Status Report on the Hydrogeologic Framework

Groundwater TAC Meeting
Columbia, S.C.
March 26, 2019

Joe Gellici - Hydrologist
Land, Water and Conservation Division
S.C. Department of Natural Resources

AGENDA

1. Introductory Remarks and Roll Call

2. Status Report on the Hydrogeologic Framework – Joe Gellici (DNR)

3. Status Report on the Groundwater Flow Model – Bruce Campbell (USGS)

4. Discussion – Campbell, B.G., and Coes, A.L., eds., 2010, Groundwater availability in the Atlantic Coastal Plain of North and South Carolina: U.S. Geological Survey Professional Paper 1773, 241 p., 7 pls.

   Let's focus our discussion on Chapter 3 of the report: *"Simulation of Groundwater Flow in the Atlantic Coastal Plain, North and South Carolina and Parts of Georgia and Virginia, Predevelopment to 2004"*

5. Discussion – Model Scenarios

6. Update on the Planning Process Advisory Committee – Andy Wachob (DNR)

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National Geological and Geophysical Data Preservation Program

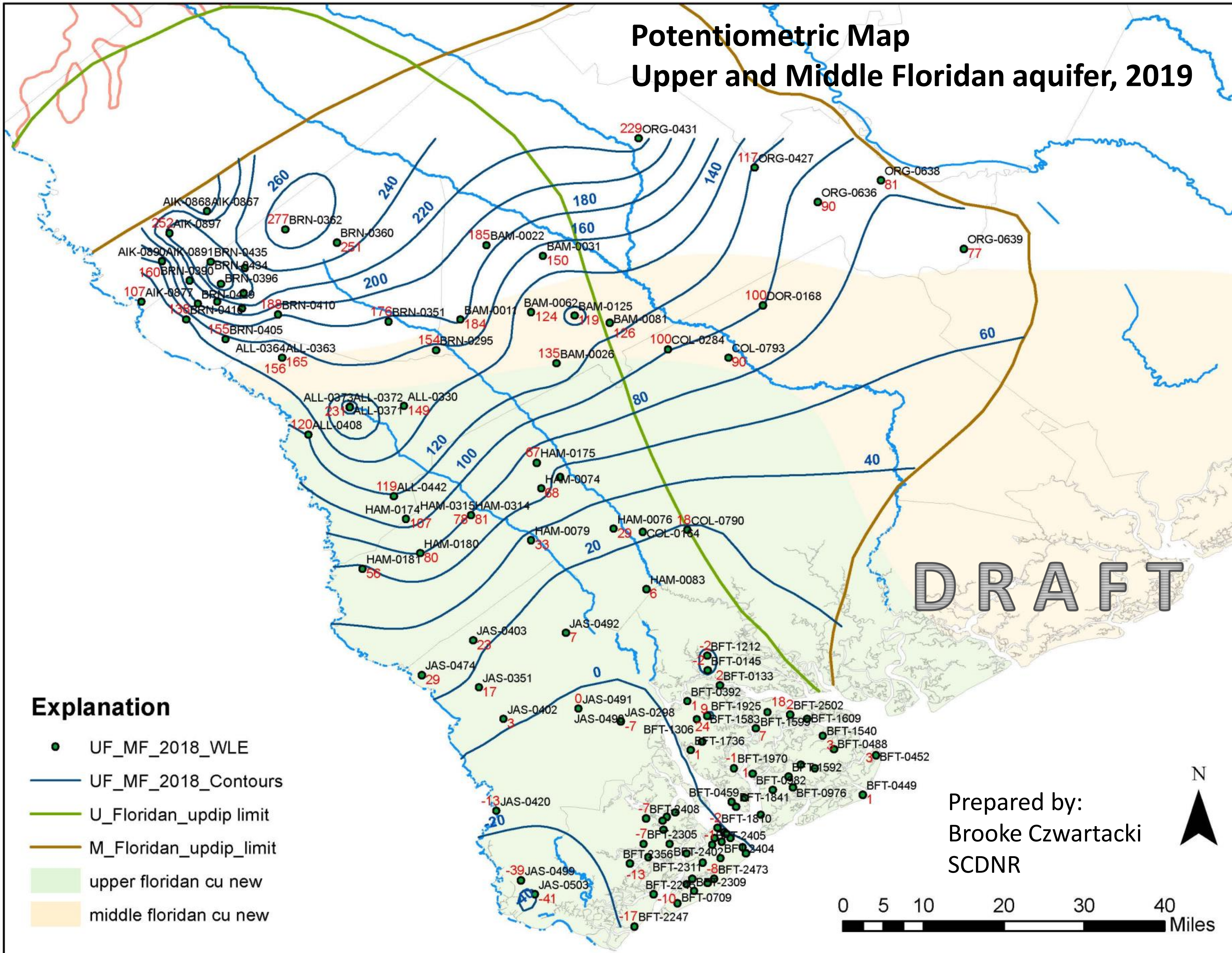
New project proposal – SC Hydrogeologic Framework Project

The goal of this project is to make the Hydrologic Framework data more accessible to future Geology and Hydrology staff, and to other stakeholders.

The tasks of this proposed project are to:

1) Convert Adobe Illustrator files of Hydrogeologic Framework cross-sections (which are graphical only) to data-driven templates using the Strater software.
2) Develop the Hydrogeologic Framework into a commonly used and accessible GIS-based database.
3) Make Hydrogeologic Framework accessible to the public with a map-based web application.

Project funding decisions will be announced week of April 29, 2019



Potentiometric Map
Upper and Middle Floridan aquifer, 2019
DRAFT
Explanation
UF_MF_2018_WLE
UF_MF_2018_Contours
U_Floridan_updip limit
M_Floridan_updip_limit
upper floridan cu new
middle floridan cu new
Prepared by:
Brooke Czwartacki
SCDNR
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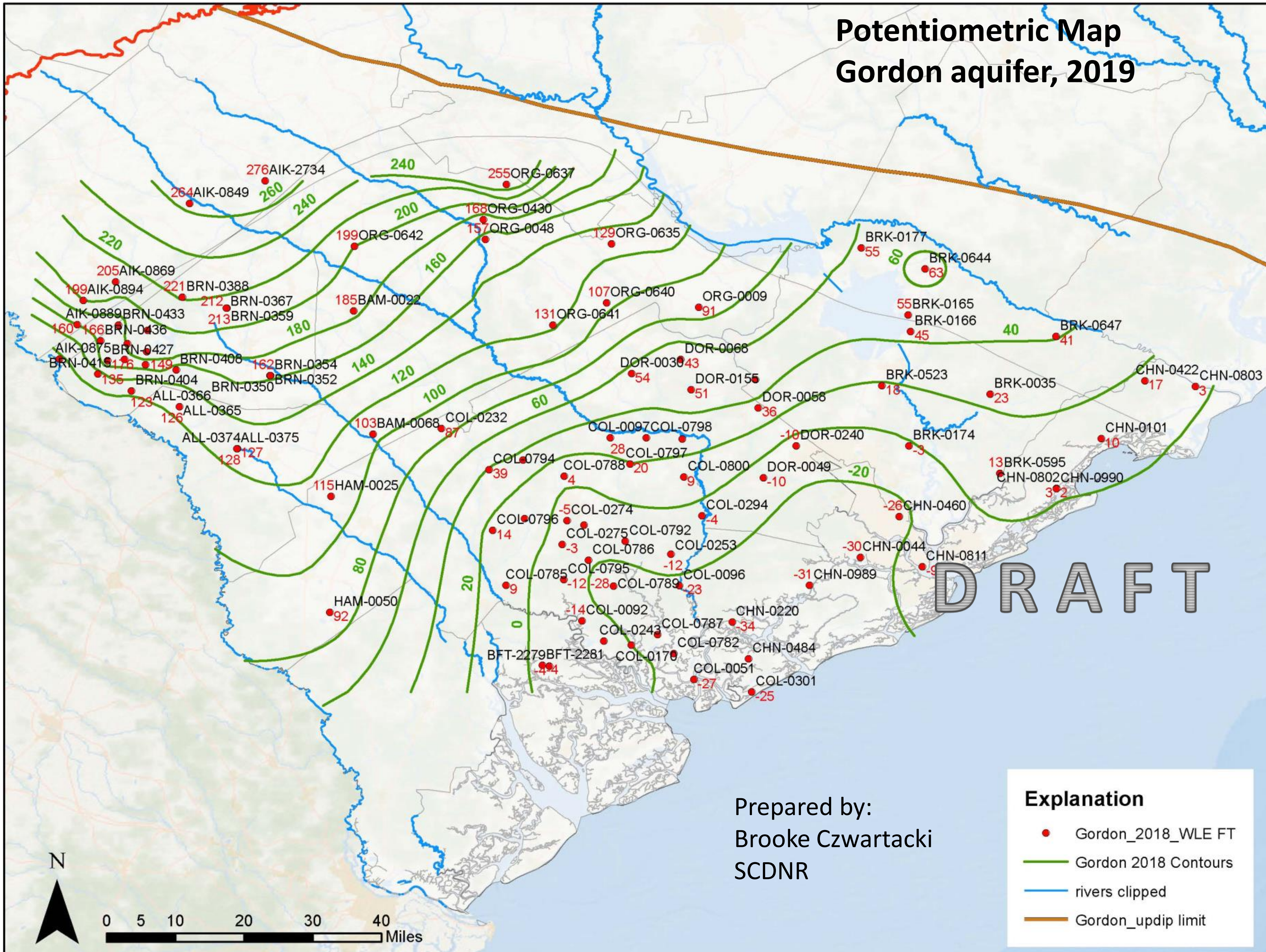
Potentiometric Map
Gordon aquifer, 2019
DRAFT
Prepared by:
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Explanation
Gordon_2018_WLE FT
Gordon 2018 Contours
rivers clipped
Gordon_updip limit
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Miles
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264AIK-0849
255ORG-0637
168ORG-0430
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212BRN-0367
213BRN-0359
185BAM-0022
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131ORG-0641
ORG-0009
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BRK-0166
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BRK-0647
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166BRN-0436
AIK-0875BRN-0427
BRN-0418
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BRN-0404
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DOR-0030
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DOR-0155
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BRK-0035
23
CHN-0422
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CHN-0803
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DOR-0058
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COL-0232
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28COL-0797
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BRK-0174
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CHN-0101
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CHN-0802CHN-0990
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COL-0275COL-0792
-3
COL-0786
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COL-0782
CHN-0484
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COL-0170
COL-0051
-27
COL-0301
-25

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Groundwater models will be used to investigate the impacts that water management strategies and projects, and climate change have on groundwater systems.

<u>Task 5: Scenarios</u>

A series of six scenarios will be programmed with the updated and groundwater flow model. These scenarios…designed to provide information on the possible effects of changing patterns of groundwater use and (or) changes in future precipitation rates and the subsequent effects on the groundwater levels and stream baseflows of the SC Coastal Plain.

Aiken County Scenarios

SCENARIO 1

Base Case: A “base case” simulation will be established that will be comprised of pumping existing wells at their reported 2015 withdrawal rates out to year 2050.

SCENARIO 2

Base Case Plus 0.5 percent Annual Increase: The 2015 withdrawal rates will be increased by 0.5 percent per year to 2050. This scenario will also include any planned future wells and their assumed withdrawal rates.

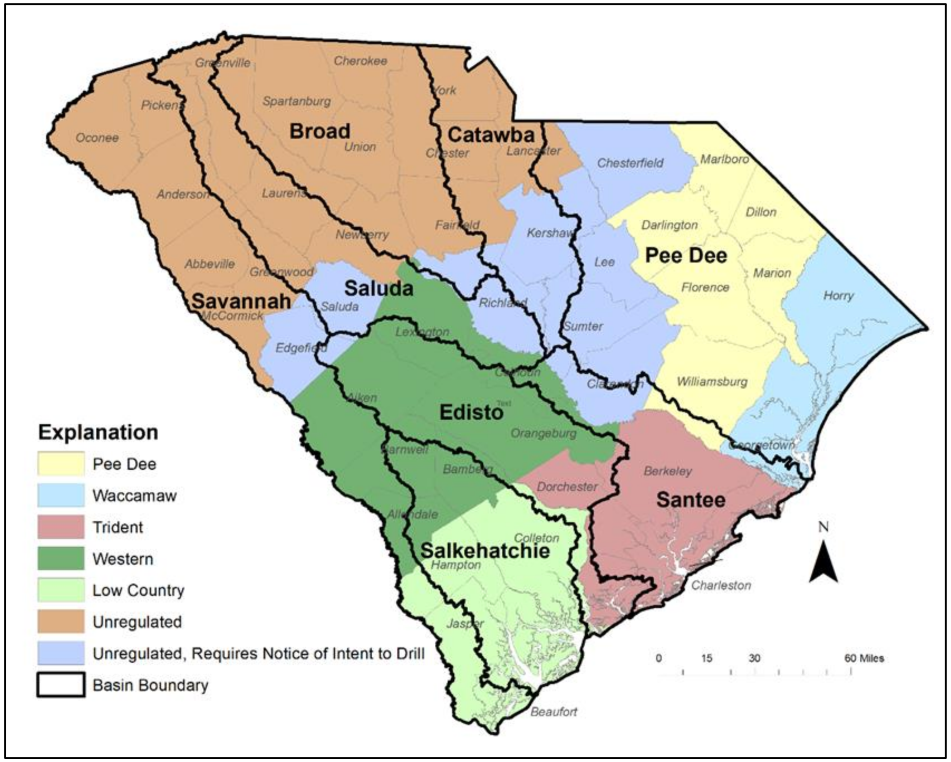
SCENARIO 3

Drought: The effect of a 10-year drought will be simulated for the years 2020-2030 by reducing the annual average recharge rates by 5 to 10 percent.

SCENARIO 4

Agricultural Withdrawals Increase: The effect of withdrawals by anticipated increases in agricultural pumping in the County will be simulated by adding 20 new irrigation wells in the study area.

How will Technical Advisory Committees in Capacity Use Areas work with River Basin Councils?



<u>Capacity Use Areas that overlie the Edisto River Basin</u>

1. **Low Country Capacity Use Area**
2. **Trident Capacity Use Area**
3. **Western Capacity Use Area**

<u>Capacity Use Areas that overlie the Pee Dee River Basin</u>

1. **Pee Dee Capacity Use Area**
2. **Waccamaw Capacity Use Area**

<u>Capacity Use Areas that overlie the Salkehatchie River Basin</u>

1. **Low Country Capacity Use Area**
2. **Western Capacity Use Area**

<u>Capacity Use Areas that overlie the Saluda River Basin</u>

1. **Western Capacity Use Area**

<u>Capacity Use Areas that overlie the Santee River Basin</u>

1. **Pee Dee Capacity Use Area**
2. **Trident Capacity Use Area**
3. **Waccamaw Capacity Use Area**
4. **Western Capacity Use Area**

<u>Capacity Use Areas that overlie the Savannah River Basin</u>

1. **Low Country Capacity Use Area**
2. **Western Capacity Use Area**

How do we quantify groundwater availability in the State?

TEXAS APPROACH:

A key part of joint planning is determining a "desired future condition" (DFC) for each aquifer.

A DFC is a long-term management goal for each aquifer. Some examples include:

1) Water levels in the Edwards aquifer will not decline more than 100 ft in 50 years
2) Water quality in the Ogallala aquifer will not be degraded below 1000 mg/l
3) 50% of the water storage in the North Plains aquifer will be available in 50 years

Once the DFC has been determined for each aquifer in the district, the Texas Water Development Board determines the "modeled available groundwater" (MAG) based on the desired future condition.

MAG is defined as the amount of groundwater that can be pumped, on an average annual basis, that will achieve a desired future condition (DFC).

As such, groundwater conservation districts (GCDs), working collectively within each groundwater management area, define groundwater availability for the regional water planning process.

Regional water planning groups must use MAG volumes for groundwater availability when developing water plans.

How do we quantify groundwater availability in the State?

Safe Yield – Inducing recharge and reducing discharge
Sustainable Development -

The World Commission on Environment and Development (1987), better known as the Brundtland Commission, defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

"Water resources cannot be developed without altering the natural environment; thus, one should not define basin yields, either as safe or sustainable, without carefully explaining the assumptions that have been made about the acceptable effects of ground water development on the environment."

The Journey from Safe Yield to Sustainability
by William M. Alley and Stanley A. Leake

Provided by Clay Duffie, June 2018

Consideration for the TAC as criteria for determining "what constitutes negative impacts of over-drafting", and potential criteria for State Water Plan.

The following could be considered:

1. Unacceptable levels of drawdown in the aquifer
2. Pumping that would exceed the safe yield of the aquifer and create a condition of overdraft, depletion, or negative impact to the aquifer
3. Reductions in pumping capacity/ lowering of water levels at other water supply wells in the area
4. Water quality degradation, including salt water intrusion and the movement of any contaminant plumes
5. Land subsidence
6. Reductions in baseflow to surface water bodies and impact on groundwater-supported ecosystems

How low groundwater levels can go before these consequences occur is currently unknown. Therefore, the effects that pumping has on the resource, environment, and on other users must be monitored so groundwater can be managed to prevent such side effects from permanently damaging the resource and from posing a threat to the public's health and well-being.