Solutions: El Paso as an Urban Example

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John E. Balliew is a native of El Paso and started working as a laboratory technician for El Paso Water Utilities in 1983. Since then, he has held several leadership positions before being named Vice President in 2007. During his career at EPWU, John has been directly involved in many of the innovative projects that have helped secure El Paso's water future. Those projects include the 50-year water resource plan, construction of the nation's largest arsenic-removal plant, the Kay Bailey Hutchison Desalination Plant and implementation of a leak detection system that reduced unbilled water by 43 percent. Additionally, he has been involved with the expansion of groundwater resources and on-going projects designed to mitigate the impacts of the region's on-going drought. In January 2013, John accepted the role as President & CEO of EPWU where he is now responsible for all aspects of water, wastewater, stormwater and reclaimed water management for the greater El Paso metropolitan area. He reports to and implements strategic policies set by the Public Service Board. He received a BS in chemical engineering from Texas A&M University in 1982 and is a licensed professional engineer.

Thank you for inviting me here to this lovely seminar. I want to talk about water solutions using El Paso as an urban example. Here in the Lower Rio Grande, as we refer to it in New Mexico, in a full release year, irrigation districts use the bulk of the water (Fig. 1). You can see that El Paso gets a little sliver, and Mexico gets a sliver. That is the allocation that we would expect from a normal release year from the Rio Grande Project. Historically, there has been some variability in terms of the reservoir level at Elephant Butte (Fig. 2). Levels have gone up and down, and right now we are in one of those down portions.

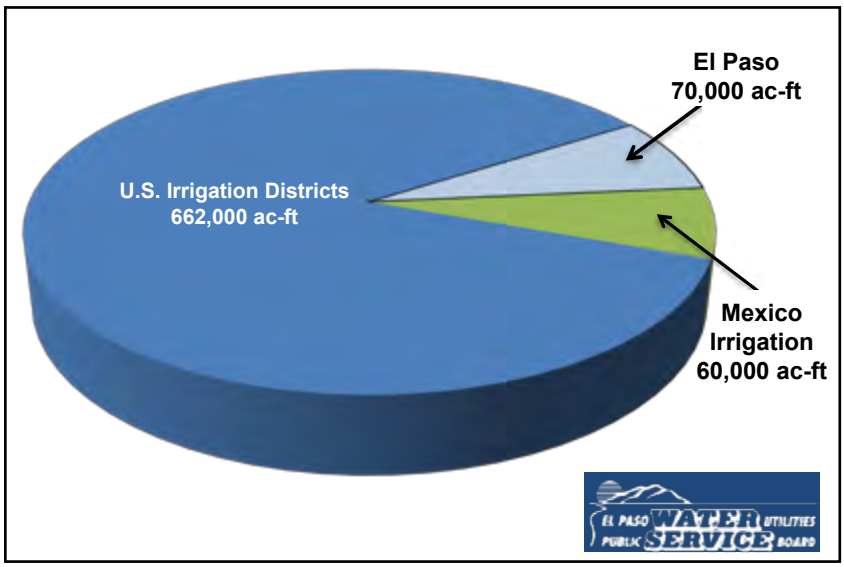

Figure 1. Allocation of Rio Grande water, full release total = 792,000 acre-feet

What does that mean for El Paso? When you look at the amount of water that we have been able to utilize from the Rio Grande Project, out of the last 17 years, only 3 years have been above average (Fig. 3). Most years have been below average, especially during recent years. Normally in a full release year, we have 70,000 acre-feet of water rights. In 2012, we received only 32,500 acre-feet and we thought that was pretty low. Then 2013 came along and we budgeted for only 25,000 acre-feet knowing that we were going to be reduced from the 32,500 that we received in 2012. We received only 7,000 acre-feet. That is the lowest amount that we have received since the inception of the Rio Grande Project in 1906.

This drop in available water has forced us into doing things quickly to take care of the problem. It only took three successive seasons for the release to go down to 32,500 and then 7,000 acre-feet. Figure 4 shows the municipal perspective. This graph covers from May 1 to July 31, the time frame in an arid city when a lot of the water is used for irrigation. The graph shows demand that

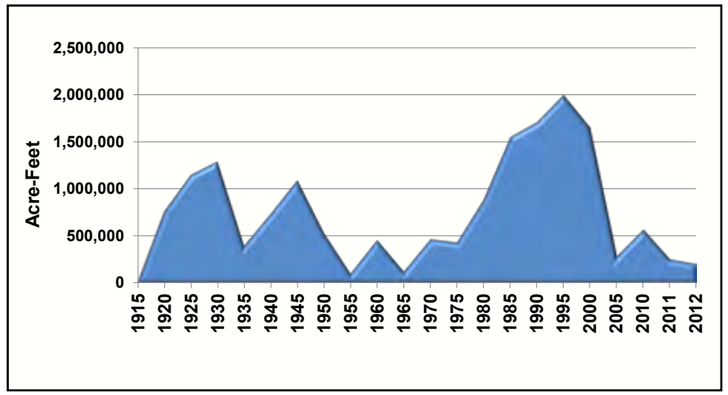

Figure 2. Elephant Butte Reservoir historic levels. Bureau of Reclamation: Upper Colorado Region historic data

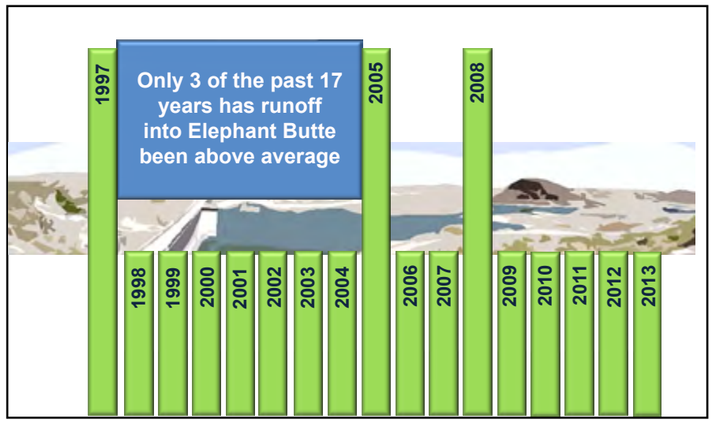

Figure 3. Drought history for Elephant Butte, 1997-2013

must be met and where we run into difficulties. Why? Normally you would have a big blue box representing available water. The red line represents forecasted actual use or demand. To plot this graph, we look at long-term forecasts, population growth, and the other various inputs. This shows you the impact of the drought. All the purple that you see above the blue box represents water that we are not getting from the Rio Grande. You can see the impact in that normally on a May 1 date we would have sixty to seventy million gallons a day of reserve capacity. You need that because things can change relatively rapidly. You may have one week when it rains followed the next week with 110 degrees–water demand can change extremely quickly. You can see at three points that we are forecasting demand to be greater than our available supply. That is a very troubling situation for a city utility because it is our job to provide water to our customers. Practically every city in the country has something that goes under the name of "water emergency" or "drought response plan" with stages that go along with it. Each one of those stages presents real economic impacts on the community.

El Paso has been practicing water conservation for a long time. Our normal course of action is very similar to what many cities have as their Stage One in their drought plan. By the time we start implementing actions, we go immediately into the economic viability of the community. We look at closing car washes and similar, and how those actions will impact customers. It is not comfortable to be in this type of a situation. In 2013, as it turned out, we had a better year than what was forecasted. The yellow line in Figure 4 represents the actual demand in the system. We had some very unusual weather patterns with precipitation that kept coming and going.

In 2013, we had a lot of variability, but the demand overall was less than what we had forecasted. This particular year we "squeaked by," and I believe that is a very accurate term to use. How did we do that? One of the things that Ed Archuleta, former EPWU President and CEO, setup was a diversified water resources portfolio including surface water, reclaimed water, conservation, groundwater, desalination, and importation. To put this into perspective, when I was hanging out in the lobby I picked up a copy of Catherine Ortega Klett's book on New Mexico's water wars. I flipped through

some of the chapters to remind me of what took place in the 1980s, because back then, El Paso only had surface water and groundwater. That was it. We thought the surface water was limited because at the time, we had a poor relationship with the El Paso County Water Improvement District #1. We primarily looked at groundwater and ways to expand it, which didn't work out well for anyone.

By expanding into these other areas, we have taken care of our own situation fairly locally (Fig. 5). In our area we have brackish water resources, and I think this applies throughout the West. In Texas, there are billions of acre-feet of brackish groundwater and New Mexico has a similar situation. Concerning reclaimed water, we make use of municipal wastewater, which I will talk more about later. Conservation is very important: every gallon that is saved is a gallon that can be supplied to customers at a later time. When I talk about importation, I am talking about importation from other basins within Texas. As the Rio Grande flows south from Albuquerque to Elephant Butte, we have two aquifers on either side of the mountain range that runs through El Paso: the Mesilla Bolson and the Hueco Bolson aquifers. These aquifers extend way up into New Mexico, with part in Texas and part in Mexico as well. About ninety miles east of El Paso are a few smaller aquifers that we refer to collectively as the West Texas Aquifers. These smaller aquifers are isolated from the Rio Grande and from the Pecos. They have internal drainage and when water evaporates, it essentially creates a salt flat. These resources are what we have to work with.

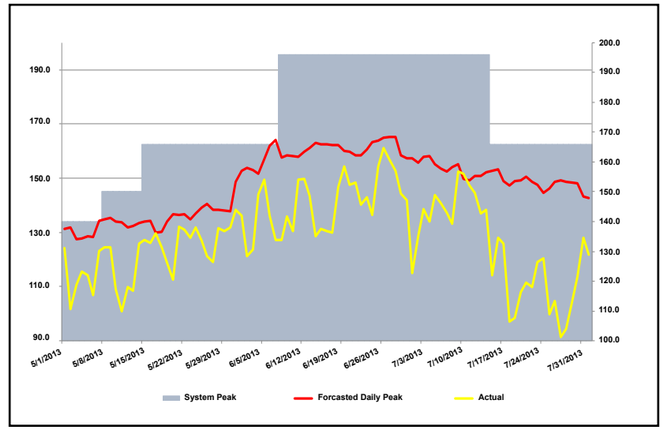

Figure 4. 2013 Summer daily peak, May 12013 to July 31, 2013

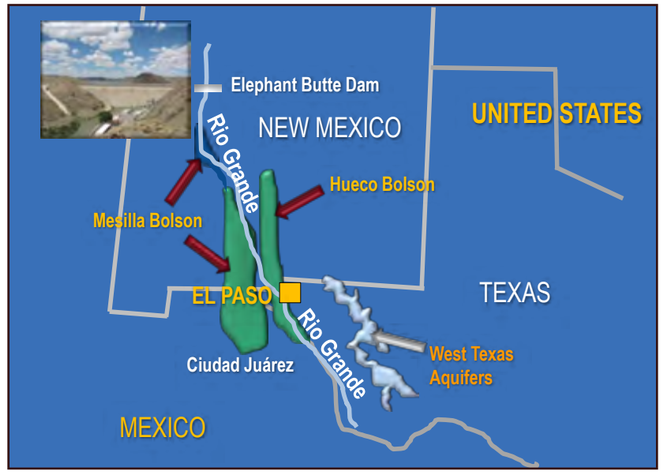

Figure 5. Regional water resources

El Paso has two surface water treatment plants and two groundwater plants. The two surface water treatment plants take water out of the Rio Grande when it is seasonally available. Other places in Texas, such as Dallas or Houston, run their treatment plants year-round. Even in a good year, El Paso runs about 210 days out of the year. When the Rio Grande is turned off, we clean the plants, do maintenance, and simply let the plants idle. In the Upper Valley, we have a large arsenic removal plant because the Mesilla Bolson is impacted by arsenic. Just to the east of the airport is an area that contains huge reserves of brackish groundwater and El Paso's Kay Bailey Hutchison Desalination Plant. Pumping inside the city has

caused brackish water to move in so the plant has a two-fold purpose: to intercept that water, and then to also provide it as a potable water source.

In 1985 we built the Fred Hervey Water Reclamation Plant to take wastewater, reclaim it to drinking water quality standards, and then inject it back into the basin. We also have three wastewater plants: the Northwest Wastewater Treatment Plant, the Haskell Street Wastewater Treatment Plant, and the Robert R. Bustamante Wastewater Treatment Plant in the south. We have been investing in what we call the Purple Pipe System: we treat water until it is suitable for use in irrigation, then we supply a separate system of pipes, pumps, stations, and reservoirs to supply customers with reclaimed water for irrigation. The system has worked very successfully. The next phase of this effort is to take the water directly to potable, drinking water quality standards, and put it directly into the system. The reason we are doing this is simple economics: we want to incentivize the customer to use this water as there is a real cost to the customer. Salt is a big deal–when water is used by customers, the wastewater produced has more salt than the water the customers started with. Customers will have to deal with salt impacts so we need to incentivize its use; because if it is potable, we can charge full potable price.

What are El Paso's water challenges? First we have the specter of drought. We also have normal customer growth. El Paso grows at an extremely steady growth rate of about 2.0 percent every year. It has never been less than 1.8 percent or above 3.5 percent. We also have $800 million of capital improvement needs over the next ten years, which creates a large financial obligation. We must produce revenue to put these types of facilities in the ground. Energy is the biggest cost that we incur–it takes energy to pump water from one place to the other and to treat that water. And we have personnel issues. We have about 1,000 employees in El Paso utilities, and about 300 of them could retire in the next year. I think many companies around the country are facing similar situations.

Now let's move to drought management. The impact of the Kay Bailey Hutchison Desalination Plant has been significant (Fig. 6). The plant has operated under a fairly steady state since 2007. We try to have a balanced approach; we get as much water from the Rio Grande as possible, but when we can't do that, we operate the Kay Bailey Hutchison Plant at full blast.

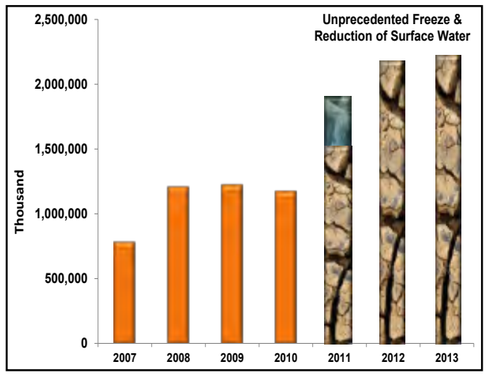

Figure 6. Kay Bailey Hutchison Desalination Plant product, 2007 – 2013

In terms of El Paso's overall supply, Figure 7 shows the two groundwater basins, the Hueco (in blue) and the Mesilla (in red) that constitute the bulk of our supply. We have been using more Rio Grande water when it is available, but you can see from the figure when we had drought years. In 2007 for example, we had to increase supply with additional groundwater pumping and our desalination plant kicked in.

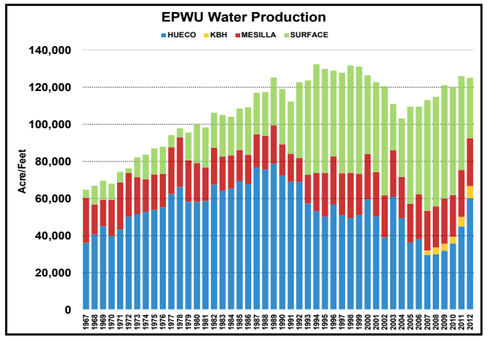

Figure 7. El Paso Water Utilities water production, 1967 – 2012

What does El Paso do to supply water in the face of drought? One problem is that we have been dependent upon the Rio Grande. We have large pipelines that go from the Rio Grande north into the city. Now we have well fields in the north and have to get that water down to the central and downtown parts of the city. This required two pipeline projects to essentially reverse the flow of the water to take the groundwater into the central area.

We became complacent with our wells as we used more and more of our surface water supply. We let many of our wells sit idle and when we wanted to turn them on, they didn't work. Those wells required a good bit of maintenance and rehabilitation. El Paso is also working with the potable reuse as I mentioned earlier. I'll be in Austin next week to meet with regulators to decide on what type of pilot plant we will need.

The state of Texas is divided into individual regions for water supply and planning purposes. Figure 8 describes the crux of our regional plan and you can see, for example, that by 2060, the Dell City Capitan Reef Groundwater will be used for West Texas water importation. The blue part of the bars represents our conjunctive use, which is our surface water and groundwater use combined. Conjunctive use will remain relatively constant, so we will need to enhance our supply in the future.

El Paso's current planning involves potable reuse/ indirect potable reuse and expansion of the Jonathan W. Rogers Water Treatment Plant. One thing that we have seen with this drought is that we may have water, but only for a short period of time. At times, we may have more water than we have treatment capacity. If we have additional treatment capacity, we can treat the full capacity of what we have and inject what we can't put into the system. In our system, we also have a plan to treat agricultural drainage water. We produced a technical report with the Water Research Foundation on a study of agricultural impacts, and we need to work out the details with the districts and the downstream users. We also are updating our

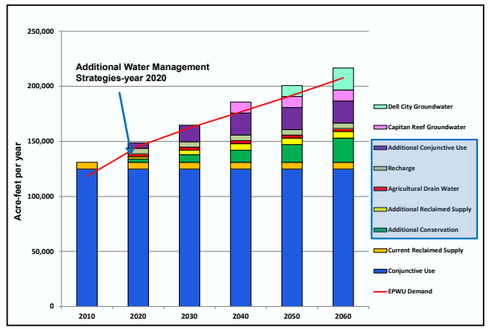

Figure 8. Water management strategies for EPWU and projected demands (2011 Plan)

costs for water importation from our West Texas basins. We will also revise our hydrogeologic models on the Mesilla and the Hueco Bolson solute model.

Figure 9 gives you a bit of perspective on the importation aspect. El Paso County is located in blue on the left-hand corner with Hudspeth County next to it in green, a distance of about 90 miles. It is a very expensive project to tap these very minor aquifers–it is a $750 million importation project. This isn't something that we entertain lightly. We also take leak detection very seriously.

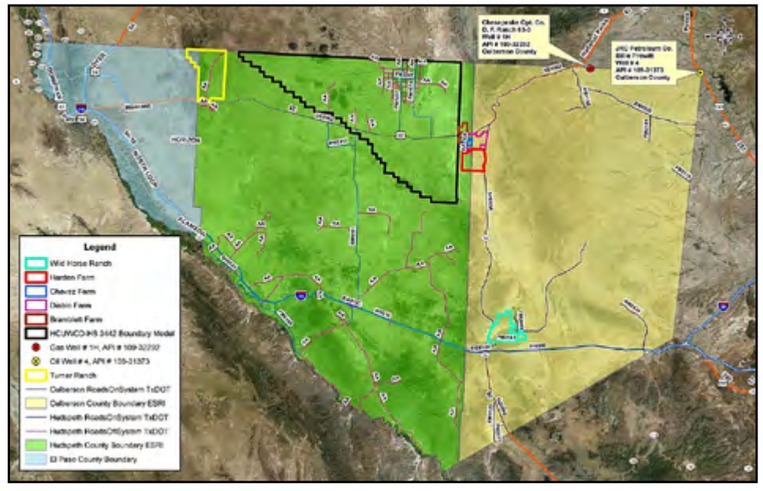

Figure 9. A map of the three westernmost counties in Texas showing Underground Water Conservation District Boundaries and the proximity of oil and gas production.

In 2013, peak demand in El Paso was 154 million gallons per day (Fig. 10). That number should actually be substantially higher. If you take into account the reclaimed water that we put in–another 6 million gallons–you come to 160 million gallons per day. The leaks we fixed in the last ten years also adds up to an additional 4 million gallons. That puts our total at 164 million gallons per day. If we actually had a 164 million gallon peak, we would have run out of water this year, so you can understand the importance of conservation and reclamation.

Thank you.

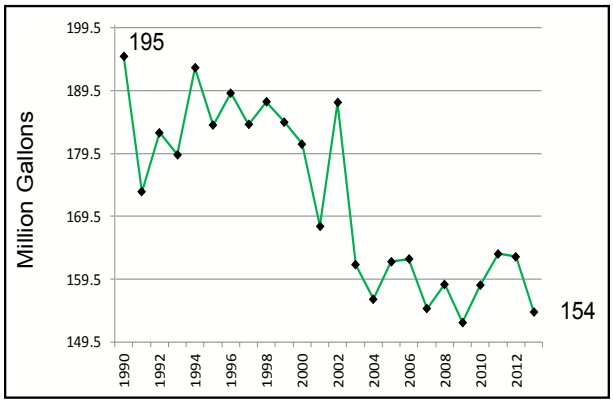

Figure 10. Peak water demand by calendar year