were to assume you were reducing the velocity on the west bank over time will it be self-maintaining or will it clean itself out or even build up the sand bar on the left or the west bank?

Answer: Amanda Cox: What I would expect if you reduced the velocities where the dikes are it's possible and probably probable that you would get sedimentation there and fill back in

Answer: Yantao Cui: I think what you are talking about is during low flow conditions when there is not a lot of sediment transport.

Answer: Amanda Cox: Yes.

Question: Gregg Werner: So it will clean itself out under high flow?

Answer: Yantao Cui: At high flow I would imagine so.

Answer: Mike Harvey: I think what you will find, I have some pictures of dikes used in different places generally what happens is between the dikes you get sedimentation it's sort of a trade off you leave the banks soft between

the dikes and you get some eddies in there you may get some erosion that's why you bury the dike in to weigh in but then you tend to get deposition and then vegetation, hence I've got some pictures of dikes on the Yuba on the Sacramento system and the Red River in Louisiana.

Question: Gregg Werner??: -----

Answer: Bob Mussetter: One of the objectives of this was to try to shift the main current over closer to the gravel bar and reduce the size of the gravel bar effectively

Question: Gregg Werner: Then once it happens from a year from now then what do you have?

Answer: Bob Mussetter: The channel will adjust to the presence of the dikes effectively it just shifts the channel over.

Question: Gregg Werner: Will it chew into the pumping plant or the City of Chico's outfall?

Answer: Bob Mussetter: There is revetment there ideally we can get the velocities even higher than they are now.

Answer: Chris Thornton: -----narrow that channel in and below that sediment and through there, that 9th dike really provided the revetment to the west bank along with rip rap so they could hold that channel in place.

Answer: Bob Mussetter: If that bank wasn't protected, that could be a problem.

Amanda Cox: Also what I brought up here is the 90,000 cfs bank full discharge same thing as what I showed at the previous look at the 10,000 you have the velocity profile here and it then compares to the baseline condition here so what's really important to know about the comparison to the baseline throughout these increases you have these increases in the velocity across the gravel bar you see all the blue here those indicate that we increased the velocity on top of the gravel bar upwards to five feet per second so it pretty substantially increases the velocity over the gravel bar and then reduces the velocity right next to the bank and also increased the velocity of the pump intake as well and that was a 17% increase.

Looking at the elevations and the topographic data here you can see this is the elevation ---baseline eating away, the red illustrates some of the material loss from the gravel bar as well and there is no deposition right here in front of or after pump intake as well for the 9 dike configuration

Question: Bruce Ross: Was there additional bed load---- at the 90,000?

Answer: Amanda Cox: Yes well not additional --- but constant bed load input.

Question: Bruce Ross: It is moving and depositing directly downstream of the pump that big blue area?

Answer: Amanda Cox: I presume that this is coming off the gravel bar and depositing downstream.

Question: Bruce Ross: There is bed load being input during that final run.

Answer: Amanda Cox: Yes. There is constant bed load input from that, yes.

Question: Bruce Ross: So that material that is deposited is bed load?

Answer: Amanda Cox: Well it's really hard for me to say.

Question: Bruce Ross: It is representative of the bed load?

Answer: Bob Mussetter: it would be bed load

Question: Bruce Ross: Rather than sand?

Answer: Bob Mussetter: Right.

Amanda Cox: To summarize the first option we investigated the 4 dike fields for protection against the west bank erosion redirection of the largest velocities to the center of the channel and creation of the downstream gravel bar migration and all of the designs achieved that to varying degrees some of them protected the west bank and not necessarily increased the velocities at the pump intake but essentially the 9 dike configuration came out to be the most suitable for the project objectives it increased the velocities at the intake 17% there was no --- velocity increases over the gravel bar and then also provided the bank stability to the west bank and at both the high and low flows.

So the second option we looked at was the dredge channel configuration

The first dredge channel I talked about starts upstream of the gravel bar and terminates right in front of the pump intake seen in the model here. Trapezoidal cross-sectioned, 12 foot bottom width, 2 to 1 side slopes and the invert was located 5 feet below the minimum level.

When we first started testing this when we turned it on it was probably like a couple hours into the testing in two to three hours that we noticed that it pretty much already filled in and we had to stop the testing and re-dredge it and start again so that we could go back and what we wanted to do was to observe the velocity at the intake over a long duration so we rebuilt the dredge channel and set up ---- right at the pump intake and monitored the velocity over time there to see what was happening as the channel was filling with sediment

So you can see we start off with an obvious increase in the velocity from the baseline and over time that just deteriorated pretty much back to the baseline conditions

This is the topography after we shut down of the dredge channel 1 option and this is the difference between the before we started testing and when we shut down this is the elevation difference and the blue line that you see here is all the filling within the dredge channel this was run for about 50 hours we did notice that it was filling almost within the first three hours

Question: Jim Gaumer: What is the relationship between the time it takes the model to make the change to what would happen out there in the river?

Answer: Amanda Cox: That's a good question that's actually backed in my table summary, I meant to touch on that. the time scale for the sediment is 1 to about 60 so one second in our model is 60 seconds in the prototype 50 hours in our model would be 3000 hours in the prototype essentially 10 days at 90,000 cfs so I would have to make sure my math is correct. That gives you some sort of idea. 100 days thank you but there's that 1 to 60 field

Question: Eric Larsen: That's about 100 days at 90,000 cfs, right?

Answer: Amanda Cox: That's right. We let this run for 50 hours it certainly filled in before the 50 hours it took us that length of time to get all the velocity data and some of the other data we were collecting it is important to note that we observed it filling within a matter of 3 or 4 hours and so when you equate that to a 1 to 60 scale then you are on the order of about 10 days

Question: Eric Larsen: But the river out there doesn't run 90,000 cfs that many days. In the analysis a while back, there's not many days a year that the river runs at 90,000 cfs.

Answer: Amanda Cox: I will say that even at the 10,000 cfs we observed it filling, I have some video showing it filling at 10,000 cfs. That's a good point.

Question: ????: So Eric at lower flows [can't hear]

Answer: Eric Larsen: [can't hear]

Answer: Chris Thornton: It would take more time and the same effect would be observed, it would just take a little longer at the lower flows.

Question: Eric Larsen: You did run it at the ----

Answer: Amanda Cox: we did run the topography data, what we didn't do is run it at 10,000 stop it and take topography data. We ran the 10,000 and the 90,000 consequently so this is the result of both of those.

Question: Eric Larsen: So it is a cumulative result?

Answer: Amanda Cox: It is a cumulative result of those two.

Question: Les Heringer: Did somebody do a study on how many times of year that happens out there. It happens December through April (90,000 cfs).

Answer: Bob Mussetter: I don't remember the numbers.

Answer: Bruce Ross: Once every two years for a day or two.

Answer: Eric Larsen: That would be the rule of thumb that flow by definition 90,000 would occur bank full is 1.5 yr occurrence interval which is typically a day or two in three years.

Answer: Bob Mussetter: It's about 1% on mean daily flow duration curve so average is about 3.5 to 4 days per year on average.

Answer: Eric Larsen: and what Amanda is saying that the model showed that it would take 10 days for that sedimentation to occur

Answer: Dave Sierperda: No, that's not what she said.

Answer: Amanda Cox: No. We observed sedimentation in 3 to 4 hours almost immediately with a 60 scale that like 240 hours in the model that's 10 days

Answer: Eric Larsen: It's 3 to 4 hours in the model and that is 10 days in the real world. I'm hearing that it runs 3 ½ days a year at that flow.

Answer: Bob Mussetter: That's a long-term average.

Answer: Amanda Cox: And again, you should be aware that these are just trends that you should be aware we have actual data from the dredging that we've done already that you guys have taken material in and out. that you guys have actually been taken out

The other thing that I would like to point out for the first dredge channel option pointed out the existing dredge channel in brown we dredged it down to the blue after 90,000 cfs it filled back into this pink line and after we ran

145,000 cfs to see what that would do as well, we thought that might clean it out. After the 145,000 cfs it completely filled in and actually had a little bit excess material on it

The second dredge channel configuration again a surrogate channel as a future option of having this dredge channel installed once this whole gravel bar sort of superimposed over the top AK trapezoidal cross section 50 ft bottom lift 2 to 1 side slopes that is oriented perpendicular to the flow you can see here the elevation map and it filled as well you can see the filling there is just a small spot that didn't completely fill in and I have another image here that shows that as well and this was the final constructed channel from our lidar data and this was the final channel after we shut down and the thaweg is still intact but the rest of the channel is effectively filled back in with material as well.

So to summarize those two dredge channel options the dredge channel 1 extended up stream the gravel bar terminated at the pump intake and the second dredge channel was the perpendicular dredge channel across the gravel bar

We evaluated them on their ability to maintain the design conveyance for the intake and both filled with sediment during testing and proved inadequate in meeting their design objectives for the timeframe

Question: Eric Larsen: Especially with the Option 2, the east to west connection end- is the modeling saying that the channel would fill in every winter and you would have to redo the channel like some other pumping plants along the river? Would that fill in multiple times every summer?

002-003421

Answer: Bob Mussetter: We really just looked at the 90,000 cfs and the 145,000 cfs as well it was a rather slow filling but it did fill in I would have to look back at the times one was slower at 100 hours

Question: Gregg Werner: So later flood flows had the same effect?

Answer: Amanda Cox: Yes it did not fill as quickly as the first one because the velocities are rather low across that section of the gravel bar but over time it completely and effectively filled back in there was that one little spot that didn't fill in but your conveyance through that channel was completely gone

So the third option of the intake relocation the idea was to find an area less susceptible to sediment accumulation and the one that we looked at was approximately 650 feet downstream from the current location

So to consider this as an alternative we collected velocity data right at that location compared that with the existing velocity data that we had for the current location and compared whether we had a larger velocity there to see if we had less deposition.

We found we had a value of 8.66ft/sec reported at the post intake relocation site compared to our 4.83 f/s greater than the current location and that site had about 80% greater velocity than the current intake location

We noted that it would require an evaluation of the west bank stability to determine the long-term operations and sustainability for that location of the gravel bar migration

So in conclusion we evaluated the three different options in the physical model the dike field, the dredge channels and the intake relocation

Option 1 the dike field with the 9 dike configuration produced conditions best suited for accomplishing the study objectives that we had specific to the hydraulic modeling it decreased the velocity along the erodible west bank and a 17% increase in the velocity at the pump intake and also had notable increases in velocity across the gravel bar

The dredge channel options were both observed to fill with sediment and both did maintain the design intake capacity

And the relocation site we looked at one relocation site and the velocity there was reported at 80% greater than the current pump location velocity.

Question: Paul Ward: Amanda, I think this was answered by Bob (Mussetter) or Mike (Harvey) your model did not discuss what amount of maintenance would be required on those channels and how often that would have to happen I presume all is says is that it is not a self-maintaining channel is all your model says is that correct

Answer: Amanda Cox: That's true

Question: Paul Ward: It has nothing to do with the ultimate maintenance and how it affects the intake passage in other words you did not make an estimate of how often or if the ranches went out and dredged that channel after the 90,000 event or the 50,000 event or whatever

Answer: Amanda Cox: No we did not and it's a little trickier when you're comparing this type of ---- because we are running one flow rate continuously have the full dynamic rate to flow rate with that perspective

Answer: Bob Mussetter: I think what this says is that pretty much every year after the winter flows you would at a minimum you would have to go back and clean the channel almost every year and it's a stochastic thing it depends on the full season it happens some years it may be low flow and you may not have to do it and other years you wouldn't get by for very long.

Question: Paul Ward: The other question I have did this model have any input from Big Chico Creek.

Answer: Amanda Cox: We actually had a set up so that we could but were told that it was not significant at 90,000 cfs we did not end up using it

Question: Paul Ward: in the gauge of your model it isn't but the mouth Chico Creek is there and it will always be there and so there's some impact from that and what the ultimate maintenance might be on that bypass channel

Answer: Bob Mussetter: on the lower portion of that channel but upper part across the bar is not going to have any effect.

Question: Bruce Ross: I think you said the bypass channel took 3 to 4 hours to fill that we back calculated as 10 days natural time which could be in the range of three years on the average but then you said it took substantially longer to fill in the 90 degree channel?

Answer: Amanda Cox: It did take considerably longer to fill that one in just because the velocities across that are lower and it's not localizing as much material. The problem is we only modeled the 90,000 – we observed filling even at the 10,000 and unfortunately at that time we did not document it – it would have been nice to document it but it would have been nice to run a couple hours at the other flows to provide that information as well but we did visually observe it filling at the other discharges too

Answer: Bob Mussetter: The other thing to remember about that perpendicular channel is correct me if I'm wrong but it tends to fill from the channel side back so once it blocks the mouth of it you have a problem

Answer: Bruce Ross: If you look at the boat ramp at Woodson Bridge which is built across the bar and you have to clear that every year.

Question: Paul Ward: But Bob (Mussetter) that's where Chico Creek would have an impact because that channel is right there where Chico Creek sits also

Answer: Bob Mussetter: That could be the only thing is under that scenario the assumption is the gravel bar is migrating down and so now it's just covering that whole side of the channel so the question is where would the mouth of Big Chico Creek be under those conditions.

Question: Paul Ward: That's my question.

Answer: Bob Mussetter: It's probably going to short circuit and go out to the river upstream from you

Yantao: Dredging a channel cross the bar is not an option because this is only a likely scenario 20 to 30 years down the road. In order to realize this scenario we still need to consider a solution before this bar goes that far.

Question: Paul Ward: I guess I need to understand it more.

Answer: Yantao Cui: what you are thinking of is dredging a channel across the bar directly to the intake but currently the bar is still upstream of the intake. In order to be able to dredge the bar, we will have to wait for it to move downstream to be directly west of the intake. That will take 20 years or so and we have to think of some kind of solution before that happens. With that, just think dredging across the bar to form an approaching channel to the intake does not form a realistic alternative.

Question: Paul Ward: 20 years is just an estimate and not conclusive?

Answer: Mike Harvey: The point of this and maybe what is confusing is to have shifted the bar down over the pumping intakes would take a huge reconfiguration of the model and so we did it basically by analogy –we said OK there is a situation and what we are really interested is not the specific solution arrangement its if you do a certain thing on that bar specific thing on that bar what happens.

You making an assumption, which by the way we think is a valid assumption, that if the bar had moved down in whatever time it takes so it totally buries the intakes and the fish screens, you get would the same effect with a dead-end dredge channel as we modeled up there.

Answer: Bob Mussetter: But to just amplify Yantao's point before you get conditions set up down here where this would even be something you would consider doing the bar has to completely shift down through that we could argue all day how long that's going to take but the problem is for Les and the pumpers what do they do in the meantime while we're waiting for that condition to get set up we have to somehow get the pumps viable so that is why Yantao is saying this is not a viable option

Question: Kevin Foerster: Amanda I probably missed you saying this but on option 3 with the relocation was that modeled with the toe rock in place on the right bank, on the west bank and was that modeled with erodible soils?

Answer: Amanda Cox: It was but the one thing that is a little deceiving is that there was the toe rock was in place essentially the whole bank was revetted in our model I did not go into a lot of detail but we had a hard boundary and then we put the bed material on top of the hard boundary and so one of the things that for that pump relocation that I talked about is that you have to pay attention to how stable that west bank is across from this new pump relocation site because our model was not going to model any erosion on that west bank ----- So this was revetted and so all of this is effectively revetted in our model. So that's why I'm being cautious in saying yes the velocities are greater but it still should be looked at closer and I know they did.

Answer: Bob Mussetter: There is an issue that we looked at that we haven't presented but I can show you the figures if you want to look at them. The question was if they assume rigid bank line in their run so the question is

over time even if we leave the toe revetment in there what's going to happen to this part of the bar if this continues to migrate down or whatever, can this erode we went out and collected some detailed sediment gradations on this bar and looked at the model results and in fact at 90,000 type flows you have high enough sheer stresses along the nose of this bar that it can chew away at that so over time this is going to widen out

Yantao Cui: That's why the City of Chico is relocating their outfall.

002-00-45-56

Question: Bev Anderson-Abbs: In your 9 dike configuration, I could be wrong about what you said, but it looked like you were going to deposit below the pumping plant. Is that what you said?

Answer: Amanda Cox: Yes.

Question: Bev Anderson-Abbs: So if there is deposit of that material below the pumping plant how is that going to in turn effect the City of Chico outfall which is below the pumping plant and would it back up and effect the pumping plant?

Answer: Amanda Cox: That's a good question. You have really high velocities in this area it's really hard to predict what's going to happen right here in our model because we don't have ----- rigid boundary, I'm not sure how that would affect the City of Chico. I would expect that most of this would move on through I'm not quite sure why this small deposit is there you still have a very restricted reach there with high velocities and that's one of the high velocity zones, like I say if you go to the 9-dike configuration so if you are looking at the velocities, I guess there is just that one little spot there that's blue but in general this is a high velocity zone so I'm not sure if that's an anomaly but you're seeing it in both in the velocities and the deposition patterns.

Question: ??? It's not on one of your cross sections either—it occurs below it so how do you measure the velocity there and interpolate between the two cross sections.

Answer: Amanda Cox: We took a measurement from some specific sites down here. We were asked to take a measurement from the current Chico City outfall and I think that's what you're seeing.

Answer: Bob Mussetter: I think the key point is that bar formed there but it doesn't progressively fill over time it just doesn't keep building up and up and eventually ----

Question: Bruce Ross: I think Bob (Mussetter) though maybe as a result of the fact of a rigid boundary on the opposite side in the physical model exactly opposite at that and you've got velocities according to that velocities high enough to erode material that you've already said are erodible so under real world conditions even with the 9 dikes I look at that and go you're still the model show you've got deposition there when you have a rigid boundary you've got a soft boundary there with velocities high enough to erode the west bank then you're going to go you have an increase potential of deposition at the pump location

Answer: Bob Mussetter: But with the dikes in place its different from the when they modeled it they didn't have the dikes in here so you have higher velocities along here that 9th dike does tend to change the current so that you're not having such a tendency to chew away right on the nose of that bar

Question: Bruce Ross: Yes but your red and yellow only come down a couple hundred feet and then you pick up your blue and green and that's actually increased velocities against that bar even with the 9 dike

Answer: Amanda Cox: One thing that I want you to know is that we have a rigid boundary in the model so we're limited as far as what it's going to show in erosion patterns it's showing some deposition but the erosion patterns are somewhat limited in our model and certainly in areas near the pump intake, we would scour down to our

original boundary so we are showing little or no deposition or erosion suspectedly zero that's just because it gets down to the rigid boundary in the model so it's possible if you scour this out to some extent that would have an influence on that as well

Question: Eric Larsen: To follow up with what Bev (Anderson-Abbs) was asking, the other day on the conference call with the Tech Team I brought this up for Bev's (Anderson-Abbs) benefit as I recall with the 9 dike configuration there was some sedimentation some sand that dropped out at 10,000 cfs. That was in the report.

Answer: Amanda Cox: No, that's not the case. All of these are cumulative things we wouldn't have stopped at 10,000 cfs and noted that and ran the 90,000. there was just one that noted that position and that was the extended dike condition and I think that was from the 90,000.

Question: Eric Larsen: We have it in our notes and maybe our notes are wrong. It was discussed the other day and it was described that it wasn't a problem to have sand deposition there because it would be blown out

Answer: Amanda Cox: By the sweeping velocities. I'm not sure where that came from we did not see any deposition at 10,000 we are actually at 10,000 cfs at our model we can't lose sediment at 10,000 cfs Effectively the sediment in our model doesn't move at the 10,000 cfs condition the way the gravel bar material that we are modeling, the bed material -----

Question: Eric Larsen: Actually I thought you said before when we were doing the dredge alternative you saw it sediment in at 10,000 already?

Answer: Amanda Cox: Yes at that one we did see it fill in because there is this acceleration into the dredge channel but yes we did see movement at that but in these dike conditions we didn't see movement. What's happening in the dredge channel it channelizes right in the dredge channel you see higher velocities for the 10,000 for the dike configuration we didn't see any real sediment movement for the dike configuration that's a good point but at the 10,000 we did see that there is differences.

Question: Eric Larsen: There is a difference. I understand that the other thing that we discussed was that the notes say and I imagine that I can go back and revisit the notes. The notes say that there was a slight negative velocity in front of the pumps at 10,000.

Answer: Amanda Cox: There is but that conditions exists currently as well. For the baseline conditions, let me go back to the baseline conditions and show you, I guess I don't have the baseline for the 10,000 conditions. Let me show you this one so you can see effectively that we are right at pretty close to zero but if you look at the change --- -- from the baseline condition of I think there is a slight increase in the velocity you're right in the negative .3 to the .3 condition. Does that make sense [Bruce Ross commented that in the text there is a -.46 for both the baseline and the 9 dike] so there is effectively no change. Does that make sense? You are in this eddy almost.

Question: Eric Larsen: The further question that I want to follow up and you guys can help me here-is the question of that satisfying fish screen conditions. I think there was some notion that it did satisfy fish conditions and there was some notion it didn't satisfy fish conditions I wasn't clear on that Dennis can you help me?

Answer: Dennis Dorratcaque: The criteria for fish screens calls for the velocity movement parallel to the screen depending on whether you're talking about national marine fisheries from California up to two times the approach velocities so at full pumping the approach velocities is about .3 so it needs .6 to get by it and the idea behind that is to keep fish from being impinged on the screen and it's also got to do with length, how long can the fish swim away from the .3 as it moves by.

Question: Eric Larsen: So the length of the screen matters then?

Answer: Dennis Dorratcaque: Yes the length matters. The screens are 15 to 29 ft long each, the cylinders so with the .5 or the .6 moving back and forth by it I don't consider it to be a problem and so for salmon California did studies back in the 70s for the peripheral canal which indicated that at a .33 fish could avoid a screen indefinitely.

Question: Eric Larsen: No matter what the approach velocity is?

Answer: Dennis Dorratcaque: For an approach velocity as low as .33 or lower the fish could avoid that screen they are strong enough to avoid it indefinitely.

Question: Eric Larsen: So then the reverse eddy and the negative velocities don't seem to be a problem.

Answer: Dennis Dorratcaque: No I would say it doesn't affect it at all as far as fish impingement is concerned on the screen.

Question: Bruce Ross: Would that also be true on the dredge bypass channel? Because there we had a ----

Answer: Dennis Dorratcaque: But the dredge bypass idea that came up as we were going through our process was at first dredge a channel that flow by the screens and that was option 1 and as the bar moves down continually keeping that open might be a more costly option so perhaps as the bar came in front of the intake you could build a dredge channel straight out to the river . the idea behind the dredge channel is we don't want a dead end there for fish so going straight out to the river with a dredge channel that channel had to be large enough for fish who are at the screen to swim against it and have a way out back to the river so that's why that channel is so much larger than the one that is flowing down from above So it was like a two part thing to keep it open with the flow by and as the gravel bar got too massive in from of the screen it would be to dig this other one as a backup option later. like we discussed it is almost impossible to predict how much sediment you would have to take out every year or how many times a year in order to do that but as soon as it fills in on the option that goes out directly to the river we are then violating the .33 flow in that direction if were pumping at full flow at the intake.

Question: Dave Zezulak: I was just going to ask the rates of the pumping plant and the sewage outfall were that considered at all? The values of the pumping and the sewage outfall during your test?

Answer: Amanda Cox: We did not simulate the pumping or the sewage outfall during the test.

Questions: Dave Zezulak: What is the normal rate when the pumps are on or when the sewage is flowing? What's your outflow?

Answer: Tamara Miller: 700 gal per day right now, that's about 10 cfs.

Question: Jim Gaumer: If I understood you correctly, the dredge channel at certain flows the sediment will block the channel. What I'm wondering what if the water goes down and the channel is now filled and I would assume that then prevent you from getting water to the pumps, then you would have to go in and dredge it. You don't have the luxury of waiting until summer time in order to go in and dredge and I would assume right after the water went down you would have to get in there right away and dredge it and I understand that you can't get in that river channel during the winter time I think from October to whenever, you can't be in the active river channel. How do you maintain that dredge channel during the period of time when you have to have the water?

Answer: Chris Thornton: That's why it's not a great option.

Question: Paul Ward: I guess again counter to that is if you incorporate that with the mouth of Chico Creek and some have some sustainability there and I think one of the points Dennis (Dorratcaque) back on your fish screen criteria the .33 is not the channel velocity on a dead end but it's much lower than that for the average channel velocity that's the screen intake velocity. but if the agencies were willing to relax that standard based upon time

and the size of fish in that channel that will clearly change what this issue in terms of size, timing and amount of maintenance and so I think there are some options if we just look at the rigid standards that give you the certain cross sections it's very costly.

Answer: Dennis Dorratcaque: That's right. Options 1 and 2 were developed assuming was that there is no relaxation of agency fish criteria.

Answer: Mike Harvey: ---As a panel we have been pretty resistant because the possibility is really not a solution it might happen it might not happen. If there were some assurance that that could happen then the general consensus has been that we would consider that more as an option but at the moment five years down the line we see no movement to relax the criteria so in terms of an option we don't believe at this stage that it's a viable option

Question: Paul Ward: I understand that Mike and I agree and that's why its incumbent upon the regulatory agencies to step up I assume when that's going to happen when we see what the bottom line cost is for all these various pieces but "m a little concerned that we're dropping this dredge option because it doesn't work physically and there's a lot of permutations of that assuming that you might get some help from the agencies on standards that would help make that the cheapest and most effective option still in my mind

Question: Mike Harvey: Howard, do you think NMFS would

Answer: Howard Brown: This is something that we can discuss with our engineers it seems like it would be somewhat of a challenge but it warrants at least bringing further discussion up in context of the cost of this but long-term I think you also need to take into account the long-term O&M costs and the long-term O&M permitting issues that come up that are associated with continually coming back to open up that dredge channel from a permitting perspective it has to be well thought out and I image over a 30 year period it would have to be revisited a number of times.

Eric Larsen: Just another thing to throw in I don't have this particularly clear in my mind but if there were some dredging to occur and the bar continues to move at some rate around 100 ft per year the bar may clear the whole situation if it moves a 100 ft per year. Its within the mid range of our estimates of 60 to 140 and its 2000 ft long. It will be 20 years before the bar clears the site and disappears from view and is no longer an issue. So after 20 years there is no longer a have to deal with dredging path to deal with it. So there are creative ways to look at it.

Bob Mussetter: Let's think about the reality of what's going to happen here why is that bar here so long as this bank line stays the way it is and this is vegetated this is an eddy zone basically that's always going to be deposition the bar is always going to be somewhere in this area and it will continue to build downstream what I hear you suggesting Eric unless I'm misunderstanding you if we just leave it alone for awhile eventually all of this stuff is just going to go away and we'll be back with the bank line over against here.

Bruce Ross: Actually if you go back and look at the 1980's picture the top of the bar is 1500 higher than it is now the state park land at the mature riparian forest they've lost 100 to 150 feet in to it the apex of the next bend upstream has cleared the end of the rock at river road so yes in fact that is an eroding bank now the top of the bar is eroding the whole thing moving down stream as a unit

Eric Larsen: That's what I thought the argument was if it was going to stay there, great! We can move the plant downstream 600 ft or 700 ft and move the intake down 600 ft or 700 ft and the bar won't get there. The bar is going to stay there. Now, I'm being facetious and that's a little argumentative so let me pull back to be more clear. The bar wasn't there a number of years ago and it has moved down into place and I think it is highly likely that the whole bar will move downstream. Yes, and I image that someone could disagree and I'm hearing you disagree.

002-010621

Yantao Cui: I probably disagree. I think it is safe to say that this is a situation with a lot of uncertainty. Now that the west bank is going to the west, the only way for this to become reality is for the west bank to come back so that the river will have the same alignment as today. But I'm not sure the west bank is coming back. In terms of the size of the bar, let's not forget the dredging that has occurred in the past years. I think we tend to over simplify things while we try to formulate a solution. I can't say that the river will certainly be back to the location.

Eric Larsen: It's only a possibility the current intake can be reused in the future.

Amanda Cox: Like the image from 1969 that shows that gravel bar as a little gravel bar -----

Eric Larsen: I did a study in the very first report and it migrated downstream and we tracked the rate of migration downstream

Amanda Cox: I thought -----it just extended downstream. I don't know if its ever really detached itself from the bank I'm not sure about that

Eric Larsen: The gravel bar has moved down, no doubt.

Mike Harvey: I think the thing we have to think about is the genesis of that bar and the future behavior of it are an area of uncertainty if you take the old adage what happens in the past is probably the best indication of what will happen in the future and that I don't think anyone can basically argue against that what it would suggest is that bar system will be downstream. what worries me about that though is that's the only way that's going to happen is that where that bar has moved down and studied it Eric (Larsen) and Yantao (Cui) did and I believe you looked at it as well Bruce (Ross) is where the bar slide down the system we didn't have commensurate erosion of the opposite bank its more or less kept a straight line down through there what we have now is a significant deflection of the bank to the west its somewhere between in a 10year period somewhere between 350 and 400 feet. Now the question is in my mind and we've also as someone also just pointed out we've taken 300,000 tons out of that [bar] in a 6 to 7 year period which means effectively we slowed the process down because what we've done is taken out the sediment load which is driver basically for change so the question we have to focus on is this bar going to just slide on down at some rate or is it in fact the start of what we might call a point bar in other words it remains reasonably anchored and as Bruce (Ross) has just said the bank is moving west and south and so this will grow with it and stay attached over a long period of time that to me is sort of the big area of uncertainty and I'm not sure that we can answer it. Eric's (Larsen) model does show that this essentially staying pretty straight going through there we really don't have a tool for this one. Eric's (Larsen) model is not a tool to actually investigate the movement of the bar on its own as an alternate bar series?? We've asked Eric (Larsen) to do that as a group and what he's basically said is that's not what my model does and so I think this is where the crux of this lies at the moment what is the probability or if you like the flip side of that what is the uncertainty regarding what that bar is going to do in the future. We've got two options it's either going to keep moving down at some as yet undetermined rate -- as yet some have not agreed upon rate or it's going to fix in and be a much larger feature that moves west and south over time and either way regardless of what happens it's not good news for the intakes or the outfall.

Eric Larsen: It's not good news. I think Mike summarized the situation well and one of our tasks is to deal with what the situation is. It's a good place to stop. I think this is a small detail, Yantao(Cui) and I did (Yantao (Cui) mostly) did try to use another theory to predict the movement of the bar -- there is a theory out there that will do it and we both think it to be inadequate.

Yantao Cui: It doesn't work here.

Eric Larsen: It's too complicated here I think Yantao (Cui) summarized it well.

Mike Harvey: I would like to add one more point that we flipped over pretty quickly what I think is important with respect to the relocation options on the bar on the pumping plant. On the physical modeling as Amanda showed

basically if you move 600 feet or so downstream you get improved velocities there but we were definitely concerned about it because if you go out there today the bar has started to move downstream there is definitely sedimentation that was not there a year or two ago. It was not taken out by dredging because we couldn't get to it under the conditions that were imposed upon the dredging so it's there and it's moving and I believe Bruce's (Ross) surveys have shown that the point bar there is eroding downstream of the interim revetment and so the question we looked at and it's one that exercised us does the interim fix or interim measure whatever we want to call it provide enough stability to prevent that bar from moving through and I think that conclusion was No it does not and so if you put, only just move the pumping plant 600 feet downstream roughly where Amanda showed you we don't believe that will buy us very much time as that bar erodes essentially the point bar on the west side erodes it provide conditions for that east bar to move downstream.

Jim concluded this portion of the workshop to break for lunch.

LUNCH

Preliminary Design and Cost Estimate for Spur Dike Configurations and Pumping Facility Relocations

Dennis Dorratcague, MWH Americas

003-00-00-07

[Please see the power point presentation in Attachment E.]

Dennis Dorratcague: We did an engineering analysis almost to the point of a preliminary design. We did a 9-dike alternative, and that included drawings and cost estimates and relocating the pump station someplace else on the river as an alternative and another alternative that came up later in the process after meeting number 4 and after we got started. This was adding another pump station at a different location on the river and I'll get into why that was done.

You can see that the river is here. It is the same reach that you have been seeing all morning. This is the pump station here and that line going to left of it is the pipeline going out to the east screen intake that's out in the river. So one alternative is the nine dikes which you see here. We laid out the pump station alternative downstream just going into the bend in the river as it bends to the west. One pump station intake is down her and the other one is up in this area. I'll step through in this order first with the groins and then the pump station in this area and the pump station further upstream.

As a preface, we did look at another pump station site and Amanda talked about some of the hydraulics there and it was about 600 feet downstream from the existing intake. We looked at that and Bob mentioned as part of that analysis, he looked at the erodibility of the east bank up here. He took some gradation samples up in this area. So we didn't look at the 600-foot downstream pump station any further. We did a hydraulic analysis at 600 -foot pump station and determined that we could probably gravity water from there up to the existing pump station. So for this alternative we would be looking at just a new intake and pipeline rather than adding a new pump station. However, if we go further downstream, a new pump station is needed just because there would be not enough depth of submergence on the pumps. This is because of the way the present pump station is built.

And the next slide—The gravel bar is in here. We don't show the river; the river is coming through here. This is the pump station and the intake. The gravel bar is here. Chico Creek comes down here and these are locations of the 9 dikes and they vary from 100 ft long to 200 ft long. There is one at 250, as I recall. So, we used the 2-Dimensional Hydraulic Model that Bob had done, and we took the data from the report that Colorado State had done on the physical model. The first thing we did was compare the data readings from the two models at common points that each predicted velocity and depths. We found that they agreed very closely and well within the accuracy of the measurements. Since there is a greater number of points, and our first effort was to define the velocities around and over the dikes so that we could properly size the rock that goes on the dikes. This is a typical dike; it shows how

each dike goes back into the bank. We picked 30 feet of dike embedment into the bank. There is no rip rap or rock between the dikes. The top of the dike at the bank was set at the 35,000 cfs water elevation. The dikes slope downward into the river. Here is the profile we looked at; here is 2 of the 100 foot dikes, and it slopes downward at a 5 %. It goes into the bank at the dotted line. Here is the bank elevation, and here is the bottom if the dike at the river. Another thing we did on this – we needed rock on the top to prevent it from being washed out, so we calculated a certain size rock. A 2.6 ft median rock size was determined. There is a core that can be put in each dike with a different size rock. We sized that to be more of a filter blanket, because, if we just put 2.6 ft rock on the substrate, we could lose rock from wash out underneath. this would produce a failure of the groin. Therefore, we have a filter blanket to prevent migration of the fines underneath the rock at the river bed. To analyze this, there are probably 5 or 6 people who have researched these kind of dikes. We looked at all of these methods of calculations. Their answers varied widely in the size of rock and how they were to be designed. We were fortunate in that the American Society of Civil engineers just published their new sedimentation book where they went through all these different methods and gave background on it. So we used that book as a basis for design.

You can see that the dikes are all similar. This shows a cross section of it. Here is the filter blanket and there is a fill in here. It doesn't make much difference what the fill is because it is protected by the surface armor rock. We set this at a 2 to 1 slope. We have a nominal flat top and the filter blanket. We also are thinking about putting rock out here around the toe. We are not sure this is completely necessary to this extent but this is a toe protection so that we don't get scour around the end. This would to prevent a scour hole from occurring here around here causing failure of this rock falling into it. This is the same feature on the right side and a close up of a typical dike

Yantao Cui: Do you have this toe protection only on the toe of the dikes or circumference the entire dike?

Dennis Dorratcague: That's right. We put it up to the bank and we are 20% on the way to a final design. There are still things that need to be worked out. You can see these lines here that delineate the extent of slope and so outside those lines is where that protection is. We show it extending back and I agree it probably doesn't need to go all the way

Mike Harvey: Most dikes are designed to just beef up around the nose

Dennis Dorratcague: You're right; we went a little bit beyond that by including it here all the way back and I agree we could make that smaller or take it out but at this level we included it because we were trying to come up with costs. I would rather be high than low on these things.

So this is the layout of essentially the 9-dike alternative. This shows some of the elevations. This is the 100 year and this is the 90,000 cfs that shows the water levels against the size of the dike. This is this is the 90,000 cfs that we picked as the bank full that we evaluated at the CSU model and this is 35,000 cfs and that is the height of the dike at the root of it at the bank

You can see the 100 year is right about in here and is quite deep over the top of the dike. The bank full is right above the dots there and we are still getting 6 ft of depth or so over the dikes at bank full at this end of the dike.

Mike Harvey: 35,000 is about the same as where you submerge the bar on the other side. It's about top of the bar elevation on the other side.

Dennis Dorratcague: Right and we took the sizing of these and the slope of it and the height and the length of it out from the bank that came from the physical model results, which were also the same as the 2-dimensional model. We stuck with the dimensions that were evaluated in the models

Question: ??: What's the river flow now how many cfs in the river now

Answer: Les Heringer: 6000 cfs

Dennis Dorratcague: The 6000 is going to be in here

Les Heringer: I don't know that CALTRANS has had any problems there down at Butte City?

Dennis Dorratcague: We talked with CALTRANS to understand why they did it and took a different approach. We used a filter blanket, they put in sheet piles down through the middle of the dikes. We just stuck with rock. It's just did it with a minimal, it's just going to be placed on the river bed and we aren't digging down into the substrate. We are going to excavate out of the bank and put the root of the dike into the bank but there's no excavation in the river. The idea of construction is that it can be built on top of the river bed, and there is no need for machinery to go into the river water. As I said, its 30 feet into the bank. In other words, when I say into the bank that is 35,000 cfs water level intersects, the bank where we started that measurement from. So it's about in total a measure of 67,000 tons of rock for the groins

I'll step through these three options this one and the 2 pump relocations and then I'll compare the costs next to each other.

Anymore questions on the dikes?

Gregg Werner: Actually can I go ahead and give a little more information. I'm Gregg Werner from The Nature Conservancy and it's been mentioned we have a conservation easement where the last two dikes would be placed. I think we should clarify our position on that and we do have a letter that responds to a letter from Les and from Dick Thieriot. Basically we've had an easement there since 1991, some six years before the pumping plant and the purpose is to protect the riparian habitat in perpetuity. The easement, in a number of provisions, precludes the proposed dikes. We've had a number of discussions with the plant owners, reviewed the provisions of our easement and our stands for amending easements.

I think that the letter really lays out and hopefully clarifies completely our bottom line. We are concerned about the dikes and the affects of limiting the meander in the area because habitat formation is dependent on river meander. We reviewed the situation at our local, the regional, state and corporate level and the determination is that we would not approve an amendment to allow the dikes on our easement area. As it is mapped, this means the last two dikes. I wanted to provide this information because I think it speaks to the feasibility of the dike option. I have some other copies of the letter which I'll be glad to share. I think I have ten left or something.

Dave Zezulak: That would be dike 8 and 9?

Question: Mike Harvey: I didn't quite hear what you said because of background noise. Did I understand you to say that basically under no circumstances will TNC entertain the dikes on the easement.

Answer: Gregg Werner: That's correct. We feel at this point that we have uphold the legitimacy of the conservation easement and clearly the dikes would completely frustrate the conservation intent of the easement

Question: Mike Harvey: Even if Eric's (Larsen) modeling shows that that's not the case.

Answer: Gregg Werner: Well what the modeling shows is that you absolutely stop meander and if you stop meander you have greatly damaged the habitat and future habitat formation for terrestrial and off-stream aquatic habitat. That's the big thing.

Answer: Eric Larsen: A while back we did one of the models and again this is a straight reach doesn't have much dynamism but I think what Mike is referring to and, correct me if I'm wrong Mike, at one point I modeled it with the groins in place and without the groins in place and it showed that there was not a large difference between the area of land reworked in the two cases. Is that what you are referring to?

Answer: Mike Harvey: That's right.

Answer: Eric Larsen: I think they are aware of that.

Gregg Werner: And, the modeling that only looks at a fairly short term: 25 and 50 years. If you look at where the river has been in the last 100 years then its way west of there so that the logical meander belt of the river is much wider than that. If you talk in terms of perpetuity, then that's much longer than 50 years.

Question: Jim Well: Gregg (Werner) is your answer to Mike's query, you said at this point, what does that mean?

Answer: Gregg Werner: Let me retract at this point at this point. We have reviewed it at our project level at our regional level at the state level and with the decision maker for our corporation and there is one consistent determination as to whether an amendment be approved and the answer is no.

Question: Mike Harvey: So effectively what you are saying is that any further discussion of dikes is irrelevant to the process because we have shown both analytically and through the models that we cannot achieve the goals of preserving the pump at its current location without the additional dikes

Answer: Gregg Werner: I think the original charge of the grant the goal was to come up with a solution that works consistent with river meander. We certainly encourage finding a way that works with river meander and that is what we would recommend.

Question: Mike Harvey: That's not my question. My question is are we wasting our time talking about going any further with dikes

Answer: Gregg Werner: I think so probably.

Question: Dave Zezulak: Does your easement extend out into the river?

Answer: Gregg Werner: It goes to the river bank the edge of the water.

Question: Jim Well: What is the definition of top of bank because that's what the easement says?

Answer: Gregg Werner: There is not a specific definition but there's a clear provision in it that says that you interpret everything to maximize the conservation benefit. So I think you know clearly that when you say "river bank," you mean where the land meets the water realizing that changes depending on water level. The dikes would extend back a ways away from the normal bank, they involve importing material they involve surface destruction and some other things that the easement speaks to. I think the big thing is the dikes are intended to pin the river in place. There's some limited on-site impacts as result of that but the big thing is that when you stop meander you stop habitat formation.

Question: Mike Harvey: At that location?

Answer: Gregg Werner: At that location and in the larger area that stopped meander would affect.

Question: Jim Gaumer: Mike (Harvey) I have a question when you anchor the spur dike into the Stiles property ---- across the river down in front of where the conservation easement property is his property rights, his property goes ---- their property stops and the river starts.

Answer: Kevin Foerster: Jim we need to get on track with finishing Dennis' discussion, what Gregg (Werner) brought up is really more appropriate for the open discussion and talk about the alternatives I think Dennis needs to have the opportunity to go on with his presentation before we get into this level of the discussion.

Answer: Dennis Dorracague: The first of the two pump alternatives is located about 3500 feet downstream of the existing pump station. This would involve an intake located here. We went as far downstream as we could. This is the levee here, the Phelan levee, and so rather than taking the intake further down here around the bend and have the pipe come back across this area, we chose to minimize the distance from the river bank to the levee and cutting through the riparian zone here.

However, presently, there is a revetment on the bank that comes down and sticks out and ends. There the river is cutting in behind it, and to protect the intake we put in rock up to that point and then moved the existing rock bank back. So that's what this shows.

So, this involves an intake, a pipe back to the pump station behind the levee, a pump into to a 6 ft diameter pipe up to around the old pump station and joining into the existing discharge pipe there. Here it joins the existing line by disconnecting the connection of the pipe back to the existing pump station.

Question: Greg Golet: Why is it that the old rock has to be removed?

Answer: Mike Harvey: The last thing we want to do is have a feature like that in the middle of a revetment it will just create an adverse hydraulic condition. The idea was from where it sticks out and it is at the end of the revetment there that the revetment is actually retreating at the moment its been undermined with separation back under here and so the idea of having flow that kicks like this and then reattach it further down on this rock is not a good idea so the idea was to just fair the bank we went out to here we would probably have to do some bank fill we don't really want to do that either if you can help it so basically its easier to pull this back, tie in and run it down the existing bank line without having to do bank fill.

Answer: Dennis Dorracague: The second pump alternative showed a view of the intake and a pipe back into the pump station. Essentially, we used the same design as the present pump station and a pipe through the levee. We put the pipe through the levee here. It's not a project levee; it's a private levee, so we can go through it rather than over it. Another thing, there's not enough water depth here to use the same types of fish screens. You need about 12 ft of depth to use them and here there is perhaps about 8 feet of depth at low water. We have a flat plat screen; it will extend about a 60 to 80 feet up and down the river bank. This can be shaped a little different, and in this example, we chose the height of it as not up to the 100 year. Suring high floods the water will go over it, we kept it pretty much the same height as the overbank area back here.

The water comes into the screens through the pipe back to the wet well and lifted up in the pumps, which will be located here. The screen will have a back wash system to keep it clean. Another choice is to slope them and use an air backwash, an air cleaning system. We also have discharge jets inside the intake to re-suspend sediments that get in there,. As you can see the dashed line is the existing ground line. And so the intake at the bottom of the screen is just about at the bottom of the river at that location.

This shows the layout. Here is the intake. It comes back to the pump station. The pipe would be buried behind the levee, and it would go over the top of the proposed city outfall. We obtained a drawing from the city and used that – its barely going to fit over, and we will have to talk with you to see how we separate the two. It will require some different treatment for the backfill than shown down here. The drawing shows the city outfall there, and we are going to go over the top of it. We might have to build up the ground over it to keep a 3 foot burial on the pipe. It's going to come in and tee in to the existing discharge line. We'll separate the line and put blind flange on the end so that in 20 years or whenever the river goes away from this screen the new pump station can be abandoned and the pumps can be re-installed back into the existing pump station. We wanted to leave that option open for the future.

This shows a picture of the revetment we talked about. We did not really design this but it shows the extent of it and what the bank line looks like through there.

Are there any questions?

Chris Leininger explained that the report that was handed out was missing the Chapter 4. For those participants that printed the report from the website did have a copy with the Chapter 4.

Dennis Dorratcague: The previous pump station intake was located down in here so Eric (Larsen) said that to avoid the rip rap which we just discussed with the revetment through here. There is an option to place the pump in the area where the existing revetment is. This calls for removing some revetment and building the intake, and then replacing rock around it. We chose a spot about 150' or so up from the downstream end of the revetment because there is a small hole for the intake. This is even shallower than the site further south.

Question: Eric Larsen: Is this just a better spot than just going down to the point?

Answer: Dennis Dorratcague: Well it's better from the point of view that additional revetment is not needed.

Question: Eric Larsen: I'm talking about if you moved it upstream 150' from the point could you come down another 100' and would it be just as effective another 100' down and still be behind the revetment

Answer: Dennis Dorratcague: No because you see the contours out here. This is a little hole.

Question: Eric Larsen: Oh I see you found a little hole that would help you.

Answer: Dennis Dorratcague: And you can see where the bank line is, it actually comes up about 2 to 3 feet up on the fish screen. This shows you how shallow that is compared to the last site. If we moved it downstream closer to the point the existing bank would probably run through the top of the screen set at this elevation.

Eric Larsen: OK thank you.

Dennis Dorratcague: We have wing walls here even though we show this bank line coming through about midway up on the screen almost. The thought is that with this kind of a layout it will create enough flow around it to keep an area in front of the screen scoured. This approach should work but we need to look at it more if it is decided to continue with this alternative.

003425

Question: Yantao Cui: How much room do you have below the screen? In other word, if there is a few feet of deposition, can the facility still operate?

Answer: Dennis Dorratcague: You can see that there is going to be a cut off there and the existing ground comes through, the screen is about 8' tall and the existing ground comes 3 feet above the bottom of the screen. So it will be dug out to start with and then we have a wing wall around it with the idea that the water will come around there and speed up and keep this cleaned out

Question: Yantao Cui: Do you have any room here between the bottom of the screen and the river bed? Something like a foot or two?

Dennis Dorratcague: You mean on the inside?

Yantao Cui: On the bottom – from the bottom of the screen to the river bed.

Dennis Dorratcague: There is no safety net if you look at the existing level underneath.

Yantao Cui: Essentially if any deposition here, there will be an operational problem.

Dennis Dorratcague: If deposition returns to where it was before the project was built then we're going to have a sediment problem.

Bob Mussetter: You could put some vanes in the river bed just outward of the intake they've done that in sand bed systems and it works really well I'm not sure how well it would work in this gravel bar setting, it's something to think about.

Dennis Dorratcague: I'm hoping that we'll get some water moving around that, that's the point here. We have to do a lot more thinking about it if this is the alternative that is going to be looked at further.

It's got the same size pipe through the dike same pump station, and the rest is quite similar except the pipeline is now 2200 feet long instead of 3600 feet long. That's the pipeline from the pump station to the connection point and once again we're going over the city's outfall here. So essentially, the pipeline is horizontal and then we start to slope it down to get past it. For your information we are figuring that we can use a controlled density fill and there is a 1 foot separation between the two pipes.

Question: Tamara Miller: ??

Answer: Dennis Dorratcague: We can dig it up re backfill it to support the pipe and keep it off of yours.

Question: Tamara Miller: How thick is your pipe?

Answer: Dennis Dorratcague: Probably about like this. I'm guessing, I haven't really looked right now. We're looking at a concrete cylinder type or something like that We are not going to be at the point were you folks are ready to go I'm sure (City of Chico),

Any more questions otherwise I'll get into the cost estimates

Jim Well: I think that this really shows here that the existing bank at the end of the revetment that Greg Golet was talking about why we're taking this off we're trying to smooth transition this revetment from the previous pump relocation come back and tie into the rest of this get rid of this protrusion in the river and the scour hole behind it this clarifies that

Dennis Dorratcague: That's good.

003832-003

Yantao: To continue with my question, so for the downstream location, you don't have to go back to the slide, it has a little bit deeper than the upstream location, do you have any safety room in case of future sediment deposition?

Answer: Dennis Dorratcague: No, not really.

Jim Well: The screens set on the floor of the structure.

Answer: Dennis Dorratcague: The screens set off the floor about this far but out in front of it is just a wall down through at the cut off. It's going to extend out, but like I said, the existing bank line is above the bottom of that intake screen.

Question: Yantao Cui: Is there any possibility to give it a little safety room by lifting the screen above the ground but goes wide?

Answer: Dennis Dorratcague: Yes, we could do that to account for a shallower screen at this location. You probably make the screen structure almost twice as long in the bank here in order to do that. It can be done, we were trying to avoid that. We were trying to reshape it there but if that's not in the cards you would have to make it longer

Question: Eric Larsen: This may not be the appropriate the place to ask this question. Another thing that was asked of me at the break and I could not answer this, maybe I'll put this question out now and we can talk about it later, would it be possible to put booster pumps along and get the intake further down? Could you get the intake farther? I don't know much about "booster pumps" without having to put in a whole new pumping station.

Dennis Dorratcague: You mean way down here in order to get it farther down the river?

Eric Larsen: No just even at this site. Could we not have to move the pumping station and just bring the intake down if there were booster pumps along the system? That would make sense. Does my question make sense?

Answer: Dennis Dorratcague: I understand it technically but it will probably cost more than this but physically it could probably be done

Eric Larsen: I see than your guess is that it would probably cost more. OK thank you

Dennis Dorratcague: I guess just maybe to recap I did not mention on the 3600 foot long pump station that was from here to down where that other one was there is about 4 to 4 ½ feet of head loss additional over what is in the existing pumps now and that's why we cant use the existing pump station. There would not be enough submergence on the pump intakes. So this one and so its about a foot to a 1 ¼ to a 1 ½ feet of head loss per 1,000 feet. So were about 3 feet of head loss in here and that still puts us outside the range of being able to use the existing pump station whereas down here at 600 we could we looked at a bigger diameter pipe and that would work

Question: Eric Larsen: As I understand it, just to share the information, this is not an exact science and we were not exactly sure where between 600 ft and 2200 ft downstream there would be a break point. It is probably not so easy to pin point that.

Answer: Dennis Dorratcague: That's right about the approximate head loss there, but it can be calculated.

Answer: Mike Harvey: It can be calculated, its not so indeterminable that is not calculable it just hasn't been.

Eric Larsen: Ok we can calculate that.

Dennis Dorratcague: Let's back up. The head loss has been calculated I don't think we need to go anymore into that. It's the existing pumps and their condition now how much we can lower the water level at the intake and not cause cavitation or poor hydraulics at the pump. That's the issue and that's not an exact science. We can put out cavitation numbers and do stuff with it. There is a certain range on that where there is uncertainty.

I'll move on just to explain what we did. We calculated costs for each of the three alternatives and we included construction costs. We used a standard approach like the Bureau of Reclamation uses. We put in an unlisted items figure. At this level, when you do about 20 % of the thinking for the design, there are things you don't think about. So there is an allowance for that and then in addition to that there is a contingency because of bidding climates, inflation between now and the future, and all kinds of things that go with that.

One of the biggest unknown is in any one of these is what is the mitigation costs. In other words, if the dike option is ever selected, open how do you mitigate that, and how much does that cost. We make some assumptions and what this is in the spreadsheet is that one line in each of the three alternatives. Here are the tons of rock that goes into the structure, either into the revetment or into the river. As you can see, there are 67,000 tons for the dikes, the 3600 foot pump station has about 13,000 tons for that revetment we talked about. Then there is 950 which will we will be taking out, more than 950 tons and putting back 950 tons for the intake structure in the 2200 foot intake.

Question: Eric Larsen: Just to interrupt again I'm sorry, but it's my understanding that you were going to revise these since our conference call and I don't see the revisions.

Dennis Dorratcague: We are revising what?

Eric Larsen: The mitigation costs. Remember Mike said that.

Answer: Dennis Dorratcague: Yes, and we can do it in a minute I'm getting to that point.

Eric Larsen: I'm sorry, good.

Dennis Dorratcague: We discussed this on the phone and made some guesses. We said if you put so much rock in the river we will probably have to take so much rock out somewhere else. This cost is based on that assumption. I made the assumption that it costs about the same to take it out as it does to put it in, and, therefore if you have to take out one half as much as you put in that is what that .5 is right there in the yellow. So that's the cost estimate if that's the mitigation factor on the cost of putting rock in so what you can do is change this to a 1 for instance and you can see how that changes the costs of the project. In other words, what I'm saying at a 1 to 1 at 67,000 tons, we have to take 67,000 tons out some place else on the river. And that cost is an additional cost to the project and that holds true with all the alternatives.

Question: Eric Larsen: For my sake can you push it as far as ----

Answer: Dennis Dorratcague: Sure.

Eric Larsen: Which I believe it was suggested to us as a possible.

Question: Tamara Miller: Why is the pump station at 2200 at \$8 a ton for installation when the other ones are in the \$40 ton range?

Answer: Jim Well: Because at the one pump relocation site we can place it from the bank right there because everything is real close to the structure everything else is out into the water.

Answer: Dennis Dorratcague: That's right, I don't recall the exact reason why.

Question: Tamara Miller: It's a unit price right?

Answer: Jim Well: We took more off than we put back in.

Answer: Dennis Dorratcague: There might be a salvage cost or something because we're taking more out than were putting in and we are going to reuse what we take out. This other assumes that its coming from a quarry where as we don't have to get it from a quarry for the 2200 foot alternative.

Question: Tamara Miller: Then in the rest of the total project costs is the double handling cost of the rock you have to take out and then put back or is that the pick a place price?

Answer: Dennis Dorratcague: No that's just installing it.

Question: Tamara Miller: So labor only not materials?

Answer: Dennis Dorratcague: I'll have to look I think that's labor, I have to go back and look at the details.

Dennis Dorratcague: This all depends on the bidding climate and everything else. We talked to the construction company that did the toe revetment and we called Vina quarry and they gave us numbers. We used those costs now. If you call again, they will have probably changed.

Jim Well: This is the total cost at a 4 to 1 that means 4 times out of the river some place for every ton put in under this project if that's the mitigation turns out to be required by the agencies involved

Question: Gregg Werner: Just a question related to that since the agencies here know better is the criteria for mitigation likely to be tons of rock or frontage feet of meander loss I don't know how they do that.

Answer: Howard Brown: What we've done with the COE on some of their set bank mitigation is a 1 to 1 in linear feet.

Answer: Mike Harvey: Roughly with the COE's SAC bank work recently the dollar values for mitigation has been about \$800 a lineal foot for mitigation.

Dennis Dorratcague: We did it this way as a left-handed way of doing it. Perhaps, we should use other ways. I imagine the actual way of doing it would be through the EIS and finding out the value and assigning the mitigation to that. At this level of analysis it is inappropriate to guess the mitigation that is required here.

Howard Brown: Maybe a better approach would be surface area instead of volume and just straight linear feet what the fish are going to see is what they are exposed to and what out on the leading edge of the design 10 feet deep of rock doesn't make a difference conceptually even if its just one foot its what they're exposed to is what's going to be resulting.

Question: Gregg Werner: Would the fish be the only criteria or would the terrestrial species affected by the loss of meander be a concern.

Answer: Mike Hoover: It would be tough to calculate that ----- direct effects would have to be calculated for terrestrial theirs a mechanism to get at indirect species indirect effects would certainly try to get at that. In construction we would have to compensate for associated terrestrial impacts as long as there is a mechanism to get at indirect effects. We would try to do that. Basically, direct effects would have to think about it for terrestrial resources. For indirect effects, we would have to look at a mechanism to get at that in some way ----

Question: Mike Harvey: So Howard (Brown) your estimate is roughly one to one?

Answer: Howard Brown: Yes, on a lineal feet basis, yes that's what I would say.

Question: Mike Harvey: So, that would be a reasonable at least to put in for the moment?

Answer: Howard Brown: Yes, consistent to what we've required in other consultation particularly with the COE.

Question: Jim Well: Mike (Harvey) if we use that \$800 per lineal foot and for the pump station is relocated 3600 feet downstream, I think you said its about 1500 feet of revetment so that 1.2 m mitigation costs based on what we just discussed if you went back to 1 to 1 or ½ to 1. I'm not sure how those numbers would compare?

Answer: Dennis Dorratcague: So, the rock installation here is equal to the cost of the mitigation before.

Jim Well: So if you took out 1500 lineal feet at a 1 to 1 at \$800 a foot you come down to \$1.2 m for that alternative that's all.

005418

Yantao: It makes more sense to do the mitigation on a linear foot basis.

Various discussions taking place at once regarding potential mitigation.

Question: Jim Well: How would you mitigate for spur dikes?

Answer: Howard Brown: We wouldn't just look at the length from the river bank because what we're really concerned about is the surface area of the rock basically stopping the fluvial function is creating a predator habitat, that's probably the main concern so we would like at the lineal feet going around both sides of the dike at each dike

Mike Harvey: Roughly 3000 feet.

[More conversations by everyone--can't hear.]

Jim Well: Attention please.

Dennis Dorratcague: Regarding the operations and maintenance costs we looked at the different alternatives and compared it to the existing. So on the groin alternative, you have the existing operation costs on the pumps for the way they are now plus you have a maintenance cost on the dikes, which depends of the on how big the floods are and what happens out there. We put in essentially \$100,000 a year it could be high or low.

My guess is they might not need that because of the way we designed it. It's fairly stout design that we calculated here and then we calculated the electricity in the pumping and you can see the costs goes up. Down below we have a cost per acre foot of water pumped and we are assuming that we are going to pump 40,500 ac ft per year and so we took the maintenance costs and just divided that amount into it. I think Les you're sitting here at about \$8 ac ft per year now.

Les Heringer: That's right.

Dennis Dorratcague: And this is the figure were talking about. We said the existing one is at \$7 and that's the way we calculated it.

Yantao Cui: I think that's fine because you are doing a comparison with identical assumptions.

Dennis Dorratcague: And you can see how it goes up with the different alternatives.

Jim Well: The increment is really what you're interested in.

Dennis Dorratcague: That's right and the increment rate is down here in the green down below the assumption of the \$100,000 here which causes the increment for the groin option actually to exceed the others which is kind of counter to what you think because we're pumping higher.

Question: Bob Mussetter: Since the revetment has to be so much longer are you assuming you are not going to have any maintenance requirement in the long run?

Answer: Dennis Dorratcague: Yes, your right to be consistent with the groins we should put some money in there for repair.

Question: Eric Larsen: Dennis (Dorratcague) the reason the electricity goes up for the new pumping station- because you have to put it in?

Answer: Dennis Dorratcague: No, you are pumping against a higher head.

Eric Larsen: Oh sure, it takes more energy.

Answer: Dennis Dorratcague: There's the heads were pumping against. What we did depending on what the river level is and how much water were pumping. The head against what you're pumping changes all the time.

Eric Larsen: Yeah I see.

Question: Mike Harvey: I think your maintenance costs are high and the way you're building them with so much additional rock that they counter scour.

Answer: Dennis Dorratcague: I think you're right also.

Mike Harvey: Typically you don't do much maintenance on dikes you build them with the assumption that they are going to scour locally and you put enough rock in so they self adjust.

Dennis Dorratcague: That's what I thought too but over at Butte City, they have some repair coming up through the last flood but I think they were pretty small.

Dennis Dorratcague: That's not an appropriate spur dike

Mike Harvey: But that's what they did

Yantao Cui: It's still a small cost even at \$50,000 compared to the overall project cost.

Mike Harvey: It's the way you are basically saying there if you take the criteria that we've used in the past then any of these options are affordable.

Les Heringer: Well, the 2200 foot one. What's the life span of that one? You would have to factor, that in 15 or 20 years, we're going to have to do something else, that should be factored into it.

Dennis Dorratcague: Les just mentioned that I did not factor into it is that the 2200 foot pump station is a lot closer to the gravel bar. So it's moving down through all this area at the same rate I don't know if it's going to or not. The gravel bar will reach that one first so its life would be expected to be shorter.

Bruce Ross: All it has to be is just long enough for the top of the bar to reach the current pump station -----so at 2200 you're probably within one or two years of being fined you may have to do one dredging at one end or the other.

Dennis Dorratcague: It's 2200 feet at 100 feet per year that's 20 years. Where as the other one might be 35 years at the same rate.

Jim Well: The criterion was we started out with a 50-year life that was reduced to a 40-year life because that was the life of the stainless steel fish screens. They've been in the water for 10 years so where settling for a 30-year life from here on.

Les Heringer: The 2200 doesn't give us 30 years.

Question: Paul Ward: I have a question about that life is it the life of the head works or just the live of the screen structure because that is a materially different cost.

Answer: Dennis Dorratcague: He's (Paul Ward) right. You can replace the screens relatively easily for a few hundred thousand.

Question: Jim Well: So you're saying the life of the facility is 50 years and were down to 40?

Answer: Dennis Dorratcague: Yes.

Paul Ward: My last point for some reason the dredging option was not included in the cost estimate and I kind of understood why it was based on conclusions of the facts why the two options didn't seem to work but I think based on the discussions I had with mike there that part of that was predicated upon the part that there were no concession by the agencies on fish screen standards and part of it was the fact that it hadn't been accounted for by tying into Chico Creek some way and so I'm kind of curious is the decision among the expert panel in your opinion that even with those factors that this isn't cost effective.

Dennis Dorratcague: A little background before the last meeting. We did a report on that option the dredge channel and we did hydraulic calcs to see what size the channels should be to deliver water and then we made an estimate about how often they would fill in with sediment and how much material would have to be removed each year to maintain those channels. I forget what the result was but that was written up in a report that went with the minutes of the last meeting.

Paul Ward: And I think I have that report but it didn't answer my question entirely I don't know if that talked about whether or not that channel size was dependent upon some relaxation of fish screen standards that's where the costs would lie I presume.

Dennis Dorratcague: We did not consider relaxation of fish screens when we sized the channels I would think you would want to size the channels to get the full flow and the relaxation would come in when it gets partially filled in and the channel is taking it all into the fish screen rather than bypassing as in Option 1. Do you see what I'm getting at?

Paul Ward: I think that concept is right I guess that the other thing that I heard based upon the physical modeling there was no connection or no assessment of the impact of Chico Creek which is always going to be connected there somewhere which also would tie into to what that ultimate cost of dredging would be because you might be able to capitalize on how that angle proposed was for the creek so it seems like to me at least there is some unanswered questions on ----- what the costs estimates on that particular option as opposed to the two or three that you're talking about here.

Bob Mussetter: Maybe I'm misunderstanding what you're thinking about the impacts of Big Chico Creek but the dead-end dredge option I think we all agree is probably a dead end just because of the time frame that is one on so that the one that I think you are referring to is the one that we were going to cut the 400 cfs channel from the head of the bar down along the distant bank line and connect it into the mouth of Big Chico and go on down is that what you're thinking about.

Paul Ward: Yes, well I think a variant of that is I guess is that you arbitrarily placed that dead-end somewhere well above the fisheries if that dead-end were at an angle that it was similar to the way Chico Creek is right now and maintain that then you have the benefit of Chico Creek now the size of that channel is where you get into the what the fish screen standards might require.

Bob Mussetter: So you are referring to the dead-end on the channel option.

Paul Ward: Well either, but either such that we capitalize on that.

Bob Mussetter: Let me just finish, the other channel that connects up to the head of the bar it fills in above Big Chico Creek so there's no relationships there Big Chico doesn't help you the dead end version that's a question whether Big Chico would offer enough if you angle it downstream or something if it would offer enough energy to keep that cleaned out I ---

Paul Ward: Well my question is we're assuming a maintenance free result and what I'm asking I think is what is the cost of that maintenance above whatever you get from Big Chico Creek and maybe that goes back to making it cost effective to the people that have the fish screen standards where to say yes instead of having to have a cross section of ----- would lower the costs and maybe you considered that I haven't been involved it seems to me that in the short term you ought to consider this.

011024-003

Yantao Cui: I was think Paul's question for dredging channel before we took the break. Based on the modeling results, it is almost certain that you will have to go out to dredging the channel every spring before pumping. That is probably not going to be accommodated practically.

Paul Ward: I don't understand that because Chico Creek connects the river every year its still connected there's a channel there.

Yantao Cui: You cannot still have the dredge channel to approach Chico Creek

Paul Ward: What I think I'm hearing from you is you have this right angle channel.

Yantao Cui: Maybe we should get the big aerial photo we see exactly what we are talking about.

Eric Larsen: Let me make a point here just to follow up on what Paul is saying here. As some of you know I've made a very inconvenient suggestion recently, which is that we don't have enough information and we need to compare some things that we don't have enough information on and I'm not the most popular guy on this project having said that and it relates to something Paul's coming in with here. I would like to see the numbers now for things like this channel compared against the numbers we have been seeing today. In fact, I made an even more unpopular suggestion and that was that we go back and revisit things that we threw away. In particular, I was wondering if just continuing dredging of the bar itself might not be comparable to some of things we are seeing here. At least I can't find numbers and I tried as hard as I could to find numbers from our last meeting so I could put the numbers against the other things. So I think for me, to make a decision that's technically based and sound, I need to see these numbers against each other. And I know that we rejected that in the past but I'd like to see the numbers put up against what we have now and some numbers put on the idea that you have that's going to require some dredging. Ask what is the cost for that and you look at those costs compared to ones were currently seeing. I can speak about this more in the discussion section. The ideas of moving the pumps are from my point of view are technically brand new. We've brought them up a couple times but we really haven't studied them. In fact, we haven't studied the technical aspects of moving the pump and put some prices on them. I was asked to guess a couple of places and I went and guessed a couple of places that looked pretty good. But, there are a lot of interesting possibilities there that I think we haven't had the opportunity to explore. You've seen the extensive studies we've done on the groins situation. I think if we put a little bit more energy into understanding some of the dynamics and thinking about the possibilities we might come up with a creative solution that involves something else. And I just can't put the numbers together yet to make that evaluation. That was the basis of my statement, that I don't have enough technical information yet to say whether this is the best moving the pump alternative or to say that moving the pump is better than continued dredging. I can't do that quite yet. So, that's just kind of an

introduction to some of my thoughts. And I think that my colleagues on the tech team have differed with me on certain points, and that's okay.

Mike Harvey: I guess the question that I would ask is okay what information do you think you need to reduce your uncertainty or help you come to whatever solution it is.

Eric Larsen: Well two things I can think of and one is a more careful examination of the costs I mean Dennis has done a great job of beginning a draft of the costs that's one and second thing I think you'll want to go into looking more at the movement of the bar and see if we can understand better how that bar may move I think that there are ways to address it that we haven't.

Mike Harvey: Specifically?

Eric Larsen: Specifically, empirical studies. Look at other places on the river where there might be bars like this. That's one way of understanding the bar movement.

Mike Harvey: That will give us, okay let's address the two things.

Eric Larsen: Let me please start off with this. One of the reasons I came to this was that if we can't do the groins we've got to do something else. And I said to myself, "in choosing what else to do, am I comfortable as a technical person saying at the end of this meeting that I can choose one?" And I said to myself and you may not agree, and I don't know who agrees or not, but I said to myself, "I don't have enough information in my hands to come out of this meeting with an informed decision. Let's say that the groin option is not an option I don't have enough information at this point to say that this is my preferred alternative. I just don't have, I'm not comfortable that I can do that. Now maybe you can help me I looked after our phone call. I looked for that information. I couldn't find it. The other issue I wanted to dredge up from the past, no pun intended, was moving the intake out. We had a brief discussion with that on the phone and I was told I could find that in the literature and earlier today I was told that there was a report on it, maybe on the table, where it shows the same level of detail of cost estimates for what it would take to have a moveable intake going out into the river from where we are now so Les can keep the pump exactly where it is and use that. If there is a study like that I would like to see it, but I couldn't find it so those are the things I need Mike to be comfortable.

Yantao Cui: Eric (Larsen), I think I made this comment earlier. I don't think all these alternatives were dismissed based just on cost. Some of them were dismissed based on uncertainty we don't have the technology to answer, or we know certain things that is going to happen really quickly. For example, if we extend the intake to the west, we don't know 10 years from now if the river is going to be moving farther away to the west, in that case we will have the same problem all over again, or if the river is going to come back to the current alignment, in that case we will have a intake right in the middle of the river.

Eric Larsen: Well, I would like to see these compared with each other and all those uncertainties put down.

Yantao Cui: The thing is we made those discussions already. I think most of those alternatives were discussed over the second workshop.

Eric Larsen: I'd like to see our numbers.

Yantao Cui: There are no dollar numbers for those alternatives.

Eric Larsen: I'd seen this particular thing but I want to see the analysis that we did. So if you're comfortable that that's not a viable option if we have to choose an option that's not the groins and you're comfortable with the intake I think we might find a creative way to spend some time thinking about it of using that in coordination with other

things that might save money and might be reliable to provide a reliable source. But I'm just thinking trying to look for a solution. I hear that you believe I'm wrong, that I'm alone going up that tree. Maybe so.

Mike Harvey: I don't think you're wrong but I think what we have to do is look at the realities at what we have on the ground I know you've come back to this issue of extending the existing inlet out there to go out to river today that's not technically feasible the bar is down there A. you've got the gravel moving down there the bar down there its just not technically feasible and that's one of the reasons that we rejected it initially it was not a cost issue it was we just cant do it with any certainty and that's the problem is the issue of certainty and we can look at certainty in two ways in theory if we engineer something we have a lot more certainty, and I'm setting up a situation, there is always some uncertainty.

And the rule of rivers there are none. And to apply that standard is an unrealistic standard no uncertainty we would do nothing on any river maybe that would be a good thing and its not in this situation we have no absolute certainty but the more we tend to engineer it the higher the level of certainty to a point at the other end of this option is uncertainty. Okay we don't really none of us can sit around this table here and say we know exactly what is going to happen in this reach of the river in this period of time we cant we don't have that ability, so what we have to look at which allows us to do some book ends if we have great uncertainty then we need to be conservative the more uncertainty the more conservative and that's just basically what happens and so if we want to be conservative then I m not sure that an empirical study about bar movement in any other part of the river is going to inform us very much about what's going on. We have a prototype in our own reach - we can say Bruce Ross just says the bar moved about 800 ft by 2006 about 60' per year top and bottom the whole thing translated about 60 feet a year we have some data in the intervening periods when we had high flows it accelerated which is what we would expect to occur and so that's when Stillwater's numbers come in it's the same data set basically just a different period same measurements it shows 140 ft per year. If we need to be as certain as we can be with a lot of uncertainty then we need to be conservative we take a number somewhere between 60 and 140 that's what our approach has done. I don't think its going to inform us any more to go to another stretch of the river because I will make you an argument that you cannot reproduce the conditions here and so what are you going to learn you have a prototype so okay I think the question we have to do if were talking about relocation is how conservative do you want to be with the estimate of migration that's the question now- if you are un-conservative which I would say is at the low end maybe it's the average end you use 60' if you want to be really conservative and take it when its galloping you take 140' you know what your distance is you dividing through its simple I think we have information its how we use the information and how we address risk and ultimately that's what were talking about is addressing risk.

Bruce Ross: That is part of why I went in and calculated the actual length of the bar if you take that and be a little conservative on that the rate doesn't matter you just have to be downstream far enough that you are relatively conservatively sure enough that the upper end of the bar as its current location about the time the lower end of the bar and that number was about 2300 feet.

Mike Harvey: If we can live with that number that's not a bad number cause it has some real advantages we are within an existing revetment our footprint goes down to achieve the goals but what we have to decide on is how much reliance we can put on that and maybe the flip side of that is if were wrong what happens.

Eric Larsen: Well he's just talking about the bar being 2300 feet or less long that's all. If we're wrong and the bar doesn't move that fast, than you get more time.

Yantao Cui: But if the bar moves faster than we estimated, it will give us less time.

Eric Larsen: Mike (Harvey) I think you stated it pretty well and I think I agree with much of what you said really that the uncertainty is a big issue and I think your analysis on how to deal with that uncertainty was that one way is to choose farther downstream and another way is to think about like Bruce is and then make sure that the existing site and that could be reactivated. So there are creative ways to think about that. I do want to make one point about uncertainty. I've spent a lot of time looking at river dynamics over the years so I'm very interested in that. What

excites me about the possibility for this job for CALFED is finding an innovative solution that accommodates water supply and accommodates river processes together as much as we can and to balance those needs I think an innovative way would be to maybe learn to live with a little more uncertainty. Now I know the engineering point of view when you're building a bridge or something is that you can't have uncertainty. We've got to put it in there bumper. But on the other hand, in designing bridges they do have uncertainty. That's why they design two or three times the safety factor. We're more intelligent about the river than we've ever been these days. We know more about the river and how things go. Is there a way that we can embrace not knowing how fast that bar goes? In which case, I don't think it's necessary to extend out that many years if we can "bookend" the extreme rates. And if we can live within those bookends some way, fine. But I think we might need to find the balance there. And I know it's inconvenient and you may not feel comfortable with me saying "work with uncertainty." You know I think one engineering path is to remove uncertainty, or to reduce it as much as you can. With the river I'm not sure that's the wisest way to go.

Bob Mussetter: Let's get back to the point here what are we trying to do one of the key objectives is to make sure that they can still get the water they need out of the river now if there's other ways they can get water without pumping out of the river then so be it. Its one thing to talk esoterically about how we deal with the uncertainty and how the bar might go here and it might go there and we might find innovative ways I don't know what you mean by that really innovative ways of fixing it but all of that says is the solutions that fit that model we don't know what the hell is going to happen with respect to that pumping plant.

Eric Larsen: I accept the fact that we don't know how far the bar is going to move. We might accept that.

Bob Mussetter: That's fine for you and I to sit here and debate that point its not fine for Les (Heringer), and Dave (Sieperda) and the guys who rely on that water.

Eric Larsen: I think you heard both Bruce and I suggest the possibility that no matter how fast the bar moves if it moves as a unit and its 2300 feet long as long as you're 2300 feet downstream as soon as it passes the pump you can relocate the pump. That is what I'm talking about an innovative way of embracing uncertainty.

012746Yantoa Cui: I'm uncomfortable moving down 2200 feet going down like this without any change in shape the problem may or may not be going away it is also growing to the west this is against-----to think this is going be happening -----without making a footprint I think it is fairly naive the river doesn't look like that the reason you do the meandering and let the river meander ----to let the riparian grow once the riparian is established -----so if we look at the bars all are going downstream the next one coming -----

Eric Larsen: I'm not sure that arguing this is useful for the rest of the group right now. I would love to discuss it. I respect your knowledge.

Mike Harvey: I don't disagree with you about the risk issue, etc., but what concerns me out of our charge is who carries the risk. We can be as innovative as hell, but its not my dollar its not my acre foot of water and I think what we have to address is the stakeholders the stakeholders need to determine what level of risk they can absorb not us. We can lay out the risk - it's the stakeholders dollars at the end of the day basically that govern this because if we don't have a solution if they can't accept the risk so I think its fine for us to debate risk and uncertainty but I think that M&T Llano Seco the refuges DFG they're are the ones who carry the risk not us and so I think we need to hear from them what level of risk is bearable.

Eric Larsen: It's part of the equation and I'm interested in moving forward and finding a solution.

Jim Well: Let's table this and discuss this later in the agenda we need to get the City of Chico in next there is no need to hold them up any longer.

City of Chico Waste Water Treatment Plant Relocation Update

Tamara Miller, PE, City of Chico

[See power point presentation in Attachment F.].

Tamara Miller: We have a wastewater plant near town that helps all 100,000 people that live in Chico to flush their toilets everyday and we have an outfall in the river near the M&T pumps

We have a project for two reasons one in which you all well know about and that's a gravel bar that is migrating and the other reason were in the river doing some work is that we need to upgrade our diffuser for capacity purposes so we have two things going on which sometimes dictates our schedule versus your all schedule. When we act sometimes because we have to get a diffuser in not because we are the gravel bar. So les asked me to share some of our timeline with you this goes back to your timeline, you are studying things, permitting things, engineering things and we have gone through the same process for our project we didn't get started until fiscal year 2003-2004 we started preliminary planning did our diffusion analysis in the river, did our geomorphology and we commenced our environmental documentation, initial study right off the bat you have heard our geomorphology referenced a couple times Ayres did that study for Carollo Engineers for the City of Chico and they used empirical information to basically say the bar moves this many feet per year so if you move this far down then you have this much life so they recommended a new spot on the edge of the river on M&T ranch in a revetment area a nice spot we all felt really comfortable with it and so we went with it. 2005 that was our defined project completed our EIR we applied for a state revolving fund loan we have to use our own money to pay for our project so we went to borrow some money from the state commenced permitting and continued design.

This is the material out of the Ayres report the empirical data that they did use to map how far they thought the gravel bar would move and how far we should move down river so I just listed that out to show you that even though it seems simple on the surface we did do some work to find our new location this is out of respect for this group because I know that you are putting a lot of energy and effort into your study and it may seem casual that we just gone but remember that flushing toilet thing.

Project timeline, in 2006 we continued our design we worked designing a water treatment control plant expansion not just an out fall so the design process for that takes quite a long time value engineering required by the state water resources control board when you use their loan program and we also continued permitting that wonderful permit process sometime in 2006 we knew you guys were slowing down with solving the gravel bar problem. Les Heringer came to us and asked can you slow down on the replacement of the outfall so if there is a compatible solution for both of us we could do that together so we said sure, we'll split our project into two in hind sight we probably should not have done that because our permit process and our loan monies have become more complicated because of that but because we are neighbors with M&T ranch we work out that relationship we have to build a pipeline through the ranch so we want to be sure that our position supports les' position in that regard In 2007 we actually completed the design for the plant expansion we held back on our design efforts for the outfall in case anything changed we permitted the remainder of the wastewater treatment plant expansion project and we began construction now its 2008 and we did finish our design for our outfall and I brought it if anybody wants to take a look right here and the specifications and the engineers estimates so that's available we did find out that because we stalled our outfall we had to reapply for a second loan for our outfall so we'll hold two loans from the state water resources control board that is if they have any money I don't know what money is available these days. We are continuing to permit the outfall even though we slowed down for les's benefit we could not get through the complicated permit process of state department of fish and game, U.S. Fish & Wildlife Service, and NOAA so we still don't have all our permits in place to this point for the outfall itself construction is scheduled for 2009 and here's our oh my gosh we can't flush the toilet time chart the bars that show in yellow those are critical points in time for us the water pollution control plant as its built now has a 9 million gallon per day capacity so at the end of 2010 with the growth pattern that we had when we started planning we would run out of space in the plant so we had to be done building our expansion and theoretically our outfall because those two went together to get to the 12 mgd capacity our outfall as it exists does have the capacity to 11.6 mgd which did give us the ability to slow that part of the project down we don't have that luxury at the plant itself so we are on a morph of 1 and 2 on this

timeline the top bar was how we would have done it the City of Chico if we were alone we would have been building in 2008 if we would have gotten our permits in time but we are now into 2009 we are not quite down to the second timeline which was stalling and building in 2010 and hopefully we will be able to build in 2009 and we will get some other options and that's what that chart shows. Does anyone have any questions on this one.

There's our permit table for those agencies present note if your permits is pending we would love some help.

One of the things I want to mention here state lands commission we have an outfall as you know right near M&T's Ranch and we're building an outfall down 1200' state lands commission wants us to abandon our land holding and get out and we alluded to the fact that we would like to negotiate that we would like to stay in both places in case the gravel bar moves past us and we can go back the same things you have been talking about State Department of Fish and Game, see your name up there and M&T Ranch at the bottom we still need our right of way.

Construction is going to cost \$4.9 million note that the engineering cost of \$500,000 is false it cost us way more especially with that permitting process because we did a lot of the design for the project as a unit with other jobs so a lot of our engineering costs are buried with our other jobs

And here's what we plan to do on les' ranch we plan to put roads and make a big mess and punch through his trees take almost 200 hundred trees out and also leave a large pile of dirt where he cant farm in addition to the pile of gravel

So with that, that is all I have, any questions

Question: Les Heringer: You said you were building in a contingency to do this again in 15 years since that's what your engineers have given you.

Answer: Tamara Miller: I confessed to Les (Heringer) that I do the financial planning for the City of Chico and when we look at this and we hear what you all are saying and we know what Ayres has told us the loan that we borrowed for this is a 20 year loan I just hope we get 20 years worth of life out of this because if we don't get 20 years life out of it we are going to have a financial crunch but yes I have actually started programming in enough money for significant outfall improvements in the future.

Question: Dave Zezulak: Just a thought if this moves forward with moving the facilities at M&T could both save funding by constructing together and by moving things together and doing things together.

Answer: Tamara Miller: Did you remember that chart about flushing the toilet? If you all can come to a conclusion today we can work that deal.

Jim Well: Maybe there is an innovative way to try and flush those toilets.

Tamara Miller: We make humor out of it, the reality is we do have a different timeline than you because we have a diffuser issue not just cleaning the gravel bar if it were just cleaning the gravel bar we would be in cooperation with the construction we just make one cross at this point maybe with the outfall we did study leaving our outfall we did have a timeline for staying where we are this actually has a bar building a diffuser at the old location if you and M&T could have solved the problem we would have been down on the second to the last bar, build outfall at the existing location

Question: Neil Schild: I'm surprised your development hasn't slowed down in the last two years.

Answer: Tamara Miller: It has slowed down.

Question: Neil Schild: You can't push it out another year then?

Answer: Quene Hansen: -----We are having so many developments come on board in the next three years we need the capacity.

Answer: Tamara Miller: And the other thing you see on there are boxes with dollar values every time we delay here we are looking at another \$250,000 in costs because we have to redo our EIR because the state water resource control board won't accept it for their loan or we have to do a new diffusion analysis because our diffusion analysis is too old so every time we go a year longer it just costs us more money.

Question: Gregg Werner: What's the criteria that affects your diffuser I mean on the fish screens it's the cross velocity, is it the flows?

Answer: Tamar Miller: It's the actual dilution factor it's the volume of our treated effluent it is actual flows so if you were to speed up the river at the location of our diffuser we could actually get a benefit from that but it doesn't look like it's a possibility.

Question: Bev Anderson-Abbs: First of all, thank you for injecting a little comic relief second I was wondering with the delta vision strategic plan and suggesting that sewage treatment plants start working at finding ways of reusing water has there been any discussions so you don't have to potentially keep moving the outfalls.

Answer: Tamara Miller: Every time we go through the environmental process reuse is a very important alternative and we seek out potential buyers of our treated effluent our primary buyer we always ask if they want to buy our treated effluent is our neighbor the M&T ranch because they have an irrigation ditch right next to our water pollution control plant but even as you've heard them say even putting their pump intake so close to the river they've got some questions about the water quality so we have never been able to find a buyer or user even if it's zero.

Answer: Quene Hansen: _____We are looking at how we can go to tertiary treatment and obviously we would have to have a buyer it costs too much to pump it back into ----

Answer: Les Heringer: You know we have talked about this many times before and because their water secondarily treated we cannot put it in our canal because it would come in contact with a crop because it comes in contact with the ground, almonds, walnuts and beans so by law we cannot take that water.

Bev Anderson-Abbs: I understand that I'm just thinking with the Delta Vision push I was just wondering. I am aware of that.

Tamara Miller: Even if we spend the extra nearly \$50 million to bring our 15 mgd plant up to tertiary we would not even be able to supply les with what he needs we would not have enough water and our schedule of needs to get our water out of the plant do not match most buyers needs because they usually have a crop related cycle and we are 24-7.

Question: Les Heringer: So tell me Tamara, at your new location would you like some security down there from the gravel bar which they have said will reach you in 15 maybe 20 years.

Answer: Tamara Miller: Yes, I would like to have some security.

Question: Les Heringer: So you would like to see The Nature Conservancy work with this group and the Conservation Area Forum to allow rock groins because I assume that would help you also.

Answer: Tamara Miller: I would like all stakeholders to be as flexible as they can we have proved to be flexible in stalling and delaying and things like that and we listened when things were brought up and we'll change our specs

to backfill in the area where that might be a cross if that helps and we would certainly like to see the nature conservancy maybe broaden their prospective and discuss things from a different perspective and it does seem a shame to have infrastructure in the river that is so vital to the community but yet not be protected. You know we've been there longer than 1991.

Les Heringer: You have been there since 1961.

Quene Hansen: We're not moving far enough away to let that gravel bar ----- we don't have that option ----- no more flushing of toilets.

Yantao Cui: My comments again. Thinking about going back to the old intake when the bar passes through is most likely not going to work. To say the bar is moving downstream is an over simplification - the bar is not moving, instead, the sediment is moving, building up in some places and eroding in some other places. The movement of the bar is also accompanied with new growth of vegetation, which decreases the erodibility of the sediment. Once a bar "passes" through an area, it is likely going to leave some footprint and the river will not going back to exactly where it used to be. That footprint will likely leave the old intake isolated from the river water.

Tamara Miller: So we don't need to negotiate very hard with the state lands commission is that what you're saying.

Yantao Cui: Well I'm not going to say that. There is a possibility that you could get that and reuse the old location, but you should count for that to happen.

Les Heringer: What concerns me is obviously here we have infrastructure that is very vital to the city for public health reasons and of course our infrastructure is vital to our ranch and of course the Llano Seco Ranch and the refuges and Bev in your conservation area forum handbook it very specially states to that issue and we have a participant The Nature Conservancy that has been part of the process since 1986 that has achieved great benefit from that process and yet they are not willing to sit down and discuss the situation with us that concerns me greatly and I'm also concerned about what that means to the process that we have all been working on along the river.

Gregg Werner: Well Les (Heringer) I think this is an extremely unusual situation. This is the one area, actually there are only 2 or 3 others, very small, where an easement comes into play. This is absolutely and legally different. I think we can certainly talk but I think for any organization with integrity, at some point you've got to say that this is what were all about and we have to live up to our commitments I think the Handbook also has a number of things in it and hard points is not the only thing. I think property rights and ecosystem restoration and other things are also major criteria.

Les Heringer: Yes, but hard points is part of the guiding principles.

Gregg Werner: Yes, as there are other things.

Eric Larsen: It's not like we have other alternatives. Les you are making it seem like there are no other alternatives I think we've seen both economically and technically although there is some uncertainty the moving the pumps and the probability of moving the pumps.

Les Heringer: I didn't say that there weren't other alternatives I just said but because of their stand this is one alternative we can't even consider here as a solution to this process that's what I'm saying Gregg (Werner).

Eric Larsen: We considered it. We spent how much time and how much money you're looking at it. We're evaluating it against the technical merits of other alternatives and I'm seeing some of the other alternatives be as attractive to me.

Tamara Miller: The one alternative that you are discussing, the spur dikes, is the only one that really benefits the City of Chico the other ones don't have that benefit I just what to check that in right now.

Les Heringer: And we started working on this in 1986 and in 1989 this handbook was developed I know you weren't here Gregg (Werner) and you weren't here Bev but it did speak specifically about and to infrastructure as an area where you would limit the meander of the river.

Gregg Werner: And it says that every case has to be looked at individually it doesn't make a blanket statement.

Les Heringer: You are coating it over like it's not important.

Gregg Werner: No it's extremely important but I think that other things are also important.

Les Heringer: Eric (Larsen) seems to think we can live with uncertainty with our irrigation water supply we cannot live with uncertainty.

Eric Larsen: I'm talking about uncertainty I think we can have a sure chance of you getting water. Say you take the lower pumping site I think there is a certainty of water there for a long time I think you have some uncertainty with the groins.

Les Heringer: I don't see the uncertainty there that I see moving down river perhaps in 15 years having the gravel bar on top of us again.

Eric Larsen: I think no estimates would make the gravel bar reach the lower site in 15 years. Correct me if I'm mistaken.

Tamara Miller: The 140 does at the lower site. The 140 hits me.

Eric Larsen: Yes, the 140 hits you. But anyway, these are the issues.

Les Heringer: I'm just really frustrated here because I was around here in 1986 when this process started I was there to work on it I helped put all that together and there was one thing that Ag got out of the deal was the ability to limit the river when it impacts infrastructure hard points and this is a prime example of that and you're just turning your back on us that's my frustration and that Shaw easement has been amended twice already.

Gregg Werner: The easement (in question) has not been amended. You are talking about a different easement with the same owner.

Les Heringer: That easement with Shaw has been amended twice.

Jim Well: We are arguing over one point here. I just want to read the primary project goal protect the existing M&T/Ilano Seco fish screen facility and its beneficiaries while investigating and identifying a technically and economically feasible long-term solution to adapt the fish-friendly pumping facility to the lateral migration of the Sacramento River.

Kevin (Forester) and Tracy (McReynolds) would you like to go next before we get back into discussion or are you okay staying here until that discussion is complete. Tracy I'm but I think what we both have to present is very quick and I think we are all probably familiar with it. Kevin I think it will take less than 5 minutes and we can do it at the end. Tracy agreed.

Jim Well: The goal today was to try to identify the alternatives arrived at for this primary objective and to bring that forward to CALFED for the next step everybody realizes it has to go through and EIR/EIS process issues like this would be addressed in the EIR/EIS process we are here to come up with solutions that fit the objectives and bring forth a long-term solution so if anybody has anything else to say we are open for discussion.

Howard Ellman: I was involved in the pump station when it was moved originally and I remember meeting at the Sacramento national wildlife refuge complex where we were told that the pump station that was being --- would be an indefinite solution and the word long-term indefinite and the word perpetuity was used this was supposed to be a permanent solution and it failed within 5 years basically so we have a certain degree of risk and uncertainty that is inherent in this process on top of that we have a situation where we know we have to do an EIS and EIR and we don't know how expansive its going to have to be it going to invoke a lot of public process there's nobody in this room I think who really believes that that can be done in less than 3 years so if we got the go ahead today if somebody fired a gun and said this is what we are going to do and this is our project and these are our applications we wouldn't be able to start working on this solution for that period of time and in the meantime the bar is moving south the river is moving west and by that point maybe all of our applications are going to be irrelevant you know we are going to be outstripped by events on the ground now in my practice I deal with a lot of technical issues and I deal with a lot of technical people and I understand and I respect their integrity but there comes a point where we have to say that we've done enough studying there is no risk-free solution and we have to act on what information we have that's done in business that's done in law and its done in government I'm new to this process Dick asked me to come to the forum meeting I've been listening to Les and Dick over a period of time but we have a term that we use sometimes when we are dealing with environmental impact issues that is paralysis by analysis and I think we are teetering on the edge of this we have to make a decision and any decision we make is that plus three years I don't have enough smarts to decide exactly which one it is but I have some inclinations but I think there is a point at which action has got to be taken thank you.

Jim Well: Thank you Howard (Ellman) not only do we have the permits to get but we have to get the funding and three years is probably close, how long did it take to get yours (Tamara Miller).

Tamara Miller: We started in 2003 and we will be building in 2009.

Jim Well: Three years is probably pretty aggressive we are probably looking at longer than that. Anybody else?

Stacy Cepello: I guess I have something to say Ord Ferry what was the next bridge down Butte City I was on the technical team when Butte City came on board with Caltrans and they came and made their pitch in retrospect I think we should have maybe questioned some of the expertise and some of the design specifics but never the less they came to the technical team several times they made a pitch to the Forum there need was to protect the function of that bridge which is transportation from one side to another we looked at it we said okay this is important public infrastructure the function is to get people from one side to the other there is no real alternative to that you have causeways approaches, bridges, levees, pipe infrastructure tied to the location of the bridge they need to protect that bank where it is what we asked was to use the least damaging alternative for that they felt they had a need to move flow to the other side of the river also and so they came up with their approach to groins as I recall there was some discussion about public access and location I think the ownership got worked out with partners and so forth but there were essentially no alternatives and the consensus of the group was this is a hard point this is a place where although philosophically some people may not agree with rocking the river it's the only alternative and that's what they did and I think it moved forward unanimously consensus they built it I think this is a very different situation I think its public but its private I think and I hear that there are alternatives I guess my concern is I heard Les say that nature conservancy or others are turning their back on that process and I don't see that at all I see this as exactly what that process is all about it's the shape of the table its not guarantees about hard points or winners or losers.

Les Heringer: No means no.

Stacy Cepello: Well then, part of the reason the handbook was written the way it was, was so that private landowners would not be stomped on that they would have rights equal to anything else on the river they are a stakeholder too they have to be treated as fairly as any other rancher or farmer and landowner I guess my concern is that my hope is that people see this as a process which is not only giving rhetoric to the concerns and principles but doing its best to address those and so I understand that not everyone here is going to agree and ultimately there might be compromise in the final solution but after having been away from this process for a couple years coming back I hope and I think what I see is people trying to address the issues in a very straight forward honest professional manner and I see that there are potential solutions out there and I hope that we can arrive at them quickly and that's what I have to say.

Jim Well: That's why this group was convened in 2002 to come up with solutions a panel was picked with technical expertise for these solutions we've done that we cant solve legal issues we cant solve political issues all we can do is report on what we come up with on a scientific basis and here we are.

Jim moved to a break.

After the break Jim moved on to the next item of the agenda.

Evaluation of Alternatives – Technical Team

Recommendation (1) – No Action

Recommendation (2) – Spur Dike Configuration

Recommendation (3) – Relocation of Pumping / Fish Screen Facility

Michael Harvey, Principal Geomorphologist, Mussetter Engineering, Inc.

Mike Harvey: As a technical panel we've spent a lot of time looking at a lot of things and I think we would like to move the process forward as follows: We believe there are a number of technically viable alternatives to meet the targets for this project, getting water to the stakeholders in an uninterrupted form and hopefully meeting the other goals as well, now some have more some have less but we think we have some alternatives. Unfortunately I don't think we have the golden bullet so we' leave it at that.

Basically, for our alternatives what we as a group suggest is that obviously we have to have a no action alternative that's not viable its not an answer but we need one. We believe on a technical basis that spur dikes will meet the goal of providing water supply to the stakeholders, if they are implemented there will be environmental impacts and part of that impact is preventing meander locally there is no doubt about that. We have two other alternatives related to relocation of the pumping plant I think we are of a mind that just extending the intakes will not work.

Eric Larsen: This is where I differ a little bit, but that I'm basically agreeing that we move forward and to put these things forward I personally am still not comfortable that moving the intake that has been explored. I just don't understand it well enough and the same thing is true of --- but go ahead Mike, I think that can be addressed in the EIS process and I don't think we need to hold up things here moving forward for that that's my understanding.

Mike Harvey: Sure, anyway we have two at this stage alternatives for moving the pumping plant one at about 2200 feet downstream one about 3500 feet. The 2200 foot one is within the existing revetment, the 3500 one requires the addition of about 1400 feet of revetment to preserve it -- it doesn't make sense to put a pumping plant out in the middle of nowhere and not protect it from a technical viewpoint it doesn't make sense. The other area that we need to consider is as we heard if you are lucky you would get the permitting done in a three-year period you are probably looking at much longer than that we know that to preserve existing conditions in the last eight years we have had two dredging(s) and so we think that there should be an alternative that preserves dredging as if you like an interim solution to maintain the supply of water to the pumps and to meet fish screen criteria.

Question: Dave Sieperda: But not long-term dredging?

Answer: Mike Harvey: No long-term dredging.

Question: Howard Brown: That would separate from the EIS/EIR?

Answer: Mike Harvey: Yes. Basically that's where we stand and what we would like to do. Maybe I can make one further comment is that we recognize the limitations, we recognize the uncertainties that are involved, we recognize that technical uncertainties do in fact involve risk and that risk is carried by the stakeholders not by the technical panel. I would like to inject a personal point just at this stage--this is me speaking not the others they can agree with me or disagree with me on it. I would like to propose to TNC to preserve one of our options that maybe they look a little broader. I recognize the issue of property rights, I recognize the issue of hanging in there on a principle however what I would suggest to you is that the work that this team has done, and specifically the modeling that Eric has done does indicate that the actual sites where the dikes are being put in will on the long term and we are defining it as 50 years and I understand that it is not perpetuity be of little environmental value. However, areas downstream do have considerable ecological value and river shifting there and maybe there is a point where you guys may look at little more broadly to preserve an option if in fact that option carries forward and that's a personal comment the other guys can either agree or disagree with that.

So these are our recommendations the four of us met outside we agreed to provide them to you pretty much in this manner and then basically any member of the team that has anything to add to that feel free to do it. Maybe we should just go around the team members and say what do you think because at some stage we are going to have to write this up as the product of workshop #5 and carry it forward so that those who are going to take this forward will actually have a document that says this is what this technical panel recommends.

Chris Leininger commented that that document is part of the scope of work in the CALFED contract.

Mike Harvey: So based on that, Eric (Larsen) would you like to start?

Eric Larsen

Let someone else start and come back to me.

Bob Mussetter: Basically I would say that I agree with the points that Mike has just made when I look at actual alternatives that he has laid out for you in my mind the trade offs are this the groin alternative from a technical perspective I'm convinced will work but if we are going to draw error bands on our ability to predict what will happen into the future I would put the error bands on that particular option as something like this relative to moving the plant for example where I would put the error bands considerably wider. I'm not trying to quantify that so again it's a matter of risk and uncertainty I think the options of moving the pumping plant downstream have enough merit that we should continue through the future processes to look at that in more detail but there are some issues there that we need to think hard about a key one is our continued ability to prevent further erosion on the west bank at the belly of the bend where the interim protection is. If we remove that rock and if we don't preserve that bank I think there is a very high risk that all the options having the intake along the east bank are at serious risk and the issue of how fast is the point bar going to continue to migrate downstream becomes somewhat irrelevant because the river is going to go the other direction and I think that's a possibility and that's something we need to think our way through as we evaluate what alternative is a real option. With respect to the dredging alternative well you know that's something that I think has shown is workable on an interim basis the bar growth apparently is continuing and has grown more down towards the intake now its bought some time but I don't see that as a permanent long-term fix so those are my thoughts.

004 00-10-04

Yantao Cui: Yantao my thoughts are pretty easy now that Mike and Bob pretty much summarizes what I think I would say to the group. I think all three are possible solutions. Moving the intake will have a higher uncertainty but is still doable. I think the stakeholders and the agencies have to talk through the risk you want to take, what

kind of investment you want to take, and ecologically whether you want to trade this reach of the river with a reach somewhere else that may have a higher ecological value.

Bob Mussetter: I have one other point that I failed to make through the process for five years we've been sitting here and it should have been clear from Mike's discussion this morning a large number of options have been on the table and we've all the various four people on the technical team have been and others like Dennis (Dorratcaque) have been here the whole time, we've considered a whole suite of options and there are a lot of things that could be put back into this mix that for various reasons that you could revisit through the meeting minutes and so on we rejected them and I think in my mind I'm not saying we should never go back and reconsider any of those but we had very good solid reasons at the time for moving on from that and so the ones that we are continuing to talk about now are ones that for whatever reason we haven't found what we consider to be a fatal flaw that made them rejected. So I just want you to realize that I'm not forgetting about all the conversations that we've had up to this point in saying what I've just said thank you.

Eric Larsen: Les (Heringer) and Mike (Harvey) I was hoping the golden bullet would come to me while I was sitting here thinking but there is no easy answer to this and so to just try to summarize some of the complex answers that come to me I have uncertainty about the groin option still in my mind and I think I expressed them earlier and I think some of those things came up and so I'm not seeing that as a certainty as much as my friends are here so I also just want to correct a little thing. I think Mike had it technically right when I did some meander modeling about the movement you know in front of the down in our reach here where the groins would be. It did show that the amount of area reworked is probably not that much different with groins or without. But that's the only thing it shows. That doesn't speak to larger scale geomorphology it doesn't speak to environmental impacts that the groins have it doesn't speak to a lot of that. And so it's not that my modeling showed that it was the same either way. It showed that that one small element was the same. And while I'm thinking about it, if the pump is moved downstream say to the farthest place - the 3000 foot location - there will be some rock there too but it's my working hypothesis that that's kind of a geologic control anyway and the river is not going to be moving into that very much. And so there's some impact there too that needs to be looked at. I personally still don't feel I have enough information about some of the things that we rejected so I may disagree a little bit with some of others on that. I think we threw some things out rather quickly. I mean I hear that the choice of the first pump site maybe was based on an hour or two conversation and some of the things we rejected in my experience were the based on an hour or two conversation. Now that I'm seeing this as more of a complicated thing than I ever imagined was going to be, I think some things warrant relooking at. But I don't think holding up the EIS and EIR process is necessary, as long as, there is a mechanism so those things can be evaluated in the next process. I'm okay with moving on. Again, I may be corrected at the end of the meeting if somebody can lay a report in front of my hands and show me the numbers are comparable to what we looked at today so that I can compare them so I still would like to see concerns over you know that Mike said that I could probably resolve this if I just went out and looked at the river, get a key and go out and go out and look at the river today, that I could probably figure it out myself. But I'm still not resolved in my own mind about the possibility of doing some kind of intake going out into the river and also continue dredging of the bar and I've said that probably many times. So however that can be preserved in moving forward, I would like that to be preserved; that my concerns remain there about those being possibly viable. And I would like to compare them with what we have on the table. That's all I can think of. I mean it's a balancing project. As I began with, it's not an easy solution. You have to balance lots of things in this and I hope as the process goes forward all these elements that need to be balanced will be there.

Open Discussions – Findings and Recommendations

Question: Dick Thieriot: Eric (Larsen) let me ask you when do you think it wise that we have a solution in place?

Eric Larsen: What?

Dick Thieriot: When do you feel it would be wise to have a solution in place?

Answer: Eric Larsen: I'm not sure that I can answer that Dick I mean from the point of view of the pump from I'm not actually as intimate with the threats that are facing the pump right now as Les would be. As I understand it the pump can be flushed and dredged as it exists right.

Question: Dick Thieriot: Eric (Larsen) you feel time matters for us?

Answer: Eric Larsen: Absolutely.

Question: Dick Thieriot: Then when do you think we should have something in place?

Answer: Eric Larsen: What I'm hearing is 6 years is probably the fastest that it could possibly be in place.

Question: Dick Thieriot: Do you think you will have something in place in 6 years?

Answer: Eric Larsen: I think it should be done as fast as it can with a reasonable solution I mean the question that comes to my mind is "am I comfortable as a technical person in saying today that this is the one that I think is best? Do I have enough information?" And it could be. Again, I've been told a number of times that these things exist. I haven't seen them. I just need a little more information to say, "yeah putting an intake out there doesn't make sense. Okay, I see the numbers. I see the analysis. I haven't seen it. I would just like to see it. That may not take very much time. But no, I'm not suggesting that things get dragged on. I think it should happen as fast as possible.

Question: Neil Schild: Eric (Larsen) have you looked at this technical memorandum that was put out in March 2004?

Answer: Eric Larsen: I knew if I complained long enough I could find it.

Neil Schild: There is a ---- similar to what these others are but I think its more than that there is additional fish screens to ---- when you put it out in the river like that you have no protection for it and no access for it and its not what I would call a reliable intake it's not like the one you have on the bank you have easy access at any time probably the only way you could access the one out in the river like that.

Eric Larsen: Can I have this by the way?

Chris Leininger: Eric (Larsen) you have it.

Eric Larsen: Well if I have it can I have another copy. I'll get it back to you, if you ever need it. This says March, good. I can look it up. This is what I wanted to look at.

Neil Schild: Yes, it's a part of the documents put out in Workshop #2.

Question: Kevin Foerster: Does it say in there Neil why the Technical Team decided to not explore that alternative?

Answer: Neil Schild: Not really. I mean we proposed that we proposed ground water wells we proposed Ranney wells all in that one document so I think it became pretty obvious that even though that this was a reasonably price one it was not reliable and there is no way as an engineer that I would ever recommend that you ever do it you could go to the other bank but in many cases there is not even a bank there so and that's the one that is eroding so you can't follow it that's what we want to do is look at one out in the center and then look at one on the other bank there is no other bank so we didn't do it.

Mike Harvey: One thing that I might just add is that think of this as a triangle we started off with a pretty wide base as we move up we get less and less in there but commensurately after we have rejected things down at the bottom

the level of effort that goes in as you move up the pyramid to assess, accept or reject goes up as well so it is not reasonable to require or even think about having the same level of effort expended on every alternative that's been laid out on the table it just doesn't work that way. I think what you also need to understand, and I'd hoped that I sort of made that point in my opening statement earlier this morning, is that as a team we carried these forward, we had discussions, we asked for information, we got information if we considered it necessary and we tried to move this process forward. There will be places where we looked at an alternative and said its not worth expending efforts on it but we did it as a team so this whole thing moved forward from a wide base with a lot of alternatives. Nobody was constrained about the alternatives that went on the table initially but then like in ever other thing there is some measure of professional judgment and experience that goes into the evaluation of some alternatives based on combined professional experience and there is a lot of experience in this room there is a lot of gray hair, got thrown out and we moved on and so just remember that that not everything can or will have the level of documentation that you've got on the alternatives that we have carried on and through. We carried those alternatives on and through because as a group we believed that they had merit, technical merit so I leave you with just that as a framework for assessing the range of alternatives that we looked at.

Question: Les Heringer: Mike (Harvey) with that gravel now out and above us and out in front of us and now below our fish screens how are we going to clean that gravel out if need arises its not even attached to main gravel bar any more.

Answer: Mike Harvey: There is a technical answer to it, it's a floating dredge. GCID has a combination of using scrapers or drag line scraper or they have their own floating dredge. You can take it out with a floating dredge.

Les Heringer: They have a place to put the material.

Mike Harvey: Exactly. We looked at it we got numbers part of our pricing for the dredge options included information from GCID. In fact they did an analysis for us Ben Pennock, GCID's Engineer, did an analysis for us based on their experience and their costs so we could do it but you have to have a dredge in there you have to have a place to keep your dredge because you can't take the dredge in and out all the time. It turns out that it is an extremely expensive proposition not that it can't be done, it's just that it's a very expensive proposition.

Question: Les Heringer: What about from the short-term standpoint?

Answer: Mike Harvey: I don't know the answer to that unless you can get down to really low-flow conditions in the river.

Answer: Neil Schild: It would have to be a pretty small dredge moveable on a flat bed.

Jim Well: Another issue connected with that would be the permits that would allow you to do that our last permit we had to leave a ring levee so we couldn't enter the river we had to leave the edge of the gravel bar there to prevent the river from absolutely removing it and then we could only take out from the inside of that.

Neil Schild: How you would get around that would be he'd have to have his pumps running and you'd dredge upstream he'd take all the effluent hopefully.

Sandy Dunn: That was a situation and the time of the year we would have to do it early.

Jim Well: He would have to do it in low flow.

Howard Brown: In higher flows, it complicates it.

Jim Well: And the material that Les (Heringer) is talking about now is all below water even at low water.

Howard Brown: The permitting is going to be even more complicated.

Jim Well: To address Eric's (Larsen) level of involvement in all these alternatives some of these alternatives were not costed out because they had fatal flaws and we didn't expend the effort to come up with costs and everything that has been done is documented and we can provide it for you but you also have the ability to go back and review the documents yourself.

Chris Leininger: We also had a budget we had to work with and the technical team put together a pretty decisive matrix to run all these alternatives through and it wasn't like CALFED gave us an open check book, they were very good to give us more money but couldn't study everything because we did not have unlimited funds.

Eric Larsen: I'm hearing that other people are more comfortable than I am. That's okay.

Jim Well: Do the stakeholders want to add anything further Kevin (Forester), Richard (Thieriot), Les (Heringer), and DFG. I don't know if you (DFG) would speak for the refuge or not?

Key Stakeholders and Steering Committee Recommendation of Alternatives for Advancing the NEPA / CEQA Process

Kevin Foerster

Kevin first of all I've been involved in this process for quite awhile and I remember that I moved here just when the pumping plant went it and then when ____ moved on I took over his spot and then I got a phone call from Les Heringer soon thereafter and we went down I remember being at the meeting with Paul and Les over in the office there in Les office talking about this problem and we started thinking about what we are going to do and came up with the idea well you know what its going to take awhile to come up with a long-term so we need to come up with a short term and a long term and the short term was actually a long term and it took a long time to get the short term ---so I didn't think the 10 years later we would still be at this point in the discussion but I've heard everything I very much appreciate the efforts of the technical team and at some point you guys just have to let go of this because as you know what happens with the technical specialists and so on the political and social realities are such that their recommendation may not be followed and I know that you can all accept that that's the world that we live in that happens all the time I think there is probably what I'm seeing and I talked with our other two fish and wildlife folks that had to leave the alternatives that mike went over I'd like us to go back over those again and probably put a little different twist on one of them no action alternative for purposes of the NEPA compliance and the CEQA compliance that's one you have to have that no action alternative though at this point includes removing the toe rock over on the other side because that's status quo we have a commitment to remove that rock over there that's part of our package I think we should consider the spur dike option and recognize that that needs TNC approval and there's some very serious issues associated with that including some legal issues. I think that there's two different pumping plant move the pumping plant options as were presented a certain distance and with those I would hope that we would consider keeping the toe rock over on that side as part of that if its technically possible so that we don't have to remove that rock over there for it and I think the maintenance dredging part, if the life of the project is 30 years and I heard you guys talk about a number of times you costed it out and how long it would and how many times you would have to dredge that over 30 years would it be six times would it be five times but that could potentially be an option if it's a 30 year project maintenance dredging associated with relaxing the fish screens and something else that might be another viable alternative that comes out as part of the process all the other stuff Ranney collectors, extended intakes, infiltration galleries, multiple production wells, in-conduit screens and so on those were addressed to varying levels over time they are all going to come back up again in the EIS process we have to address those not to the same level as the ones you've recommended but we still have to address those and we have to explain to everybody, to the public why we dismissed those before so we going to have to figure out why we dismissed a few of those that's it for me.

Question: Eric Larsen: Are you recommending that we add what the Technical Team proposes we add ----

Answer: Kevin Forester: I would say if we are at a 30 year if we've changed our goals if we are a 30 year maybe again if its dredging maybe we somehow find somebody to take that money that would allow us to go in and dredge at seven times over the next 30 years put that money off to the side somewhere and the golden permits are all associated with that so whenever it needed to occur it could occur and maybe that cost is 1/2 the cost of moving the pumping plant.

Question: Neil Schild: You also say that in conjunction with variance of fish screen criteria.

Answer: Kevin Foerster: Absolutely, relax the fish screen criteria.

Neil Schild: That's important.

Kevin Foerster: I think that's very important I have a very vested interest in this I have baggage I guess I should have told everyone this I rely on that pumping plant it provides water for some of the wetlands that I'm responsible for managing I guess I should have said that up front for people that don't know. But I'm very interested in keeping that pumping plant and keeping that water coming down.

003037

Yantao Cui: The long-term dredging ---- I think there is one thing that we did not mention. Essentially if we take the gravel out of the river, we will create a discontinuity for sediment transport in the river that may have some long-term consequences. Any consideration of long-term dredging must consider the possibility of returning dredging sediment to the river.

Kevin Foerster: Absolutely, that's a very good point considering what are we going to do with the gravel see for me I think we ought to be and I understand the complexities with the problems that we had with the state lands and needing a mining permit and so on and this is such a big large-scale project that we have to figure out a way Tracy to deal with that gravel and maybe the answer is some commercial level operation and I know we have heard no before on it you know what maybe that's not going to be it doesn't make sense for us to spend \$1million, \$2million or \$5 million trucking the gravel up to Red Bluff to put it back in the river maybe there is something that can be done and so if we can ask the agencies to relax the fish screen standard perhaps we can ask to have some creative way of dealing with the gravel there also that includes having a commercial operation to come in a deal with the gravel that is out in front that I know that got dismissed earlier but I'm tying all in on that different alternative.

Bob Mussetter: Let me throw one point out on that too by taking the gravel out of the river from a river engineering point of view we are disrupting the supply so I understand that there are water quality issues and so on but a logical thing to me would be to take it out of the place where its causing the problem and put it back in the river downstream and then we are not disrupting the overall supply in the river.

Paul Ward: That should be noted that's what GCID has done they stockpile it downstream and high flows takes it back into the river.

Howard Brown

I'm going to give my thoughts from NOAA Fisheries and part of the steering committee I agree with the range of alternatives that have been put out so far and obviously we need to include a no action alternative I believe the spur dike configuration should be included in the alternatives analysis and definitely understand that there's you know from NOAA fisheries we have concerns about lateral channel migration and habitat formation increased predator habitat from installing the rock and so forth but I still think it has been given enough analysis that warrants being included in the EIR/EIS and I'll say this in terms of trying to be completely objective here I've never been a big fan of spur dikes but I saw some that were installed in the Red River that were put in, in the 80s my folks lived near the Red River and I've seen these spur dikes evolve over time and I know it's a different system but I've been impressed with the sediment recruitment between the dikes and the progression of the riparian forest that has

developed between those dikes and I know it's a totally different system that needs to be taken into account but I think in certain situations they can certainly contribute to riparian successional development just to throw that out there I agree that we need to have the two relocation alternatives included in there and I also agree with the proposal to have a long-term maintenance dredging alternative with modified fish screen criteria and I'm willing to carry that flag to look into those options for a waiver with our agency and to point out something that Mike brought up earlier I think that the bar is going to move again and there needs to be some consideration for some sort of interim action that addresses the recruitment of that bar while the EIR and EIS is in the development that's my input.

Question: Mike Harvey: I just have one question. Gregg (Werner), one of the solutions that we had looked at was the dredging solution and one of our problems with dredging is in fact disposal of materials one of the solutions that somebody came up with was the possibility of pumping it across on to the gravel bar that you have an easement over. Would that fit within your easement standards or is it unfair to ask you that question now without you having had time to think about it.

Answer: Gregg Werner: We will look in detail but the easement speaks strongly to not importing any material and things because you are really disrupting the natural situation. We can take a look. That's enough of a new question that to say absolutely no would not be valid so maybe you could shoot me an e-mail kind of explaining it and we can check that out.

Mike Harvey: There is a possibility and let me tell you why it is a possibility of putting the spoils onto an area where they would drain they would be high and dry there you would not have to berm them and if then if the river does get high enough to move down through there it would rework that was the idea behind it there are issues about can we get a dredge line across the river with a lot of navigation stuff or just as a question.

Question: Gregg Werner: Question, would that be the launching essentially using that as a launching point?

Question: Eric Larsen: Is that what you are saying a launching point, if that could be recruited and launched at that point?

Answer: Mike Harvey: Where we would try and spread it I think out and on to I think that dredging on other river systems where they don't take it out of the river they just sort of move it around to meet water quality standards they can't just pump it straight into the river they try and find areas up on point bars, etc. that are high so they can pump on to that it will drain so that it will drain there they don't have runoff they don't have turbidity problems but then when the river comes up its able to get at that material and keep it in the system.

Answer: Gregg Werner: We can look at the other possibility might be that there's a large part of the point bar that is off our easement to the south. We might be able to pump across our easement and get to that with the same situation coming into play. If we could find a launching point that is economical and still work with the easement standards that could be very positive.

Mike Harvey: Our biggest problem is probably navigational hazards trying to run a dredge line across the river I think they make them so they can sink them so they are operational we've always needed a place to dispose we've run out at M&T.

Jim Well: DWR and DFG you are all present on the Steering Committee.

Bruce Ross

Bruce I think I'm the technical person from the Steering Committee and I like the thought of carrying forward those three alternatives go ahead and carry forward the dike alternative two relocation alternatives and maintenance dredging alternative through the EIR/EIS process and like Kevin was saying the ultimate decision may not be a technical one it may be a social economic political one as to which of those alternatives becomes the ultimate one

that we process I do as a technical person I reviewed the physical model results and I still have some reservations about whether even the 9 dike would meet all the requirements that we needed to meet and I'd be happy to talk about that on a side bar somewhere we don't need to take up time with it now.

Carl Wilcox

From the department's perspective as to the suite of alternatives --- get to it and keep in mind particularly this issue relative to the need to address temporary nature of the existing toe structure and how that gets incorporated but I think its time to move on and pursue these and deal with the issues and start to define what you are going to do and start working on the permits.

Tracy McReynolds

Piggy backing off of what Carl (Wilcox) said as far as regards to interim project and timelines that we are with this current long-term and looking at an EIR/EIS process it could be upwards of 4 to 5 years we are going to be up against our short-term project of having a life-span of 5 years and maybe we do something with that rock again its been mentioned here about the need to dredge there's probably a real reality that we are going to need to have another interim dredging by the time we get something in place long-term so I have mentioned to my regional management that we do need to act on the rock that exists and to have a solution to reintroduce that upstream in an in-kind swap of some kind for spawning gravel we have not acted on that process but it is something that we need to do as a department and quickly as least to deal with what is stockpiled right now and if I think that adding dredging to the long-term solution as an alternative is imperative and looking at a process for continued dredging and how to move gravel and where to store it stockpile and/or take it across river whatever we are going to do it needs to be part of the alternatives that I think needs to be explored to just to add that I am aware that I inherited a pile of rock that is grown and that cant grow any more so I do need to work with my agency to find a solution for that.

Les Heringer

Speaking for the ranch I work on we put in the first fish screen on Butte Creek we started that whole process to help fish and wildlife and fish and game the Llano Seco Ranch we led the way on Butte Creek what we have done has been for all the right reasons and then we were on Big Chico Creek and we moved to the river and we gave up a lot to do that we gave up 40 cfs of our water in Butte Creek to do that again for all the right reasons and we thought our troubles were over and five years later we were dredging gravel out of the river and as Tracy said there is 300,000 tons of gravel there now that something needs to be done with and they didn't really want the gravel it just ended up having their name on it they got it because from the Corp I believe we would have needed a mining permit which we would probably still be working on and also State Parks put a value on that gravel put a value on it for aggregate and not for a gravel bar that needed to be moved out of the river so that's why fish and game put their name on it and I certainly appreciate that because it certainly expedited that whole process but none the less its still there and we do need to deal with it . the M&T ranch as I said earlier Llano Seco Ranch came into being in the mid 1800s by the time the M&T folks came on board that pumping plant was there so I think we should call that the Llano Seco / M&T Pumping Plant I think that's probably a fairer description of that pumping plant I've told the Llano Seco folks and I've told the fish and wildlife folks the majority of water that comes out of that pumping plant supplies the refuge even though I get involved because we manage that pumping plant the majority of that water goes into the canal right down to this ranch.

???It goes to the wetland it doesn't go to the refuge?

Les Heringer

Yes I'm speaking of the Llano Seco holdings the majority of that water comes down our canal under Ord Ferry Road and on to this great ranch so even though I'm the one that gets out in front of all these issues that's my nature and I have solved a lot of problems and I'm hoping I can solve this one but as a water manager we need water every day of the year we cannot deal with uncertainty the banks wouldn't allow that for us our insurance folks wouldn't allow that to happen without a dependable and reliable supply of water we are out of business look at the folks in the Westlands down there right now they are in the shape where they may not get water next year and they are

scrambling around trying to deal with that issue I really don't want to be in that situation up here so I do appreciate we have had a great group here we've worked with for 5 years now we have accomplished a lot we've went back to ft Collins a couple times and we've looked at Ranney collectors in Sacramento and Sonoma county and I've learned a lot but I feel that I really need to move on and deal with this problem in a precise manner now that the study is completed so I hope that everybody in here can all work together on this and try to solve this problem together because it is an issue that effects different watersheds and of course different stakeholders so I appreciate everybody's efforts here ducks unlimited you guys have been great you really have we could not have done this Jim was there when we built the pumping plant he was there when we put it all together and Chris you have been great too this thing would not have moved forward without your persistent nature everybody else in here lets just maintain a dialogue and lets get this done it concerns me I go out to our the pumping site out on the river you cannot see the gravel but you can see the riffle and right now the gravel is just below the water line and it's right above our screen and in front of our screens and ½ down in front of the city's diffuser so there is stuff going on out there we have had some dry winters and it concerns me that if we get a wet winter and we may not like what we see when the river goes down so we need everybody to be proactive and positive on this issue.

Dick Thieriot

I don't have anything great to add other than as you all know the problem started in 1997 and we've had a lot of very serious expensive high level engineering focus on it for 5 years and here we are 5 years and \$8 million later everybody I know is trying to come up with the best answers from their point of view everybody is trying hard to do that but where we've gotten after \$8 million is today a very thoughtful presentation from our folks that is basically saying let's bring pretty much all the things we initially considered back on the table let's take a new look and there's always wisdom in saying there is always wisdom in saying that you don't want to rush you want to take a look but again from a stakeholders point of view its pretty scary and I don't know if its possible but I would only hope that going forward there would be a somewhat streamlined methodology that we can use where we don't find ourselves five years and \$8 million from today sitting here in the same position as again in all fairness you guys are all great but when that system goes down you guys are not going to carry the pain and so again if there is a way to streamline this and if there is anything we can do to help streamline this nature conservancy has come from the point of view which I can completely understand and I trust that they will try to be helpful to us in finding a solution but I do think we have to find a way to speed up this system if it is at all possible otherwise I don't think there is any way that we can win but thank you all of you again it's been a really impressive thing to watch over the years its really has.

Chris Leininger

Jim (Well) just asked what's the next step and of course we don't have the institutional memory of Olen here I'm what's left, we had a scope of work that CALFED has asked us to schedule out deliverables and part of the deliverables are to write up findings and that's why you see on the agenda the findings and recommendations of each one of these investigations that each one of these consultants were paid to do and so the next recommendation would be to write those up and bring them forward in the context that was just discussed here it needs to move forward in the EIR/EIS and I would encourage the folks at CALFED to work with us on that document to move forward through the process and like dick says we need to find a streamlined process that is going to be the next discussion with CALFED they write the check and they have to maintain a level of scheduled events so that they know that their money is being well spent so I think that's the next step.

Jim Well: Do any of you at CALFED want to say anything?

Carl Wilcox

I think from my perspective I think we totally needed this and having some of the documents and sitting through the presentations I think the interests of CALFED relative to what the expectation were have been well met the level of science that has gone into this is very good and I think we've gotten to a point relative to the stakeholders there are specific actions that are on the table that decisions need to be made about how to proceed and so I opinioned this from being on the outside and not understanding not what goes on I certainly understand much better now and its like so many of these issues it seems almost intractable but I think there are ways forward I think the

agencies need to look at particularly at some of the issues around permitting keep in mind though that resource agencies are not the only permitting agencies and that there is a whole suite of other people and I think you alluded to State Lands and water board and some of those people I think we can look at working together and be proactive about how these things have gone I think there is an urgency to it there are things in place that need to be either kept in place some decisions made about those and timeliness is important ---- and that's my comments the program will look at assisting as we can

Dave Zezulak

Carl leaned over and gave me some direction that we need to get the agencies together to talk about these regulatory issues but ---- all the different things we are working on and responsible for. NOAA Fisheries has the federal lead for threatened and endangered anadromous fish and so all of your permitting actions whether it be dredging or anything else would have to go through Howard's shop. It will go through our shop because we carry that on the state's side and so if we are able to understand the project and the nature of the project what the goals of it are and what the alternatives are and where to ----- we are better able to put together workable solutions to put together ---- measures ----- measures and actions that can be taken. Just today listening to what happened at one point we almost came to an impasse over the spur dams or wings whatever they are called the point being it involves another stakeholder and the legality of whether or not it violates their conservation easement which they entered into on the part of their stakeholders point being in the meantime with Tracy's ever going pile of rocks there's a need to move those and they have value to the fishery resource. You may have stumbled on a somewhat eloquent solution that could be explored. At least to see if it's a solution in terms of I've heard the different number of wing dams say eight nine is there an alternative usefulness for a pile of rocks at the bottom end of your sixth spur or your eight spur project in other words could you stay off the nature conservancy lands with wing dams and have a fairly hard substantial location for rocks that would be injected into the river providing spawning habitat and recruitment downstream. I would like to see somebody do a quick five minute penciling of what that might benefit and how substantially that would it reduce your efficiency in terms of keeping the channel open. I mean it is something that could be considered if everybody's working towards finding the best possible outcome for all not sides but all stakeholders and people involved here

Chris Leininger: We have our other folks who had to leave early if we had the consultant write up what you brought forward today in consultation with these gentlemen so that they could understand what we all discussed here and we are going to have to move forward with the steps for an EIR.

Question: Jim Well: Does that come out of the notes that we've taken today and the results of this workshop or does it have to be a piece of paper that's signed today here.

Answer: Chris Leininger: No I think we have to write it up to satisfy the requirements of our contract that at the end of the day we were to put together an proposal which you all have discussed right now and bring that proposal forward and that was the purpose of having you gentlemen come from CALFED to understand this conversation first hand because we weren't sure what steps we wanted to take as you saw at the end of the agenda next steps its nice to say to streamline all of the points that we discussed somebody has to take up the charge somebody actually has to spend time on it to get those permits moving forward to do the EIS/EIR to also put together the recommendations we have had a real process with the tech team as far as coming together and writing something up distributed it among themselves that takes a little bit of time but we need to write it up and I'm thinking on my feet I think its our delivery to you we can write this up as the final discussion here and move the EIR forward help me out.

Mike Harvey: I think we have the vehicle that is pretty much there. We have a summary document at the end of Workshop #4 and we can probably expand that out to the end of workshop #5 that fills in what has transpired today it will provide a synopsis of each of the studies that were reported and then obviously the backup documents will be the full study reports that will provide in one place a summary of where to go basically and the recommendations.

Chris Leininger: In the proposal it was the tech team presenting the technical recommendations to the Steering Committee and then the steering committee giving those recommendations back each of you as stakeholders needs to make that contribution transparent in the document not only the stakeholders Les and Llano Seco but all the stakeholders that are here we might ask you to weigh in on that and write part of that report as well so that its well documented what everyone had to say here at the meeting. that was the deliverable to CALFED, the recommendations you've all pretty much agreed upon to move through the process.

Question: Greg Golet: So relative to next steps we've got this technical component done what is the process for moving forward with doing the environmental documents selecting a project who is going to lead that?

Jim Well: As I understand it there is an amendment workshop in February at ERP we need to have a proposal before then sometime in November in order to make that deadline there's funding left on the grant that has allowed this to occur to date I think there was money saved on our dredging effort this last time that created some funds that are remaining it would be our intent to propose a new task to start the environmental documentation with the remaining funds I don't know if its enough to do it totally I don't know if its enough to include engineering designs to get it to the point we need to get through the EIR/EIS process so our step would be to transfer the funds to a new task and maybe request additional funds that's what is required on our part.

Chris Leininger: Keeping in mind that we need to ear mark funds as Tracy said and everyone here when that gravel bar walks down so that we can uncover the pumps if we have to and keep them pumping and the fish screen clear

Jim looking at the costs that we have incurred at the two removals to date that would eat up the funds that are left. So maybe there is nothing there for the environmental process.

Gregg Werner: I just wanted to mention that our major purpose today was to provide to the stakeholders a bottom line in terms of The Nature Conservancy, our easement and the potential of amending their easement. So, I just ask that that bottom line be included into the report.

Jim Well took the letter for incorporation into the meeting documentation.

Review of the NEPA Process

Kevin Foerster, Project Leader, Sacramento National Wildlife Refuge Complex

Kevin Forester: About the NEPA process Carl (Wilcox) talked about it CEAQ process I'm understanding that Ducks Unlimited the position at FWS that this is probable going to involve an EIS skip the ea we talked about tiering off the record of decision for CALFED doing an---- that's what we did for the interim and its that big (holding up the document) that's what we did to get the toe rock in and the gravel and the ASIP Report our regional director looked at it and said don't come back to me with the final solution without an EIS and that's our position and I think everybody is familiar with NEPA and CEQA -----so I wont go into that.

Review of the CEQA Process

Tracy McReynolds, Assoc. Fishery Biologist, Region 2, Calif. Dept. of Fish & Game

Tracy McReynolds: I think we are obviously looking at a joint EIS/EIR process I did bring flow chart with the EIR process notice of preparation of the draft EIR the agency prepares that and submits it to the office of planning and research to the responsible trustee agency if it is federal funding it would go to the federal agency there is a 30-day response on the part of those agencies on the notice of preparation of the draft EIR the draft EIR is circulated after that 30-day period prior to the completion of the EIR there needs to be scoping and early consultation and its required when it's a joint document obviously in this process there is going to be a scoping and early consultation and its imperative that that happen to get other public folks involved in this process once you have the draft EIR completed the lead agency puts together the notice of completion and files that with the office of planning and

research which opens up a public review period of 45 days that public notice of completion is put out in meeting postings newspapers etc., once the comments are received the lead agency prepares written comments they incorporate into the EIR usually it's a section of the EIR the response to those comments is presented to our decision making body of the lead agency for certification for the final EIR findings are issued on the feasibility of avoiding or reducing the significant environmental impacts lead agency goes through the approval process whether to approve or put forth or carry out the project the notice of determination is written and issued to the office of planning and research and ----- I think you will be able to follow that in the process again its online.

Question: Neil Schild: Will DFG be the lead agency?

Answer: Tracy McReynolds: I believe DFG will be the lead agency. We were the lead agency on the short-term project.

Question: Neil Schild: Who is going to be the lead on NEPA?

Answer: Kevin Foerster: This is still a fish-passage issue AFRP from the FWS will still be on it for a fish passage issue.

Tracy McReynolds: It gets back to all of these alternatives I know Dick (Thieriot) expressed having to bring up all these alternatives but they do need to be and will be looked at in both of the documents all of the alternatives on the table particularly for the EIS they need to be evaluated in a much greater detail than in the EIR process but everything needs to be thrown out on the table and will be included in that document and hopefully we can streamline that document but it's a lengthy process and but it is going to started with getting it funded. We need to get funding to start that process.

Chris Leininger: Thank you all for coming and we will have a document that will package the summary of this workshop. We will get together with the folks at CALFED. Thank you all for coming.