POLICY MEMORANDUM

SUBJECT: Future Water Resources – Alternative Sources

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DATE: October 28, 2015

Topic and Purpose

The population of Texas is expected to nearly double by the year 2060, with a large shift towards urban areas. It was stated in the 2012 State Water Plan, "In serious drought conditions, Texas does not and will not have enough water to meet the needs of its people, its businesses, and its agricultural enterprises." (TWDB, 2012). The water development pattern of major cities is in line with the microeconomic principle of low hanging fruit, whereby they are using convenient surface and groundwater supplies, importing when that isn't enough, and finally turning to alternative sources of water (Richter et al., 2013). Texas is following this trajectory of reactive water planning that generally is less efficient and more costly. This memo aims to recommend some strategies to break this pattern and begin proactive planning to meet the projected demand of about 22 million acre-feet/year by 2060 (TWDB, 2012). By assessing the current obstacles for implementing alternative sources of water and the existing political regime, possible policy alternatives will be offered.

Background

Proactive planning is jumping right into the more sustainable, alternative sources of water, rather than unsustainably using the local surface and groundwater sources to depletion and then turning to these options. Groundwater is such a desirable resource because it is where the people are, not just in streams and lakes. Current trends in over pumping of some groundwater aquifers are leading to negative impacts such as dry wells, higher pumping costs, less surface water supplies, poorer water quality, and land subsidence in some areas (USGS, 2015). Surface water depletion has similar issues with increased withdraw costs, decreased water quality, less aquifer recharge, and implications for downstream users and e-flows. To negate these issues, Texas should look to alternative sources of water including: aquifer storage and recovery (ASR), rainwater harvesting, re-use from the home to region scale, conservation, and brackish and seawater desalinization among others not discussed in this paper such as water markets, water neutral development, cloud seeding, and brush management.

Aquifer storage and recovery is an option that will see much greater use in Texas in the near future. According to the EPA (2012), "Artificial aquifer recharge (AR) is the enhancement of natural groundwater supplies using man-made conveyances such as infiltration basins or injection wells. Aquifer storage and recovery (ASR) is a specific type of AR practiced with the purpose of both augmenting groundwater resources and recovering the water in the future for various uses." Currently there are three ASR facilities in Texas, located in Kerrville, San Antonio, and El Paso.

Rainwater harvesting can be done at the household level or as a collection of buildings. It involves capturing natural rainfall and using it for irrigation, drinking, domestic use, aquifer recharge, and to reduce the amount of runoff associated with storms. This works more to augment the water supply than meet additional need since it depends on natural weather patterns and is not available during times of drought (TWDB, 2012).

Water reuse as defined by the Texas Administrative Code is, "domestic or municipal wastewater that has been treated to a quality suitable for a beneficial use." This is done at a regional level as wastewater treatment plants are necessary to purify the water. One classification is direct reuse which is returning the treated wastewater to a distribution system, and the other is indirect reuse which returns treated water to a water supply source. Major reuse projects are in Abilene, the Tarrant Regional Water District, Cleburne, San Antonio, the Colorado River Municipal Water District, and Wichita Falls. A similar water alternative is greywater which is generally at the household level. This involves using untreated sink, shower, and bath water for things like lawn irrigation (TWDB, 2015).

Conservation is the best alternative source of water because it saves the limited resource we have and saves the consumer money. Conservation can be on an individual level by simply using less water. It can be at the household level by switching to low flow toilets & showers and altering landscape to be less water intensive. It can reach up to the regional or state level through water restrictions, more efficient power plants, fixed leaky infrastructure, and education.

Desalination (referred to as desal from here on out) is the process of removing salt and other dissolved solids from seawater or brackish groundwater through either thermal or membrane methods. As of 2010 there were 44 brackish desal plants in Texas. With improving technology and decreasing cost, desal is expected to produce nearly 310,000 acre-feet of potable water by 2060 for Texas (Sierra Club, 2013).

Key Issues

The issues associated with alternative sources, making individuals and cities hesitant to adopt, can be summed into 4 main points:

1. *Public opinion:* While it is important to remain transparent, it should be an equal consideration that education can inform people of things they don't need to know. Influencing public opinion is a tricky science and will be crucial to move forward from passing bills allowing new sources such as desal plants and ASR to doing their part with rainwater harvesting and greywater re-use.
2. *What's the incentive?:* Currently there is no reason that cities would switch from their cheap and convenient surface and groundwater supplies to a more expensive alternative. There is a reason the pattern Richter et al. (2013) pointed out has held true. Even if cities see the benefit of alternative sources, they often don't have the funding to make it happen.
3. *Externalities:* There are a whole host of externalities to balance with alternative sources. ASR, reuse, and desal will require additional energy inputs (with their own hidden water use and air quality impacts). Rainwater harvesting and reuse could have an impact on downstream users and e-flows by limiting water returned to the water supply source. Desal creates brine or concentrate water with high levels of salts and minerals which result in disposal challenges, and the use of brackish groundwater may negatively impact the freshwater supply within that aquifer. With seawater desal there is the issue of impingement and entrainment at the water intake pipes (Sierra Club, 2013).
4. *Who should conduct studies?:* Some of these sources have been in use for longer than others but overall there is a need for additional studies, especially on the longer term impacts. There is an unresolved issue of who should be responsible for conducting these studies and who should pay for them.

Stakeholders

Stakeholders involved with alternative sources of water include rural and urban customers, downstream users, the environment (e-flows), groundwater conservation districts (GCDs), state government, local government, regulatory agencies, and the TWDB. Rural and urban users (residential & industry) alike will share an increase in the cost of water if that is the route cities take. If we continue on the path of depletion, rural users will feel the impact first because they often rely on a groundwater well on their property. As the aquifer is increasingly drained they will have to spend money to dig a deeper well or pay to get water from another source. This will potentially be a source of conflict. Downstream users will potentially be impacted by increased reuse and rainwater harvesting within a region. The more these sources of water are used, the less water that will be naturally making it to rivers -- with it being captured by homeowners and less treated wastewater being returned to rivers. Like downstream users, this could negatively impact environmental flows. Both downstream users and environmental interests may take issue with this as it deprives their rights and would be in violation of SB 3 enacted by the 80th Legislature (TWDB, n.d.). GCDs will have a role in making decisions regarding the continued use of groundwater and have some authority regarding ASR and desal disposal methods. State and local governments have one of the largest roles in this issue because the biggest obstacle to implementation is the cost. Governments can allocate funds, provide incentives, and create policy to direct and encourage increased alternative usage. Regulatory agencies such as the TCEQ and EPA will increasingly be called upon to permit new sources and make sure that requirements such as e-flows are still met (TWDB, n.d.). The TWDB is tasked with statewide water planning therefore they must continue to assimilate the state water plan,

conduct studies, and fulfill duties tasked to them by the Legislature. Since there are so many stakeholders involved, it remains to be seen who will actually conduct further studies on feasibility and could be a point of conflict. A final source of conflict among these stakeholders may be whether the cost of these projects is passed along to the ratepayer or subsidized by state or local governments.

Current public discussion surrounding the topic

Though the 2011 drought was devastating, it has served as an eye opener to Texans and has spurred research looking into additional sources of water. The losses in agriculture, city wide water restrictions, and the need to truck in water in some places proved that Texas does not have enough water to meet the need. Researchers Bridget Scanlon and Jay Banner of the University of Texas at Austin and Robert Mace, the deputy executive administrator of the TWDB are in agreeance; Texas needs to diversify the water portfolio. They have cited conservation, ASR, desal, and reuse as good options to make this change and additional feasibility research is now in the works. It is not easy to predict future droughts and the duration could be much worse than what was experienced in 2011 so it really is imperative to be prepared (Airhart, n.d.).

During the 2014 Texas Water Summit one conclusion was along the same lines stating that the economy may face big issues down the road if water consumption isn't better managed, and it was stated that alternative sources should be looked at but we don't know the impacts and they will be expensive (Kulshrestha, 2014). Talk amongst the water experts indicates we need alternative sources and we need to continue informing decisions with research.

Assessment of Current Policy

The use of aquifer storage and recovery (ASR) is authorized under HB 1989 of the 74th Legislative session. This alternative source has been proposed as 0.9 percent of future supply in the state water plan by regions E, G, H, J, K, and L and is being investigated by conservation districts, cities, and utilities across the state. The TCEQ is responsible for permanent permitting and temporary permitting for pilot projects under TWC §11.153 & §11.154. Water is injected underground under the EPA Underground Injection Control program and regulated by the TCEQ in accordance with 30 Texas Administrative Code (TAC) Chapter 331, Subchapters H and K designed to maintain water quality. Finally, groundwater conservation districts have the authority to regulate ASR within their jurisdiction and do so to varying lengths (Webb, 2015). As of 2011, 22 GCDs banned ASR and the others did not address it. Progress has been made to clean up the regulatory setting with HB 655 of the 84th Legislature, pushed by state rep. Lyle Larson, standardizing regulation and reducing cost. This bill considers surface and groundwater injected water the same and all permitting has been moved to the TCEQ (Texas Water Policy, 2015).

Regional Water Planning Groups must consider rainwater harvesting as a potential strategy under the Texas Water Code 16.053 (e) (5) (c). HB 645 of the 78th Legislature bans homeowners' associations from banning rainwater collection systems but allows them to set rules. HB 2430 of the 79th Legislature set water quality recommendations for rainwater harvesting. During the 82nd legislative session, a number of bills were passed regarding installation of rainwater collection systems and their interaction with the public supply. In accordance with Texas Tax Code §11.32 and §151.355, some sales and property tax breaks may be in order. Finally, some cities like Austin do and will offer their own rebates or other incentives to install rainwater harvesting systems (TWDB, n.d.).

New and existing water reuse sources will make up approximately 10 percent of the supply by 2060 according to the state water plan. Since this involves discharging into waters of the United States, all reuse projects must be in compliance with the Clean Water Act and the Safe Drinking Water Act if applicable. Quality, design, and operation associated with reuse are regulated in Texas under 30 TAC Chapter 210 & 321 Subchapter P and Texas Water Code § 26.0271. Regulation varies for water with which the public may come in contact and water they would not. There are a number of studies funded by the TWDB further researching reuse and its future possibilities (TWDB, 2015).

Greywater recycling is not listed as a water supply in the state water plan. It is permissible under state code but generally the residential installation cost and health risk of untreated water hold people back. Additionally, increased residential reuse could be a problem for sewer systems that need a certain level of flow and even downstream users who depend on treated wastewater entering the system (Aboii, 2012). Progress was made with HB 1902 of the 84th Legislature which expanded the definition of greywater and allows the TCEQ to adopt and implement more domestic use (Bourbois, 2015).

Conservation as an alternative water supply is the most encouraged through policy but generally actions are at the regional level. It represents 24.2 percent of the supply in the state water plan to meet the 2060 demand. The Texas Water Development Board encourages and supports conservation efforts through programs such as irrigation metering and water loss audits, data collection, and by providing resources for agricultural, industrial, commercial, and institutional water conservation programs. Proposition 6 of the 83rd Legislature has set aside 20% of the newly allocated $2 billion to fund conservation projects in the state water plan (StateImpact, n.d.). However a step backward was taken by Greg Abbott during the 84th Legislature by removing $1 million in funding for conservation education programs (Bourbois, 2015). Groups encouraging conservation among all users include the Water Conservation Advisory Council, Texas Living Waters Project, and the Texas Water Conservation Association (TWDB, n.d.). Cities are doing their parts with things such as outdoor watering restrictions or rebates for water saving appliances like low flow showerheads and toilets (Galbraith, 2012).

Desal brine water in Texas is disposed of in surface water, sewer treatment facilities, evaporation ponds, lagoons, and injection wells. This is regulated by the TCEQ and injection must be in compliance with the Underground Injection Control Program of the Safe Drinking Water Act. A failed bill was introduced during the 83rd session of the legislature "to exempt brackish groundwater wells (defined here as 1,000 mg/l or greater) from all permitting requirements of groundwater districts." As per direction of the Texas Legislature, the TWDB is conducting studies, and small seawater desal demonstration facilities are in the works in South Padre Island and Brownsville (Sierra Club, 2013).

Current policy is inadequate. All alternative sources of water, including conservation, still make up well under half of the supply for 2060 in the state water plan (TWDB, 2012). Though these alternative sources are gaining ground with bills discussed above and others such as HB 2031, 1421 & 3858 and SB 991 & 551 there are still "bad" bills being passed (Bourbois, 2015). Additionally, regulation and permitting is available but not called upon very often. Due to lacking incentive and economic sense, Texas will continue along the Richter et al. (2013) path without stronger political action.

Possible Policy Alternatives

1. The first policy recommendation is that the existing regulation and permitting processes are standardized, much like what HB 655 did for ASR. This will reduce an unnecessary obstacle for implementation.
2. The second policy alternative is to raise the cost of water to reflect the true cost. While the tiered system where those who use more pay a higher rate is a good start, the cost for all users is too low. By raising the price, consumers will have a heightened understanding of the value of the resource so they'll use less and there will be funds to pay for alternative sources. This would most effectively be done at the regional level.
3. The third policy alternative is to increase public education. Most people don't realize we are in a drought or where their water actually comes from. In cities especially, the mentality is that water comes from the tap and is not an interruptible resource. There needs to be an increase in the amount of money and creative effort put towards public education. The more the public knows, the less they'll use. This could be done at the state level with something similar to Proposition 6 allocating funds through the TWDB or at the regional level. It may be more effective regionally; rural consumers tend to have more awareness and see exactly where their water comes from while urban users would benefit more from education.
4. The next policy alternative would work best at the state level with an act like Proposition 6 to provide funding for additional research of alternative methods. Most of these sources need additional research especially regarding their long-term impacts. This should be done by an agency like the TWDB or TCEQ.
5. The final policy alternative would work best at the state level with an act like Proposition 6 to provide incentives through rebates or subsidies to start using alternative sources now. All the alternative sources (aside from conservation) require a large capital investment that most regions cannot afford on their own. This will be a hard sell since it makes economic sense to go with the low hanging fruit first, but is necessary in the long run. Policy must be further informed by science of the detrimental effects of depleting our convenient surface and groundwater supplies and the need for new sources.

Conclusions & Recommendations

In conclusion, we are slowly moving towards more alternative sources through individual and regional decisions as well as Legislative action, but that isn't sufficient. We are still on the path of depleting our convenient surface and groundwater sources, moving to importation, as evidenced by all the noise around "gridzilla", and finally to alternative sources. This is not sustainable water planning and will be less efficient and more expensive in the long run; policy must head in a new direction. It is recommended that any red tape hindering implementation be removed, the cost of water be raised, a greater effort be put forth for public education, additional research be funded, and alternative sources incentivized now.

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