Proposed Desired Future Conditions for Aquifers in GMA 8 and Red River GCD

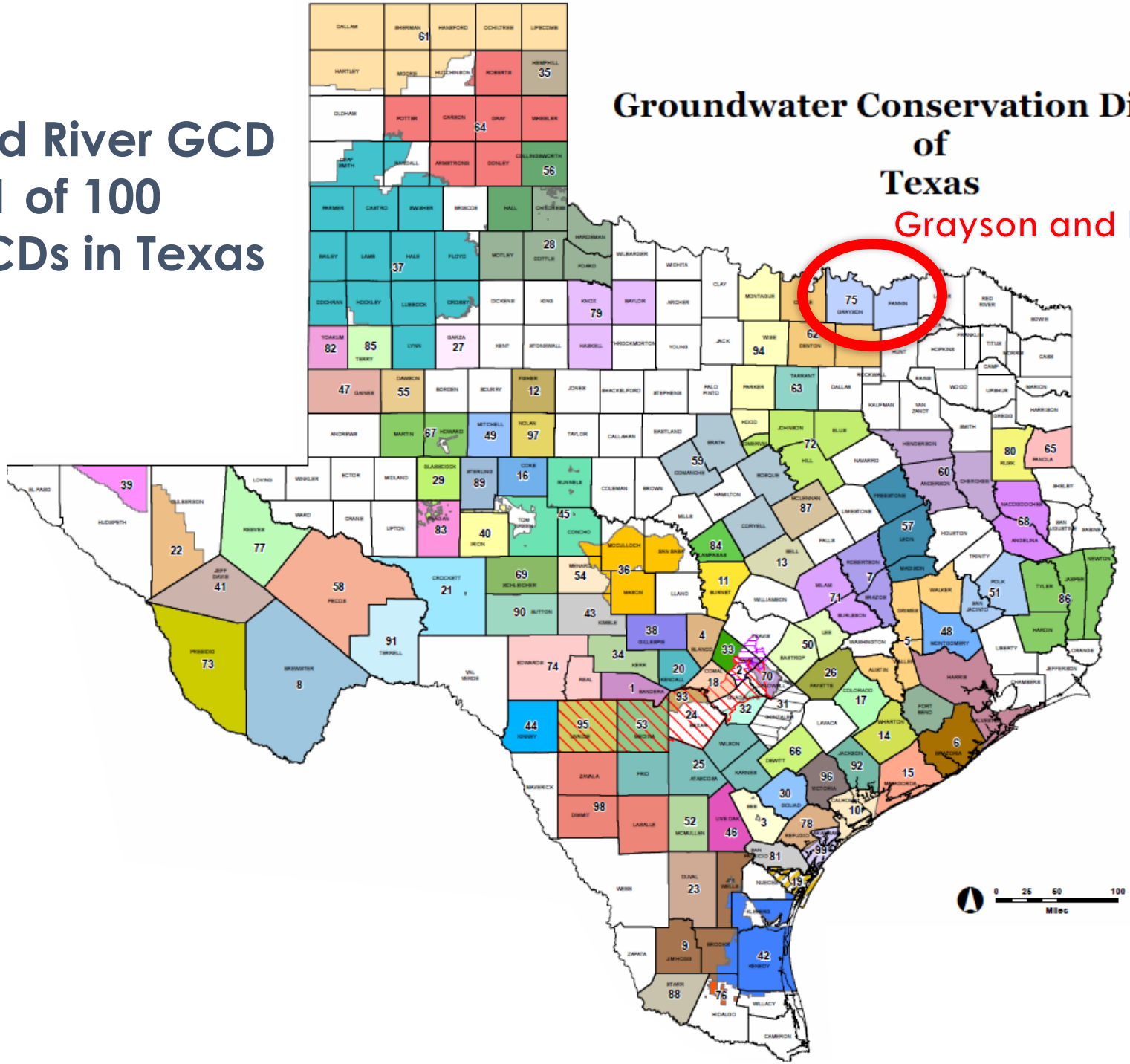
June 9, 2016

Public Hearing

Background on Red River GCD

- Fannin and Grayson Counties included in the North Texas Priority Groundwater Management Area ("PGMA")
  - This PGMA was designated by Texas Commission on Environmental Quality ("TCEQ") in 2009
  - PGMA designation occurs when the area experiences, or is expected to experience "critical" groundwater declines
  - Required the counties to coordinate with their legislators to create a GCD or have TCEQ create a GCD for them
- Red River GCD created by Texas Legislature in 2009

Red River GCD is 1 of 100 GCDs in Texas



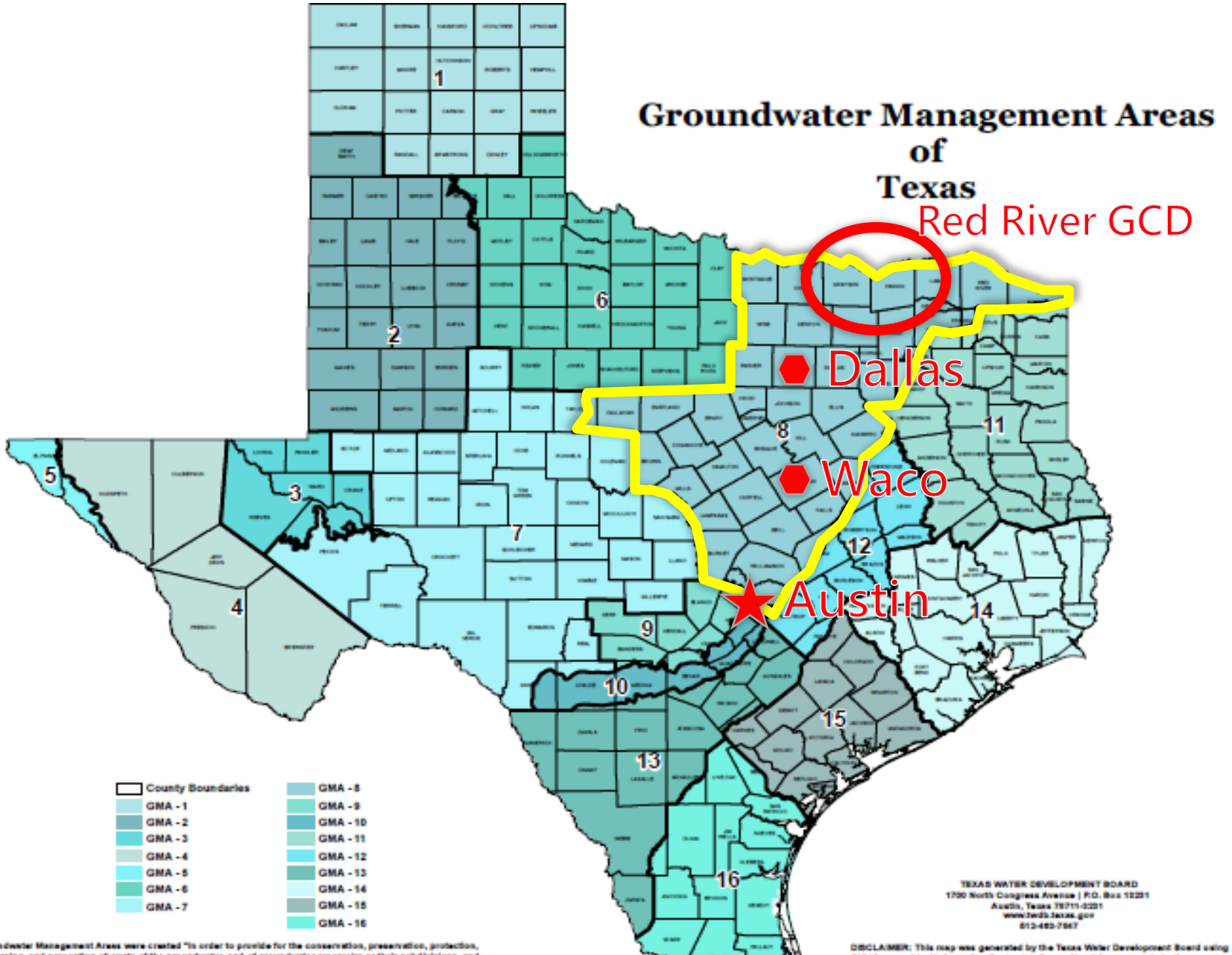
Red River GCD Generally

- Governed by:
  - Enabling Act passed by Texas Legislature in 2009 (Ch. 8859 of Texas Special Districts Local Laws Code)
  - Chapter 36 of Texas Water Code
    - Amended each legislative session since Ch. 36 created in 1995; anticipate continued revisions by Texas Legislature
  - Other general statutes governing governmental entities in Texas
    - Such as conflict of interest (Tex. Gov't Code Ch. 176) and Public Information Act (Tex. Gov't Code Ch. 552) statutes

Requirement to Develop DFCs

- Chapter 36 of Texas Water Code requires GCDs to participate in joint planning with other GCDs for the common aquifers in designated planning regions
  - Planning regions are called "Groundwater Management Areas"
  - 16 Groundwater Management Areas in Texas
  - Red River GCD is in Groundwater Management Area 8 ("GMA 8")

Joint Planning – GMAs map



Joint Planning

- Required to establish Desired Future Conditions ("DFCs") for the aquifers in GMA 8
  - Must be done in conjunction with 10 other GCDs in GMA 8
  - GMA 8 will adopt DFCs that cover relevant aquifers in GMA 8
  - Red River GCD will thereafter adopt DFCs, consistent with GMA 8 DFCs, that cover the Woodbine and Trinity Aquifers within Fannin and Grayson Counties

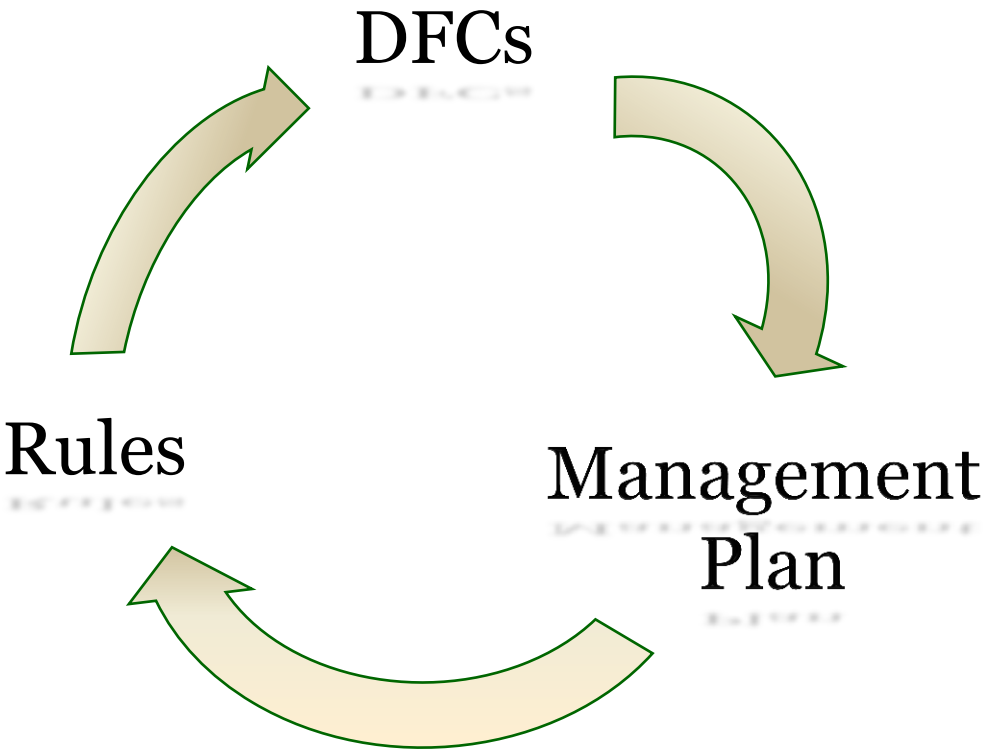
- DFC defined in Ch. 36 as:
  - a quantitative description, adopted in accordance with Section 36.108, of the desired condition of the groundwater resources in a management area at one or more specified future times (such as pumping level in 2070)

Joint Planning Continued

- Once DFCs are established, a Modeled Available Groundwater ("MAG") value is issued by Texas Water Development Board
  - MAG is the amount of groundwater available for pumping on an average annual basis to achieve the DFC
  - MAG is an important tool to know whether a GCD is on track to achieve the DFC

Significance of DFCs

- Long-term goal of how to manage the groundwater resources
- GCDs incorporate DFCs into Management Plan within 2 years from adoption
- GCDS implement DFCs into rules/regulatory program within 1 year after updating the Management Plan



DFC Considerations

- Aquifer Uses or Conditions
- Supply Needs and Management Strategies
- Hydrological Conditions
- Environmental Impacts
- Subsidence Impacts
- Socioeconomic Impacts
- Private Property Rights
- DFC Feasibility
- Other Relevant Information

A New Standard for Desired Future Conditions per Chapter 36 as amended in 2011

Highest Practicable Level of Groundwater Production

Conservation, Preservation, Protection, Recharging, and Prevention of Waste of Groundwater, and Control of Subsidence

A New Standard for Desired Future Conditions per Chapter 36 as amended in 2011

More pumping

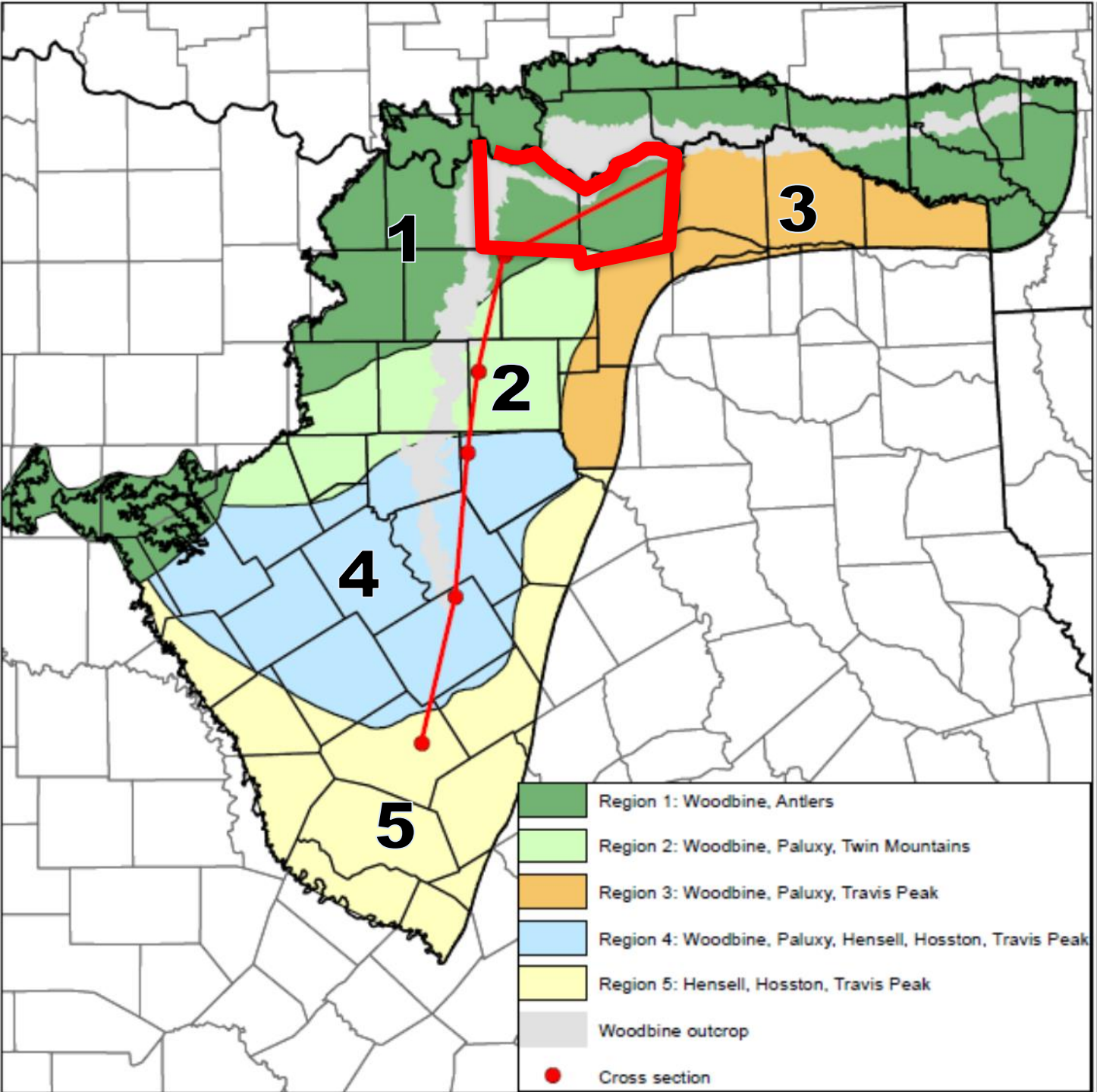
Less pumping

Groundwater Availability Model (GAM)

- What is a Groundwater Availability Model (GAM)
  - A computer model that contains comprehensive information on each aquifer such as geology, aquifer hydraulic properties, pumping, recharge, surface water interaction from rivers and lakes, etc…
  - The GAM is used to make predictions about future water level decline in aquifers based on pumping that is incorporated in the model
- Collectively, GMA 8 has performed ten (10) model runs using the updated GAM in order to better understand the aquifers and how they are impacted by various levels of pumping
- Runs covered a wide range of possible scenarios
  - Stop all future pumping
  - Hold pumping at 2010 levels (referred to as "baseline pumping")
  - Increase pumping above 2010 levels

Run 10 Description

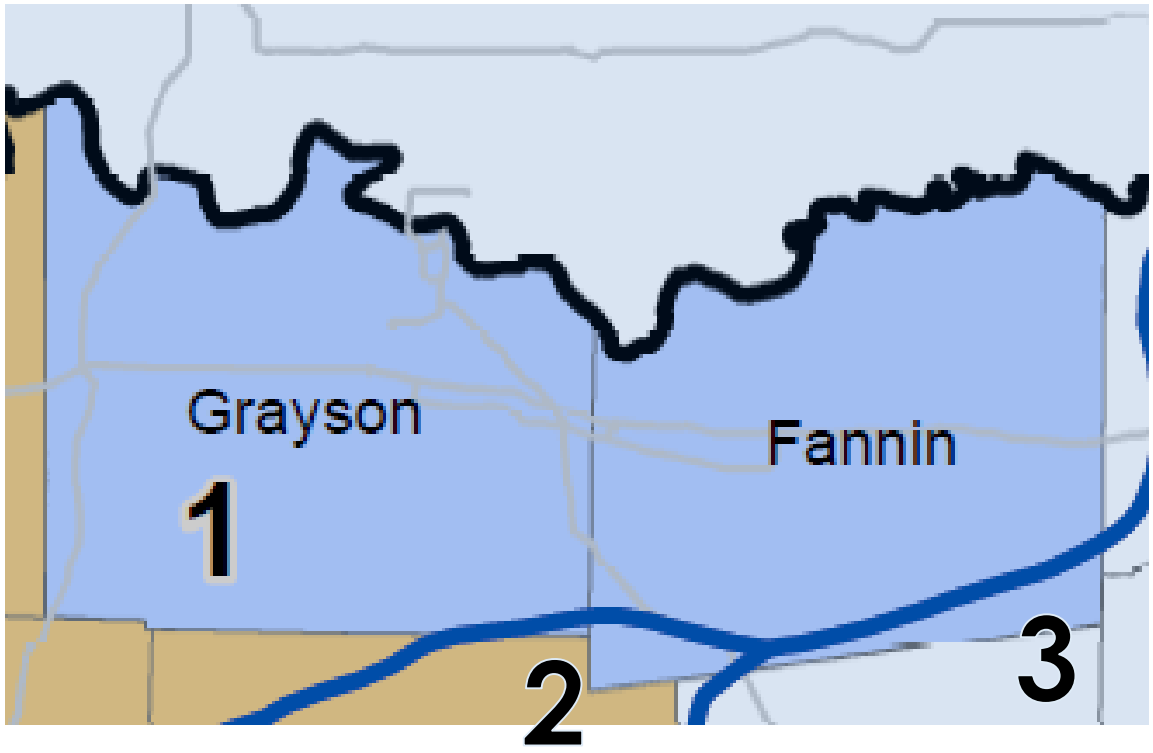
- Used TWDB accepted version of the updated Northern Trinity Woodbine Groundwater Availability Model
- Initial conditions set at modeled water levels on January 1, 2010
- Adjusted pumping amounts per RRGCD Board of Directors guidance as they considered 9 factors
- No changes were made to historical pumping locations in the model – only pumping rates were modified in the runs



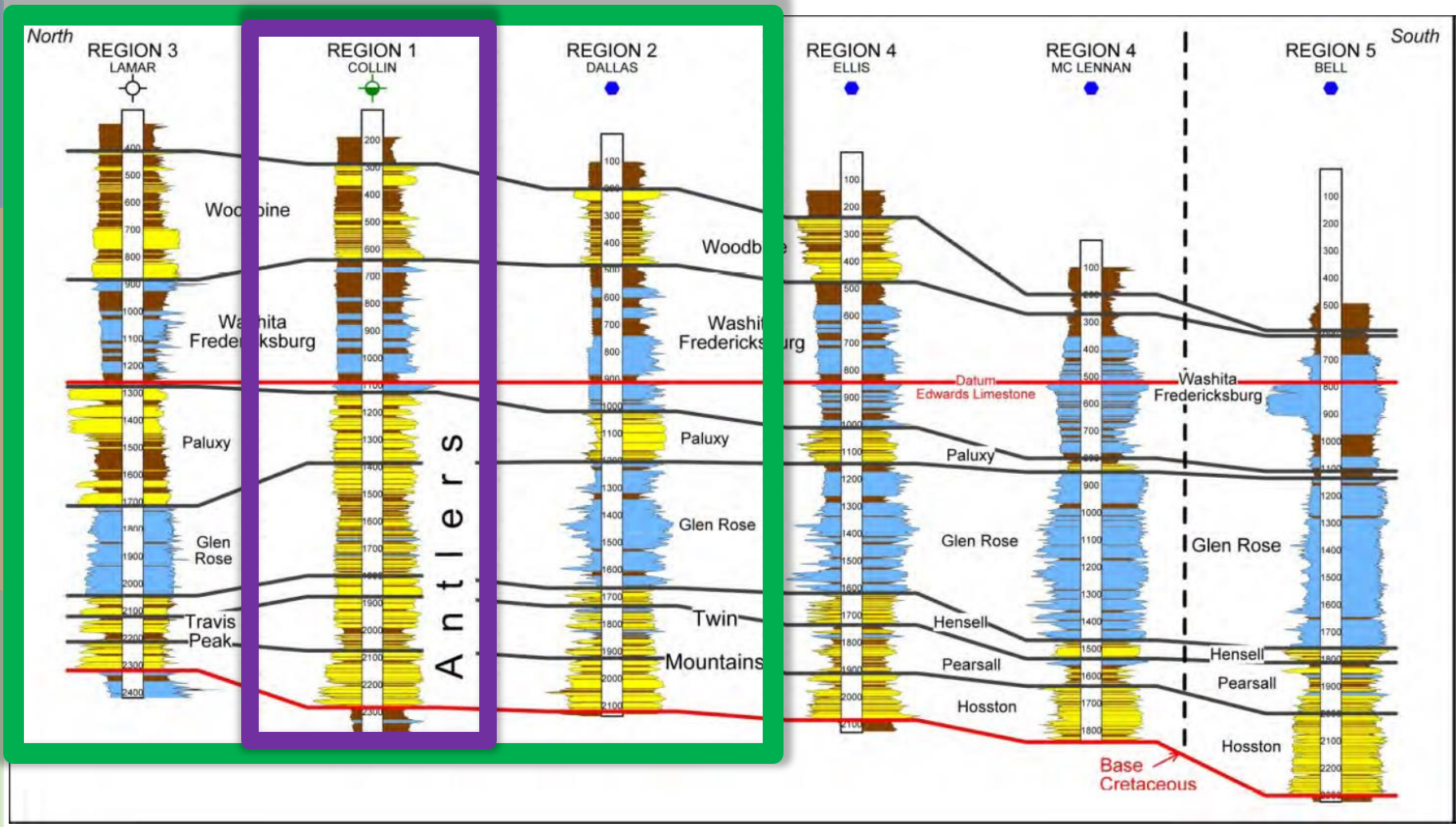
Hydrogeologic Regions in Northern Trinity Aquifer

Hydrogeologic regions are generalized areas defined by stratigraphic and lithologic similarities and aquifer names common to each region.

Hydrogeologic Regions

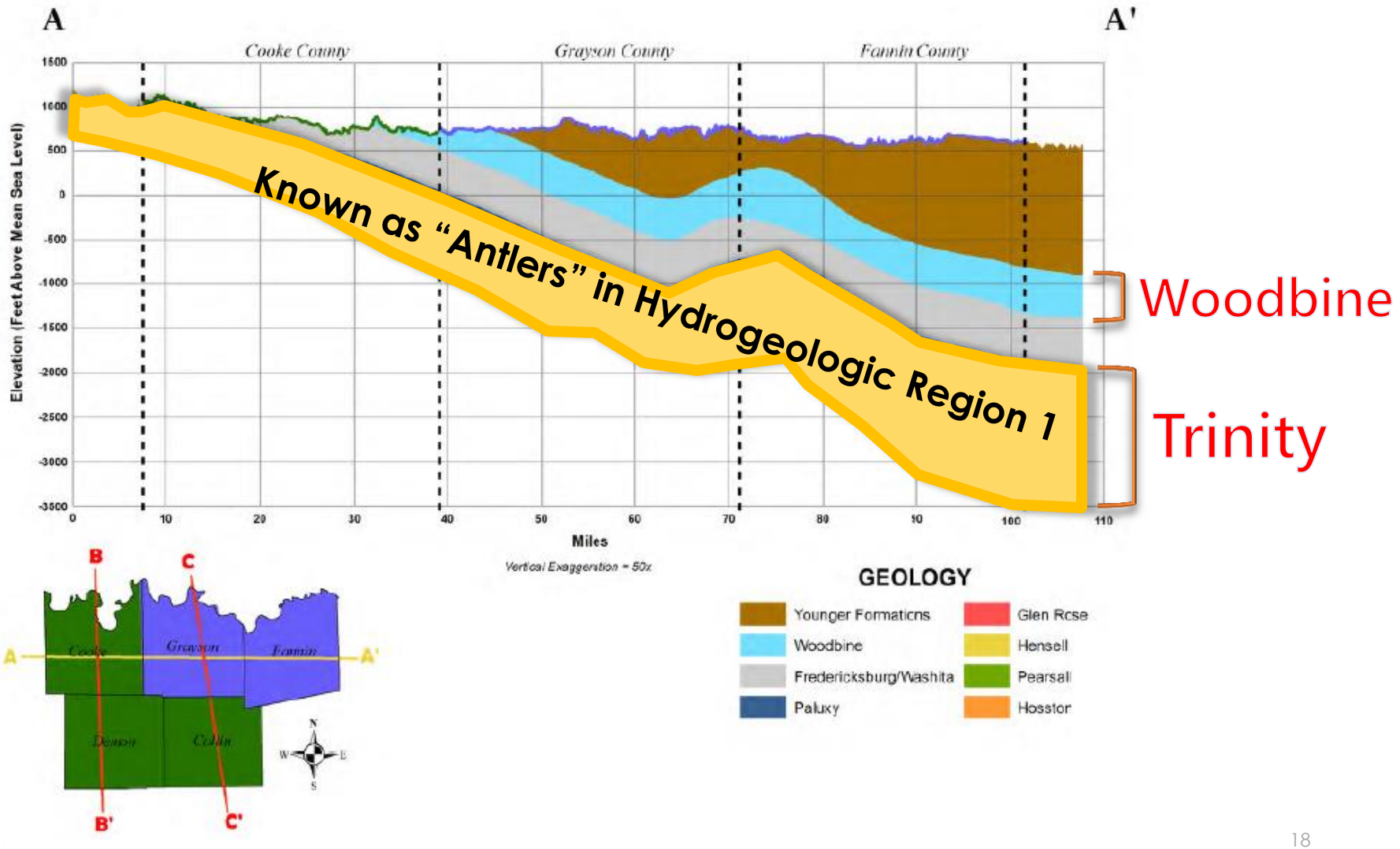


Northern Trinity Aquifer



yellow = greater than 50 percent sandstone
blue = greater than 50 percent limestone
brown = greater than 50 percent shale (very impervious)

Model Layers (Woodbine and Trinity)



Aquifers in Each Region

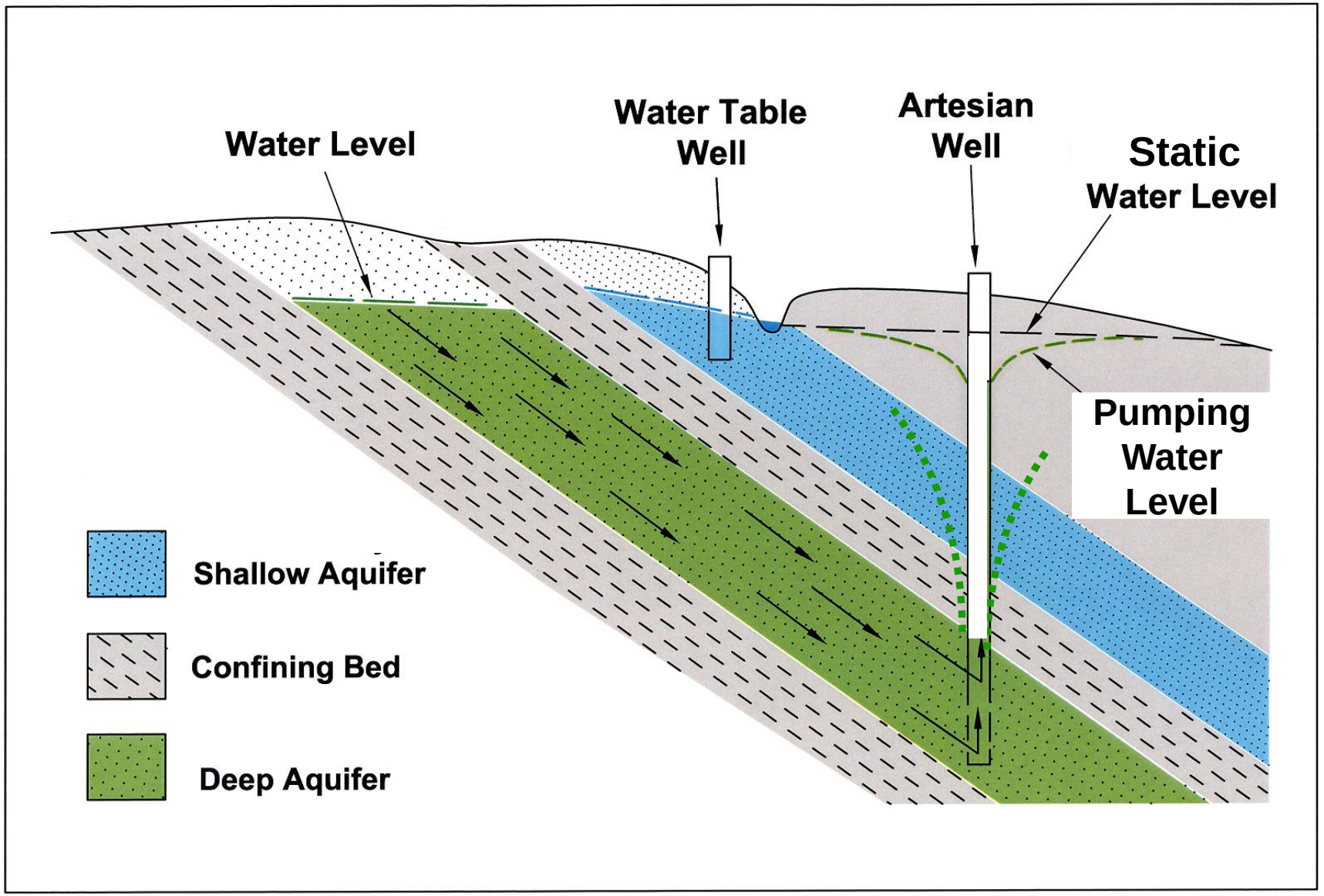
Trinity Aquifer

Model Terminology	Region 1	Region 2	Region 3
Woodbine Aquifer	Woodbine	Woodbine	Woodbine
Washita/ Fredericksburg Groups	Washita/ Fredericksburg	Washita/ Fredericksburg	Washita/ Fredericksburg
Paluxy Aquifer	Antlers	Paluxy	Paluxy
Glen Rose Formation	Antlers	Glen Rose	Glen Rose
Hensell Aquifer	Antlers	Twin Mountains	Travis Peak
Pearsall Formation	Antlers	Twin Mountains	Travis Peak
Hosston Aquifer	Antlers	Twin Mountains	Travis Peak

yellow = sandstone aquifers

(after Kelley, Nov 18, 2015)

Confined and Unconfined aquifers



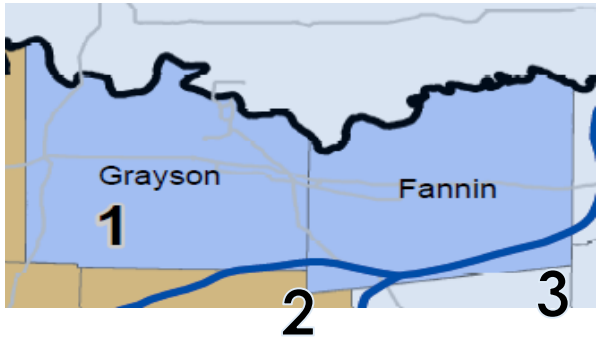
Proposed DFCs

- Cover Woodbine Aquifer and Trinity Aquifer
  - Trinity Aquifer DFCs broken down by aquifer layer
- Used new groundwater availability model ("GAM") to consider impacts
  - 10 different model runs
  - Best available data
  - Data will improve with each 5-year Cycle
- Red River GCD considered all statutory criteria in addition to other important local considerations in establishing DFCs
  - DFCs adopted considering regional and state water plans;
  - project significant surface water resources to be available in area
- GMA 8 adopted Run 10 results as basis for Woodbine and Trinity DFCs
- DFCs calculated and presented by aquifer at four levels
  - Aquifer Wide
  - Hydrogeologic Region
  - Groundwater Conservation District
  - County

RRGCD Run 10 Pumping Amounts

All Values in Acre-Feet per Year Unless Otherwise Noted
MGD = Million Gallons Per Day

Aquifer	Fannin	Grayson
Woodbine	4,924 (4.4 MGD)	7,526 (6.7 MGD)
Paluxy	2,088 (1.86 MGD)	0
Glen Rose	0	0
Twin Mtn	0	0
Travis Peak	0	Not Defined
Antlers	0	10,716 (9.7 MGD)
Total	**7,012 (6.3 MGD)**	**18,242 (16.3 MGD)**



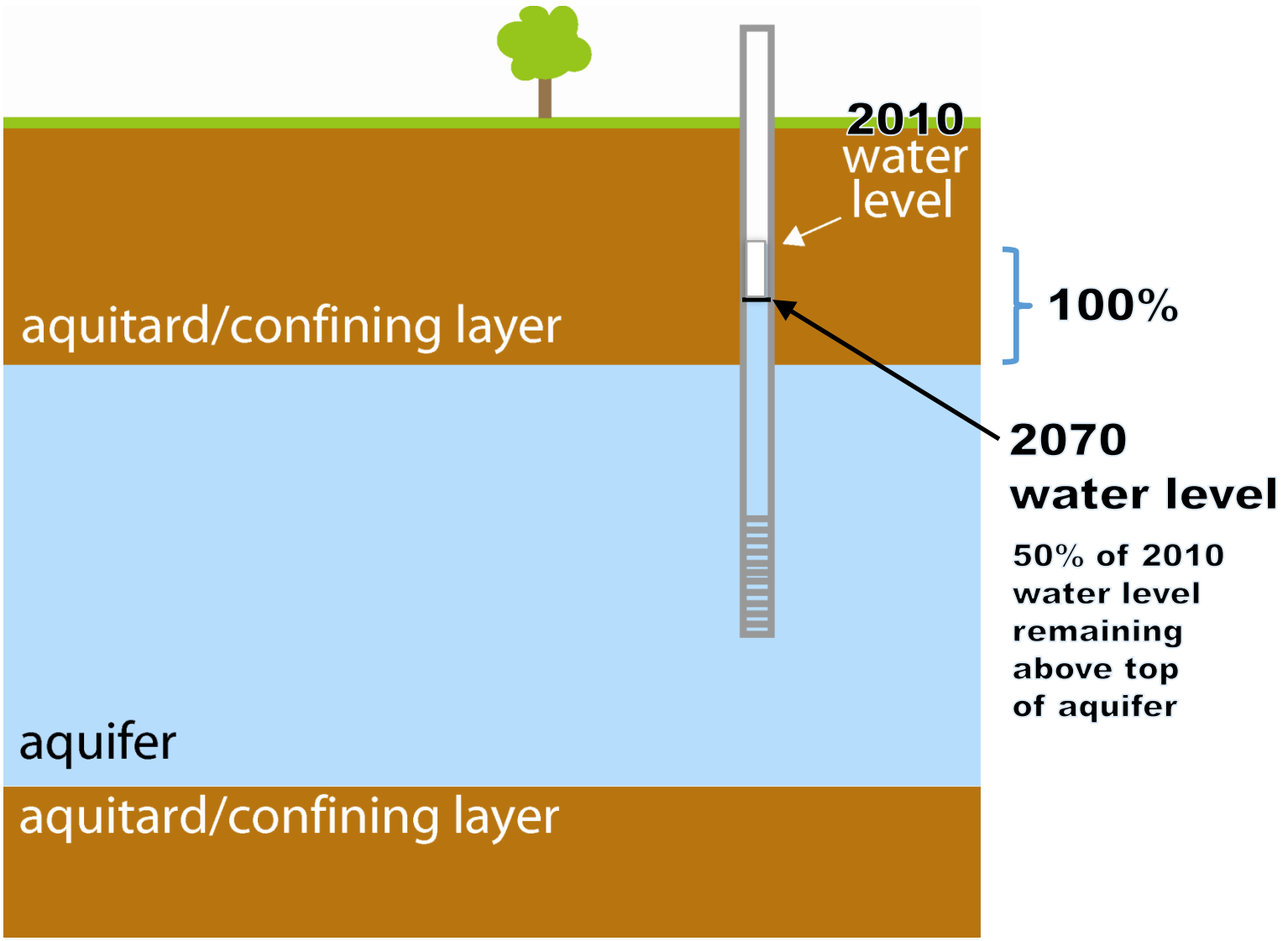
RRGCD Proposed DFCs
Average Drawdown per Aquifer

Values in Feet

Aquifer	Fannin	Grayson
Woodbine	247	160
Paluxy	688	922
Glen Rose	280	337
Twin Mtn	372	417
Travis Peak	269	Not Defined
Antlers	251	348

Note that drawdown projections are on county-wide basis (not site specific) and calculations include outcrop and downdip areas

confined (or “artesian”) aquifer



Run 10 Results (based on Proposed DFCs)
Percent of 2010 Water Level Remaining Above the Top of the Aquifer (Artesian Head)

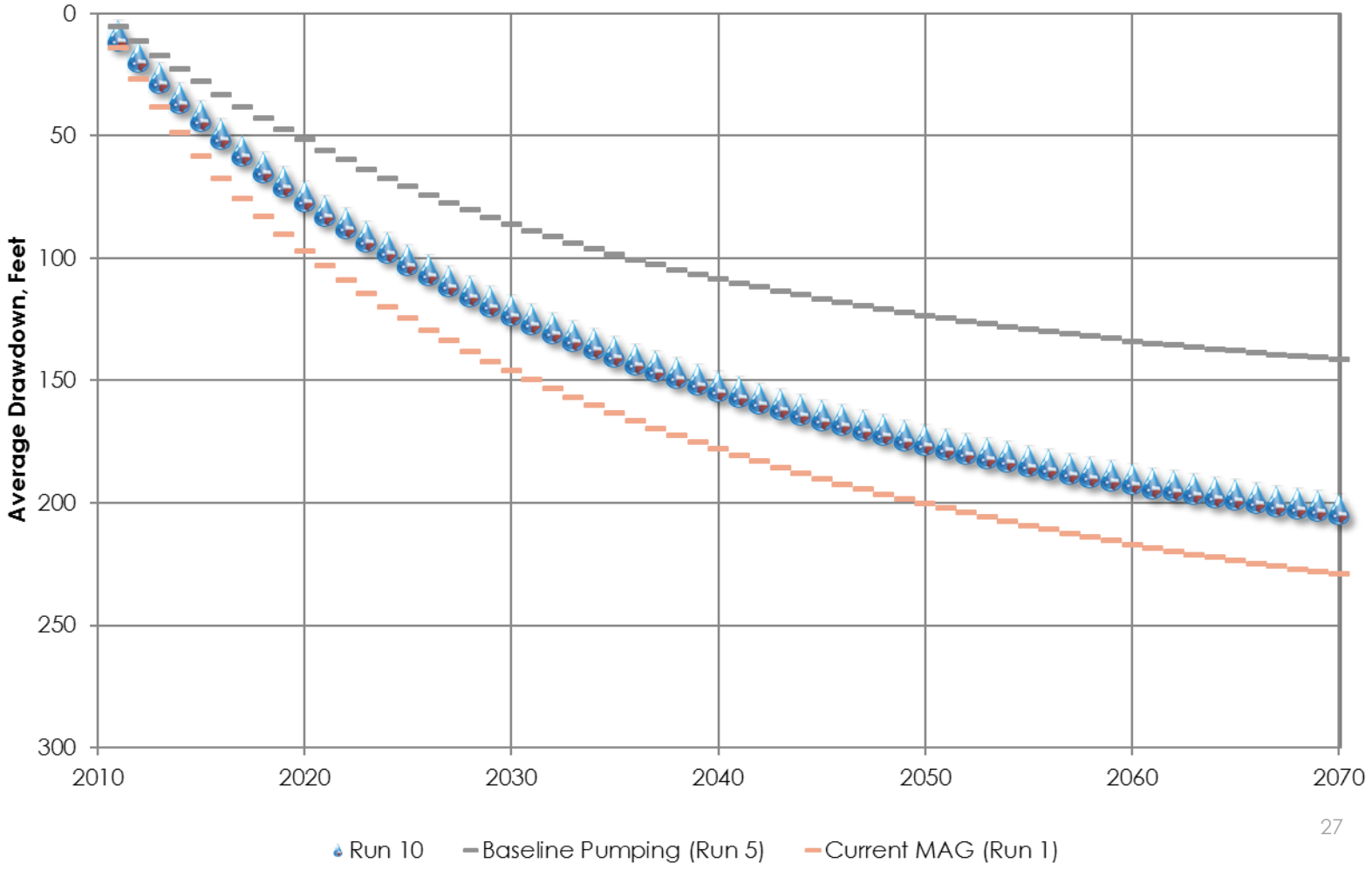
Aquifer	Fannin	Grayson
Woodbine	56%	5%
Paluxy	70%	40%
Glen Rose	89%	83%
Twin Mtn	86%	84%
Travis Peak	92%	Not Defined
Antlers	83%	51%

Values above the top of the aquifer show the projected amount of artesian head still remaining above top of aquifer in 2070 averaged across the county

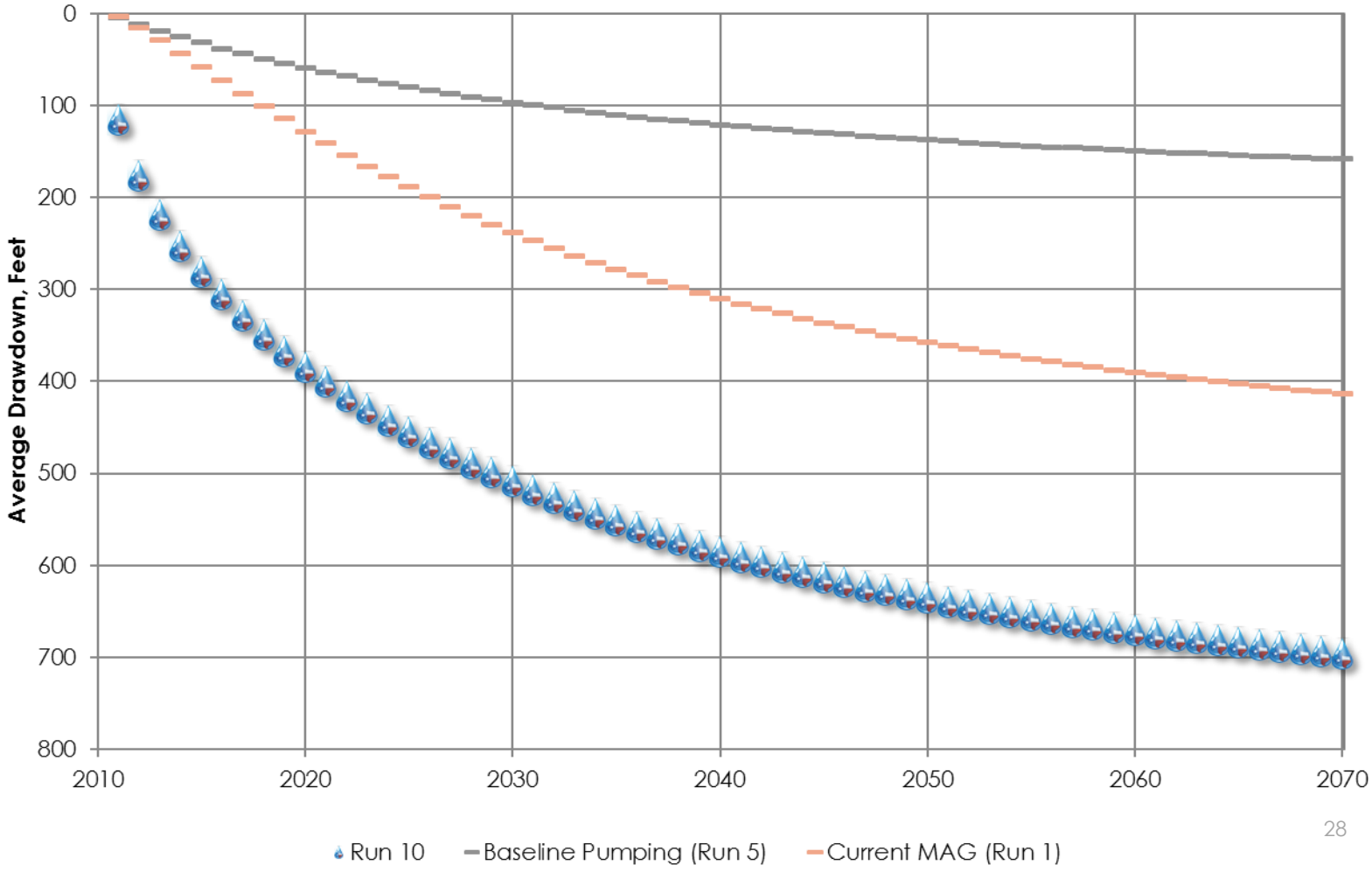
In Reviewing Proposed DFCs:

- Proposed DFCs developed by considering many factors and statutory criteria
  - including baseline pumping and current MAG values
- Reference to baseline pumping means the estimates of groundwater pumping in Fannin and Grayson Counties in 2010
- Reference to Current MAG means MAG issued for Fannin and Grayson Counties from last round of DFC joint planning
  - DFCs last adopted in 2011

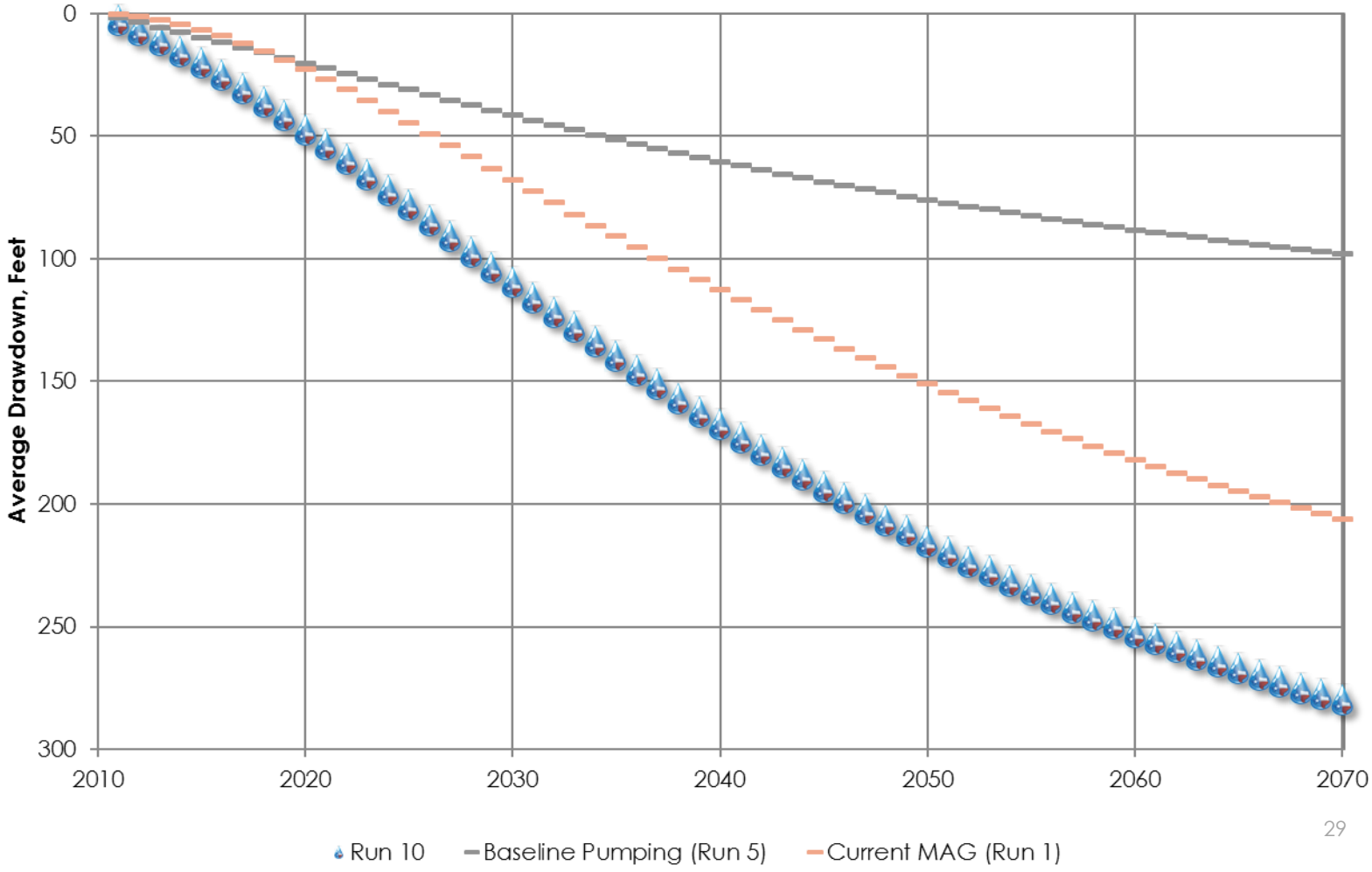
RRGCD Proposed DFCs
RRGCD Average Drawdown - Woodbine



RRGCD Proposed DFCs
RRGCD Average Drawdown - Paluxy

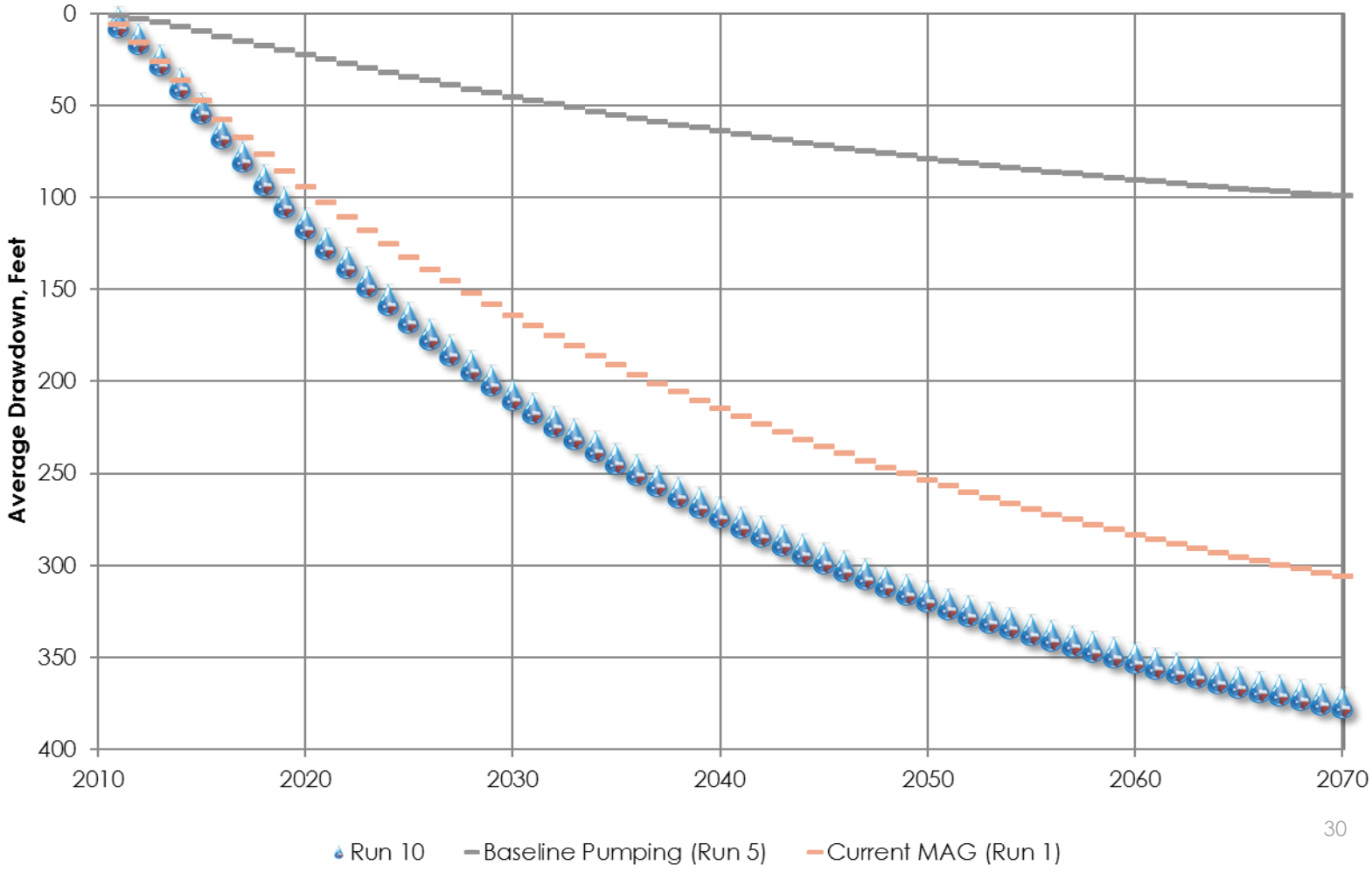


RRGCD Proposed DFCs
RRGCD Average Drawdown – Glen Rose

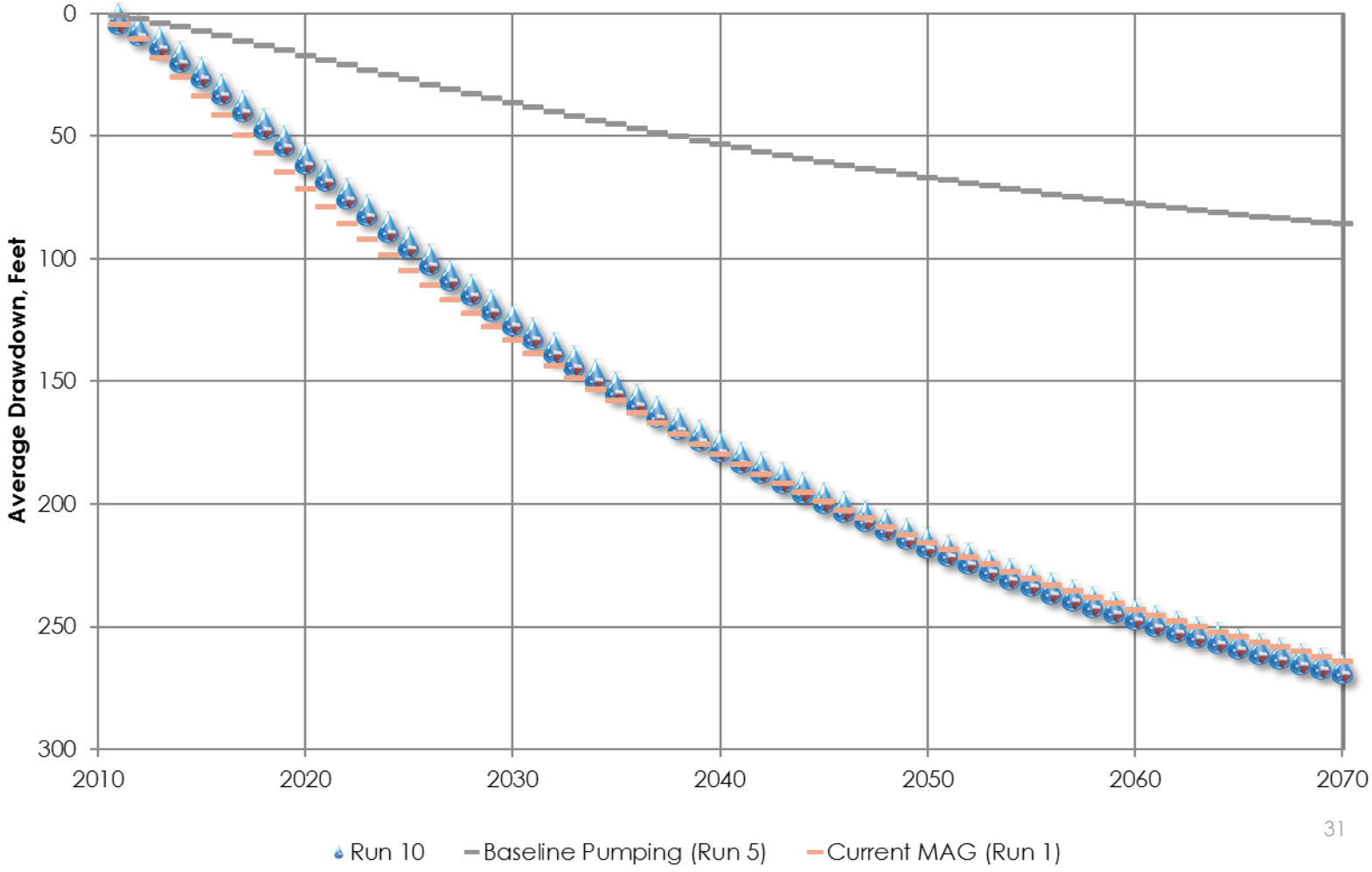


RRGCD Proposed DFCs

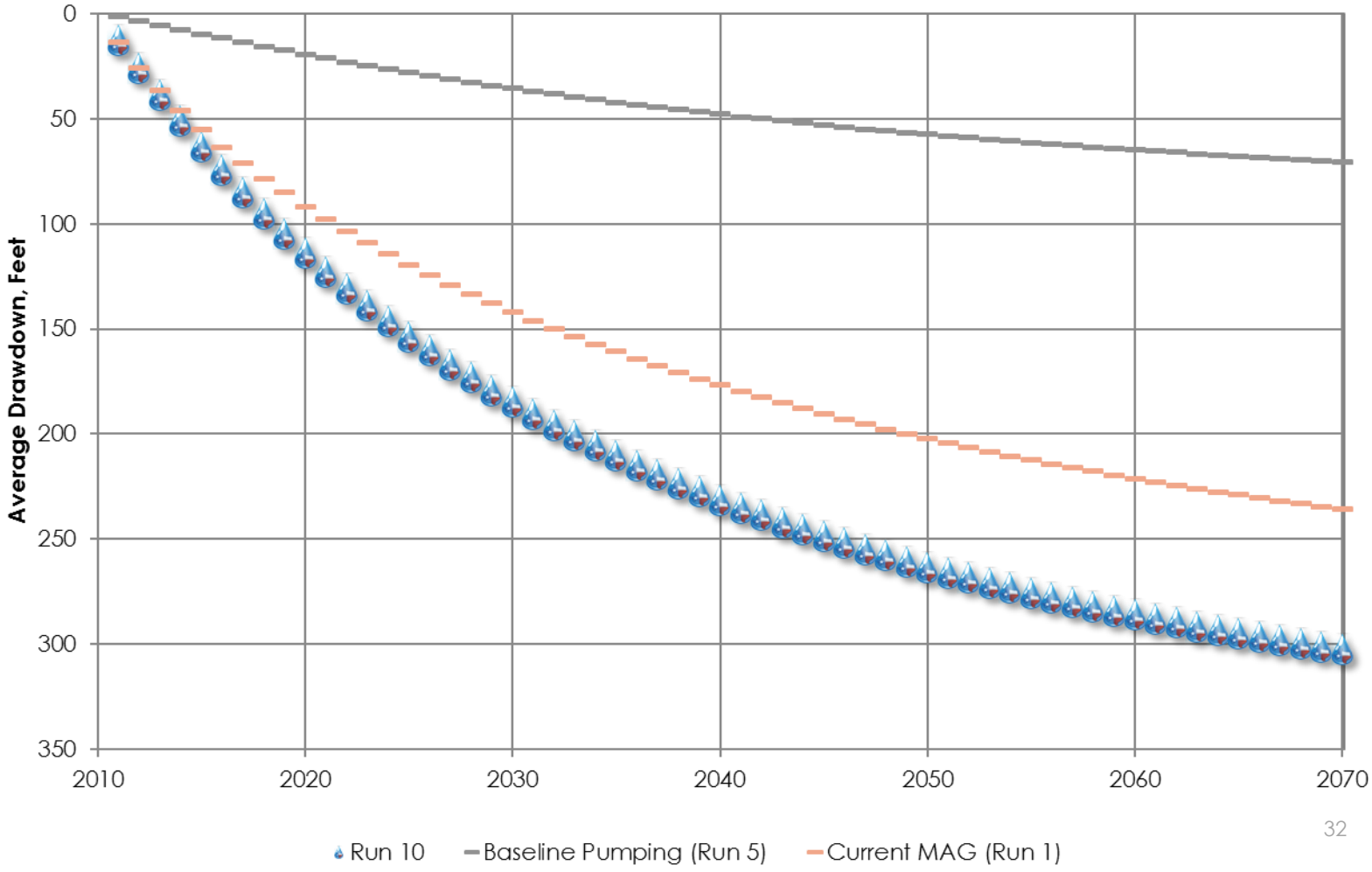
RRGCD Average Drawdown – Twin Mountains



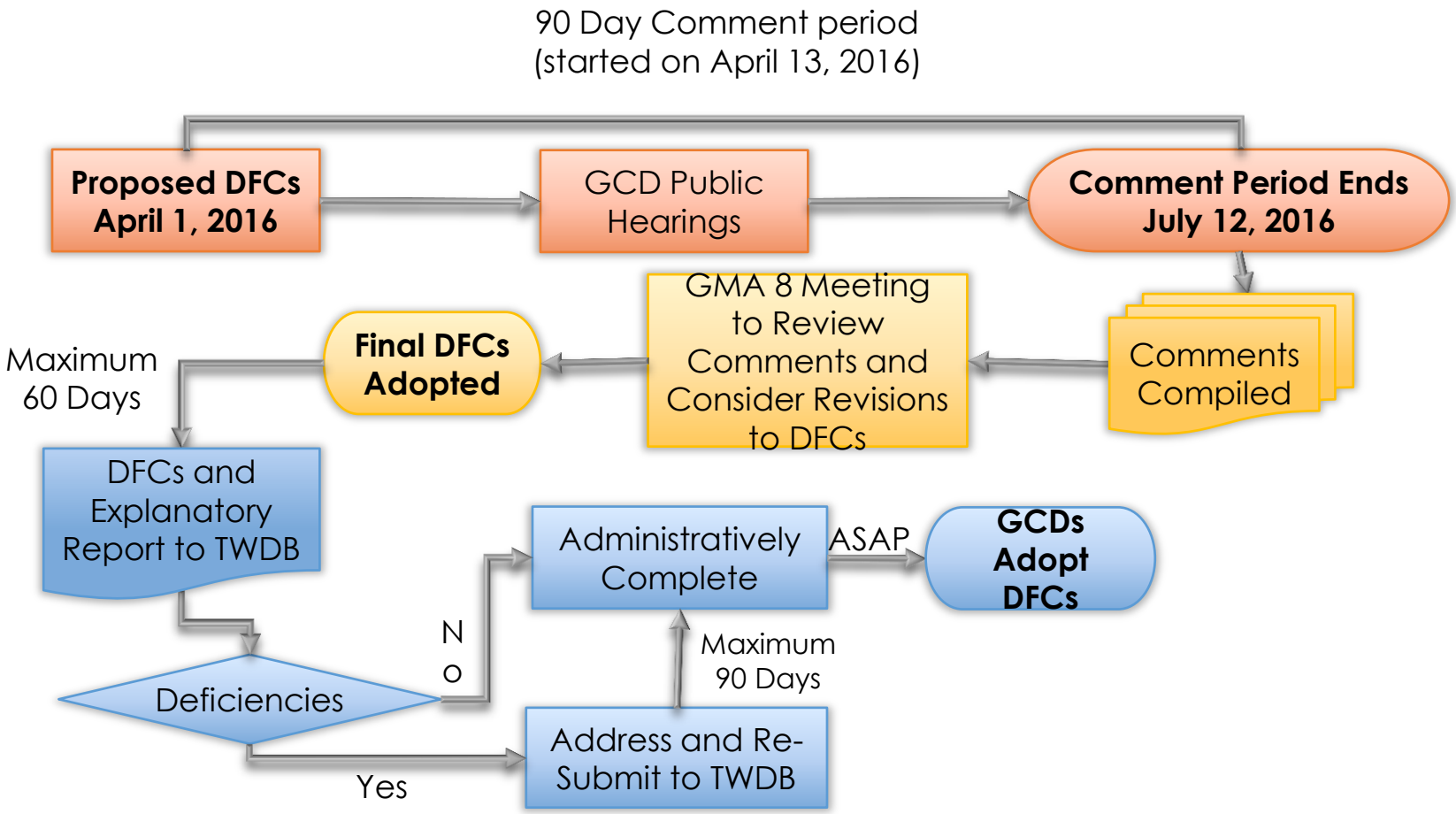
RRGCD Proposed DFCs
RRGCD Average Drawdown – Travis Peak



RRGCD Proposed DFCs
RRGCD Average Drawdown – Antlers



GMA 8 DFC Process Illustrated



Next Steps

- Comment period ends at 5:00 p.m. on July 12, 2016
  - Verbal and written comments accepted at public hearing
  - Written comments accepted through comment period
  - Red River GCD must prepare a summary report of comments
- GMA 8 reconvenes to review comments/summary reports and will adopt DFCs
  - timeline: expected fall 2016
- Red River GCD will thereafter vote to adopt its DFCs
  - timeline: expected late 2016/early 2017

Next Steps

- DFCs are sent to Texas Water Development Board and an official Modeled Available Groundwater ("MAG") number is issued
  - timeline: expected mid-2017
- Red River GCD will revise Management Plan to include new DFCs
  - timeline: expected mid-to-late 2017
- Red River GCD will begin rulemaking process to regulate groundwater withdrawals based on achieving DFC
  - timeline: expected late 2017/early 2018

Next Steps—Next Round of Joint Planning

- Chapter 36 currently requires GCDs to undergo DFC process again in 2020
- Red River GCD will have opportunity to see whether surface water projections were accurate
  - Will also evaluate condition of aquifers to determine if changes are necessary during next round of planning
- Can adjust DFCs as necessary during next round of joint planning
  - occurs every 5 years
  - or earlier if agreed by GMA 8

Questions ?

RRGCD Proposed DFCs
Average Drawdown per Region/Aquifer

Aquifer	Fannin	Grayson	RRGCD	GMA 8
Woodbine	Region 1: 218 Region 2: 668 Region 3: 503	Region 1: 158 Region 2: 654	Region 1: 187 Region 2: 666 Region 3: 503	Region 1: 160 Region 2: 227 Region 3: 144
Paluxy	Region 1: ND Region 2: 671 Region 3: 698	Region 1: ND Region 2: 922	Region 1: ND Region 2: 700 Region 3: 698	Region 1: ND Region 2: 337 Region 3: 131
Glen Rose	Region 1: ND Region 2: 320 Region 3: 257	Region 1: ND Region 2: 337	Region 1: ND Region 2: 322 Region 3: 257	Region 1: ND Region 2: 210 Region 3: 102
Twin Mountains	Region 1: ND Region 2: 372 Region 3: ND	Region 1: ND Region 2: 417	Region 1: ND Region 2: 377 Region 3: ND	Region 1: ND Region 2: 313 Region 3: ND
Travis Peak*	Region 1: ND Region 2: ND Region 3: 269	Region 1: ND Region 2: ND	Region 1: ND Region 2: ND Region 3: 269	Region 1: ND Region 2: ND Region 3: 120
Antlers	Region 1: 251 Region 2: ND Region 3: ND	Region 1: 348 Region 2: ND	Region 1: 304 Region 2: ND Region 3: ND	Region 1: 177 Region 2: ND Region 3: ND

Values in Feet
"ND" = Not Defined
*Travis Peak represents drawdown in both Layer 6 and 8 in Regions 4 and 5 (Hensell/Hosston)

Run 10 Results

Percent of 2010 Water Level Remaining Above the Base of the Aquifer

Aquifer	Fannin	Grayson	RRGCD	GMA 8
Woodbine	74%	65%	71%	80%
Paluxy	73%	47%	72%	86%
Glen Rose	91%	87%	91%	91%
Twin Mtn	89%	87%	89%	79%
Travis Peak	94%	Not Defined	94%	88%
Antlers	91%	78%	86%	81%