

Transcript of September 24, 2008

List of Presenters:

1. Jeff Tannler: Presentation on ADWR Water Budget for Tucson Active Management Area

Presenter #1

**ADWR Water Budget FOR TUCSON
ACTIVE MANAGEMENT AREA
PRESENTATION BY JEFF TANNER,
DIRECTOR
ADWR, TUCSON ACTIVE
MANAGEMENT AREA
(ALSO PRESENT LAURA GRIGNANO)**

MR. TANNER: Mr. Chairman, members, thank you very much for having me. I really appreciate it. As Jim mentioned, I'm Jeff Tannler. I'm the Area Director for the Tucson Office of ADWR. I appreciate the opportunity to present ADWR -

CHAIRMAN JIM BARRY: - stop you for one second. I've got - Gail Cordy, did you want to speak on the Study Area Boundary Issue?

MS. CORDY: Yes.

CHAIRMAN JIM BARRY: I'm sorry, Jeff. I just looked -

MR. TANNER: No problem.

CHAIRMAN JIM BARRY: - at this speaker card. Go ahead.

MS. CORDY: Well, actually, I was happy to hear that you're not limiting the scope of your study. I'm a hydrologist and, as we all know, hydrology doesn't stop at any manmade border or boundary. And so what I am encouraged to see this Committee consider, not only the current areas for Tucson - for Tucson water delivery, but the future areas, as well as the entirety of Pima County and beyond. I think that's really important not to limit your boundaries, because your hydrologic answers are - may come from within and outside. Thank you.

CHAIRMAN JIM BARRY: Okay. Calm down, Vince.

MEMBER VINCE VASQUEZ: So, all the groundwater basin - it should be groundwater discussion - I think that's my larger point is that -

CHAIRMAN JIM BARRY: Okay.



Now, we'll also be talking about the water use pursuant to grandfather groundwater rights, which are shown here in lurid green. Kinda remember that a lot of the water rights are in the Avra Valley area and down south toward the Green Valley area, keep that - keep that in the back of your mind. I knew I was going to do that.

Now, what's shown here in blue is the location of Service Area rights within the Tucson Active Management Area, and Service Area rights are the type of right that is held by a water company, a water provider, that type of thing. And then to just help orient you, the location of Tucson Water's obligated Service Area is shown here in snazzy orange, and I bet you couldn't tell I'm color blind, huh?

Tucson Active Management Area

- ◆ Goal of **Safe Yield** by 2025
- ◆ **Safe Yield:** *"A groundwater management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial recharge in the active management area."* A.R.S. § 45-501(12)

So, the Tucson AMA has a goal of attempting to reach Safe Yield by the year 2025. Safe Yield is a balance between the amount of groundwater withdrawn from the AMA, and the annual amount that is naturally and artificially recharged. Currently, the AMA is not at Safe Yield. We're in an overdraft condition. By constructing and

analyzing a Water Budget, we can see our progress towards Safe Yield over time, determine where we stand currently, and use that assessment to project toward the future to make an estimate of whether we're on track to meet Safe Yield.

One point to keep in mind is that the definition of Safe Yield is for the AMA as a whole.

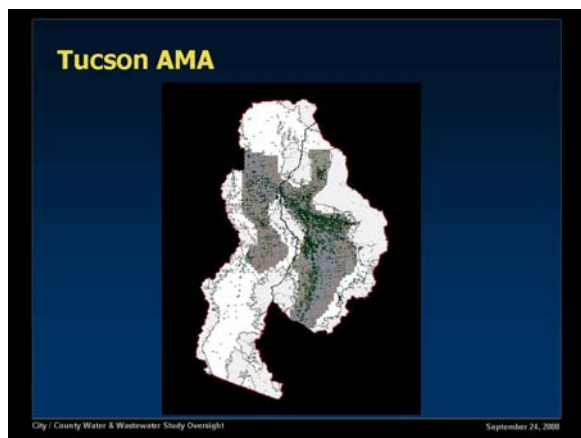
You make have heard of studies where overdraft has been estimated for a smaller area within the AMA. One example is a consulting study that was done a few years ago for the Green Valley area. If you've got the data available, it may be possible to estimate overdraft for other defined areas, such as the areas served by a water

Water Budgets

- ◆ Hydrologic perspective
 - Groundwater Modeling
 - Examines pumping, water levels over time
 - "Wet Water"

provider or a set of water providers, but the Groundwater Code and the Management Plans look at Safe Yield on an AMA basis, so that's what we're going to be focusing on for our discussion today.

Now, there's different ways about - going about construction of a Water Budget depending on what you're trying to determine, and I'll show you two perspectives. One of them is a hydrologic Water Budget, and that looks strictly at the volume of water in storage in the aquifer, with amounts input into and output from the system, and groundwater models are used, which involves dividing the area of study into individual cells and examining water levels and historic pumpage within these cells over time.



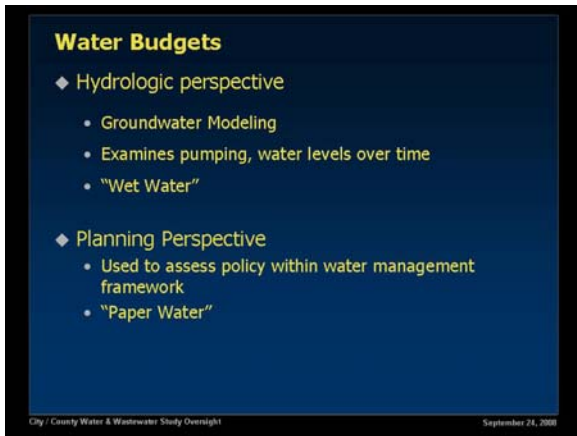
Now, what you see here is the Tucson AMA, and that dividing line in the middle is dividing the AMA into two sub-basins. On the left is the Avra Valley Sub-Basin and, on the right is the Upper Santa Cruz Sub-Basin. The gray areas on the edges are areas of hard rock where there's no aquifer and the white areas in between are the areas where the sand and gravel and clay form to make an aquifer.

Now, you can kind of think of this as two freeways merging, kinda - you know, think of I-10 and I-19, the water's going from south to north through the Avra Valley Sub-Basin on the left, and the Upper Santa Cruz on the right, where they meet is this area right here. Up here is the CDO Wash and it comes down; it all funnels into the Santa Cruz River and it goes out into the Pinal AMA up through here. So, this is all one basin, there's two different sub-basins; just, you know, we've had some talk about that earlier tonight, so I wanted to - wanted to point that out. And just to orient you again, here are the roads, major roads within the Tucson Active Management Area, if that kind of helps you picture things.

Now, what you see here are the cells for the Tucson AMA groundwater model, and then these dots represents wells that are used within the groundwater model from which water levels have been measured in the past, and these are GWSI wells; that stands for Groundwater Site Inventory, and that's a database that's maintained by our Hydrology Division.

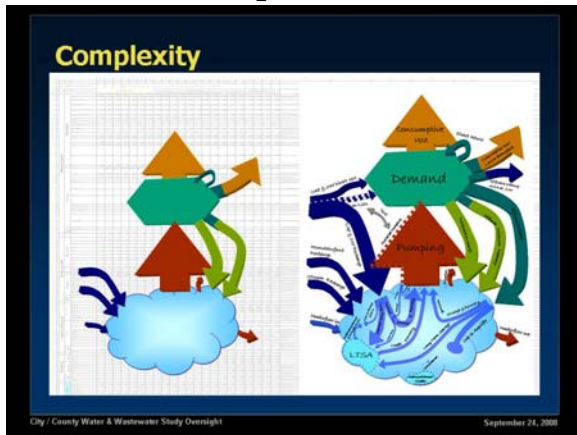
So, again, with a hydrologic budget, the amount of water in the area of study is determined and the amounts of water entering and leaving the aquifer are calculated, and you

think of it like a checking account: How much water's in the bank, how often do you get your paycheck deposited, or the surprise check from the lottery - sometimes that comes - and how quickly are you withdrawing cash? So, that's a good way of looking at it.



Another way of looking at the Water Budget is from the planning perspective. This method is used to assess the effects of policy in managing water and this is about - this is where the term "paper water" comes in and, unfortunately, where it starts to

get messy, and it really does get messy. Back in 1985, the rules were a lot more simple in the Tucson AMA, there was no Recharge Program, no water bank, no Assured Water Supply rules, no CAGR; it was mostly just groundwater use, which is what got us into this predicament.



Through the years, water management has just become more and more clever, and you've probably seen this thingy before, this is an illustration that former Tucson AMA Director, Ken Seasholes, had put together. Sharon Megdal, in one of the recommended readings on the - on the Website for tonight, she referred to this as the "Water Budget monster."

The cloud at the bottom - Ken likes to use clouds - that represents the aquifer. The arrow going out the top is consumptive use. The arrows on the left represent water coming into the aquifer, either naturally or artificially. And the arrows on the right would be return flows, or water that is used, but ends up back in the system in the form of incidental recharge. And then there's all sorts of nefarious activity going on in the cloud, in the - in the aquifer down below, and it's generally water policy at work. So, you may find this figure either intriguing, or maybe off-putting, but, in any case, it's fairly abstract and it takes a while to get your mind around it. Laura Grignano, my colleague who is also here, she and I refer to this quite a bit, because it does kind of help with the abstract of Water Budgets.

So, there's wet water and there's paper water and, as tempting as it is to stick with the strictly hydrologic Water Budget, we actually look at both, the physical side from the hydrologic budget and the policy from the planning budget. And remember both are for a specific area; in this case, Tucson AMA as a whole, and it's for a specific duration of time, and we're going to look at 1985 through 2006.

Analysis

- ◆ Hydrologic perspective
 - Groundwater Modeling
 - Examines pumping, water levels over time
 - "Wet Water"
- ◆ Planning Perspective
 - Used to assess policy within water management framework
 - "Paper Water"

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So, what's displayed here at kind of a 50,000-foot view - I don't expect you to read these numbers - that's a recent version of our Tucson AMA Water Budget, and this is from July, and this is probably going to get a few more tweaks in the future; there's - there's always something. Laura and I found a few details that we want to tweak just in the last couple of days; always subject to revision, but generally we feel - feel pretty good about the numbers. Now, I'll make sure that this gets uploaded onto the - onto the City/County Website as well.

Water Budget Table

Tucson AMA Supply & Demand	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
INDIAN SUPPLY	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
MUNICIPAL SUPPLY	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
INDUSTRIAL SUPPLY	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
AGRICULTURAL SUPPLY	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
TOTAL SUPPLY	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
INDIAN DEMAND	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
MUNICIPAL DEMAND	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
INDUSTRIAL DEMAND	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
AGRICULTURAL DEMAND	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
TOTAL DEMAND	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
EXCESS SUPPLY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DEFICIT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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And we start by looking at demand by sector, break it down to agriculture, municipal,

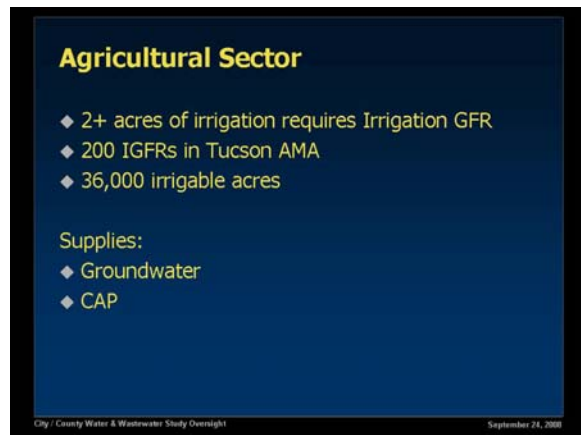
Sectors

- ◆ Agricultural
- ◆ Municipal
- ◆ Industrial
- ◆ Indian

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and industrial sectors, and then Indian water supply, since that does affect the overall water - Water Budget with any Active Management Area. And, as we go through this, I'll show you the assumptions that we use, some of the numbers for recent years. And we have some trends graphs for what's been happening over time for each of the sectors, and we'll look at those. And I'll warn you as I go through this, I'll probably inadvertently slip in a few abbreviations, like ag for agricultural, muni for municipal. I won't even realize I'm doing that, but fair warning.

So, for the agricultural sector, a little bit of background. The 1980 Groundwater Code put a number of limits on



water use within the AMAs, and one of those limits is that in order to irrigate over two acres of crops or pasture, that land must've been irrigated between the years 1975 and 1980. If land has that irrigation history, then it qualifies for an irrigation grandfather groundwater right.

Within the Tucson AMA, there are about 200 irrigation rights at this point, and that is about 36,000 acres that's allowed

to be irrigated, and most of that ag, like we saw in the - in the map earlier, that's standard in either Avra Valley, or in the Green Valley/Sahuarita area where FICA grows about 5,000 acres of Pecans. We do have one irrigation district that has a physical distribution system, and that's a Cortaro/Marana irrigation district; that CMID. Irrigation rights have an annual allotment of water. The combined total allotment for all irrigation rights within the Tucson AMA is a little bit over 150,000 acre-feet.

Now, as a side note, as land moves from agriculture to development, the irrigation right which stays with the property, that is usually permanently extinguished, and usually for Assured Water Supply credits. Until 20- - until the year 2025, a grandfathered right can be extinguished for Assured Water Supply credits; it - as you get closer to 2025, the amount of credits you get steadily decreases until 2025, when you don't get any credits. You get a finite amount of credits; that's not credits that you get each year; it's just a finite lump that you can use toward proving an Assured Water Supply. Now, the farmer that - that has the farm, they usually wouldn't need extinguishment credits, but these credits can be sold to an entity who could use them, and that would either be a developer - a developer or a designated provider.

One other note, just to - just to be clear, when I mention irrigation - again, that farms or pasture - so crops that are grown for sale or for human or animal consumption, that doesn't include turf irrigation under the Groundwater Code definition, and there are separate conservation requirements for turf facilities, so just to be clear on that.

Now, in the Water Budget Table, what's shown in- - includes water used pursuant to irrigation rights, either withdrawn from their own wells, withdrawn by CMID and delivered

to rights, or CAP water received, and this is just an excerpt of the - of the whole budget, but just for simplification reasons.

Agricultural Demand, Supply

Tucson AMA Supply & Demand 98 DRAFT, SUBJECT TO REVIEW
THIRD MANAGEMENT PLAN

All figures expressed in acre-feet

		2005	2006
AGRICULTURAL			
DEMAND			
Groundwater		95,848	87,755
Groundwater (in lieu)		68,458	63,511
SUPPLY			
Groundwater		16,400	18,794
CAP (direct use, no in lieu)		10,990	5,450
Other surface water		0	0
Effluent		0	0
INCIDENTAL RECHARGE		23,962	21,939

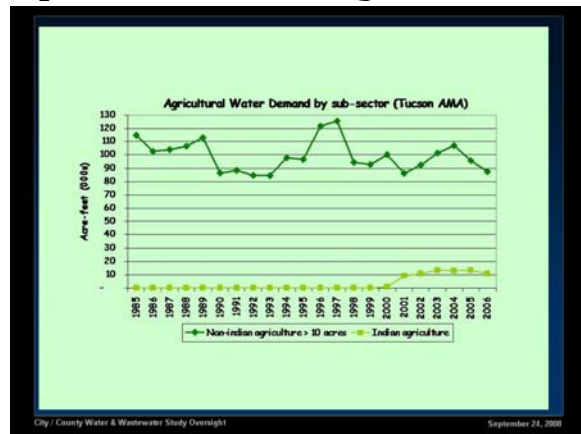
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Now, demand for 2006 was 87,755 acre-feet. On the supply side, you can see that 5,450 acre-feet of CAP were used in 2000. There's also a line showing in lieu groundwater. This is physically CAP water that's delivered to a farm and used in lieu of groundwater. This arrangement's called the "Groundwater Savings Facility," and we'll touch on this a couple

more times during - during the evening.

The owner of a CAP allocation, usually either a municipal provider, could be the Water Bank, they accrue recharge credits for the CAP water that's used at the farm, and this is kinda hard to picture. I'll - I'll touch more on this when we - a little bit later when we talk about recharge activities.

You can see also there's a line for incidental recharge. Let's talk about that for a minute. That's the amount of water that's estimated to have percolated down to the aquifer after being used for agricultural purposes. So, a

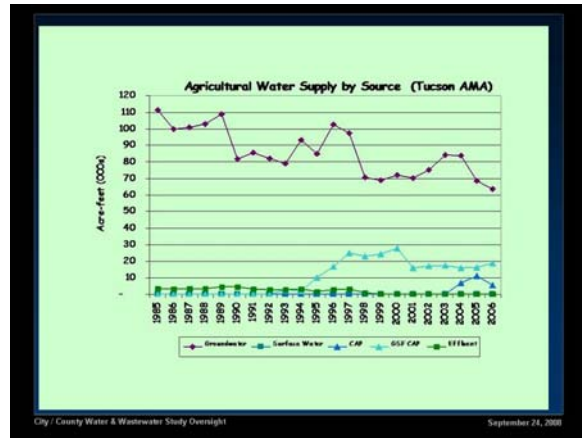


farmer applies water to his field, some of that water gets used by the plant and gets incorporated into the plant material or leaves through evapo-transpiration. Some of the water applied is lost directly from the soil through - to evaporation. Some is held by the soil itself. The rest of it eventually percolates down back to the aquifer. Now, we estimate

the amount of incidental recharge for agricultural as the percent of water reported as being used by the irrigation rights.

Before the year 1990, we estimated incidental recharge at a rate of 25% of the total irrigation water use. For the years 1990 up to present, we have reduced that - we estimated at 20% of incidental recharge, 20% of the irrigation demand. The reason that has changed, we assumed that irrigation efficiencies have increased over time as better technologies, better practices have been used.

So, the water demand by non-Indian agriculture over time has decreased overall, and it fluctuates, depending on how many acres are in production, which that depends a lot on the price of cotton and wheat and corn, if there are any subsidies, set-asides, also if it's a hot, dry year, then water is - use is, of course, higher. Indian agriculture has been increasing since about 2000 as a result of increased irrigation at - on reservation farms.



Now, the supply to meet non-Indian agriculture has changed over time. Historically, it was groundwater. And then starting in the mid-1990s, CAP water was used in lieu of groundwater at Groundwater Savings Facilities, GSFs. I mentioned that a minute ago. More recently, farms have been taking incentive-priced, non-Indian ag, or NIA pool water, and that's a type of CAP water that doesn't earn any recharge credits. There's not much to speak of as far as surface water in our - in our AMA. This shows up a lot more in the Phoenix Active Management Area because they've got the Salt River Project.

As you can see, there's a little bit of effluent that was used until about 1998. CMID had, historically, an effluent contract with Pima County, and they received some effluent up until that time when the contract ended.

Municipal Sector

- ◆ 26 Large Providers; 119 Small Providers
- ◆ 9 Designated Providers

Supplies:

- ◆ Groundwater
- ◆ Surface Water
- ◆ Effluent
- ◆ CAP

What we count in municipal includes large and small providers, water providers that have Service Areas rights. A difference is a large provider is one that serves more than 250 acre-feet of water. A small provider is under 250 acre-feet. Large providers have more stringent conservation and reporting requirements, but both

large and small providers are required to measure and file an annual report with the Department of Water Resources each year. In the Tucson AMA, we have 26 large providers and 118 small providers, and of these providers nine of them are designated under the Assured Water Supply rules.

Municipal Demand, Supply

Tucson AMA Supply & Demand		7/23/08 DRAFT, SUBJECT TO REVISION				
		THIRD MANAGEMENT PLAN				
All figures expressed in acre-feet		2002	2003	2004	2005	2006
MUNICIPAL (includes water utility)						
DEMAND		185,876	184,671	186,877	190,049	193,400
SUPPLY		155,043	122,252	109,620	105,276	105,132
Groundwater		19,047	49,650	64,340	71,132	72,179
CAP (direct line, reservoir, replacement)		0	233	173	188	210
Other surface water		11,784	12,227	12,744	13,453	15,941
Effluent		7,435	7,307	7,475	7,602	7,730
INCIDENTAL RECHARGE						

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Now, demand by municipal providers - again, that includes both large and small - and that includes both the residential and the nonresidential components. So, your house, obviously, would be in the residential side. The Circle K on the corner, or the Walgreen's on the corner, as it is these days, the carwash, many of the golf courses, parks, schools, Tucson Mall, everything

commercial that is provided by a water provider as a customer delivery, that is in the nonresidential, and that includes both effluent and groundwater that's served by a provider such as Tucson Water.

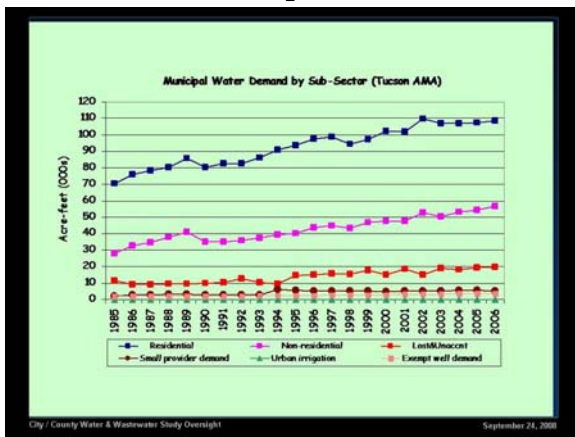
What's also included in these figures is lost-and-unaccounted-for water. What that is, that's the difference between what's withdrawn from wells and what's served to customers, and that can include leaks, un- - unmetered deliveries, if there are any. There may be, possibly, problems with individual water meters. Providers are limited to more than - no more than 10% lost-and-unaccounted-for water. So, that's their - that's their limit. Anything over that and there's a compliance issue.

Also, what's included in the muni sector is an estimate of pumpage from exempt wells. Now, just as a review, an exempt well is one that pumps 35 gallons per minute or less and, because of its relatively small pumping capacity, it's exempt from measuring and reporting requirements, they can also pump without having to have a groundwater right.

In the Tucson AMA, the figures for the 2006 that are shown here, that accounted for about 7,400 exempt wells. Right now, we ran a list recently, it's up to about 7,600. Within Tucson Water's obligated Service Area - just as an aside - there are currently about 1,800 exempt wells. Now, since exempt wells

aren't required to measure or report water use, we've used an educated estimate of about one-half-acre-foot per year per exempt well. So, that's a best guess estimate; that includes some exempt wells that don't pump; some exempt wells that pump more than that.

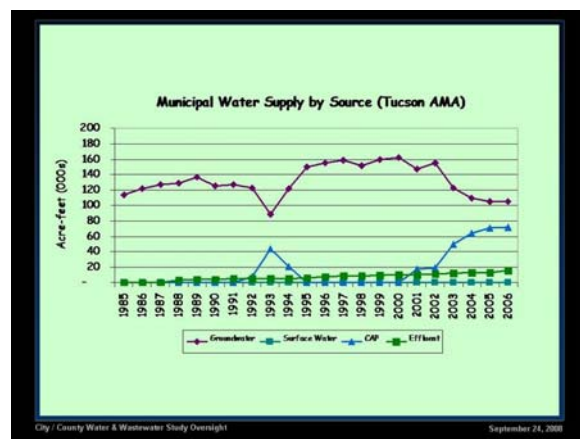
As far as municipal supplies used in 2006, there were



just over 105,000 acre-feet of groundwater used, 72,000 acre-feet of CAP, and almost 16,000 acre-feet of effluent, most of which is delivered to turf facilities that are served by municipal providers. There was a small amount of CAP used directly by Tucson Water in the treatment process at the Hayden Udall Treatment Plant and that's to keep it - keep it up and running. The remainder of CAP water is recharged and recovered.

So, looking at the trend graph for demand for large providers we break water again down to residential and nonresidential components, and you can also see lost-and-unaccounted-for water here. All these components have steadily increased with population growth. Small provider demand and water use by exempt wells are also shown on this graph; they're - they're toward the bottom.

As far as supplies used to meet that demand, the dark-blue line at the top is groundwater. The light-blue line below that is CAP, and you can really see the drop in groundwater and the corresponding jump in CAP in the years '92 through '94; that's when Tucson Water delivered CAP water directly. And you can see CAP water start to take off again, especially in 2003, and



that's as Tucson Water begins recharge and recovery at SAVSARP - at CAVSARP - and now SAVSARP - that's CAP water that is being blended into the delivery to Tucson Water customers. Effluent is a lot smaller supply, but you can see it's - it's steadily growing.

ALTERNATE MEMBER BOB COOK: Jeff, does that include CAP replenishment or is that just . . .? Does the groundwater that's shown there, that does not include then CAGR D replenishment any - anywhere on that graph in the blue or the...? So, the groundwater that's used in there, a - a good portion of that would be replenished?

MS. GRIGNANO: We actually have it on a separate line in the annual budget.

ALTERNATE MEMBER BOB COOK: Okay.

MS. GRIGNANO: It's not a - it's not as much as you think right now -

ALTERNATE MEMBER BOB COOK: Right.

MS. GRIGNANO: - which will increase, but - but it is on a separate line in the budget (inaudible; not speaking into a microphone) Jeff's going to mention (inaudible) up into this -

into this section, but we pull it out because it's relatively small (inaudible).

MR. TANNLER: Yeah, you'll be - you'll be seeing that more in the future slides, so - and if you still have questions, we can keep on going through the . . . okay. So, any other questions so far? We'll - we'll take questions at the end, also.

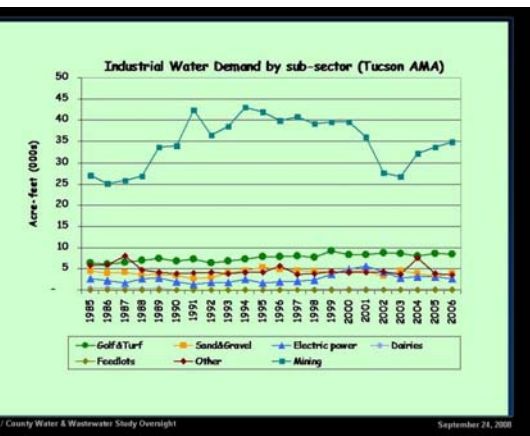
CHAIRMAN JIM BARRY: We're going to take questions at the end, please.

MR. TANNLER: Okay. We'll do that. Okay.



So, for the industrial sector, that includes dairies of which we have one. There's a lot more dairies in the Pinal and Phoenix AMAs. Of course, we have mines, sand and gravel operations, power plants and many turf facilities. Generally, many

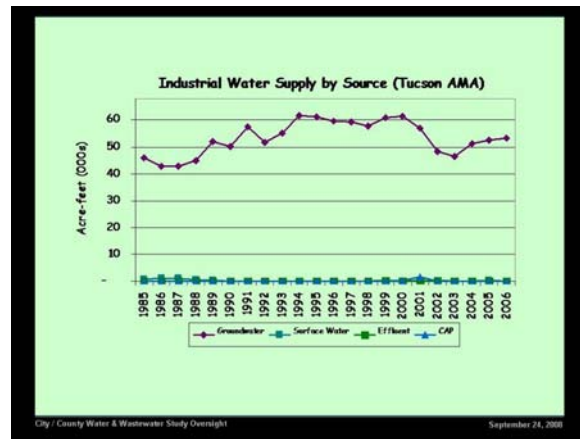
of these industrial facilities have their own wells and groundwater rights or other withdrawals authorities, and there are specific conservation requirements for each of these types of facilities. One thing



to note in case a question comes up: Rosemont is not included in these numbers for water use that you'll see, and that's because Rosemont Mine is not using any water yet, just in case that comes up.

Now, turf facilities include golf courses, parks, schools and cemeteries. Any facility that has more than ten acres of turf, lakes and water, intensive landscaping, that qualifies as a turf-related facility under the Management Plans.

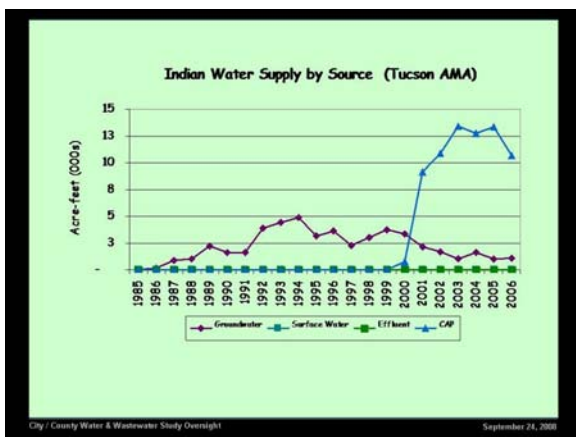
Looking at the numbers, the vast majority of industrial demand has been met with groundwater, which isn't - isn't surprising. The largest user of - within the industrial sector, is the mines. And this graph shows how much the mines use within the industrial sector; it also shows how much mine use fluctuates over time. Mines are the - the top line there. The fluctuation is mainly due to the price of copper. And, as far as mines, this includes the Sierrita, the Twin Buttes, Silver Bell and Mission Mines. So, on the supply side, you can see again that industrial demand has been met almost completely by groundwater.



Indian Water Use

Tucson AMA Supply & Demand		98 DRAFT, SUBJECT TO REVISE
		THIRD MANAGEMENT PLAN
All figures expressed in acre-feet		2005 2006
INDIAN		
DEMAND		14,370 11,678
SUPPLY	Groundwater	1,005 1,043
	CAP (direct use no. in flow)	13,365 10,635
	Other surface water	0 0
	Effluent	0 0
INCIDENTAL RECHARGE		3,341 2,659

Now, let's talk about Indian water use for a minute. Parts of the San Xavier and Schuk Toak Districts of the Tohono O'odham Reservation are located within the Tucson Active Management Area. Water use is not required to be reported to DWR and there are no State water conservation requirements. Water demands and recharge activities, though, can have an effect on the water balance within the Tucson AMAs, so that's why these supplies and demands have been included in the budget.



Most the demand is for agricultural irrigation, and most of the irrigation is served by CAP deliveries. Some groundwater is used for domestic purposes with some leased to ASARCO for mining. And incidental recharge comes largely from the agricultural sector. We base it, in this case, on 70% irrigation efficiency.

Now, as far as Indian supply, the Tohono O'odham have an allocation of 66,000 acre-feet of CAP between the San Xavier and Schuk Toak Districts. This is being used to meet ag demand, as

well as the Arroyos Recharge Program Project, which is located on the reservation.

Now, let's spend some time talking about recharge. This is where things get a little bit more complicated from the

Recharge

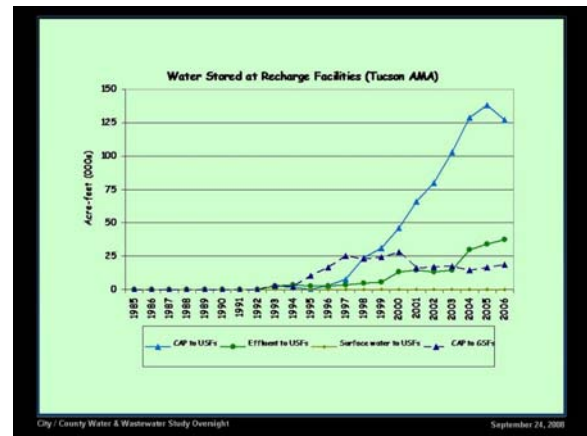
- ◆ Types of Permits
 - Water Storage Permit
 - Underground Storage Facility (USF)
 - Groundwater Savings Facility (GSF)
 - Recovery Well Permit
- ◆ Activities
 - Replenishment
 - Annual Storage/Recovery
 - Long Term Storage Credit Accrual

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accounting side of the budget. There are different types of permits to the Recharge Program, and I'm not going to get too mired in the details, but I do want to spend a little bit of time on this 'cause this might help you understand some of the different recharge activities that occur within the Tucson AMA.

A water storage permit allows an entity to store a certain amount of water, which is usually CAP or effluent, at a particular facility. A facility permit is issued to an entity who owns and operates a storage facility. So, an entity would have a facility permit for something on the ground, and then there could be multiple storage permits for multiple entities to store at that facility, so keep that in mind.

There are different types of facilities. An underground storage facility can either be constructed, which in a Tucson AMA that's generally spreading basins. Some examples of that would be CAVSARP, SAVSARP, Pima Mine Road Projects. Managed facilities are situations where effluent is discharged, let's say, to the Santa Cruz River, with Lower Santa Cruz Managed Project. So, they're using the - the river as the storage facility. The accounting's a little bit different between the two.

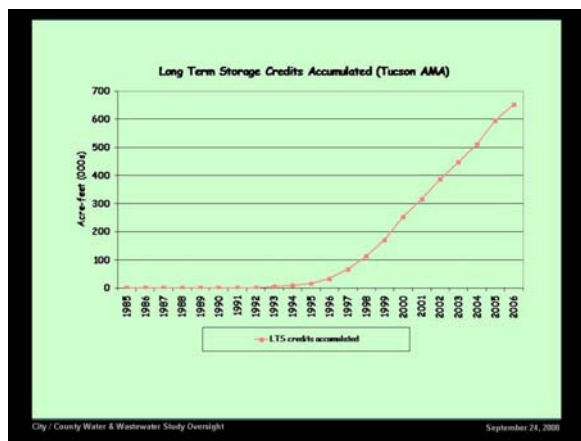


The other type of facility is our old friend, the Groundwater Savings Facility - that keeps coming up - this is an arrangement between a farmer and municipal provider, or the water bank. The farmer takes providers, CAP, physically, and uses that in lieu of groundwater. Credits are accrued, based on the amount of groundwater that is not pumped, those credits go back to who had the CAP allocation, which would be the provider in this case, and the advantage - advantages of this arrangement, the CAP water gets used more fully and more quickly than it otherwise would, and a provider can accrue recharge

credits even if they don't have direct physical access to Central Arizona Project water.

Now, one of the disadvantages is - that comes up, water can be withdrawn in a different location later on than where it was recharged. So, it's not a perfect arrangement. But, keep in mind this was to allow flexibility and to allow more quick and full usage of CAP, which is very important.

Now, some of the different recharge activities: Annual storage and recovery is easiest to explain and understand, CAVSARP and SAVSARP, the water is recharged and recovered within the same year. There are no long-term storage credits that are accrued. Long-term storage credits happen in a lot of cases where there are only certain cases where you can -



where you can accrue the long-term storage credits, but that's what happens a lot with Water Bank affirming for - for future supplies.

And I mention replenishment here, that can occur either beforehand - Rosemont Mine is recharging water in advance, replenishing in advance of their anticipated withdrawals - usually, replenishment is - happens

after-the-fact, and that is conducted by the Central Arizona Groundwater Replenishment District, CAGRD, on behalf of Member Service Areas, which are designated water providers, or member lands, which have certificates of Assured Water Supply; both of these have a replenishment obligation.

Landowners and water providers within the Phoenix, Pinal and Tucson AMAs rely on the CAGRD to replace groundwater for new developments. And I'll note that, again, Assured Water Supply and recharge rules allow recharge in one location within an AMA, and potential recovery of that CAP within a different area; again, this allows flexibility. One - one issue that can occur is, although AMA-wide, there is replenishment, there may be certain particular areas where water levels are declining if they're not in the same location where recharge has - recharge has occurred, so . . .

Now, this shows the amount of water stored at recharge facilities, and by different types of recharge facilities. Most of the CAP is stored at Underground Storage Facilities, or USFs, such as CAVSARP and Pima Mine Road. CAP is also stored at GSFs, and effluent has been stored at Underground Storage Facilities

as well. Now, this is a graph showing the amount of long-term storage credits that have been accrued through the year 2006.

Other Parts of Budget

- ◆ Riparian Demands
- ◆ Cuts to Aquifer
- ◆ Long Term Storage Credits
- ◆ Net Natural Recharge

Tucson AMA Supply & Demand		7/22/08 DRAFT, SUBJECT TO REVISION				
		THIRD MANAGEMENT PLAN				
		2002	2003	2004	2005	2006
All figures expressed in acre-feet						
OTHER						
DEMAND	Riparian	3,700	3,700	3,700	3,700	3,700
	Cuts to the aquifer	6,471	6,552	13,617	15,368	16,364
SUPPLY	LTS credits for replenishment	6,009	2,046	5,581	7,276	8,477
	Net natural recharge	60,800	60,800	60,800	60,800	60,800

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Now, finishing up the last parts of the Water Budget Table, riparian demand accounts for the amount of groundwater that's used by riparian vegetation. The cuts to the aquifer line with certain types of recharge projects, there's an amount of water that's required to be left to benefit the aquifer that's not recovered, and that amount does not accrue credits, and there's different amounts of

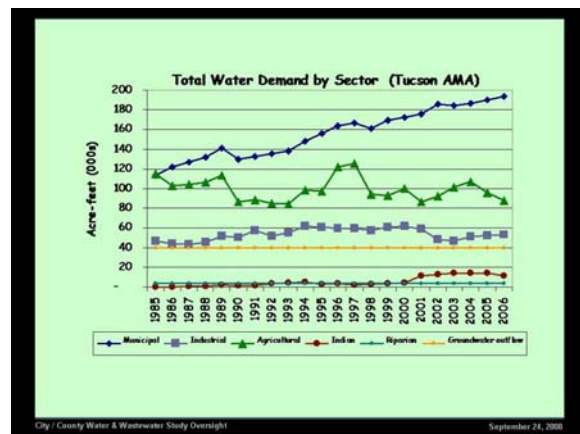
cuts to the aquifer, depending on the type of recharge that's going on.

Long-term storage credits for replenishment; that's actually a subset - that's what Laura was mentioning a minute ago - that's a subset of municipal replenishment, and that's probably going to go up higher in - in the budget under municipal - the municipal category, so . . .

And then natural recharge is the amount of water that's naturally recharged to the aquifer, and it's generally arrived by adding mountain front recharge, which is the amount of recharge that happens where the - the mountains meet the - the alluvial basin, plus streambed recharge, plus underflow in, which is water - groundwater coming in from the Santa Cruz AMA, in our case, and underflow out, which is water - groundwater leaving the AMA and going out to the Pinal Active Management Area. Now, note that natural recharge - that's not the same as incidental recharge. Incidental recharge is what comes from applying water, let's say, for a golf course, or for agriculture, and what naturally seeps back to the - to the aquifer.

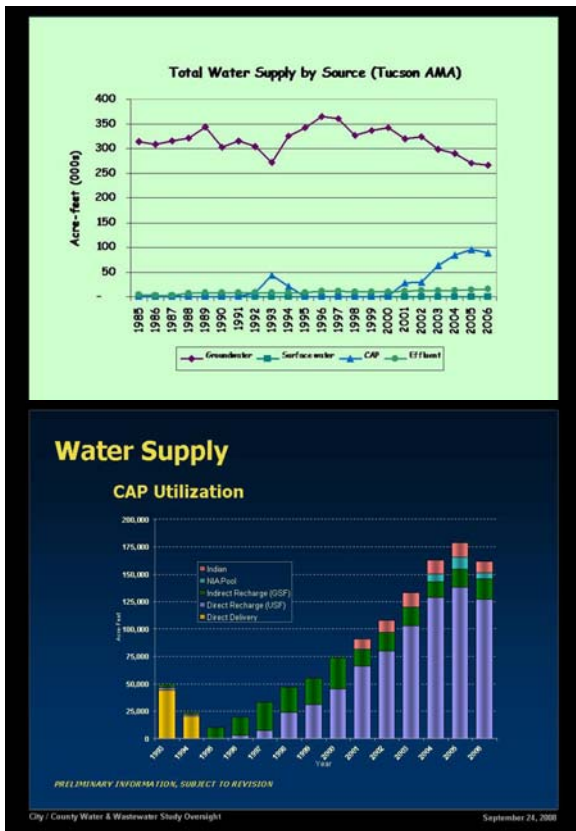
So, let's start adding all of this up. Here's an overall look at water demands by sector within the Tucson AMA. The top line is municipal, and you can see that's been steadily going up through time. Ag fluctuates; it's kind of coming down; definitely not as much as we might have predicted 20 years ago.

Here's a quick use - quick look at overall use of supplies over time for the



Tucson AMA. Again, you can see that groundwater is the largest source, and you can see a definite blip where Tucson Water did direct delivery of CAP. You can see the blip in - in CAP water, and then it comes back down. The - with the use of CAP - recovered CAP in the last few years, you can see that groundwater use is starting to come down again. This is a - just a quick look at CAP utilization over time within the Tucson AMA. This is from a presentation actually by CAGRD, but I thought that might be helpful for you to see what's been going on over time. The blue down at the bottom is direct recharge. The yellow at the left, that's direct delivery during '93/'94 time frame by Tucson Water.

And now we get to the very bottom of the - the budget table. There's the last line that talks about additional recharge for future use, this is where water that's been stored for recovery at sometime in the future comes in; that's water stored by the Water Bank for MI firming; that also includes interstate storage on behalf of Nevada.



And then the amount of over- - overdraft that's calculated. I'll take you to a graph in a second that's going to show how we've done with overdraft over time. I did want to mention - I'll continue on. Okay. So, let me do a little bit of explaining on this. The top line is groundwater. The - the second line down, which I think is - is teal, that shows the net natural recharge and cuts to the aquifer; that appears to be fairly steady; the reason is that just because of the whole - the whole scale of this. We assumed that natural recharge is fairly steady throughout time, just that averages out. GRD replenishment

has increased since about 2001 but, again, that's - that's such a small scale compared with the overall Water Budget that it - it doesn't - doesn't show up dramatically in this graph.

And overdraft is the bottom line in red. Now, I want to point out that overdraft, that is plotted - plotted on a reverse scale, so although it looks like overdraft is increasing in the last several years, that's actually getting closer to

zero, which is where that - that blue line is in the middle. You can see it - it mirrors the - the groundwater use just about inversely, and you can see that in '92, '93, '94, we got closer to Safe Yield, that's when Tucson Water was directly delivering CAP, they were required to stop doing that, so we went back to groundwater largely and now, through recovered CAP, we're getting closer again to - to Safe Yield.

So, our AMA goal, again, is an attempt to reach Safe Yield by 2025. Are we going to make it? Well, that's a very good question. All of this work that Laura and I and others in our Phoenix office, that's been done to - as part of the AMA Water Resource's Assessment, and it's going to help us in gauging where we are currently with respect to Safe Yield. What we're going to be working on very soon is projections of future demand and supplies.

In the Third Management Plan, we developed projections. For example, we predicted previously that ag use

was going to be reducing, and that is happening, but not nearly as fast as we had originally predicted. So, projections are sometimes off. They can be affected by a number of factors, and there's always some uncertainty, but we do need to make an educated guess so that we can start planning now.

Now, this is glimpse at an interactive tool that we are going to be

using in our analysis. You can check out what this is. You can ramp up and down different demands, supplies, sources of water, and this is something that Ken Seasholes, former Tucson AMA Director, developed. This is just an example. These are not real numbers, so don't go copying'em down.

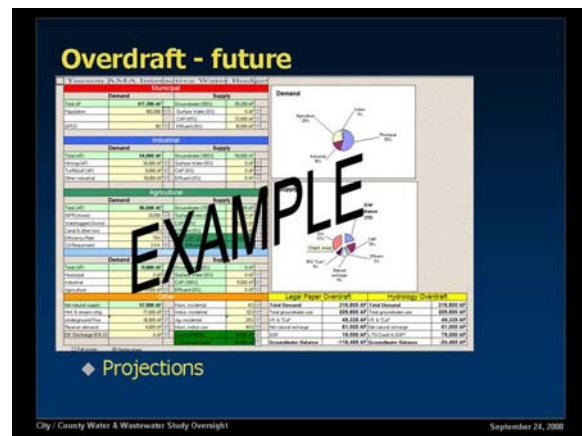
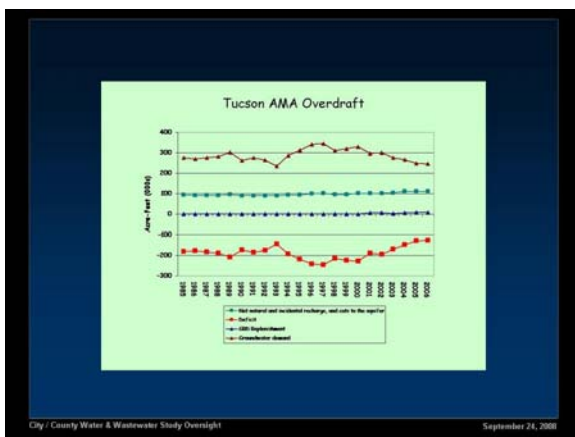
As you - as you adjust

Overdraft – Tucson AMA

Tucson AMA Supply & Demand		2028 DRAFT, SUBJECT TO REVISION				
		THIRD MANAGEMENT PLAN				
All figures expressed in acre-feet		2002	2003	2004	2005	2006
OVERDRAFT						
TOTAL		194,660	166,344	147,984	129,746	129,585
ADDITIONAL RECHARGE FOR FUTURE USE*						
OTHER	(Net artificial recharge)	385,016	447,058	511,020	596,041	652,470

* Includes storage for Colorado River drought, and interstate storage on behalf of Nevada

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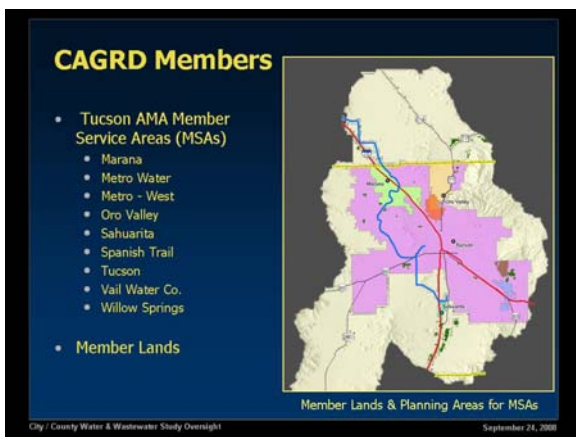
supply, demand for different sectors, different - different components of this, the pie charts on the right will - will adjust, and it's actually - it's actually pretty cool. I chickened out on - on having it in the Power Point presentation, 'cause I figured it would probably crash, but - but you kinda get the - get the idea.

This is going to be very helpful in a sensitivity analysis, figuring out what factors have the greatest effect in getting us to Safe Yield, and what factors ultimately do not have as much of an effect. And we can run different scenarios, different what-ifs, and some what-ifs. Let's say that shortages are declared on the Colorado River. What if a certain new mine begins withdrawing water in the future? What if overall municipal GPCD reduces between now and 2025? What if it doesn't? What if irrigation rights are extinguished and taken out of production more than - than they are now?

Our goal with the Water Resource's assessment is to show the water supply and demand trends, and to show projections for the future, and these will, hopefully, give us an indication of how close or how far from Safe Yield we're going to be based on these results, and we're hoping by the end of this year, that's going to lay the groundwork for the Fourth Management Plan. Using our best professional judgment, even with the best case scenarios, we can get - can we get to Safe Yield with the statutes and the rules the way they are? Probably not, but we're - we're going to show how close that we're projected to get.

If we're not going to get to Safe Yield by 2025 based on these projections, then what - we'll identify what are some of the biggest impediments to Safe Yield and what are some of the statutory changes that need to happen? Some examples of issues that were discussed in the Governor's Water Commission several years ago include groundwater users and uses that don't require replenishment. Grandfathered rights, for example, don't require - don't have a replenishment obligation. Critical area,

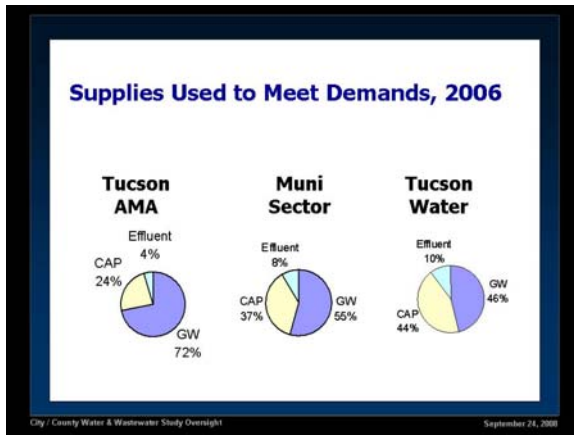
or sub-area management where, although AMA-wide, Safe Yield could be reached. What if there are certain particular areas, such as maybe Green Valley where there's more of an overdraft? How is that dealt with? Availability, reliability and utilization of renewable supplies. The full December, 2001, report with Water Commission recommendations - incidentally, that's available on



our Website, www.azwater.gov, and that's under the Publications area of our Website.

So, finally, I wanted to mention a little bit of where Tucson Water fits in with - with all of these numbers. Tucson Water is a designated provider. They are a member Service Area with the CAGR and, since 2001, Tucson Water has had CAGR replenish 5,000 acre-feet per year on its behalf.

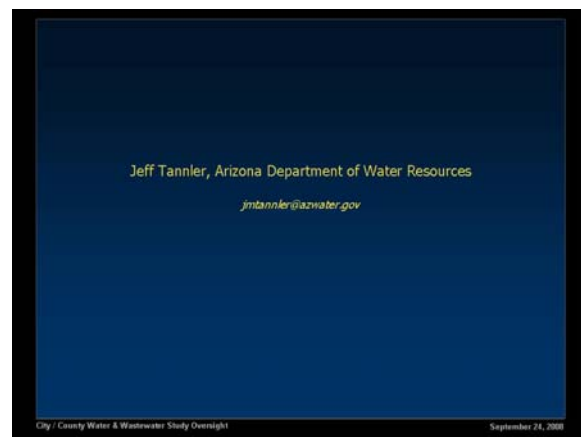
And I wanted to give you a very quick and simple look at how the supplies used to meet demands fall out with Tucson AMA within the municipal sector and with Tucson Water. You can



see that, as far as Tucson AMA as a whole, groundwater for 2006 was used for 72% of the demands. Within the muni sector, 55% of demands were met with groundwater and Tucson Water deliveries were down - that was 46%. So, you can see that, in - in a sense, Tucson Water's ahead of the curve. I'll also mention that Tucson Water is definitely the - it's clear - the largest provider

within the AMA. They account for 72% of the water use for 2006 that is used within the municipal sector, so . . .

So, I hope this information's been helpful, and I'm sure you'll have a lot of questions, and I'm going to invite my colleague, Laura Grignano, up. Together we'll try and answer any questions that you've got and do our best to answer them. Thanks.



CHAIRMAN JIM BARRY: Let me do Bob, 'cause I stopped him from asking before.

ALTERNATE MEMBER BOB COOK: Yeah.

CHAIRMAN JIM BARRY: And this is a question, Bob.

ALTERNATE MEMBER BOB COOK: A question on - of the definition of lost-and-unaccounted-for water. Would you define that? There's - what water is that? Is that leakage or poor meters or . . .?

MR. TANNER: That is - okay - let's say you've got a provider that - just for simplicity - let's say a provider that withdraws groundwater from wells and that's their whole supply,

just for - for discussion purposes. They're required to measure with meters on the wells, how much water they withdraw. They're also require- - large providers are required to report how much water is delivered to customers, and the two numbers usually don't exactly match. What the difference is, that's lost-and-unaccounted for water -

ALTERNATE MEMBER BOB COOK: Between the two meters?

MR. TANNLER: Between where the withdrawals happen at the well and the total deliveries.

ALTERNATE MEMBER BOB COOK: Okay. Well, I noted that in your - your graph that in 2006, that lost-and-unaccounted-for water was 20 - almost 20% of total.

MR. TANNLER: Now, that - yeah, I can see if I can go to that - the - the graph showed lost-and-unaccounted-for water increasing steadily over time, and that's as a total volume of water, and it's proportional to the amount of water that's withdrawn by providers; that's not showing the percent of lost-and-unaccounted-for water; that's showing overall. As providers are serving more water, there's a higher lost-and-unaccounted-for water, but amount of volume of water, but that doesn't necessarily mean that -

ALTERNATE MEMBER BOB COOK: Oh, I see. I was comparing it to residential. So, it's basically - it's showing 20,000 acre-feet of lost and 100,000 -

MS. GRIGNANO: Add - add nonres and res together and then . . .

ALTERNATE MEMBER BOB COOK: So, it is a relatively large number?

MR. TANNLER: It's - it's significant, yeah, and that's - that's why there's a requirement to limit it to no more than 10% of your - of your total - total water use.

CHAIRMAN JIM BARRY: Tina?

TINA LEE: Yes, I know -

CHAIRMAN JIM BARRY: Microphone, Tina, please.

TINA LEE: Thank you. You had mentioned that exempt wells are exempt from the requirement of reporting. Is there any way to estimate what their relative proportional share is of the overdraft of the groundwater?

MR. TANNLER: That is - it's within the - that's within the Water Budget. Again, we've estimated one-half acre-foot per well, and then we'll apply that out by the number of wells.

MS. GRIGNANO: I think - I think the wells were about - what'd you say? 7,000?

MR. TANNLER: About 7- - let's say 7,500.

MS. GRIGNANO: Approximately 7,500 wells, and then multiply that by .5 acre-feet, so it's a relatively small amount of water in, you know, in the grand scheme of things.

TINA LEE: Thank you.

CHAIRMAN JIM BARRY: Bonnie, then Marcelino.

MEMBER BONNIE POULOS: Within the Tucson AMA, has any entity ever been refused an Assured Water Supply certificate?

MR. TANNLER: I'm trying to think. I am not aware of any.

MEMBER BONNIE POULOS: Why is that?

MR. TANNLER: There - well, let me say two things. Ultimately, I don't know of any that have been denied. There have been applications where there are a lot of questions on them, so we've got some back-and-forth with the applicant. But, ultimately, if they can show that the water is legally continuously and physically available, then they can qualify for a certificate of Assured Water Supply.

Now, there may be cases where - where a certificate is issued for less than the entity applies for. We use a model on interior and exterior use to calculate how much water would be - would be issued with the certificate.

CHAIRMAN JIM BARRY: Marcelino, then Sean.

MEMBER MARCELINO FLORES: Okay. One of the first questions I had is, perhaps, just a clarification. There was a slide showing the GWSI wells.

MR. TANNLER: Yes.

MEMBER MARCELINO FLORES: I wanted to just ask: Are these strictly monitoring wells, or do they actually - are they actually pumping out or consuming water?

MR. TANNLER: It could be both. Our groundwater site inventory database said there are some monitor wells, but a lot of the wells in that database are production wells. We've got a hydrology field crew that - there's got to be a less tedious way of doing this - we've got a hydrology field crew that one of their prime functions is to - there you go - is to measure water levels around the State. There are some wells that are referred to as "index wells," and those are measured at least every year. There are actually some wells that have transducers in them, and that's electronic equipment that take continuous water level measurements. There are other wells within the Active Management Area where water levels are - are measured maybe once every five years; they do a basin-wide sweep. So, it could be - it could be a monitor well; it could be a full-fledge production well.

MEMBER MARCELINO FLORES: Is there a way to kind of break out the percentage of which are monitoring or, like you mentioned, the index transducer?

MR. TANNER: There - I think there are ways of doing that, and I can - I can get you that information.

MEMBER MARCELINO FLORES: Okay. And then another question I had, it was regarding the - there was a slide showing the mining, slide number - there was no slide number I think - but -

MR. TANNER: Thank you, Michael.

MEMBER MARCELINO FLORES: - it shows the - the industrial water demand by sector and -

UNIDENTIFIED MALE SPEAKER: What slide number was that?

MEMBER MARCELINO FLORES: It looks like maybe 24.

MR. TANNER: Yeah, probably 20 -

MEMBER MARCELINO FLORES: Yeah, there you go.

MR. TANNER: - 20. Okay.

MEMBER MARCELINO FLORES: The - the top -

MR. TANNER: The supply or demand?

MEMBER MARCELINO FLORES: I think the demand.

MR. TANNER: Okay. So, it'd be the one right before that, so which -

MEMBER MARCELINO FLORES: The one right before that -

MR. TANNER: - I can -

MEMBER MARCELINO FLORES: And the - the top one is the mining; correct?

MR. TANNER: Yes, correct.

MEMBER MARCELINO FLORES: Is - is that a consumptive use, or does that come back in the monster to the aquifer as incidental recharge? What is - what - is that a consumptive figure and then -

MS. GRIGNANO: That's what they withdraw from their wells. So, some of that - in the mining process, they do recycle some of their wells, but each year this is based on the meter readings from the mine's groundwater wells.

MEMBER JOHN CARLSON: Well, he's asking: Does that even go back into the supply system?

MS. GRIGNANO: Yes, some of it - some of it does, as Jeff talked about incidental recharge for each of the sectors.

MEMBER JOHN CARLSON: But, you don't have a good figure on that?

MS. GRIGNANO: We do. We use - in the model, I don't know if Jeff mentioned it, but in the model we use 12% incidental recharge for the industrial sector.

CHAIRMAN JIM BARRY: Okay. Let me jump in here. I promised Sean was next. Go ahead, Sean.

MEMBER SEAN SULLIVAN: Okay.

MEMBER MARCELINO FLORES: Well, I still had just one last question, but . . .

CHAIRMAN JIM BARRY: Oh, I'm sorry. Go ahead, Marcelino.

MEMBER MARCELINO FLORES: The last question I had was just I - I - I - the - the natural recharge, I'm presuming, is just a small amount in - in the grand scheme of things, that's kinda why I wasn't - well, is it, in fact, a small amount in the Water Budget? And then, you know, as far as I understand it's a high level and it's really flat at - at the very top level but, I mean, is - how real is that figure, that assumption? 'Cause I can just imagine, you know, somehow rainfall plays into that and I don't know . . .

MR. TANNLER: Sure. And, you know, flood events, like the flood of 1983, the flood of 1993, that will, obviously - well, that can increase the amount that year. We use an average figure of 60,800 acre-feet per year for the - for the entire AMA.

MEMBER MARCELINO FLORES: What assumptions are - is that figure based on? Or what year was the information drawn from for those assumptions?

MS. GRIGNANO: I - I actually don't know the actual years that they used for the averages. Our hydrology section has talked about possibly using - because, you know, just like it spiked you can have floods and drier years. In some AMAs, that makes more of a difference than others, such as in the Santa Cruz AMA where surface water and groundwater are - are linked very closely because of the shallow, I guess, groundwater levels and that could have more of an impact, say, in the Santa Cruz AMA in their budgets, and so I think they're looking into possibly being able to - to make that look a little more natural in the budgets, but right now it's just averaged out over time. But, we can - we can try to get that period of time that was used for the - the net natural recharge for you.

MR. TANNLER: And that - that is derived from groundwater models, from modeling figures.

MEMBER MARCELINO FLORES: Thank you.

CHAIRMAN JIM BARRY: Sean and then -

MEMBER SEAN SULLIVAN: I want to -

CHAIRMAN JIM BARRY: - John and then Bob.

MEMBER SEAN SULLIVAN: I want to try to wrap my head around the way that the Replenishment District works. So, say a large development in the Cienega area, Green Valley area, the way that they can reach - get their 100-year certificates is through membership within the district, and then they would then pump groundwater outside of that basin; correct?

MR. TANNLER: That is correct. If they - let's say they're applying for a certificate of Assured Water Supply, they would - one option is they would join the CAGRD, they would

become member lands, and the G- - the GRD would replenish - within three years of when the water is withdrawn, they'd replenish on their behalf.

Now, there's some - you know, I mentioned extinguishment credits, let's say a developer or maybe a designated provider, let's say they have a large volume of extinguishment credits, they can use those also toward proving an Assured Water Supply, that would mean that they would have to have less water replenished by the - the CAGRD.

And if a - let's say if it's a provider, if they've got access to a renewable supply, such as CAP, again, less - less that they would need to have replenished by the - by the GRD. All the designated providers within the AMA are members of the GRD, including Tucson Water. Tucson Water's got all sorts of alternative supplies. I believe that the 5,000 acre-feet per year, that's - that's kind of a - to keep the - keep the membership active, in a sense.

MEMBER SEAN SULLIVAN: Okay. And so the - the Replenishment District itself has a 100-year water supply to replenish the water needed for all of its members?

MR. TANNER: They . . .

MS. GRIGNANO: They - they have to make a plan, I believe it's every ten years, of explaining - and I think Cliff Neal may have talked about that when he was here a couple months ago - about where those supplies will be coming from -

MEMBER SEAN SULLIVAN: Okay. And I think -

MS. GRIGNANO: - to meet the - the demands.

MR. TANNER: Michael, go to that very last slide, the one that's after the . . .

UNIDENTIFIED MALE SPEAKER: (Inaudible; not speaking into a microphone.) Okay.

MR. TANNER: Yeah. This is one I -

UNIDENTIFIED MALE SPEAKER: Is that it?

MR. TANNER: Yeah. I don't know if that's helpful. That's within . . . it's within the Phoenix, Pinal and Tucson Active Management Areas; that's the historic obligations that CAGRD has been required to meet. There's also a graph which I don't have that shows projected obligations in the future. So, they're saying that they're - CAGRD is going to take care of the replenishment for 100 years. So, slightly different than saying that they have 100 years' water supply, but I - I can - you're kind of on the right track.

MEMBER SEAN SULLIVAN: So, one - one follow-up on that. If there were to be a shortage, where is their priority? Would it - would the water and CAP go to direct users and no - and no more - and replenishment would stop, or would they

continue to have a priority in order to replenish the aquifer and the pumping?

MR. TANNLER: The - I know there is a - is - there is an order in which - who - who gets shorted first. Ken Seasholes with CAP actually might be able to address that question.

KEN SEASHOLES: Let me take the first part of your question - Ken Seasholes for CAP - and that is the 100-year supply through member lands is groundwater, so you have to demonstrate to ADWR (inaudible; not speaking into a microphone) reliable 100-year supply (inaudible) enrollment in the CAGR doesn't prove the 100-year supply, but it does (inaudible) make your contribution to - to Safe Yield. So (inaudible) all you have to do (inaudible) 100-year supply (inaudible) that does nothing but (inaudible) the legal requirement offsets (inaudible). The physical supply has to be on-site and that's done through the Department of Water Resources.

The CAGR, which is the different operating part of the Central Arizona Project has to have a current Plan of Operation that identifies current supplies for a 20-year period and potentially available supplies (inaudible) and if the mechanism that it uses (inaudible) the other supplies (inaudible).

CHAIRMAN JIM BARRY: John, you had your hand up -

MEMBER JOHN CARLSON: Yeah.

CHAIRMAN JIM BARRY: - and then we'll go to Bob and then move on.

MEMBER JOHN CARLSON: On your figures, the recharge was very steady over your 12 or 14 years that you showed us. I can't believe that. I mean, how do you get at this and how do you prove it, and - and maybe that's a good average, but it's - it's got to vary. Maybe it's good for three years, pretty steady, but it's got to change up or down, and I - it was a pretty steady line across there.

MR. TANNLER: Let's -

MS. GRIGNANO: That was the net - the net and the incidental recharge.

MR. TANNLER: Right. That is going to be slide 35. Yeah, the - okay, again, the top line is groundwater. You can see that fluctuates over time. That second line is the net natural and incidental recharge, and that's what we're talking with Marcelino about where that's - that's averaged over time and that cuts to the aquifer, which has to do with the amount of water that's left in the aquifer with certain types of recharge projects. Are you referring to that middle line, the - the blue one that looks pretty steady over time?

MEMBER JOHN CARLSON: Well, I'm confused by your definitions a little bit. But, my point is: Both of those

lines are pretty steady over a very extended period of time, and I just - just my natural instincts would tell me that it's got to show a trend; it might be steady for five years, but it's got to show a trend up or down and back again, or whatever, and I don't see it. So, I -

MR. TANNLER: It's -

MEMBER JOHN CARLSON: - maybe you don't - and I realize you're limited about how many places you can observe and keep track of it and so forth, but I just - you know, I just - that's my question.

MR. TANNLER: I think it's all - it's all within the scale. The - the blue line in the middle, GRD replenishment, that - that is just at zero up until about 2000, 1999, or so, and then you can see it's starting to deviate from the zero line, and that's all a matter of scale; that's - the GRD has begun replenishing, but that - that is a small amount in respect to the - the whole budget numbers.

MEMBER JOHN CARLSON: Okay. Now, with your figures on the Tucson Active Management Area - and you show the Pinal, a little bit about Phoenix, some of our water goes to Pinal, we get some water from down below, I didn't see anything that kinda reflected this, or is it unimportant, or is it equal or what?

MR. TANNLER: Oh, the amount of water that -

MEMBER JOHN CARLSON: Goes into TAMA from upstream and the amount that leaves us and goes downstream?

MR. TANNLER: Right. That's incorporated into the net natural recharge -

MEMBER JOHN CARLSON: Okay.

MR. TANNLER: - and that's within the 60,800 number.

MEMBER JOHN CARLSON: Yeah. And I didn't see - I don't know if you - you were talking about well levels a little bit but, you know, to me a trend is: Where are we? Have we kept track over the - a long number of years of depth to water in the various sub-basins of groundwater? And you didn't present anything, but is it not important in your presentation or where are we on that?

MR. TANNLER: It is important, yet - we - we do have that data and you're correct I did not present that tonight. Again, tonight we're focusing on Safe Yield, on an AMA-wide basis.

MEMBER JOHN CARLSON: Okay.

MR. TANNLER: But, you raise a very good issue. There are particular areas where groundwater levels have declined, let's say, Green Valley area for one. The Central Wellfield within the middle of Tucson, historically, that was dropping as more and more groundwater was withdrawn. Since Tucson Water has

been delivering a lot more recovered CAP, the water level has actually been coming up within -

MEMBER JOHN CARLSON: Yeah, I realize that.

MR. TANNER: - the Central Wellfield. Yeah, I'm sorry, that's not presented in this, but that's -

MEMBER JOHN CARLSON: Well, that's your choice, but I had a question on it.

MR. TANNER: Yeah.

MEMBER JOHN CARLSON: The final question -

MR. TANNER: Uh-huh.

MEMBER JOHN CARLSON: - Indian water. Seems a few years ago there was some talk about being able to purchase water from Indians, especially up north. Where are we on that? I've lost track of - of - of any ability to trade with the Indians on water, or whatever.

MR. TANNER: That's something that we're anticipating will - will be a possibility in the future. I don't have current status on - on what's being done in - in Tucson AMA, other than ASARCO.

MS. GRIGNANO: Well, I can - ASARCO is, through the Indian Right Settlement Act, able to lease up to 10,000 acre-feet of CAP. They started using that in the - in 2007, and I believe we're ramping up the use of that this year, more than they used last year, and can use up to 10,000 acre-feet. It will be similar to the in lieu - to the - the Groundwater Savings Facility Program that Jeff talked about, the farms. They will - ASARCO will stop pumping most of its groundwater and use the CAP water, but the credits will be accrued and go to the Nation that then - then can be pumped later, or leased to someone.

MEMBER JOHN CARLSON: Thank you.

CHAIRMAN JIM BARRY: Okay. I'll - we're going to do Bob, Bonnie, Vince, and then we're going to go to the audience.

ALTERNATE MEMBER BOB COOK: One - one more question on net natural recharge. What are the components of net natural recharge? And is - is it true that you're treating it like a constant?

MR. TANNER: We're averaging out to a constant. The components are: Mountain front recharge, which -

ALTERNATE MEMBER BOB COOK: Say that again?

MR. TANNER: Mountain front recharge, which - what that is, is let's say that you've got - I'm trying to think of the best way to illustrate that - the Tucson Basin, you've got the Catalinas - where the Catalinas meet the - where the sand and gravel starts, at that junction across the mountains, that's where mountain front recharge occurs.

ALTERNATE MEMBER BOB COOK: Uh-huh.

MR. TANNLER: We've got inflow, which - that's what John mentioned a minute ago - inflow -

ALTERNATE MEMBER BOB COOK: Riparian.

MR. TANNLER: Well, inflow into the - into the - into the basin through the Santa Cruz, from Santa Cruz AMA, outflow to the Pinal AMA -

MS. GRIGNANO: Streambed.

MR. TANNLER: - streambed recharge, which occurs - water can recharge, potentially, anywhere within the - the Tucson AMA, but it recharges a lot more quickly and effectively within the streambeds.

ALTERNATE MEMBER BOB COOK: So, it is all rain; is that true?

MS. GRIGNANO: Snow melt. Snow melt.

ALTERNATE MEMBER BOB COOK: Snow melt -

MR. TANNLER: Snow melt and rain.

ALTERNATE MEMBER BOB COOK: - snow melt and rain?

MS. GRIGNANO: Mountain, yes.

ALTERNATE MEMBER BOB COOK: Okay.

MR. TANNLER: Ultimately.

ALTERNATE MEMBER BOB COOK: Okay. Okay. So, it - it - is it possible that that average could actually change given what we do with the way we catch water? I mean we could intentionally catch water and change that number?

MR. TANNLER: That could change as water harvesting becomes more widely used then that could potentially - I'm not sure how much - but it could make a change to how much water eventually gets -

ALTERNATE MEMBER BOB COOK: So, you're actually -

MR. TANNLER: - recharged.

ALTERNATE MEMBER BOB COOK: - saying water harvesting could be a source of water supply?

MR. TANNLER: I - you could certainly say that, yes.

ALTERNATE MEMBER BOB COOK: Okay. You heard it here.

CHAIRMAN JIM BARRY: Bonnie and then Vince, and then we're going to go to the audience.

MEMBER BONNIE POULOS: I know we're harping on this net natural recharge, but if we could go back to slide number 30, I think it is, that says "Other Parts of the Budget." I think what several of us are having a hard time with is that in that slide riparian demand and net natural recharge are the other two constants that I've really seen in any of your slides. And, I guess, intuitively, it's difficult to understand that; I mean, granted, this is only a five-year time period, and if we looked over a 25-year time period, maybe that would change. But, with the destruction of riparian areas that's happening at an ever-increasing rate in Pima County, and with the paving over

of a lot of areas that normally would supply recharge, and the drought that we've been in for the last seven years, how can you really explain that those two numbers are remaining constant when everything else is changing? That's - I think that's the overlying question that all of us are - are having here, because I find that difficult to understand, and I'm wondering if it's because it's not really truly being monitored in a very accurate way.

MR. TANNLER: It's - it's definitely tough to get a handle on. You - you've got very good points with increased - potential increased runoff with more paved surface area, less riparian use, global warming could have an effect, positive/negative. Let's say that there's - there's more rainfall in a particular summer; that definitely, in real life, that does fluctuate. I think for modeling purposes, they - they take an average. But - but you've got a good point. It is - it's tough to get a definitive figure for year by year on that; that - that is tough to - tough to monitor. So, not a satisfying answer, but I agree with you.

CHAIRMAN JIM BARRY: Vince?

MS. GRIGNANO: I would - just to add to that. That that's something that we can also use the interactive tool that Jeff was talking about, to run scenarios where we say: Okay. Maybe net natural recharge is only two-thirds of what we thought it was with global warming, you know, for - for projection purposes. What effect does that have on Safe Yield if we're really only getting 40,000 acre-feet. We can - we can run scenarios that change that number and see what effect it has on - on the overdraft.

MEMBER BONNIE POULOS: Well, I think the other thing that - that might need to be looked at is how you're making the assumption for those numbers in the first place, because if every single one of your other numbers that we're actively measuring (inaudible; not speaking into a microphone) wells changes, it's very difficult to believe that these numbers shouldn't change as well. (Inaudible).

CHAIRMAN JIM BARRY: Okay. Vince?

MEMBER BONNIE POULOS: (Inaudible; not speaking into a microphone) think the methodology change also needs to be looked at.

MEMBER VINCE VASQUEZ: The - what is the projected overdraft at 2025 in the contributing sectors proportion of that overdraft? Do you have that number by any chance?

MS. GRIGNANO: We have those numbers done for the Third Management Plan. We have not done the new - the projections with the data that we have to this date, and that's what we're working on and hope to have done by the end of the

year. But, if you go to the Third Management Plan, we projected in the Third Management Plan that we would get close to meeting Safe Yield, but that we'd be off by about 50,000 acre-feet. And if you look at the sectors' supplies, you can see that the industrial sectors is primarily groundwater, so that's contributing more than, say, municipal. Well, depending - it's all relative - depending on the total demand, but you have to then look at the supplies based on each sector, and I believe that's probably talked about in the Management Plan as well, so

MEMBER VINCE VASQUEZ: Quick - so, of the 50,000 acre-feet projection overdraft, what percentage industrial, roughly, is it like 80% -

MS. GRIGNANO: I don't -

MEMBER VINCE VASQUEZ: - 70%?

MS. GRIGNANO: - I don't have those figures off the top of my head -

MEMBER VINCE VASQUEZ: All right. Thank you.

MS. GRIGNANO: - yeah. We can - we can figure that out for you based on the TMP projections.

CHAIRMAN JIM BARRY: Okay. Let's go to the audience. Tracy, do you want to ask yours as a question?

TRACY WILLIAMS: I have some questions to this issue and then Call to the Audience, and I'd appreciate if Melaney would write the questions down for us.

CHAIRMAN JIM BARRY: Okay. Could you come up to the microphone, or - or bring the microphone to . . .

TRACY WILLIAMS: Okay. The - the first question that I have is about the levels of water that are declining. I think we need a graph of where those levels are declining in terms of what communities, what sections of the aquifer. We need to know where the pluses and minuses of the aquifer. So, I'd like to see that graphed out in very simplistic ways.

Number two, I'm really glad Bonnie and everyone brought up the natural recharge issue, because I have written down here: No way, not with the channelization of washes, not with - and, Hi, Arlan - not with Pima County allowing construction of residential happening in floodplains and washes, and then the community being asked to bail out over in Catalina, you know, homes that are right in the washes. So, I don't believe that figure either and I think, you know, in order for more credibility we need to look at that math and make it more real.

And, number three, three years it takes for them to replenish the members. Are they meeting it? And I think they're not. And so I'd like to know how far behind in that

three-year window of opportunity what that graph looks like, and I'd like to see that.

CHAIRMAN JIM BARRY: Okay. Anybody else?

MR. TANNLER: We can work on getting that.

CHAIRMAN JIM BARRY: Mr. Stagner?

CLYDE STAGNER: I . . .

CHAIRMAN JIM BARRY: Please get him the - the microphone.

CLYDE STAGNER: I could get up here for you. TMA Safe Yield can interpret it as a nine-entity gestalt TMA sustainability. Shrink it in, people, 'cause you're one Tucson boundary sustainability. The complexity of variable necessitates adaptive management for property, commodity and cost is applicable. For example, TMA budget cites an annual evapo-transpiration of 3,700 acre-feet, I believe you've heard (inaudible) through 2025, mainly in the Upper Santa Cruz. However, the Tucson Plumbing Code promulgated yesterday can cause an annual loss of 32,570 acre-feet of gray water evapo-transpiration - and the reference is quoted - quantity monitoring, quality monitoring and costs for prioritizing and allocation data are necessary to keep the sustainability, adaptive management system viable for evaluations of the Tucson Pima gestalt.

These variables require user identification for applicability. Tucson Water's Department designation of only two users, two users, nonresidential and total deliveries. How are going to break that down? (Inaudible) gestalt. You need more data. These variables require user identification for applicability. Tucson Water's Department designation of only two users, nonresidential and total deliveries - reference Tom Arnold, Tucson Water email, is inadequate for sustainability, adaptive management, as - an example of replaced input data, reference Pima County effluent generation utilities report 2004 annual acre-feet fluent (sic) from the Metropolitan Treatment Facility for calendar year 2004, Arthur Park (sic) Golf Course 581.4 acre-feet, Silver Bell -

CHAIRMAN JIM BARRY: Mr. Stagner -

CLYDE STAGNER: - 533.5 acre-feet -

CHAIRMAN JIM BARRY: - I'm going to have to ask you to wrap it up, please.

CLYDE STAGNER: - Kino Sports Complex, 329.92 at a cost of \$189,281 for an acre-feet cost of \$573.72 per acre-foot. Additional data's available in the above-cited reference. Note that similar data is required from the Tucson Water Department.

To obtain monitoring data from the Pima Wastewater Management, a records request is required; reference Jeff Provot (ph.), Pima wwm email. To view Avra Valley groundwater and

surface CAP monitoring data requires a physical presence at TMA headquarters on Congress Street. All quality, quantity and costs applicable to water sustainability require a comprehensive exclusive mandate for openness and availability to the public and governmental entities, preferably in a centralized data bank.

Mr. Jeff Tannler, Director, AWA (sic) Tucson AMA, has proscribed TMA's Water Budget for Safe Yield and sustainability. Today's sustainability and (inaudible) Institute, Rockefeller Philanthropy Advisors released their 2000 report card for 300 colleges and universities. The college sustainability report card gave Arizona State a B+. Stanford University -

CHAIRMAN JIM BARRY: Mr. Stagner, please -

CLYDE STAGNER: - received an A- and fourteenth ranking. Anybody here from Arizona, you're down much further with a B. The director's sustainability and energy (inaudible), Joseph Stagner, my son, was dubbed a sustainability czar by the university newspaper of Stanford.

What is the legacy of the Pima County Water Study Oversight Committee? The Committee present purview - present purview include paradox, auto-analysis, politically (inaudible) independence, situated in a (inaudible), governmental pay and positions, which is their sustainability. A Tucson Pima czar for sustainability and water management with authoritative accountability, responsibility and cost analysis is indicated. This czar and the staff should be independent of Tucson and/or Pima County managers and report to joint official sessions of the Tucson Council and Pima County Supervisors (inaudible) managers, implementation and subsequent action would be at the discretion of responsible and accountable electable officials.

An alternative is a contract for sustainability and water management with Kathy Jacobs, Director of the (inaudible) University of Arizona Water Institute. Respectfully, Clyde Stagner. I have the (inaudible; not speaking into a microphone). Thank you, Mr. Chairman.

CHAIRMAN JIM BARRY: Any other questions? Colette? A question, please. Where's the - where's the microphone?

COLETTE ALTAFFER: Thank you. Colette Altaffer. Can you tell me if there is any entity within the Tucson Active Management Area that currently does not meet its Assured Water Supply designation?

MR. TANNLER: I'm not aware of any, no.

COLETTE ALTAFFER: Other than that, I think there's a footnote in your Third Management Plan that there are four, including Surprise and Marana, are they still out of compliance?

MS. GRIGNANO: Surprise is not in the Tucson AMA.

COLETTE ALTAFFER: Right.

MR. TANNER: Right, that's in the Phoenix AMA.

MS. GRIGNANO: Don't know.

COLETTE ALTAFFER: Okay. Second of all, we know that dams and recharge basins have a limited life span. What will happen when the two dams that we depend on for our water for the Colorado River silt up to the point that they are no longer usable? Will - will we be able to continue to meet our Water Budget? And, if not, how are we going to meet that?

MR. TANNER: I'm going to defer to other agencies for - for that. I - my guess would be that there is a plan for - for dealing with storage at Lake Mead and Lake Powell.

CHAIRMAN JIM BARRY: Any other questions? Okay. Yes, one more and then we'll do Call to the Audience.

CAROL HELLER: Carol Heller of Central Tucson. I wonder if there are any measures that will appear in the next Management Plan that - that could be used - potential measures to address the prospect that Safe Yield will not be obtained by 2025?

MR. TANNER: Very good question. Our - our hope is to identify, again, where - where we are with respect to Safe Yield, and where we're projected to be and look at - at some of the reasons why we're not getting there, hopefully identify some - some areas that can get us closer to Safe Yield. Some of those may require statutory change.

CHAIRMAN JIM BARRY: Sean has a request to make a staff (sic), and then we'll go to Call to the Audience.

MEMBER SEAN SULLIVAN: Very quickly. Jeff mentioned that there - some kind of body put together a report that had suggestions on statutory and rule change that would better help meet Safe Yield. Could we include those within the inventory section for this? And then also if ADWR has any other suggestions on how we could meet those at the local level through policy and such, those would be very welcome I think. And also - I'm sure you already have this in a map that has overdraft, Safe Yield geographically throughout the Tucson AMA as one of the speakers in the - in the audience mentioned.

UNIDENTIFIED FEMALE SPEAKER: Are you talking about the water levels?

MEMBER SEAN SULLIVAN: Yeah, that would great also.

UNIDENTIFIED FEMALE SPEAKER: Yes.

MEMBER SEAN SULLIVAN: Thank you.

CHAIRMAN JIM BARRY: Okay. Tracy?

TRACY WILLIAMS: Tracy Williams, lifetime residence. It's pretty obvious we all live in the desert, and the groundwater Management Act has systematically been weakened over the last 25 years which has been delaying our conservation efforts and our ability to control growth. It's a fact that

we've over-allocated our water supply. Recharge does not keep up with the rate of pumping. The cycle of unrestricted growth seems pretty cancerous to me; it's out of control.

Economic development drives water policy, and that's a given in this Arizona region and it's time that the water supply begins to drive our land use policy. The total water supplies in Arizona are likely to decrease when we look at all the changes that are happening. And my big question is: How are we going to achieve sustainability? And I think about this in a very common sense and practical way. We've got to control growth. We've got to deal with our population, which will deal with our demand and it's going to take a lot of effort to do that, but we need to also change our economy.

So, I'm very encouraged by your report and I'm hoping that your agency will start enforcing some of the rules, the laws so that we can all actually achieve sustainability.

CHAIRMAN JIM BARRY: I've done this again, and we've gone to Call to the Audience and I should've said: Thank you very much for your presentation.

MR. TANNLER: You're welcome.

(Applause.)

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CALL TO THE AUDIENCE

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MR. TANNLER: You're welcome.

(Applause.)

CHAIRMAN JIM BARRY: Maybe before this phase is over, I'll learn to thank the presenters before we go to Call to the Audience. Anybody else? Thank you, Tracy. Anybody else?

(No response.)

CHAIRMAN JIM BARRY: Anybody want to adjourn? I'm sor- - okay. Adjourned. Thank you very much.

Next meeting is the 2nd? Thursday, at the Manning House. Thank you all.

MEMBER JOHN CARLSON: 6:00 p.m.

CHAIRMAN JIM BARRY: 6:00 p.m.

(Conclusion of meeting.)

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CERTIFICATE

I hereby certify that, to the best of my ability, the foregoing is a true and accurate transcription of the audio recording of (Presentations) excerpts of the City/County Water & Wastewater Study Oversight Committee Meeting held on September 24, 2008.

Transcription completed: October 6, 2008.

DANIELLE L. KRASSOW-TISDALE