SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF SAN BERNARDINO

DEPARTMENT NO. S-32 HON. JOHN P. WADE, JUDGE

CHINO BASIN MUNICIPAL WATER DISTRICT, et al.,)
)
Plaintiff,)
vs.) NO. RCVRS 51010
)
CITY OF CHINO, et al.,)
)
Defendants.)

REPORTER'S TRANSCRIPT OF ORAL PROCEEDINGS

June 29, 2009

APPEARANCES:

(See next page)

REPORTED BY: BETTY J. KELLEY, C.S.R.
Official Reporter, C-3981

APPEARANCES:

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FOR CITY OF CHINO:	JAMES E. ERICKSON Of Counsel to City Attorney
FOR AGRICULTURAL POOL OF THE CHINO BASIN:	REID & HELLYER BY: STEVEN G. LEE
FOR MONTE VISTA WATER DISTRICT:	MC CORMICK, KIDMAN & BEHRENS BY: TRAM T. TRAN
FOR THREE VALLEYS MUNICIPAL WATER DISTRCIT:	BRUNICK, MC ELHANEY & BECKETT BY: STEVEN M. KENNEDY
FOR CHINO BASIN WATER CONSERVATION DISTRICT:	BRUNICK, MC ELHANEY & BECKETT BY: STEVEN K. BECKETT
FOR WESTERN MUNICIPAL WATER DISTRICT:	JOHN J. SCHATZ Attorney at Law
FOR THE CITY OF CHINO HILLS:	JENKINS & HOGIN, LLP Attorneys at Law BY: JOHN C. COTTI
FOR CUCAMONGA VALLEY WATER DISTRICT:	BEST, BEST & KRIEGER Attorneys at Law BY: JILL N. WILLIS
FOR CALIFORNIA DEPARTMENT OF CORRECTIONS:	EDMUND G. BROWN JR. Attorney General BY: JENNIFER NOVAK BY: CRAIG STEWART

REPORTED BY: BETTY KELLEY, C.S.R.
Official Reporter, C-3981

SAN BERNARDINO, CALIFORNIA, MONDAY, JUNE 29, 2009

9:30 a.m.

DEPARTMENT NO. S-32 HON. JOHN P. WADE, JUDGE

(Betty J. Kelley, C.S.R., Official Reporter, C-3981.)

THE COURT: Good morning, everyone.

All right. We're here on the third of a series of reports I'm asking the Watermaster to provide. Does everyone want to give their appearance, please.

MR. FIFE: Good morning, your Honor. Michael Fife for Chino Basin Watermaster.

MR. ERICKSON: Jim Erickson for City of Chino.

MR. BECKETT: Steven Beckett for Chino Basin Water Conservation District.

MR. KENNEDY: Steve Kennedy for Three Valleys Municipal Water District.

MR. COTTI: John Cotti for the City of Chino Hills.

MS. TRAN: Tram Tran for Monte Vista Water District.

MR. LEE: Steven Lee on behalf of the Agricultural Poll Pool.

MR. SCHATZ: John Schatz on behalf of Western Municipal Water District.

MS. NOVAK: Jennifer Novak, Deputy Attorney General, California Department of Justice for the California

Department of Corrections.

MS. WILLIS: Jill Willis, Cucamonga Valley Water District.

MR. STEWART: Craig Stewart on behalf of Department of Justice, Department of Corrections.

THE COURT: I want to inform everyone here that this is the last of these hearings that I intend to set up. I am retiring at the end of September and the case will be transferred to some other judge, and I don't have any idea who that's going to be at this time. If I did, I would let you know, but I don't have any idea.

The reason I've had these hearings is because I've tried to create, by transcript and exhibits, a record for the person who will replace me so that they won't have to go through the process that I did of reading a lot of voluminous reports so that they can go through these transcripts and exhibits and get up to speed faster than I think that I could. So that's the reason I set these hearings the way I did. So this is the last one I'm going to call, and I will have control of the case until the end of September.

Do you wish to proceed, sir?

MR. FIFE: Yes, your Honor. I have just a couple of matters to begin with. And we were going to save this till the end, but we'll be requesting another hearing. There's an agreement, a storage agreement, that has come through the process, and all storage agreements require Court approval. So we'll be asking to schedule a hearing.

THE COURT: That's fine. I'm not saying you can't have any more hearings. I'm just saying I'm not going to call another one.

MR. FIFE: But we do hope that we could do that at the end of today because we would like to schedule it at the end of August.

Today we're going to be covering four, five and six, as you know. As a procedural matter, before we had the first hearing in February, we submitted a set of procedural stipulations to the Court that all the parties had agreed to abide by. Those stipulations were specific to that hearing and we did not do anything about those for the April hearing. But the parties have agreed -- or rather Watermaster has proposed to the parties that the stipulations remain in effect for today's hearing. We did put out a notice to all parties and ask them if anybody disagreed with that, to object.

We've had no objection, and so I have committed, on behalf of the parties, to state that we'll be abiding by those stipulations that were in place for the February hearing.

We have -- We have scheduled this hearing today. We think we can be done before lunch. We believe the first presentation on program element four can be done before the morning break, and then five and six can be completed before lunch. That's our hope, just to let you know.

THE COURT: Thank you. All right.

MR. FIFE: So with that, Mr. Malone, if you'd like to come to the stand.

THE COURT ATTENDANT: If you'll stand here, face the clerk and raise your right hand, please.

ANDREW MALONE,

called as a witness by the Watermaster, was sworn and testified as follows:

THE CLERK: You do solemnly state the testimony you shall give in this matter shall be the truth, the whole truth and nothing but the truth, so help you God?

THE WITNESS: I do.

THE CLERK: Thank you.

THE COURT ATTENDANT: Please be seated.

Will you state and spell your name for the record, please.

THE WITNESS: Andrew Malone, M-a-l-o-n-e. I'm with Wildermuth Environmental.

MR. FIFE: Mr. Malone, please proceed.

THE WITNESS: Okay. Good morning, your Honor. I think I'll stand, if that's all right with you.

THE COURT: Yes, sir. Just make sure you keep your voice up for the reporter.

THE WITNESS: Sure.

The outline in my discussion today is basically going to cover these four points. I'm going to try to keep this as nontechnical as possible, but there are some basic concepts on the technical level that you need to understand in order to make the rest of the presentation make sense.

So I'll cover some basic concepts. I'll cover the background of subsidence and ground fissuring in Chino Basin, which led up to it becoming part of the OBMP and then the monitoring program, the monitoring and testing that was done for the OBMP implementation that ultimately led us to develop the criteria for our long-term management plan to manage subsidence and ground fissuring on the go-forward basis.

We'll cover -- This management plan was approved by the Court in 2007, and we're now implementing the plan. So I'll give you some updated information on these and data and the current status of our implementation.

So as basic concepts go, this is a map that was extracted from a USGS publication of the United States, and anywhere in blue on the map is where land subsidence has been associated with ground water pumpage. And so this is just to show you that the issues that we have in Chino Basin are not unique to just our area, but it is an issue that's being noticed and addressed nationwide.

This is a map here of the Las Vegas area. And here in Las Vegas they depend on our ground water, and they pumped it historically and they've drawn down water levels. And what you're seeing here is a radar satellite image that has measured land subsidence across the Las Vegas Valley associated with this ground water pumpage and draw down of water levels. When I say draw down, the definition of draw down is the lowering of ground water levels. And I'll use that term frequently here because it's very much closely linked to land subsidence.

The white lines here on the map are mapped faults, geologic faults, and they can create barriers to ground water flow. And so when draw down occurs, they can control where the draw down occurs, and they can also cause differential subsidence of the land surface and a crack may open up in these locations.

These are some of the same concepts that we're going to be talking about in Chino Basin. So this, again, is another example of this process not being unique to the Chino Basin. It's something that people are addressing in many different places.

This here is a ground fissure associated with this process, but this is in Arizona. The ground fissures that I'll show you in Chino Basin are clearly not this big, but this is just to illustrate the concept that this sort of ground fissuring can occur.

I've shown this slide here before. These here are sediments that were sampled as a well was being drilled down in the Chino Basin. What you can see here is that our aquifer system consists of sand and gravels, layers of sand and gravels inner bedded with layers of clays.

Can you go back?

The ground water exists within the pore spaces of these sands and gravels, and there's pore space in these clays, too. These clays are saturated with water as well. When a well turns on, water flows through these pore spaces to the well to supply it with the water. Because these pore spaces are so small and are not as interconnected in the clays, the water flows very slowly in the clays.

So what actually happens is when the well turns on, the water flows towards the wells and the sands and gravels, and the water pressure is reduced. And what that -- what happens then is that the water in the clays begins to slowly drain into the sands and gravels. And when that happens, these clays can squeeze because that water pressure in the clays provides some support to the clays. And so these can squeeze and ultimately results in land subsidence at the surface.

I have a series of cartoons to illustrate how this occurs. What this is supposed to represent is a cross-section through our aquifer system. And the green are the clay layers and the white are the sands and gravels. The wells have openings typically in the sands and gravels because we all know that this is where the water comes from. So when a well turns on, the water begins to flow towards the clays.

Pressure is reduced and water begins to drain out of the clays.

Can you go one more.

This is about as technical as I'm going to get with you here. But if we go inside -- at any point inside one of these clays, this is the pressure distribution and the vertical stress that this clay is feeling on the inside. First of all, it's feeling all of the overburden or all the saturated sediment that's on top of it, and it's a downward stress. And what is balancing that downward stress so that this clay remains in its stable geometry is the pore pressure within the clay and the inner granular stress. It's the grain-to-grain contacts that are supporting the overburden.

By pumping, we can change that pore pressure in this clay.

So can you go ahead with the next slide.

The well turns on -- the next slide -- and water begins to drain out. And then if you focus in here -- go to the next slide -- the pore pressure is reduced. And this right here we call this inner granular stress. We call that the effective stress. And I'm going to use that term again and again. But this effective stress increases, and when that increases, the clay compresses and rearranges itself to become stronger to now continue to support the clay.

So go ahead.

When the well turns off, water can infiltrate back into those clays, and the clay geometry can expand. This can happen in an elastic fashion where when water drains out of the clays, it compresses. When water infiltrates back into the clays, it expands. And we see that at the surface is a rising and a lowering of the ground surface in an elastic fashion and it's measurable, on the order of about an inch is what we've measured in Chino Basin. But in the Orange County Basin, it's been measured as up to four inches of elastic deformation. Typically nothing that we really worry about in terms of threats to infrastructure or anything like that.

However, we have a different flavor of compaction of the aquifer system when we reduce pore pressures too much in these clays.

Can you go on to the next one.

We have what's called the maximum past effective stress, and this is a very important concept because this is the threshold where the system transitions over from elastic to inelastic or permanent compaction of the clays. And this results in permanent land subsidence. And this is really our threat to infrastructure is when this happens. So identifying this is a very important criteria to manage it in the future. And you'll see how we identified it in our specific case in -- later on in the presentation.

So go ahead to the next slide. You can see that what we've done is we've gone past it.

And go to the next slide.

And this, obviously, is just for illustration, but the clays compact. Land subsidence.

Now, one other point to make here, another key technical point is that because these clays are so impermeable, that this drainage and equilibration of pressure between the sands and gravel aquifers and these clays, because it takes so long -- because the drainage occurs so slowly, it can take a very long time to equilibrate, and this compaction can go on for years and years. And depending on the thickness of these clays and their permeability, their characteristics of permeability, it can even be hundreds of years before they ultimately compact to what their ultimate compaction would be.

Okay. So I think you're equipped with the basic concepts now to understand the history and how we're managing subsidence in the future.

I believe I've shown this slide before, but this is turn of the century 1905. This area right here, ground water levels were all the way to the surface. If we drilled a well in this area over here, water would flow out without even pumping. That's how much pressure was in the aquifer system there, completely saturated sediments here.

Ground water recharging in the northern parts of the basin and flowing to the south. And down here, because we had these flowing conditions for wells, what it indicates was there's a lot of clays in here where this water pressure from the four bay areas was causing extra pressure to occur underneath some of these clay layers.

So the take-away here is that we have completely saturated conditions and clay layers in this area, the necessary conditions for subsidence to occur in the future.

Right here, I'm showing you where subsidence did occur and was measured most severely in the 1990's.

This is a map here again of the Chino Basin and showing you water level decline or draw down over this time period.

You can see up in this area here in the Pomona area 150 feet of draw down, about a hundred feet of draw down in the Ontario area, and down here in the Chino area, about 150 to a hundred feet of draw down.

This is for the shallow aquifer system that this map was created for.

What I'm showing you here are some locations of some wells that when we get to the next slide, I'm going to show you the water level time history over this time period of these wells and how we came to have this much draw down by the year 2000.

And most of our discussion is going to focus in and the maps that I'm going to be showing are going to focus in on this southern area of the subsidence area that's been mapped here.

So what you're seeing here is a time series of water levels in the wells, those six wells that I was showing, from 1935 to about the year 2000. And right here, ground water levels were at about the ground surface back in the thirties. You see a lot of decline, on the order of a hundred to 150 feet of decline of water levels all the way up to about 1978.

What you're seeing here in the gray line represents climate. This is a wet period. This is a dry period. So there's -- there was a lot of pumping going on in the Chino Basin. It was a relatively dry period up until about 1978 and water levels were declining. This was when the judgment that allocated pumping rights was executed.

And now we have -- in the seventies we have imported water from Northern California that's available for use and for replenishment of the aquifer system, and we're just managing the basin now and we're starting to actually reverse this water level decline in this area at least and water levels remain relatively stable. This is for the shallow aquifer system.

We're also going to be talking about the deep aquifer system, the deep confined aquifer system in our area of subsidence.

And this is its history starting in about the early 1990's. This is that area, the southern area of the subsidence area that was mapped in past slides. And what you're seeing here are a number of deep wells. A lot of these were drilled in about 1989, 1990. There was one well that was there for a few decades before, maybe two decades before, and these wells pumped water from the deep system. And we had ground fissuring here represented by these red lines here occur in about the early 1990's, 1992, about.

So move onto the next slide.

These are what some of those grounds fissures looked like. This is one that was on the prison property in February of 1991 that developed.

And this is another one here on the prison property in December of 1992.

The fissures developed here first on the prison property and then began to propagate in the early 1990's to the north and to more urbanized areas. We certainly don't want this occurring in the future.

So when these fissures occurred, it caused a lot of investigations and studies. And one of those was ground level surveys across the area. And there was some surveying that was done as early as 1987, and that was used as comparison on the go-forward basis through the 1990's.

What that indicated was that we had about 2.2 feet maximum of subsidence that occurred right along Central Avenue here. And it was concentric on some of these wells, generally in the area of the wells, and a very steep grading of subsidence occurred here on the eastern limb of this trough of subsidence. And so that made people think that this differential subsidence was linked to the ground fissuring.

So that was the area that we were looking at down here. Here are the ground fissures again. And what we also did was we looked at the radar satellite imagery. We went back and looked at 1993 to 1995. About 1993 is the beginning of this type of data.

And so this is over a two-year period, and this is in centimeters, the red showing the areas that have subsided the most and the yellow showing the least and blue actually showing a little bit of rebound of the land surface.

And so what this is indicative of is a lot of subsidence occurring down here. This was where most of the subsidence was occurring, but it was also occurring to the north up here in the northern parts of Chino and in Pomona and near the Ontario areas over here.

You can also continue to see the northward propagation of this deferential subsidence here. No fissuring that was noticed up in this here, but clearly the threat for this fissuring to continue to occur here if this subsidence continued. Luckily, it did not.

Can we go to the next slide.

Different scale here. We're not looking at 50 centimeters. We're looking at 15 centimeters, and actually, just 12 in these areas right here. And this is from 1996 to 2000. So the rate of subsidence was slowing down.

And by 2000, by around 2000, it had almost abated to nothing down in this area here where the fissuring had occurred.

But again, the same pattern continued, subsidence up here in Pomona and Ontario but at a much lower rate. And then still subsidence in this main area here but also at a reduced rate.

So when the development of the Optimum Basin Management Program was going on, this issue here was linked to the production and the basin management practices. And to the extent that it could be managed, the subsidence and ground fissuring could be managed by basin management practices, it was decided that we should go ahead and try to do it.

And in the OBMP, there were three main steps in program element four. And that was to minimize the subsidence and fissuring in the short-term. And the way we did that is we executed a forbearance agreement between the parties and Watermaster, the parties over in Management Zone 1 and Watermaster, to reduce production by 3,000 acre feet per year in the area. And that was to occur during this time here where we were to conduct an investigation into the extent and the rate of subsidence and the mechanisms of subsidence and fissuring. And ultimately, equipped with this information, we were to develop a long-term management plan to reduce or abate the subsidence in the future.

So this next part of the discussion is going to focus in on that second point there, the investigation.

Do you have any questions to date?

THE COURT: No.

THE WITNESS: Our monitoring and testing program consisted basically of two different elements. One was the monitoring of the ground surface itself. And we did this in different ways. Conventional benchmark surveying. So we have benchmarks that were already existing out in the area. We added more to the network where we felt we needed to and we did this twice a year.

We also did horizontal distance measurements across the area that had fissured before so we could better understand what was going on at the fissure zone. And then using this radar imagery that we call inSAR, we were going to do that as well.

Then the monitoring of the possible mechanisms behind the subsidence. We're going to monitor ground water production very closely. We're going to monitor what we call peizometric levels, but that's basically the water levels in the wells, and then we were going to actually measure the compaction that was occurring in the aquifer system.

So these were the areas where we did the surveys. So again, there was an existing network here, and we expanded it to the north and we expanded a line out here to cover an area that really isn't covered by the inSAR data. This is inSAR data from '93 to '95, and I think I told you this before, it's not very good down in these agricultural areas, so this is an area where a lot of pumping is going on because of the Chino desalter that's been recently installed here. In the year 2000, it began pumping. And so this was a way to monitor some of the subsidence that might be associated with it. But basically, all the monitoring was going to go on here in this main area of subsidence.

And these are just some of the benchmark monuments where we do the leveling surveys. This is a more sophisticated and stable benchmark as compared to these, but it turns out they both do a very good job for us in our monitoring program.

And these are just the surveyors doing their work.

For the inSAR, can you go to the next one. Go backwards. Sorry.

No, I'm sorry. I thought there was something else in here but there's not.

For the inSAR, the way this works is that the radar satellite passes over the land surface and shoots a radar wave down and it rebounds back and is sensed by the satellite. And the amount of time it takes for that to occur is associated with the height of the ground surface. It comes back for a second pass. It does this once a month, goes around the earth once a month, comes back for consecutive passes and does the same thing. And any change in the time is related to a change -- is interpreted as a change in the altitude of the ground surface. So that's how the radar satellite imagery works. It's a relatively new technology that came into use, and most of the data that we use comes in from the early 1990's. It's developing, but it's progressively more and more used. Newer satellites are up there collecting high resolution data today.

This is what that imagery looked like back in the early 1990's, and this is -- this was our area where most of the subsidence was occurring and where our ground fissuring was occurring. But you can also see this really sharp gradient of subsidence to the north in the Northern Chino area, and then you can see the Ontario and Pomona area up here.

As far as our aquifer system monitoring network went, the yellow line, just to orient you again, is our zone of historical ground fissuring. Everywhere where you see a red dot here is a well, and we put in a water level recording transducer to measure water levels once every 15 minutes. So we did that everywhere on both sides of the fissure zone, very extensive monitoring of water levels.

We also -- the center piece of the monitoring program was the installation of the Ayala Park Extensometer, and we have monitoring wells that go down to different depths with the aquifer system to monitor water levels at different depths. And this is also where we're monitoring our compaction of the aquifer system.

I believe I showed you this before too, but this is what our extensometer looks like. It's a dual extensometer, one monitoring the shallow aquifer and one monitoring the shallow and the deep aquifer. And the way this works basically is that we create this very stable land surface datum here, and we drill two wells and we put a concrete plug at the bottom of each one of these wells and we install a steel pipe that goes down and rests on the bottom of the hole on the concrete pad.

As water is pumped from the shallow or the deep aquifer system and the system compresses, this will come down but the pipe will remain relatively stable. And so we measure that displacement right here at the ground surface, and we do this every 15 minutes, too. We have this electronically monitored every 15 minutes, too. So very high resolution subsidence data is recorded here.

And because we have a record of subsidence all the way through down to the bottom of the deep aquifer system and we have another one here in the shallow system, we can subtract these two records from each other and figure out what's going on only in the deep system. So this was our strategy. And we hired a retired USGS scientist to come in and help us construct this and develop our strategy, and it's worked quite well for us.

This is what the deep extensometer looks like at the surface. Again, this is the steel pipe here and this is the well that it goes down in and goes down about 1400 feet and rests on the bottom, like I said, a concrete pipe.

Up here you can see the top. That's our ground surface datum. And this right here is a lever arm that is pulling some of the weight off the pipe. There's 1400 feet of steel and it wants to bend under its own weight. And we don't lift it off the bottom but we try to take about 70 percent of the weight off of it so that we create a -- not a friction free environment but we create less friction in the pipe between the pipe and the well casing.

That's what that looks like.

Outside of the building we have wells that go down two different depths within the aquifer system, and we have transducers into each well that are monitoring water levels every 15 minutes. So the whole monitoring system wakes up every 15 minutes, takes a reading, shuts down for 15 minutes and does that repeatedly.

Another really important part of our system, we have our whole system out there now, and we're doing our monitoring but we also do controlled pumping tests. Like I told you earlier, there was not much subsidence occurring by the year 2000 in this area. So our strategy was to try to cause a little bit of subsidence so we could identify that threshold by where the system transitions from elastic into inelastic compaction. So that was our strategy. So we had to run some controlled pumping tests to figure out what that threshold was. That was to become our criteria in the future for managing subsidence.

So I think that pretty much explained that. I know this is small here, but if we were successful in identifying that threshold, this would define the usable storage volume in this area and it would be our key finding.

What you're seeing here is a time series of water levels at the Ayala Park Extensometer. And this goes from about 2003 to 2005. And what you're seeing here in the black line is a deep piezometer that's measuring water levels in the deep aquifer system.

And what you're seeing here is a shallow piezometer that's measuring water levels in the shallow aquifer system. And the reason why they're responding going up and down is because there's a nearby well, maybe a thousand feet or so away, a nearby well that's turned off and on. And so the water levels in these monitoring wells are responding to that well turning off and on.

And there are shallow wells. I say that well, but there are shallow wells that are turning off and on and there's deep wells that are turning off and on. And you can see here that the deep water levels are responding a lot more than the shallow water levels. And I can tell you that there's more pumping that's going on in the shallow system than the deep system. And this is very typical. This exaggerated response is very typical of a confined aquifer system.

And so what's happening -- The main point to take away here is that in the deep system, there's a lot more stress being imparted to the aquifer system down there because the water levels are changing so much. The water level change is so much greater than what's going on in the shallow system.

This purple line here is the compaction that's being recorded by the extensometer. And this is the deep extensometer record. So you can see here as the deep system is drawing down, and even when it comes up and then draws down again, you see little perturbations that follow the water levels in the deep system.

So indeed the system does compress when water levels are drawn down. And when water levels come back up, the system expands. So you can see here this is mostly elastic deformation that's occurring. This is one inch of deformation, so mostly elastic that's occurring.

This was our first controlled test that we tried to cause some inelastic compaction, and we weren't able to do it. We weren't successful in doing it. We didn't draw water levels down far enough.

We ran another test in 2004 where we turned on two wells and drew water levels down to about 280 feet below the ground surface, and we felt like we did cause -- the data did indicate that we did cause some inelastic compaction. And the way we figured that out was we looked at these data in a different graph, something called a stress strain diagram, and we let water levels recover all the way back up to their pretest conditions to see if we had any permanent compaction that occurred, and we discovered that we did have a tiny bit occur.

This is that stress strain diagram, and I'm not going to get too much in depth here, but we're basically employing the compression at the extensometer versus the water level. And this here is when water levels are declining and the system is compressing. That was a 2003 test. And then we let water levels recover, and this green line is our 2004 test.

When this green line begins to bend over and become more horizontal, this is indicative of when the system is transitioning into permanent compaction. This is all elastic in here, but when we came up here to about 250 feet, we felt like we transitioned the system into inelastic compaction. And then we confirmed that by letting the

system come all the way back, water levels come all the way back to their pretest conditions. And if you come across here, it looks like we caused maybe about 1/100 to 2/100 of a foot of permanent compaction. That's how we interpreted the data.

We continued to use this chart here to interpret our data, and I'll show you some more recent results. But this was at the conclusion of our interim monitoring program where we identified this as the threshold right here, about 250 feet, as our maximum past effective stress and our management criteria. This would become our management criteria for the future.

Yeah, keep going. There's just some animation here to show how we're interpreting that data.

So our conclusions of the IMP. That stands for Interim Monitoring Program. Our conclusions were that during the time we were monitoring this system, that most of the deformation that was occurring in the system was elastic. There was very little inelastic occurring.

Note that we had the forbearance agreement where we weren't pumping as much. We had reduced that by about 3,000 acre feet during this time period. And that this conclusion is really only for the types of pumping that were going on at that period of time. Obviously, we need to continue to monitor the system under different regimes of pumping and without the forbearance agreement.

That the deep system causes the most stress to the system, those water levels. That was one conclusion.

And that we were able to identify this threshold for inelastic or permanent compaction, and it was at about 250 feet below the ground surface at one particular piezometer. This was to become our index well for our management criteria.

We also identified a barrier. I talked about Las Vegas having those fault barriers. We think we identified a fault barrier that would create the potential for this differential subsidence and fissuring. This barrier seemed to be a line right with the ground fissuring, so it made a whole lot of sense to us that this barrier was also playing a role.

And then the fact that we also began to notice that there was subsidence in other areas, that these were areas that we haven't really studied yet but they're areas of concern.

So we had enough information to develop this long-term management plan. We call it the MZ-1 Subsidence Management Plan, and sometimes it's referred to as the long-term plan. Sometimes it's referred to just as the MZ-1 Plan. But the monitoring program results provided the technical foundation for that plan. And we also did some limited modeling, computer simulation modeling to evaluate the effectiveness of our plan.

So in the MZ-1 Plan, we basically delineated the area that it applies to, and I'll show you a map of that and the wells that it applies to, mainly the deep wells in the system.

And then we identified a guidance level. And we took that 250-foot level at the PA-7 piezometer, and we added a five-foot buffer, so 245 feet below ground surface was going to be our guidance water level to not cause permanent compaction in the future.

This here is our managed area in red, and all the orange dots here are the deep wells that are managed wells. And this right here is our extensometer. And where that well is, that PA-7 piezometer, is where the guidance level applies to and, again, our ground fissuring right here.

What the MZ-1 Plan also called for was a free exchange of data between Watermaster, who is doing the monitoring at the Ayala Park Extensometer, and the parties, the pumping information, their water level information, allowing Watermaster to continue to have transducers in the wells and collect the data, visit the wells and collect the data.

We would continue the same type of monitoring in the managed area, in these areas of subsidence area.

Concern outside of the managed area to start to expand the monitoring, and this is where PE-4 blends with PE-1, the monitoring program element. And PE-1, we are --

Watermaster is also supposed to be monitoring subsidence basin wide.

The plan also calls for an annual report to review the data, the recent data. And an evaluation and update of the plan if the annual report warrants it.

What we're showing here in green is the managed area. And this is the 1996 to 2000 inSAR data that I showed earlier.

And outlined in blue are some of our areas of subsidence concern that are outside of this managed area.

And we understand a lot about the subsidence in this area here. We don't understand it quite as well in these other areas, the potential for it.

Could we go to the next slide.

Sometimes we don't know why -- In some areas we don't know why the subsidence is occurring.

We don't know what this threshold level is that might cause additional permanent compaction. We don't know the properties of the sediments that might control how much subsidence is going to occur in the future if we have additional draw down.

And then is ground fissuring a threat? Where? Can it be monitored, predicted and managed?

Can you go backwards.

Again, we think that this is potentially an area where ground fissuring might be a threat. The inSAR data is

very good at identifying those areas. There are some other areas where the subsidence looks differential, too. Fissuring has never been documented in these areas but it's of concern.

So now going to some recent data and some of our future plans, and then there's a last slide on some potential challenges that we face.

This is some of the recent inSAR data, and we're about plus and minus five centimeters here on our scale here. And this is from 2005 to 2008.

What you can see is down here in the managed area, there's not much permanent compaction going on. But in the Ontario area and the Pomona area, we continue to have subsidence. Again, you know, five centimeters maximum here over this three-year period, but it continues on, just like it has all through the 1990's.

When we look at water levels and wells up in these areas, you might expect that there would be draw down associated with the subsidence, but that's not the case. We're seeing either stable water levels and in some cases even rising ground water levels so it's a little curious.

Our initial interpretation of this data here is that we had a lot of draw down, if you remember that map, 150 feet of draw down here historically, about a hundred feet of draw down here historically. There may be thick clay layers that are continuing to drain because of those long-term draw downs that occurred back in the early part of the twentieth century and later. So that's -- This is new information and that's some of our initial interpretations of that new information.

The inSAR data remains incoherent. That's the term we use. It remains incoherent and absent in this area. This is of particular concern to us down here because this is the desalter well field where we're purposely trying to lower water levels. We're going to be drilling new production wells down in this area to gain hydraulic control. And so we anticipate more draw down in these areas.

There are some agencies that have drilled wells and have plans for pumping in this area. And we know that the geology is similar to the geology in our managed area. And this is an area where ground fissuring has occurred in the past. In fact, if you go back to the 1970's, there was even some fissuring that was observed in this area back as far as the 1970's, before a lot of this deep production occurred in this region. So this is an area of concern.

In addition, as part of basin reoperation, we are predicting draw downs across this part of the basin as well. Not so much in this part of the basin but over here more in the central part of the basin. And so again, draw down is predicted in these areas, and we don't quite understand exactly the subsidence mechanisms like we do -- as well as we do in this area here.

That's some of our future challenges.

And this is going back to the 1996 data.

So can you page back and forth between the two a little bit.

So you can see the changes in subsidence from the 1990's, the late 1990's, to the mid to late 2000's; again, continued subsidence in these regions, the cessation of subsidence here.

In this area here, we really don't have a whole lot of water level data, and so it still remains a very curious area to us as to why this subsidence occurred here in the 1990's and why it's not occurring today.

There's some unanswered questions related to subsidence.

This black line here, this is a stress strain diagram again. And the black line here is some of our most recent data in 2007 and 2008. And the reason why I'm showing this here is you're seeing this curve bend over just like it did up in here. But we haven't exceeded the 250-foot level. So this is causing us some pause, and we don't quite understand why it's occurring.

One of the things that we are contemplating and is actually called for in the Management Zone 1 plan is to have periods of water level recovery and allow the water levels to recover back here so we can do this same analysis. So that's something that we are going to be tackling this fiscal year in fact.

So our plans for 2009 and 2010 are the continued monitoring in the managed area. Our transducers have been in the ground since 2003, so six years about. And some of them are starting to fail. We're starting to update the monitoring network so we're spending some money doing that.

We are continuing to collect pumping data and, of course, the water levels.

The ground level surveys. We're still doing the surveys in the managed area.

And, of course, the inSAR. And the Ayala Park Extensometer Facility, it continues to collect information.

Again, I just talked about this, the recovery of ground water levels.

Chino Hills is performing an aquifer storage and recovery test where they're going to try to inject water into the ground. The objectives there are to see if they can temporarily store water in the ground and also how that was going to affect water levels and subsidence in this area. That's another objective.

So Watermaster is supporting that ASR pilot test. About one-third of the cost is being supported by Watermaster.

We also have about $80,000 that we are devoting to further data analysis and some water supply planning, possibly some new pumping tests to better understand how to use this managed area, and also to better understand that stress strain curve, why it's bending over.

So we're planning on doing some modeling possibly, but the MZ-1 Technical Committee is going to get together and talk about how we're going to spend this $80,000 this fiscal year for some of these efforts.

And, of course, the reporting, the end of the year reporting. Our budget for this fiscal year is $545,000.

And then our monitoring outside of the managed area. Again, we continue to monitor ground water levels as part of other programs and ground levels using the inSAR. And the inSAR costs us about $100,000 a year to look at subsidence basin wide across the entire Chino Basin.

So some additional potential challenges.

This one is typically mine that I struggle with. It's a complex process. It requires a lot of education of the stakeholders. It's a technically complex process. It's somewhat invisible. Unless a crack opens up in the ground, it's somewhat invisible. It requires extensive and expensive monitoring to figure out things like this threshold level or how much subsidence you might anticipate if you draw the water levels down 10 feet, 20 feet, a hundred feet, how much subsidence is going to occur? In order to make those sorts of predictions, it requires a lot of monitoring and testing that can get very expensive.

The link between the ground fissuring and the subsidence is not very well understood in the scientific community. It's probably very site specific depending on the soil structure. And so developing management criteria to manage ground fissuring in the future is also somewhat problematic from a technical basis alone.

Our MZ-1 Plan, we call it voluntary. It's basically, we provide guidance to the pumpers. There's no -- What we've done is we've set this water level, and we've said you go ahead and manage your pumping so as to not exceed that ground water level and cause future compaction. But it's basically providing guidance and not compelling them to compliance.

That hasn't been a problem. As you can see, we haven't violated that criteria. And so it hasn't been a problem, but I'm just saying potential challenges.

And then also subsidence has typically been viewed in the past as a local problem. And to Watermaster and all the parties' credits, this has been an issue that we've studied in detail in one specific part of the basin and a lot of money has been spent on it.

And so I'm just pointing out here that it's a success story, but there's also a feeling that a lot of money has been spent on one specific part of the basin. And it appears to be a local issue.

Our recent data is showing that it's likely not a local issue, that there's subsidence occurring elsewhere. That draw downs in one part of the basin can affect subsidence in other parts of the basin if that draw down migrates towards it.

So these are just some of the potential challenges that we face.

And that's the end of my presentation, if you have questions.

THE COURT: No, I don't.

Does anyone have questions?

Apparently not.

All right. We'll take a short break and then we'll start the rest. We'll be in recess until 20 minutes to 11.

(Recess.)

THE COURT: Next witness, sir.

MR. FIFE: Your Honor, we'll call Mr. Ken Manning.

THE COURT ATTENDANT: If you'll stand here, face the clerk and raise your right hand, please.

KENNETH MANNING,

called as a witness by the Watermaster, was sworn and testified as follows:

THE CLERK: You do solemnly state the testimony you shall give in this matter shall be the truth, the whole truth and nothing but the truth, so help you God?

THE WITNESS: I do.

THE CLERK: Thank you.

THE COURT ATTENDANT: Please be seated.

If you'll state and spell your name for the record, please.

THE WITNESS: Yes. My name is Ken Manning, M-a-n-n-i-n-g, and I'm the Chief Executive Officer of the Chino Basin Watermaster.

MR. FIFE: Mr. Manning, please proceed.

THE WITNESS: Very good.

If I could kind of continue the pattern that Mr. Malone set up, if it's okay, your Honor, I'd like to stand.

THE COURT: Oh, certainly, sir.

THE WITNESS: Your Honor, the first element that I'm going to talk about, there are two of them that I'm going to be up here today to talk about.

The first one, program element number five, is the element dealing with supplemental water and the exact element as it reads is, "Develop and implement regional supplemental water programs."

Now, to some degree, this area has been -- is overlapping into other areas. Program element number two covered a portion of it. Program element number three covered a little bit of it, and it intertwines with even some of the stuff you just heard with Mr. Malone.

So first, we kind of talk about what is a region? If you go back in time back into the earliest part of the 20th century when people were settling in the Chino Basin, there was no doubt that region meant basin wide. Farmers were moving into the area. They were pumping water from under ground, using it. They were concerned about what was going on within the basin. They weren't really concerned about what was happening on the Colorado River or up in Sacramento. So the basin was considered the region.

Over time, that moved into a theory that really what we meant by region was watershed. You have agencies that were developed, the Santa Ana Watershed Project Authority, SAWPA, other municipal water districts were created. There are five within the Santa Ana Watershed. So those were created when the basin expanded out to be become watershed as the definition of region.

Then those agencies became members of the Metropolitan Water District and when overdraft became an issue, importation of water was important, and the definition of region then became dependent on the Metropolitan Water District. So now we're starting see the Metropolitan Water District as the definition of region.

The State of California, when we started importing all of our water -- and I'll explain why we're using statewide water in a little while -- but as we started importing state water, the region now really becomes the State of California. It encompasses all those things we had before and actually becomes much more broad.

Now, the next question is where do we go next in terms of a definition of region because we know that right now, that the State of California is unable to supply all of the water needs for the Chino Basin and much of the Metropolitan Water District territory.

So what are we doing next in terms of the definition of region? We're really consolidating that term again. We're actually making region more interim, trying to make ours more self-sufficient and less dependent on imported sources of water.

One of the areas of real concern for those of us in the Chino Basin, because we use state water project water to recharge into our basin for supplemental water, is this whole area of the Delta.

In you -- If I can go back -- If you can go back one, Frank, one slide.

You'll notice that the state water project, that the project will come down here just above Sacramento and it stops. Now, there's a whole series of blank space until you get down to an area here, which is the Banks Pumping Plant, before it starts to move again south into Southern California. That area is on this next slide.

This is the Delta. This is the area where it stops just above Sacramento. And the water, moving its way south, comes through both the American and Sacramento Rivers and moves down through this series of man-made deltas and conveyance systems that were built using migrant labor back in the late 1800's, and it connects back up down here at the Banks Pumping Plant. And this system, because of policy decisions in the State of California, is no longer capable of carrying the kind of water that we need down to the Banks Pumping Plant and then down to Southern California.

Recently, there were two biological opinions that were submitted to the Court, one on the Delta Smelt and one on salmon. Both of those provide restrictions on moving water through the delta. So now we have a plumbing system where we don't have it connected, and this is a real problem for us. And there isn't one in the State of California that believes the solution to this problem will be solved in less than 10 years. Many estimates are as much as 20 to 25 years. So we have a real problem here that's causing us in the Chino Basin to have to reevaluate this whole definition of region. And we talk about how we're going to solve our water problems.

So what is supplemental water? In many cases for us now it's recycled water. It's increased storm water capture. We'll walk through some of these in more detail in a few minutes. And increased Santa Ana River inflow because of this issue of reoperation of our basin, we're actually encouraging additional water from the Santa Ana River, where we never did before.

But the one area where we're not trying to rely, although we'll take it when it's available, is this whole area of imported water.

Now, how do we get replenishment into the ground? Again, putting water back into the basin to offset production is what we are in business to do. And so we do that with a series of projects that actually put water -- This is Montclair I and II. This picture is taken from a helicopter just about over the 10 Freeway.

There's two more basins down below it, Montclair III and IV. This is the San Antonio Creek running alongside, and water is diverted off San Antonio Creek into Montclair I, and then it flows into II, III, IV and then back into the river. So these are the kinds of operations that we use.

This is another basin, which is a good example, because it uses two of our inlet structures and it's a good example. So I pulled this one up. This is a confluence of two different creeks, the Dear Creek, the intersecting with Cucamonga Creek and then it flows south down towards Prado. This is the Turner Basin. This is Archibald on the right. We have Fourth Street up to the north. The 10 freeway is just below me, and Ontario Airport is just below that.

This coming off of Dear Creek, we use what's called a drop inlet diversion. I'll show you a picture of it in a second. Essentially what happens is just as it's described. The water will flow into a graded trench that was created.

It drops down into an inlet and then down, in this case both into Turner I and into Turner III, and then we'll recharge this.

This is what we call a flow by basin. Water flows by and we divert it into these recharge facilities.

The other kind of facility we use to divert water is what's called a rubber damn. In this instance, a rubber about three feet high damn is inflated using air. It diverts the water into an inlet structure that then goes into our basin, so this is being used to divert into Turner Basin I. Turner Basin flows into II and then water will flow back out into the Cucamonga Creek if these get too full. So there's a fail safe mechanism there. Again, this is a flow by basin.

These are the two facilities. This is the typical rubber damn. This is a drop inlet here.

The other kind of facility that we have within the basin is a flow through basin. And within the flood control facilities and the recharge basins, that's owned by the Chino Basin Conservation District, IEUA, flood control, we have a variety of these different kinds, but they fall within those two categories.

In essence, this is just a wide spot in the stream. So what is happening in here, the West Cucamonga Channel is flowing down into Ely I. The water will fill in Ely I. As you see, it spills over into Ely II, Ely II spills into III, and if it gets too much water, it will then flow out.

The down side of this kind of a basin is that as you can well imagine in a large storm, all three basins will be full and every drop that enters this end is going out the other end, so recharge is minimized.

The down side of the inlet structures is if flows are too large, you can't divert all that water into the basin. So both of the basins have their challenges and limitations, but we use them to their maximum extent.

The Chino Basin parties have spent 50 million dollars over the last five years improving these facilities in order to increase the amount of recharge within the basin. Amongst all of the 26 different facilities that we now operate, we have the capacity to put in the ground approximately a hundred to 110,000 acre feet of water per year if the water is available, and that's a big if. But we do have a large enough bucket to take just about everything we need into the basin over a period of time.

This is a map of the basin showing a lot of the facilities that we operate within the Chino Basin. The Rialto Pipeline is at the north. It's a Metropolitan Water District facility. There are -- That's where the pipe is that takes state water project water.

We have the upper feeder that runs through the middle of the basins, also a Metropolitan Water District facility. And the yellow dots that are on both of those lines are turnouts. At any of those yellow dots, we can actually turn water out and either put it into a treatment facility or put it into a channel and have it funneled down from one of our recharge facilities, San Sevaine, Victoria, Day Creek, into the Montclairs or Upland Basins or down to Brooks. All of these facilities are utilized when water's available from the Metropolitan Water District.

The facility that we use primarily is the Rialto Pipeline because it recharges farthest north, allows us to maximize the water through the system. You'll notice that the majority of our system is above the 60 Freeway in the upper half of the basin, allowing us to be able to flush water from the north down to the south. And that's the strategy that we use.

Now, as was pointed out in Mr. Malone's testimony, MZ-1 is a major concern for us. So we have a lot of facilities over in this area where we actually are required to put in 6500 acre feet of wet water per year into the basin in order to be able to recharge using wet water here. That's part of the strategies in the MZ-1 Plan.

The other facilities that we're utilizing are utilized periodically depending upon the availability of water. But priority, MZ-1 is the highest priority for recharge. MZ-3 over in this area is our second highest priority. MZ-2 is third. But what you end up with is a fairly good blend. We have to create what is called hydraulic balance in our recharge so we have to constantly monitor this to make sure water is going into all those facilities.

Also, off the Rialto Pipeline -- and I'll show you a chart showing you how much water is being utilized -- there's a joint powers authority, the WFA. It's a treatment facility that's made up of six different agencies. And it creates a water source, surface water source for all the agencies on the western portion of the Chino Basin. Up here is a turnout that supplies water to the Cucamonga Valley Water District's two facilities that also treat water.

Not shown on the map but located over here to the east is a facility that is now supplying the Fontana Water Company. And it's fairly recent, just went into operation just this last year, that helps us diversify the kind of water that comes into the basin.

Characterized, water going to these treatment facilities is a higher priority than is the water going into the recharge facilities. The water that comes -- we get generally in the recharge facilities is what's called interruptible water, and the water going to the turnouts is what's called firm demand from the Metropolitan Water District.

So as we recharge into this basin, it generally comes from north to south.

Also shown on the map at the south is the desalter well field. This shows the current configuration of the well field, Desalter I and Desalter II. And I'll show you additional slides on that later.

Our Desalter III expansion will include a series of wells that will be built down in this area down in the south, and this will create that term we called hydraulic control, so that no water will escape our basin and go down into Prado and then cause problems in Orange County. So that's the plumbing system within the Chino Basin.

This is an interesting slide because it talks about supplemental recharge. And it tells a story more than just what's in the bars. And I think it's important because if you characterize the thought process that has gone on in the Chino Basin, this area that we showed from 1960 all the way up to about 1977 is a period of time, and there's no supplemental recharge, no importation of water into the basin, pumping is going on and basin levels are going down. And because there's no agency other than the Chino Basin Conservation District -- and their operations were limited -- there's no really recharge going on within the basin. So you're seeing essentially no recharge going on all the way up to about 1977, '78.

Then we have the process of the adjudication. Chino Basin Watermaster comes into existence and immediately starts importing water and putting it into the basin, and you'll see these bars. The colors represent the different systems, the different creek systems that we have. But you'll see in magnitude, it will fluctuate from year to year with an average right around seven or 8,000 acre feet per year. There are some years where we have no recharge, and it's these years especially, this 1995, '96, '97 years that was the impetus for the creation of the OBMP.

At that point in time, Watermaster was utilizing a series of paper exchanges of water instead of bringing in wet water. The economics of bringing in water were more expensive than the exchanges of water. And this not bringing in wet water was really the impetus that started the OBMP. So once the OBMP was created, again you start seeing recharge of wet water.

Now, what we're seeing here in 2007 -- and we have statistics for 2008, but this was an older chart that I pulled up -- is now you're seeing the improvements, the 50 million dollars that we just invested in our facilities. This is the result of this 50 million dollars. Now we're able to recharge far more water into our facilities than we were ever able to recharge in the past.

Again, that will fluctuate from year to year. If you showed that chart for this last year, it will be zero again because there's no importation of water. All you'll have are those flows from what minor storms we've had and some recharge of recycled water and those kinds of things. So it tells a story even though it's just a series of bar charts.

This is an interesting graph that I put up because it shows a little bit about now I've shown you where we've been. Now I want to talk about what we're thinking about for the future in terms of where we're going.

And for the purpose of 2010, it's right on the horizon for us, and I want you to concentrate right here at this line where the yellow and blue intersect each other. The yellow, everything above the yellow is native water. So these are the resources that were available to Chino Basin and have always been available to Chino Basin and how they are used. So as you look at each chart, everything above the yellow is native. So we're talking in this particular case about local surface water. This is water that comes out of the canyon. And many of our producers utilize canyon water. They treat it and serve it to customers.

The green is our Chino Basin ground water. And this represents the safe yield at 140,000 acre feet today. We do anticipate that that safe yield is going to go down by some small amount up into 2030, so slightly smaller here but still in the same magnitude.

This small bar graph right here is the controlled overdraft. When the judgment was created, Chino Basin was allowed 200,000 acre feet of overdraft, 5,000 acre feet per year. That runs out in 2017. So in 2010's paragraph, it still shows up. You'll see in 2020 and '30, it's disappeared.

This area up above here is the area of reoperation. The Court approved the 400,000 acre foot of reoperation or in the south, we are going to use desalters to bring down the water level of water in order to create this hydraulic control. So this reoperation water, in 2010, represents a fairly sizable amount.

As we go on up from 2020 to 2030, that amount becomes smaller and it becomes consistent. And in the year 2031, actually, right around there, it goes away. So we don't -- We don't have it in perpetuity but we do have it all the way through 2030.

Now what is interesting is this area below the yellow. The yellow is going down. This yellow is the non-Chino Basin ground water. So this is an area of -- Many of our basins, our producers have access to ground water other than the Chino Basin. They can be from the Rialto Basin, the Cucamonga Basin the six basins. They can bring water in because they're boundaries overlap and for those basins they have access to water outside of Chino Basin so that represents and it's fairly consistent all the way through the chart.

This magenta color is the recycled water, and you'll see that it's in the 10,000-acre-foot range here in 2010, but you'll see this becomes larger as we get into 2030. And I'm using this as a fairly conservative number. This can be considerably larger depending upon policy decisions that are made within the Basin as we move on.

This area of blue is direct use. This is the water that's going to those treatment facilities that I told you coming off the Rialto Pipeline. This is the water that's taken off that at firm demand, treated and then served to customers without pumping ground water. So this blue stays fairly consistent. Our assumption is that those waters are going to stay fairly consistent.

Now, where we are is that here we are at 330,000 acre feet in 2010, at total demand, 380,000 acre feet in 2030 at total demand. These are based upon estimates using the Urban Water Management Plan as a basis for the pumping in the future.

What we have as a variable down here is this replenishment of imported water. Right now we filled it in with just the category "imported water". In reality, if we don't end up with this amount right here, if this water is not realized in some way, shape or form, other elements within this chart have to vary. They become variables. Either we have -- either through conservation, additional water from other sources, something in there, additional recycled water has to go on. Something has to change in order to meet that demand or that demand has to come down. The demand curve has to alter.

So this is what we're thinking about now. And Chino Basin Watermaster is in the process of going through its

Recharge Master Plan. We talked about that the last time we were together. We have a deadline of July 1st of 2010 to complete that process. And so we are working, and these are the kinds of things we're talking about and how we're going to move forward.

I can illustrate these just a little bit differently on the next two charts. This is the 330,000 at 2010. And you can see -- I want you to concentrate on the blue here, which is our total supplemental right now, represents about 32 percent of our production. And that's what we're leaning on right now.

If you go to 2030, this becomes 49 percent if nothing else changes. And so our challenge is for us to find a way to not be dependent on the State of California and on the Colorado River Projects and become more self-sufficient here locally.. And so those are the challenges that we've got within the Chino Basin.

This is the recycled water. And I threw this in at the end of the presentation so you can see the amount of commitment that the Chino Basin parties and the Inland Empire Utilities Agency have for recycled water.

This is the plumbing system as it exists today. This has been implemented at the cost of tens of millions of dollars. And this is the cooperation of all the cities within this area and the County of San Bernardino.

And you'll notice that also, we're also in this case coming over into somewhat the County of Los Angeles and into the County of Riverside eventually. This plumbing system will expand over the next decade to include all of the basin, and these are the major lines.

What is not shown are all of the other lines that the cities, the Cities of Ontario, Upland, Rancho Cucamonga, Chino, all have implemented on their own to serve customers. This system now goes to recharge basins. Here's the Ely Basins. We showed the overview right here. And we have recycled water into those.

We have up here into our Turner Basins, up here into 7th and 8th Street Basins, up to Day Creek and Hickory and Banana. So we have water now going to our recharge basins so we can recharge directly.

There's a problem with that in that you have to use a diluent water at some formula. Right now it's two-thirds, one-third diluent. We're trying to get that to 50/50, working with the Department of Health Services. So we're trying to modify this system to meet the demands of the future.

We're also serving customers. The cities and county have facilities, parks, golf courses, medians. Then we also have industrial customers that are using. I just heard Ken Jeske say that the City of Ontario now has 110 industrial customers within the City of Ontario. And that's indicative of what's going on throughout the basin as we're trying to get people off potable water and more on recycled water for direct use.

Down here is the desalter facilities. Okay? And that's it. I don't know if you have any questions.

THE COURT: Does anyone have any questions?

You have the next part too, I guess.

THE WITNESS: Uh-huh.

THE COURT: All right.

THE WITNESS: Your Honor, the next element that I want to talk about is this whole issue of cooperative programs, program element number six. And the element actually reads, "Develop and implement cooperative programs with the Regional Water Quality Control Board and other agencies to improve basin management."

Now, this implies that there are a lot of different agencies we are to work with and we do. But it's focusing on the regional board as a primary subject. And so that's been -- the majority of my presentation is going to discuss what we're doing with the regional board.

So what I've tried to do in this slide is give you a bullet list of some of the things that are highlights of what we are actually working with the regional board on and have been over the last five or six years.

The Watermaster has collaborated with the regional board in a development of the water quality objectives from the Chino Basin. The regional boards were required under

Water Section 13241 to create water quality objectives within every basin in the State of California. So we went through a process to determine those objectives within the Chino Basin, working cooperatively with the regional board.

The second bullet talks about creation of a program called maximum benefit. When those basin objectives in the Chino Basin were developed -- and they were developed by zone, so they have five management zones within the Chino Basin -- when we looked at those objectives and we looked at the ability to use recycled water, there was not what they call a simulative capacity. In simple terms, what that means is objectives were already so low that the introduction of recycled water would have exceeded our objectives, therefore, making the introduction of recycled water illegal. We would have violated our own plan.

So in order for us to be able to use recycled water, we worked with the regional board in the development of a program called max benefit. Now, when we started talking to the regional board about this, nobody else in the State of California had ever been through this process. The State of California uses -- There's two different ways of determining basin objectives, antidegradation, which says you have to go back to 1972 and establish your objectives based on what the water quality was back at that period of time. And so that's what we did in the first bullet.

In the second bullet, we said wait a minute, the second part of that statement about creating basin objectives talks about using to the maximum benefit of the State of California those waters that are available to those regions. So we said there's got to be a way to create a different basin objective.

And so with the regional board's assistance and our consultants and the Watermaster parties, we worked through and created a process called max benefit, the first in the State of California to be done.

We spent over two million dollars creating studies that allowed us to be able to go to the regional board and, with confidence, say to them that we can create hydraulic control within our basin and, therefore, isolate the Chino Basin from all other entities around us, Orange County, eastern, western, any other entities around us. We are isolated. And because of that, we should be able to raise our basin objectives in order to be able to introduce recycled water to the maximum beneficial use of the State of California.

The regional board saw the wisdom in that and worked with us through the process, and it was approved in 2005 by the State Water Resources Control Board, the first one in the State of California.

Since then, there's been about three other basins that have gone through that. And the state, on a regular basis, holds Chino Basin up as an example as to what can be done and how to do it in this area of max benefit.

The collaboration and the development of the 2004 Basin Plan Amendment. We have to go through that process every four or five years. And so this was the first time that we had done that in cooperation with them.

We then had to go through the reviews, 2003, 2006, and we're now working on the 2010 Basin Plan Amendment with the regional board.

We provide monitoring data annually to the Regional Water Quality Control Board. You might remember in my last presentation to you about monitoring. I mentioned that I like to characterize our basin in high definition. That is, compared to other basins throughout the State of California, we can see our basin in so much more detail that we can make decisions here and work with our basin far better than anybody else.

The presentation you just heard from Mr. Malone is a good example of that. That's the kind of detail we can do here. Others have no idea how to get to that point. And so we are -- We work with the regional board in supplying this data to them and evaluating water quality and other issues within the Chino Basin.

Watermaster provides the funding to develop the investigative orders for the regional board on the Ontario International Airport. A few years ago the regional board came to us and said, "Listen, we've got a lot of data that implies that this plume of contamination is coming from the Ontario Airport. We don't have any money. We don't have the staff to be able to complete these orders, cleanup and abatement orders, and so can you help us with this?"

So the parties got together and said, "Yes, we'll help fund that process for you." So we allowed our consultants to work with the regional board to help write and draft up these cleanup and abatement orders for the Ontario Airport.

We also provide technical support and data for the County of San Bernardino's efforts in cleaning up of the Chino Airport. I'm going to go into both of those airports' cleanup problems with you in a little more detail in just a second.

And the last bullet is kind of a catch-all. And, in essence, what happens now is the Watermaster, working with the regional board, have a number of issues where we work cooperatively. I think that over a period of the last decade, Watermaster and the regional board have developed a cooperative spirit that allows us to be able to work with them. They know that we have a tremendous amount of data, data that they don't have available to them through their own sources, and so we work cooperatively on discussing of issues and working through those. And there's a number of examples of that in the Chino Basin.

Next, I talked about the plumes of contamination in the basin. Let me talk about the three -- These are the major plumes within the basin. I'll talk about a couple of others in a few minutes, but these are the ones we're concentrating on now.

This basin located in Ontario is a plume of contamination that was caused by G.E.. It's the called the Flat Iron Plume. At one time General Electric manufactured -- almost all of the irons in the world were manufactured in Ontario. Included in that process was a series of cleaning things. The disposing of that waste or the cleaning materials got into the soil, and it's caused this plume of contamination.

Orders have been issued on this plume and they are now in the process of cleaning it up and it's no longer expanding. It's staying pretty stable because of the pumping that's going on and the cleanup activities that G.E. is operating under. So we monitor that with the regional board and work with them, but it's pretty stable right now.

This plume just below the Ontario Airport is another plume that was created by General Electric. This is called the Test Cell Plume. The Test Cell Plume was a plume that was created when G.E. was manufacturing parts for aircraft. And again, the cleaning solvents, the TCE, was disposed of within the properties and then got into the soil and created this plume. Again, just like the Flat Iron Plume, this is under control and is no longer expanding. And so the work that's being done on both of these plumes is pretty stable, and we are now in just a monitoring mode with that plume.

The Milliken Land Fill is located over here to the east. And again, this plume is being dealt with by the county. It is capsulized. It's no longer moving outside of its boundaries. And they have a work plan in place to keep it stabilized. So we monitor it. We attend meetings just like we do the others, but right now there's no need for us to intervene in those because they're being dealt with.

The other two plumes are the Ontario International Airport Plume, as we refer to it. The airport doesn't like that name but this is how we've characterized it.

The second one is the Chino Airport. So let me talk about the Chino Airport Plume first.

Frank, again.

This is a picture of the Chino Airport. You've probably seen it before. We're flying just at the eastern end of the airport. This is the youth prison here. Over here is the Chino Institute For Men. Euclid Avenue is running right down at the end of the runway here.

It was operated as an airfield since the 1940's. The Department of Defense operated it in '40 to '48 during the war years. The county acquired the property in '48. It was leased to a subcontractor until 1960, and then the municipal -- or county took it over in 1960, and it operates it still to this day.

Activities that have gone on at the site, aircraft operations, storage, maintenance, munitions, manufacturing actually went on there for awhile. Aircraft salvage was going on. And the materials that we were concerned with that they were using there were, obviously, aviation fuels, different lubricants and solvents that have found their way into the aquifer. In 1986 TCE was detected. It's a volatile organic compound, and it was detected in the ground water.

At that point, the Chino -- the regional board suspected that the Chino Airport was the culprit in this particular program, and they issued cleanup and abatement orders in 1990, order 90-134.

So in 1991, the contractors for the County of San Bernardino came in and disposed of 300 containers of hazardous waste. 81 soil borings were drilled and they found soil VOC's within the soil.

At that point things kind of stopped. The source was taken care of and they knew they had a problem in the soil. But at that point the regional board kind of lost focus, and so things kind of sat for a while.

Then in the early -- right around 2002, 2003, Watermaster got involved after the OBMP was created and started pushing on the regional board and asked them to revive the cleanup and abatement orders and start pushing again.

At that point, the county hired a consultant, Tetratech, to come in. They developed a work plan in 2002 and they've put in five shallow water table wells. And they've developed samples, although they go back to June and July in 2003, two up gradient, three down gradient, and then these wells have been taking samples.

I've included a series of two slides of the Chino Airport because it explains why this is a problem for us being so far south in the basin. Here's the plume as we have characterized it today. And all of these dots represent different wells. Most of them agricultural wells or sampling wells that have been put in to show where the extent of the plume is actually headed.

As you might remember from the last slide that showed the plume, the magnitude has drifted south. There's a large portion of the VOC plume that's actually moved south. So this is the characterization in the year 2000. This is before the desalter wells were turned on.

This is now 2003, the same plume, and you'll see the gradient of water is now changing, moving water to the desalter wells and away from the natural --

If you could to go back and forth, Frank, back between those two.

You can see that the change is having a definite effect on the direction of water. And so it's a concern to us because now what's happening -- and this is the bottom of the Ontario Airport Plume and this is the Chino Airport Plume -- it's now pulling that VOC into the desalter wells, which means that our parties in the Chino Basin are cleaning up the county's mess.

So we're in negotiations now with the county and working with them cooperatively trying to find a solution to that whereby the solution in this case is already in place. How much are they going to have to pay for us cleaning up their problem?

So those are discussions going on now. And I talked about the fact that we're going to be putting in five new wells. Those five new wells that are going in. They're actually going in right through. They're being partially designed not to maximize capture of some of this plume, working with the county, and they're going to help pay us back. At least that's what we're anticipating.

So conclusions.

At one time the Chino Airport had come up with this theory that their plume was really not their plume. Their plume, in fact, was an offshoot of a plume that was found on the Chino Institute For Men's property. That plume over in that area has been isolated, and we were able, through our creation of data, Watermaster's own data, we were able to prove in fact that that is not, there's no hydrologic connection between the Chino Institute Plume and the Chino Airport.

The data, Tetratech's investigation is consistent with Watermaster, and that's important because now we have two different corroborating pieces of evidence that show that what's going on is in fact what's happening, which is really important to us.

Extensive ground water level and water quality monitoring programs allows us to draw our own conclusions, so we're not relying on -- In a typical plume of contamination the consultants for the PRP's, the potential responsible parties, is the agency you're relying on for the evidence to help draw conclusions on those potential responsible parties. In this case, we have two sets of evidence. We are able to draw our own conclusions based on our own evidence, based on our own monitoring.

This puts us in a real advantage, in the driver's seat in being able to help design the programs that were going on here. What's happened is the County of San Bernardino now accepts responsibility for the plume, and we're working together cooperatively, hopefully finding -- and we've found some grant funding that's going to offset the cost of some of this expansion of the desalter programs.

Next is the Ontario International Airport Plume. This, again, is the airport. I'm sure you've flown in and out of it many times. We have the 10 Freeway just above, the 60 Freeway down below here.

The Ontario International Airport Plume, in the early

2003, the regional board had the data. They had the information that says that they suspected the parties that were operating on the Ontario Airport were in fact the responsible parties for the plume, but they lacked any staff. So we worked with them and became part of their staff in working with them to help draft those cleanup and abatement orders. In 2003, Watermaster agreed to provide this assistance and we helped them write the CAO's.

The Ontario Airport, it operated as an airfield since the 1940's, U.S. Army Air Corps. '42 to '47. Post war there were a number of agencies and organizations that were operating out of the airport. This is a list of some of them.

There were 77 airport facilities that were evaluated. There were 22 with confirmed solvent use. Those were the ones we could absolutely identify used the solvents that we were detecting in the soil and the ground water.

Six of those documented were Lockheed, Ontario Aircraft Services, Otto's Instrument Service, American Airlines, Federal Express, Department of Airports. Those are some of the agencies. Some of those have changed ownerships and some of them have sold their properties so things have changed a little bit.

Those recharge into the Cucamonga Creek. You might remember that I showed you the Ely Basins, the flow through basin. The West Fontana Channel was the recipient of most of that flow off of the airport and down into those Ely Basins. Lockheed was actually fined for discharging heavy metals and solvents into the City of Ontario sewers, so we know that they were using those kinds of materials. So there's a lot of evidence that we're able to find that incriminates those people who operated the Ontario Airport.

With the assistance of Watermaster, we are able to write the cleanup and abatement orders, and we wrote them against these six parties, Lockheed, General Electric, Boeing, used to be McDonald Douglas, Aerojet, Northrup and the Department of Defense. We've held several meetings with all of those parties. They've all shown up. And the first four, Lockheed, General Electric, Boeing and Aerojet, have banded together and are working with Watermaster on a testing program.

They recently have drilled four wells that were agreed upon by Watermaster, the responsible parties identified and the regional board, as to where we would place those wells in order to get additional information about what the extent of the plume is at the northern end. We have got data at the southwest end of the plume. We just don't have good data at the north end of the plume. So this was to help. They still have a theory that they didn't cause it. So they're trying to prove they didn't do it, and we're trying to get additional data to try to help us analyze. It may come out that they didn't cause all of it, maybe somebody else attributed to it, and in that case a third-party lawsuit will probably take place, and you understand the process from then on.

So at this point they've completed four nested wells and they're starting to take results. Starting next month Watermaster will take co-samplings with them. So as they take samples, we'll take the same sample with them. They'll test it using their testing agencies. We'll use our agencies to make sure that the information that we're getting is consistent and valid. Not that we don't trust them, but we think it's good to have that information.

One of the issues that is in the news a great deal right now is this area of perchlorate. And the San Gabriel Basin has a large perchlorate plume in what's called the Baldwin Park Operable Unit.

And then there's another area in our local newspapers that gets a lot of press, and this is the Rialto-Colton Plume that's up here right along the river.

And then up here in Fontana, there's a large plume of perchlorate that is operating that's being examined. And there's a lot of activity going on there, a lot of fighting amongst agencies and parties and still no resolution on who is going to pay and how they're going to resolve these two issues.

Now, in the Chino Basin, what we were finding is there was one plume -- this is the Stringfellow Super Fund

Site. The lead agency on that is the Department of Public Health. And so Watermaster is not working with the regional board on this, but we do monitor this plume. And it is well invest -- very good investigation data, very good work is being done to isolate this plume and to work with the resolution of all the constituents, not just perchlorate but there's a large perchlorate in this plume. And we know that perchlorate there to be the kind that was used on rocket fuel, so it's similar constituents used in these two plumes that has been identified as rocket fuel.

But what we were finding throughout the rest of the basin is we would have individual hits of perchlorate in wells that are fairly small and some a little bit larger but none to the magnitude you're seeing in other parts of the basin.

And the other thing that was kind of strange with that is that we don't have any facilities, even the Ontario and Chino Airports that were operating, did not use perchlorate in any of their operations. There was no evidence that there was any perchlorate ever on those two sites.

So the regional board, in its early investigations and findings of perchlorate, had a lot of hits for perchlorate but no smoking gun. So the regional board started coming up with, "Well, if we don't have a smoking gun, is there another theory of where this perchlorate might have come from?"

And they started doing research in periodicals that were in the early 20th century. This is a sample of two them of them. This is a quote from one of those articles. "The splendid agricultural success at Fontana --" and they're talking about orchards, citrus "-- is largely due to the wisdom of the management in using liberally Chilean Nitrate of Soda." Fertilizer. So they started looking at maybe this perchlorate that we have in the Chino Basin is an entirely different species than the perchlorates being found in San Gabriel Basin or in Rialto and Fontana.

So the regional board, Bob Holiff, came up with a theory, that based upon those advertisements they were finding in periodicals, that maybe this is coming from the Chilean fertilizer. So the Atacama Desert in the northern part of Chile is a very arid and dry region. The average rainfall is one-tenth of an inch per year. It's very dry. So what collects in this basin stays in this basin. It doesn't wash out. It doesn't dilute. It stays there. So we have this very arid region, and it was being mined for fertilizer and imported to the United States. And as we know from the advertisements, a large portion of that was coming to the Chino Basin.

So what we did is we found a gentleman who was doing research in this area from the University of Illinois. Neil Sterkio. And Mr. Sterkio, Dr. Sterkio was doing work, and he said that in his work he was finding there are two distinct signatures between the perchlorates that are naturally occurring and man-made, and that if we got him samples from our wells, he could tell us whether or not that perchlorate was in fact man-made or whether it was naturally occurring.

So we went to our parties in the basin and we had voluntarily collected 10 samples from different wells, agricultural wells and municipal wells, in areas where we had perchlorate. Again, synthetic rocket fuel propellants, explosives, flares, fireworks. Natural are your salts, your nitrates and some of these other kinds of things that we're talking about.

We know that based upon the research that we have done since the regional board came up with their theory, that the Inland Empire, at the rate of about a hundred to 500 pounds per acre of this Chilean fertilizer were introduced to the basin per year. 200 pounds of Chilean nitrate per acre per year is 2.4 pounds of perchlorate per acre per year.

In 1939 there were 78,000 thousand acres of Citrus in the Inland Empire, so that's a lot of perchlorate. So what we did is we took from those wells that volunteered -- this happens to be Pomona well -- we took an off-stream portion of water, put it through a filtering device, collected time sequence of water, and then disconnected those in all 10 wells and sent them off to the University of Illinois.

This is what we found. That if you -- as a control sample, Mr. Sterkio, Dr. Sterkio went down to the Atacama Desert and took samples of their fertilizer down there, and this was the signature of the samples from the desert in Chile. And this, in contrast, is the chlorides and oxygens, and if you were to run a line through the middle of this particular chart, anything above this -- that line is man-made, below that is distinctly naturally occurring.

So then they went out to Las Vegas wash and to Edwards Air Force base where they knew they had man-made perchlorate introduced into the system and took samples. And they came up with this controlled system where they knew what the signature of man-made and the signature of the natural occurring looked like.

And these dots, the blue dots on the chart are the wells within the Chino Basin. All of them fall clearly into the naturally occurring fertilizer category except one, 199. This is an agricultural well that's over on the eastern, but it's still on the lower portion of the chart. But it's not clearly in this definition, so we think there's something else going on there. Still don't know what it is yet. But it's not into this man-made, so at this point we're still not saying there's a smoking gun somewhere. We're saying that something else is influencing that sample.

So why is that important? It's important because the parties within the Chino Basin now know that they can look all they want. There's no smoking gun. This is their problem they have to solve, and there's a variety of ways to solve these perchlorate problems at low magnitude that they can deal with locally.

Some of them are shutting down wells. Some of them are blending them out. Some are treating. But these are a lot of different things that are going on within the basin.

So it's important that this information be captured because now we can move on in the area of perchlorate. We're not out looking for some defense contractor that went out of business in 1972 or something.

There also is a potential for grants from the USDA that we are -- because this is an agricultural process that was encouraged by the USDA, we're looking to see if there's in fact funds out there for the parties in the basin that might help them pay for some of this perchlorate cleanup in these small isolated well situations.

And with that, that kind of covers our program element number six.

THE COURT: Thank you, sir.

Any questions?

All right. I spoke too soon earlier, and I ignored my own notes. We still have one more meeting to conduct on the last three issues. And I think we're going -- first of all, what meeting did you want to set up?

MR. FIFE: Yeah. And, your Honor, there's -- it might be convenient in this regard because the next three program elements, two of them do concern storage programs, and this will be a storage application, so they fit together nicely in terms of the hearing.

We would like to do this as early in August as possible. The second week of August would be ideal if we could have a date during that week.

THE COURT: And do you envision that taking less than a day?

MR. FIFE: Certainly, yeah. For the actual approval portion of it, we'll probably cover that all in the papers and probably won't need any testimony, and then we can do the other part fairly quick.

THE COURT: Okay, August 11th?

MR. FIFE: I think that would be good.

THE COURT: August 11th at 9:30. We'll talk about area seven, which is salt management programs, area eight, ground water storage management, and area nine, storage and recovery, conjunctive use programs, present and past activities and future plans as to those areas so as to implement the Optimum Basin Management Program.

MR. FIFE: And we'll be filing a motion for approval sometime within the next couple weeks before that hearing, also.

THE COURT: All right. And you folks are going to take care of notice, right?

MR. FIFE: We will, your Honor.

THE COURT: All right. Thank you.

MR. FIFE: Thank you.

(Proceedings concluded.)

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF SAN BERNARDINO

DEPARTMENT NO. S-32 HON. JOHN P. WADE, JUDGE

CHINO BASIN MUNICIPAL WATER DISTRICT, et al., Plaintiff, vs. CITY OF CHINO, et al., Defendants.	NO. RCVRS 51010 REPORTER'S CERTIFICATE

COUNTY OF SAN BERNARDINO)
) ss
STATE OF CALIFORNIA)

I, BETTY J. KELLEY, C.S.R., Official Reporter of the Superior Court of the State of California, for the County of San Bernardino, do hereby certify that the foregoing pages 1 through 71, inclusive, comprise a full, true and correct transcript of the proceedings held in the above-entitled matter reported by me on June 29, 2009.

DATED this 7th day of July, 2009.

BETTY KELLEY, C.S.R.
Official Reporter, C-3981