Role of BRACS in the State Water Plan

Matt Webb
Texas A&M AWRA Student Chapter
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Texas Water Development Board
Water Science and Conservation
Innovative Water Technologies
The statements contained in this presentation are my current views and opinions and are not intended to reflect the positions of, or information from, the Texas Water Development Board, nor is it an indication of any official policy position of the Board.
Texas Water Development Board

• What is TWDB?
  • State agency, founded in 1957
  • Response to drought of record
  • The name has changed but the mission’s the same

• Mission
  • Provide leadership, planning, funding, & education for conservation and responsible water development

• TWDB is not a regulator
  • That role is served by Texas Commission on Environmental Quality (TCEQ)
The Big Report

- The State Water Plan
  - Established by SB 1 in 1997 in current form
  - Compilation of reports from the 16 Regional Planning Groups
  - Revised every 5 years with a 50-year horizon
  - Serves as a guide to state water policy
  - Provides information on demand, supply, and strategies

- By 2060
  - 82% increase in population
  - 22% increase in water demand
  - 10% decrease in existing supplies
  - 8.3M acre-foot need by 2060
  - How do we cover this need?
Recommended Water Management Strategies for 2060

Source: 2012 State Water Plan
Historical Means Challenges

- Surface Reservoirs Snapshot since 2012
  - Storage has been below long term median since at least 1990
  - 10 of 12 months of 2013 set low records back to at least 1990
- GW depletion and subsidence
  - Decrease from 2010 to 2060 from 13.3M ac-ft to 10.1M ac-ft
Innovative Water Technologies (IWT)

• Area of growing interest
  • Result of aforementioned challenges with historical means
• Team goals
  • Participate in research and demonstrations
  • Disseminate information via outreach
• Team technologies
  • Rainwater harvesting
  • Water reuse
  • Aquifer Storage and Recovery
  • Desalination
  • Brackish Resources Aquifer Characterization System (BRACS)
Real Quick – Salinity, TDS, and Desal

- Total Dissolved Solids (TDS) defines salinity (USGS)
  - Fresh (0-999mg/L); EPA limit for potable water
  - Slightly saline (1,000-2,999 mg/L)
  - Moderately saline (3,000-9,999 mg/L)
  - Very saline ( >10,000 mg/L)
  - For reference, seawater is near 35,000 mg/L
  - “Brackish” is a flexible term

- Desalination - treatment to potable standards
  - Almost universally reverse osmosis (RO) in the U.S.
  - Energy costs are large portion of operating costs
  - Lower TDS equals lower operating costs
Desalination Interest

- **Number of Facilities**
- **Desalination Plant Capacity**

<table>
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<th>Year</th>
<th>Number of Facilities</th>
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TWDB Brackish Water Studies

• TWDB Report 157 - 1971
  • Aquifers very broadly categorized
  • 1600 well logs interpreted across the state
  • 7 large volumes of data; very cumbersome
  • Be glad we have PC’s!
• TWDB Contract Report #2001483395 - 2003
  • Estimated 2.7B acre-feet brackish water in place
  • Good report, but...
  • Regional in scope
  • Limited in areal extent
  • Generalized hydrologic parameters
  • Original data not public
BRACS Background

• Funded by the 81st legislature in 2009
• Mission is to:
  • Map and characterize brackish aquifers
    • Geophysical well logs and other available data
  • Develop parameter-screening tools
  • Develop replicable groundwater flow models
• Purpose
  • Assist communities assess viability of resource
  • Not a substitute for specific site evaluation
BRACS Projects

• Pecos Valley
  • Report published June 2012
  • Laid foundation for methods, sources, datasets
  • Available on TWDB website
• Gulf Coast Aquifer
  • Corpus Christi ASR Conservation District
  • Completed March 2012
• Queen City - Sparta Aquifer
  • Atacosa and McMullen counties
  • Final review in process
• Upper Coastal Plain, Central Texas
  • Centered around Gonzales County
  • Carrizo – Wilcox aquifer is part of the study area
  • In process
• Gulf Coast Aquifer
  • Lower Rio Grande Valley
  • In process
Referenced Study Areas

Study Areas
Complete
- Pecos Valley
- Gulf Coast, Corpus Christi ASR

In Progress/Ongoing
- Sparta and Queen City, Atascosa and McMullen Co
- Upper Coastal Plain, Central
- Gulf Coast, Lower Rio Grande Valley

Proposed
- Blaine
- Edwards-Trinity Plateau
- Dockum, North
- Dockum, South
- Upper Coastal Plain, Southwest
- Gulf Coast, Central
- Gulf Coast, South
BRACS Deliverables

• Dataset construction (database, GIS) of project information
• Well data (water, oil/gas) collection for interpretation
  • 43,737 data records to date
• Aquifer properties compilation
• Map of aquifer extent to 10,000 mg/L TDS
• Water volume calculation
• Each aquifer may require unique analysis based on data availability and local hydrogeology
• Provide *all* information to interested stakeholders
Well Control

• Lots of well control!!
  • Not always sure what you need until you need it

Sources
• Bureau of Economic Geology
• Texas Railroad Commission
• Texas Water Development Board
• Texas Commission on Environmental Quality
• Others

Source: Pecos Valley Aquifer Project
Geophysical Well Logs

- Sensor packs pulled up the well bore on wire
- Most common “tool” types
  - Spontaneous potential
    - Electrochemical between drilling mud and formation
  - Gamma Ray
    - From natural radioactive decay
    - Generally higher in clays/shales, lesser in sands
  - Resistivity
    - Long – represents the formation chemistry
    - Short – represents the mud filtrate chemistry
- TWDB Report 343 for further information
Interpretation Uses

- Lithology
  - Sand thickness
  - Clay thickness
  - Net sand calculation
  - Water volume calculation

- Stratigraphy
  - Formation vertical extent
  - Formation lateral extent
  - Formation sand content
  - Correct aquifer assignment of water quality and aquifer properties

Source: Sparta – Queen City Aquifer Project
# Database Entry

## Lithologic Description

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Source: BRACS Database
GIS Point Depth Control

Upper Coastal Plain
Wells defining Wilcox bottom
Surface outcrops shown

Source: Carrizo – Wilcox Aquifer Project
GIS Surface Control

Upper Coastal Plain
Wilcox top
Surface Raster

Source: Carrizo – Wilcox Aquifer Project
Apply GIS Raster Math – Pecos Valley

Source: Pecos Valley Aquifer Project
Cross Section Generation for GIS

Source: Pecos Valley Aquifer Project
Gather More Data

- Aquifer and Well Test Data
  - Well yield
  - Transmissivity
  - Storativity
- Water Quality Data
  - Primarily TDS for this study
  - Bias is towards lower TDS

Source: Carrizo – Wilcox Aquifer Project
Now Tie Measured TDS to Log Data

Source: Gulf Coast Aquifer Project, Corpus Christi ASR
Bring it Back Together in GIS

Source: Pecos Valley Aquifer Project
And Now Get to Volumes

• Apply known (or estimated) values
  • Control location
  • Formation thickness
  • Percent sand
  • Storativity
  • TDS

• Pecos Valley Results
  • 15M acre-feet (<1,000 mg/L)
  • 46M acre-feet (1,000 – 2,999 mg/L)
  • 39M acre-feet (3,000 – 9,999 mg/L)
  • 1M acre-feet (>10,000 mg/L)
BRACS Summary

- Detailed brackish groundwater resource evaluation
- BRACS project deliverables available on TWDB website
- Geophysical well log files available upon request
- Contract reports and deliverables available on TWDB website
- All in support of the State Water Plan