Simulation Results for S-7 and S-11, Yegua Jackson and Brazos River Alluvium Aquifers

Presented to:

Brazos Valley Groundwater Conservation District

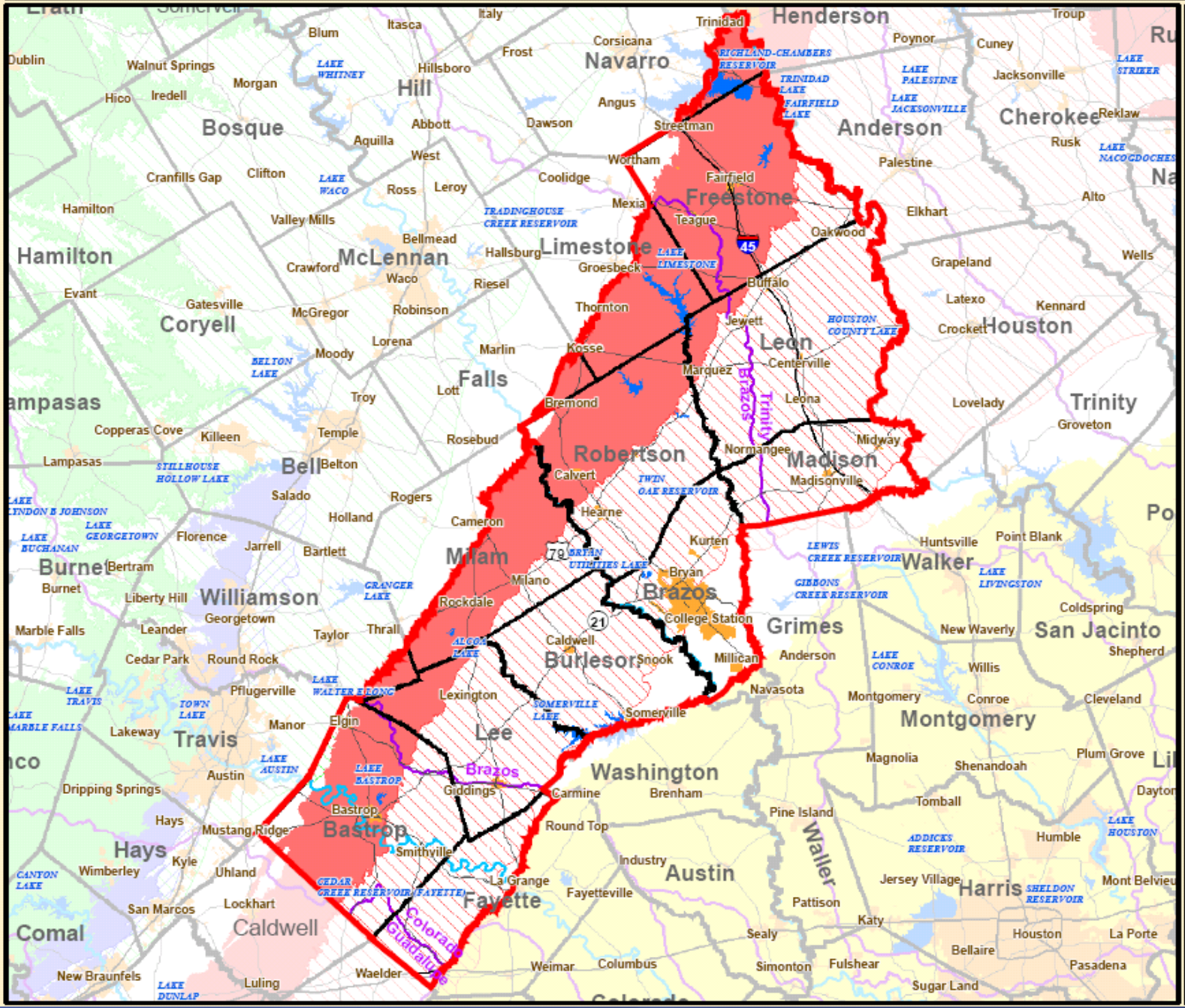
Board of Directors

By

Ground Water Consultants, LLC

February 11, 2021

Groundwater Management Area #12



MAP LEGEND

- GMA #12
- River
- River Basin
- Reservoir
- Cities
- Counties

Major Aquifers

- Cenozoic Pecos Alluvium
- Seymour
- Gulf Coast
- Carrizo - Wilcox (outcrop)
- Carrizo - Wilcox (downdip)
- Hueco - Mesilla Bolson
- Ogallala
- Edwards - Trinity Plateau (outcrop)
- Edwards - Trinity Plateau (downdip)
- Edwards BFZ (outcrop)
- Edwards BFZ (downdip)
- Trinity (outcrop)
- Trinity (downdip)

Map prepared by Mark Hayes
Texas Water Development Board
GIS Section
12/21/2005

0 7 14 21 28 Miles

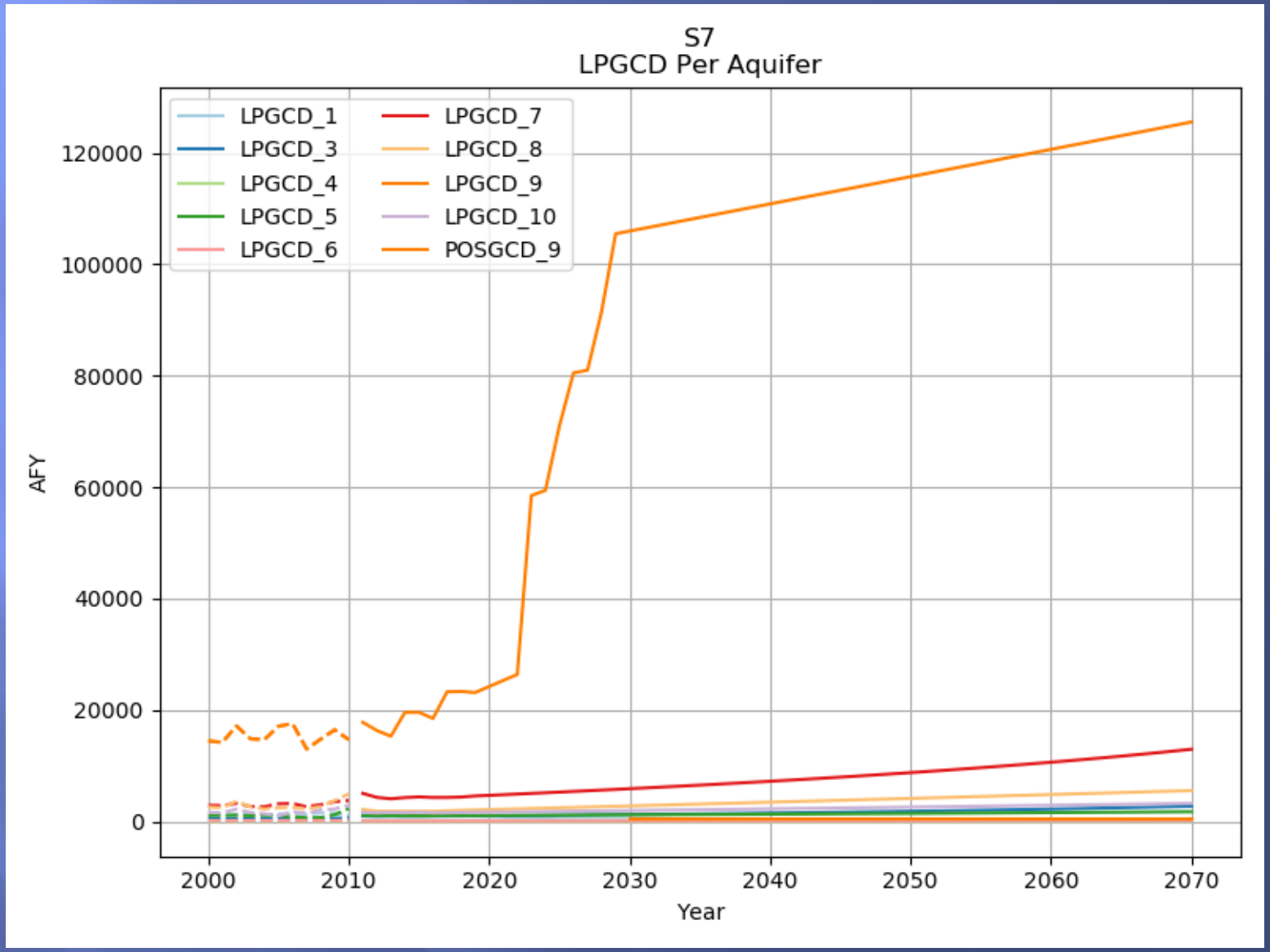
1 inch equals 26 miles

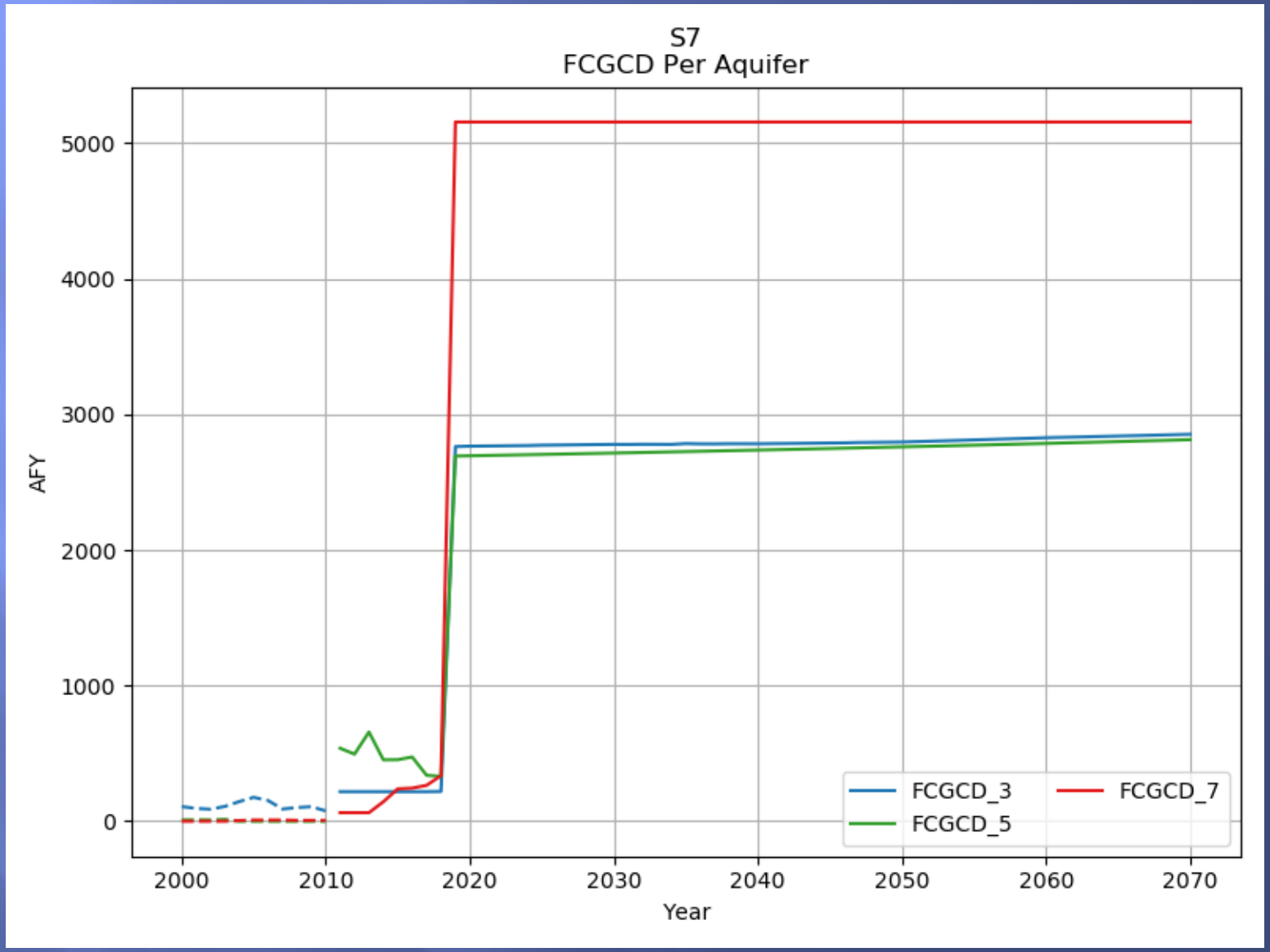
Model Layers- Aquifer

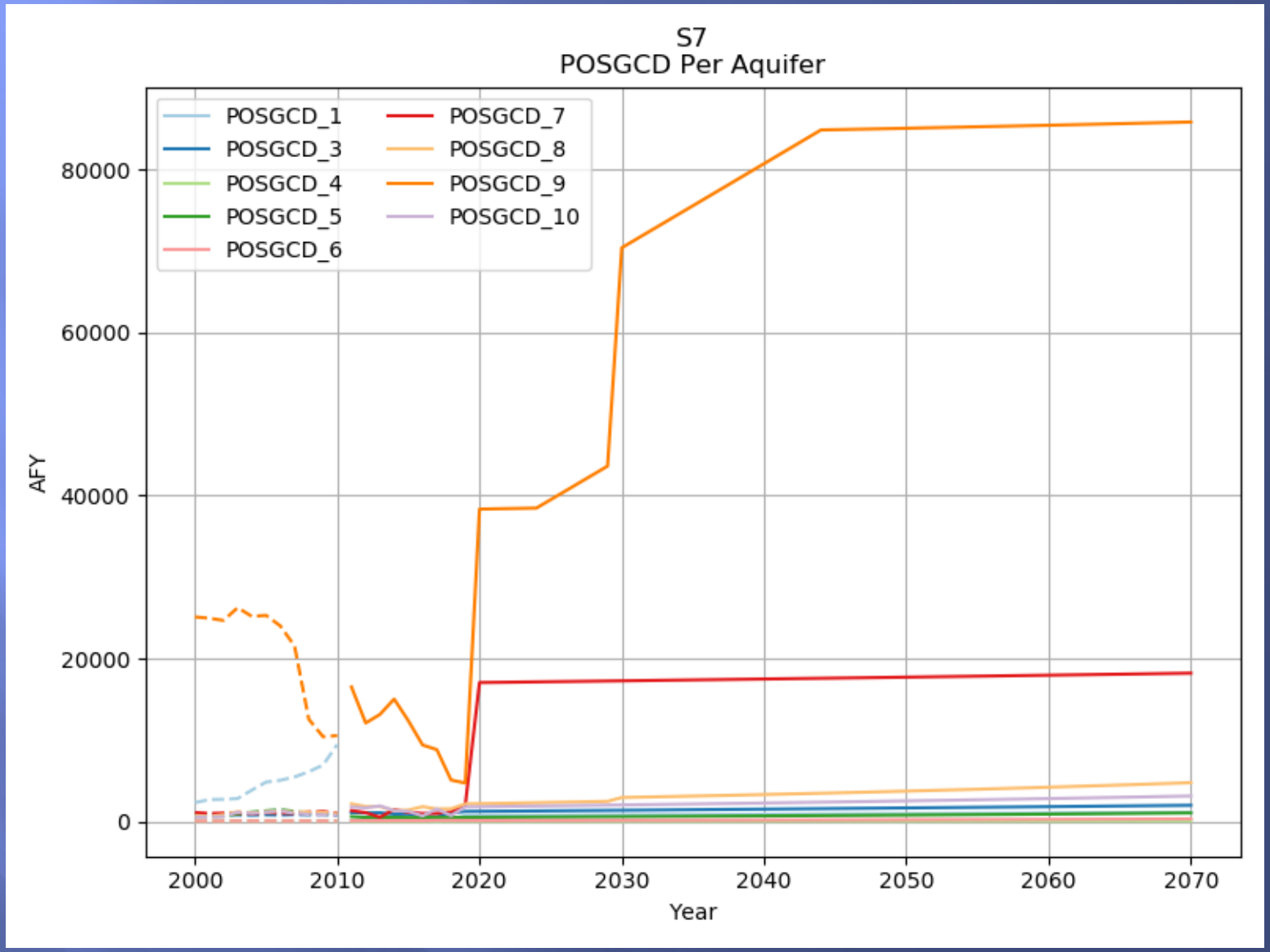
- Layer 1- Colorado and Brazos River Alluvium
- Layer 2- Shallow flow systems
- Layer 3- Sparta Aquifer
- Layer 4- Weches Formation
- Layer 5- Queen City Aquifer
- Layer 6- Reklaw Formation
- Layer 7- Carrizo Aquifer
- Layer 8- Calvert Bluff Aquifer
- Layer 9- Simsboro Aquifer
- Layer 10- Hooper Aquifer

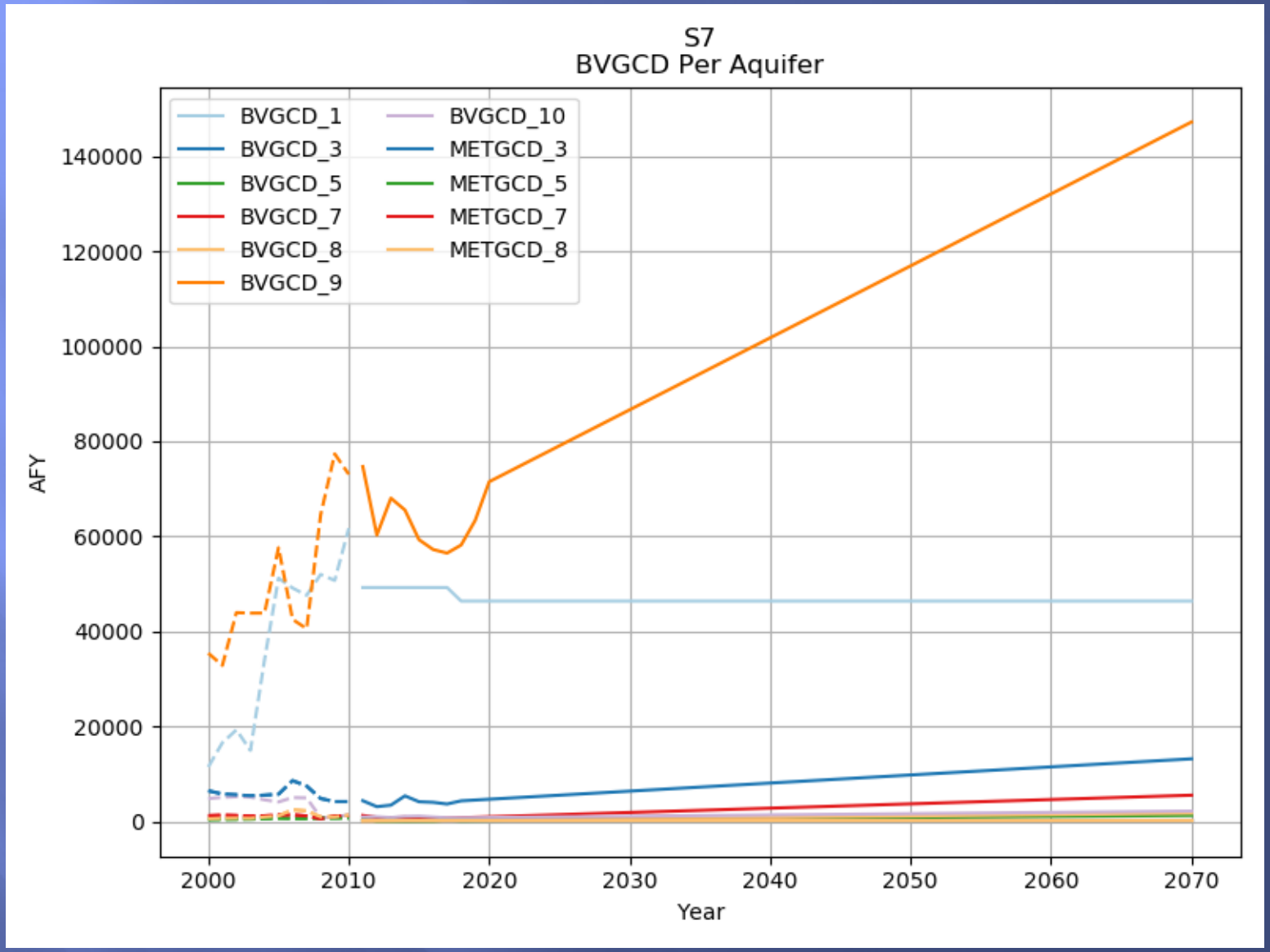
Model Run S-7 and S-11

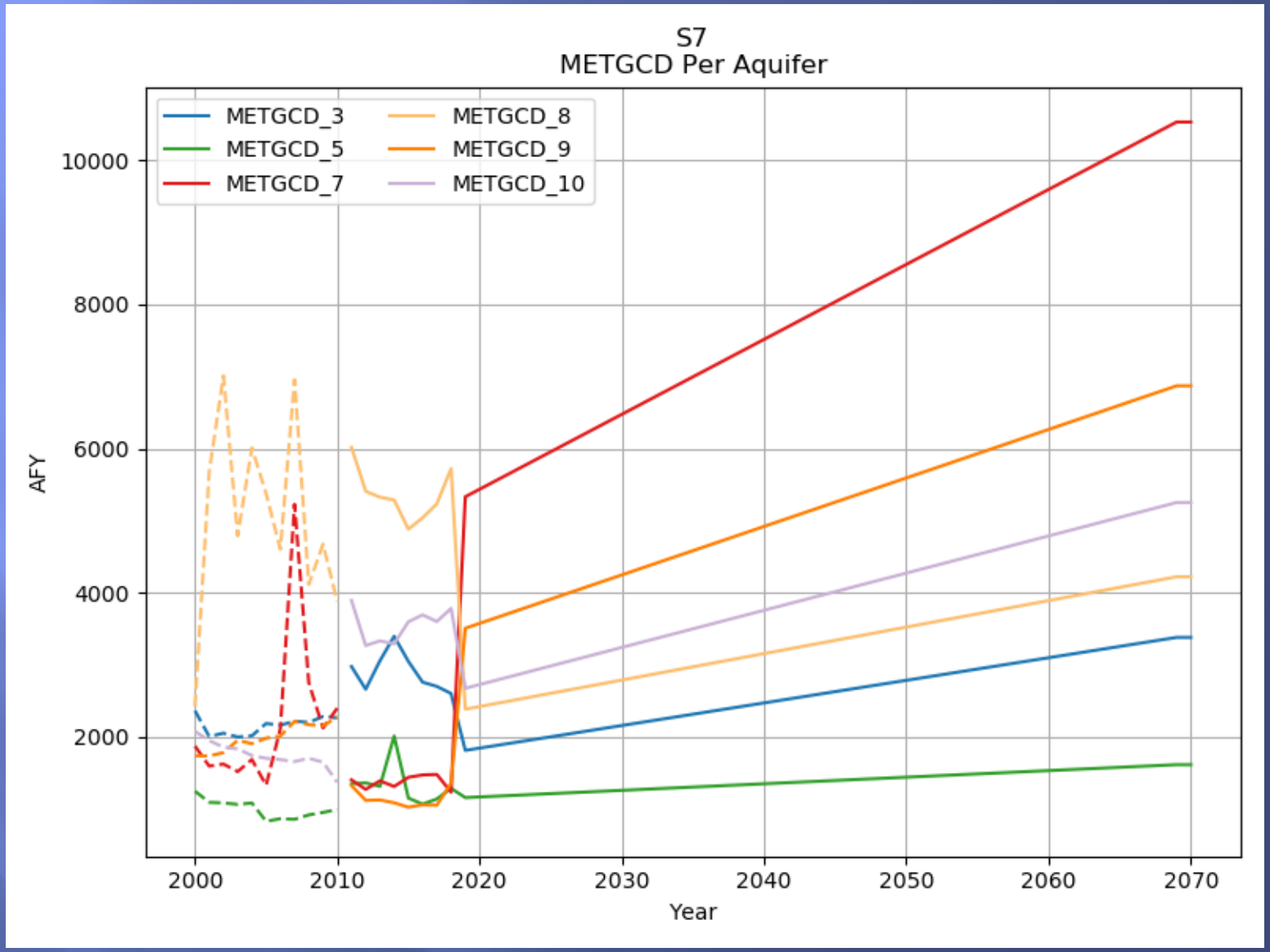
- Sparta(3), Queen City(5), Carrizo(7), Calvert Bluff(8), Simsboro(9) and Hooper Aquifers(10)
- Both runs- estimated historic pumping from each aquifer for 2011 to 2018
- S-7 and S-11 (anticipated ramp up of pumping for 2019 to 2070).
- S-7 results presented to board on 12-5-19 and 11-20-20 and S-11 results will be presented to GMA 12 tomorrow 2-12-21


S7
LPGCD Per Aquifer
LPGCD_1
LPGCD_3
LPGCD_4
LPGCD_5
LPGCD_6
LPGCD_7
LPGCD_8
LPGCD_9
LPGCD_10
POSGCD_9
120000
100000
80000
60000
40000
20000
0
AFY
2000
2010
2020
2030
2040
2050
2060
2070
Year


S7
FCGCD Per Aquifer
AFY
5000
4000
3000
2000
1000
0
2000
2010
2020
2030
2040
2050
2060
2070
Year
FCGCD_3
FCGCD_7
FCGCD_5


S7
POSGCD Per Aquifer
POSGCD_1
POSGCD_3
POSGCD_4
POSGCD_5
POSGCD_6
POSGCD_7
POSGCD_8
POSGCD_9
POSGCD_10
AFY
0
20000
40000
60000
80000
2000
2010
2020
2030
2040
2050
2060
2070
Year


S7
BVGCD Per Aquifer
BVGCD_1
BVGCD_3
BVGCD_5
BVGCD_7
BVGCD_8
BVGCD_9
BVGCD_10
METGCD_3
METGCD_5
METGCD_7
METGCD_8
AFY
0
20000
40000
60000
80000
100000
120000
140000
2000
2010
2020
2030
2040
2050
2060
2070
Year


S7
METGCD Per Aquifer
METGCD_3
METGCD_5
METGCD_7
METGCD_8
METGCD_9
METGCD_10
AFY
10000
8000
6000
4000
2000
2000
2010
2020
2030
2040
2050
2060
2070
Year

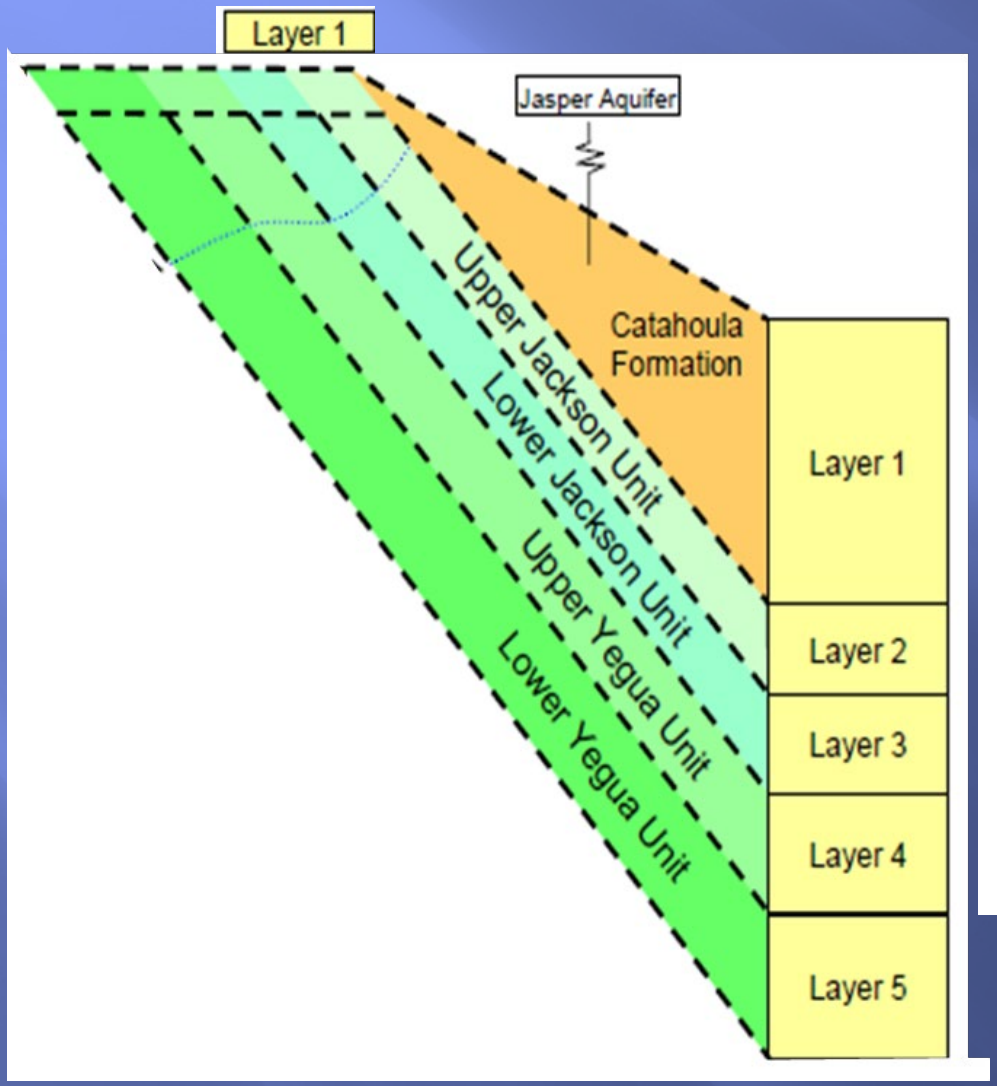
Average Drawdown From Runs S-7 and S-11 in the BVGCD

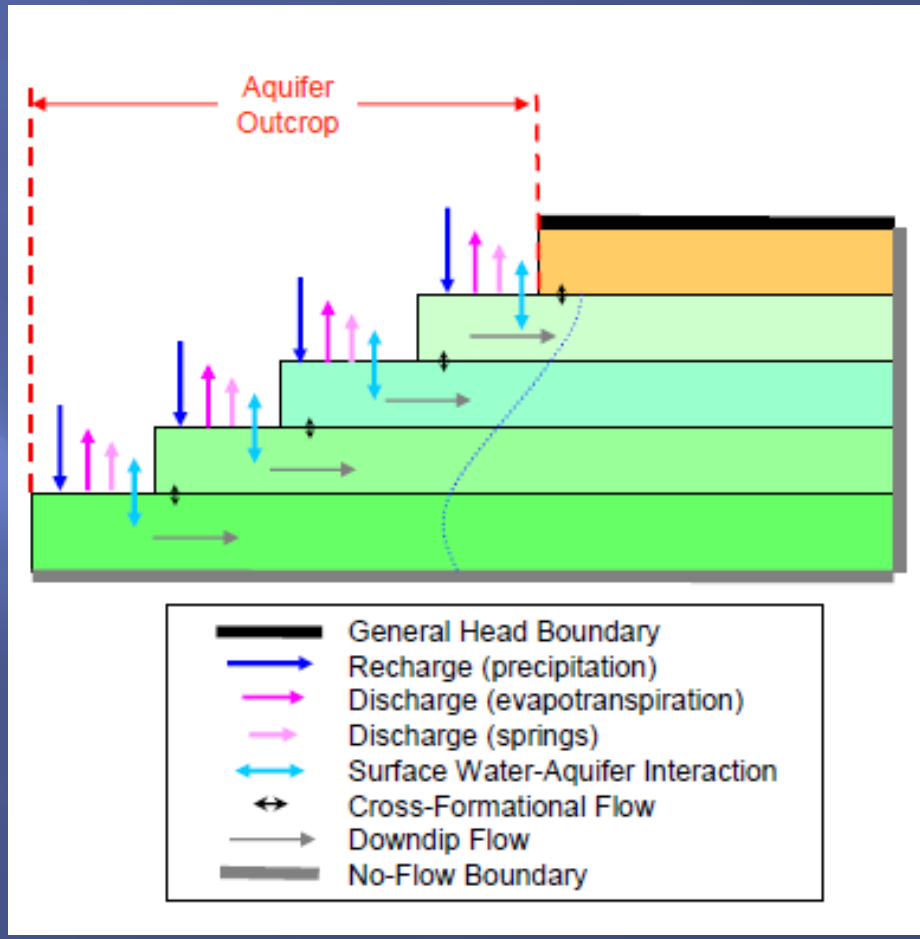
Aquifer	Average Drawdown(ft) in BVGCD for S-7 and S-11 from 2000-2069 Using the Revised GAM			
	POSGCD Pumping 2069 for S-7, ac-ft	POSGCD Pumping 2069 for S-11, ac-ft	S-7	S-11
Sparta	1,983	4,070	49	50
Queen City	1,045	1,600	41	43
Carrizo	18,205	18,205	84	84
Calvert Bluff	4,761	4,701	114	116
Simsboro	85,855	79,396	260	260
Hooper	3,126	3,093	178	178

Note: Total pumping and pumping by aquifer in BVGCD and all other areas within GMA 12 the same for Runs S-7 and S-11 except in the POSGCD

Yegua – Jackson Aquifer

Yegua-Jackson GAM



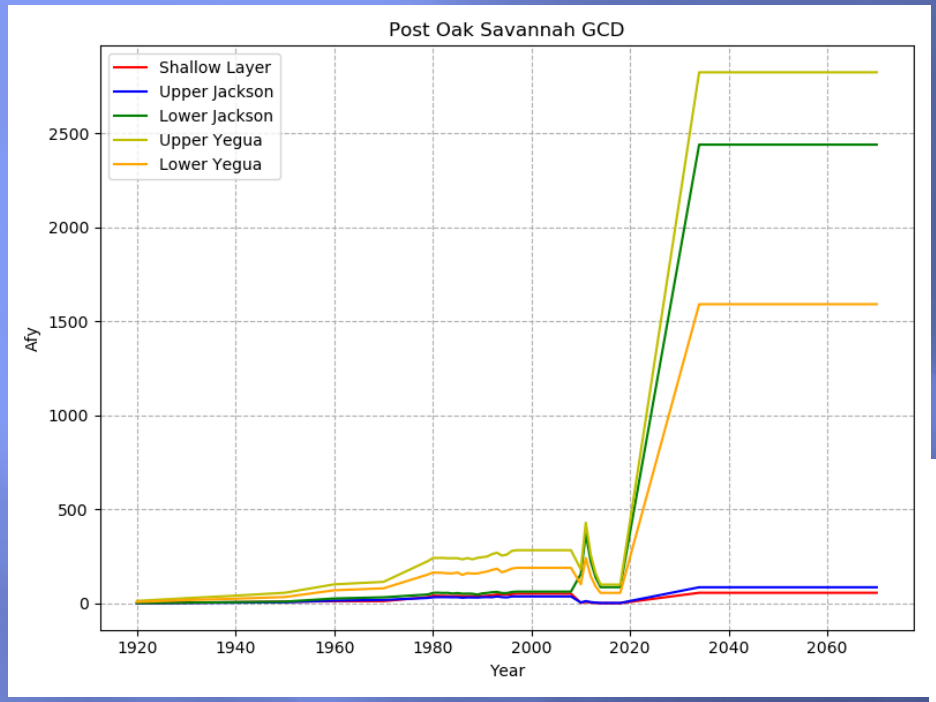


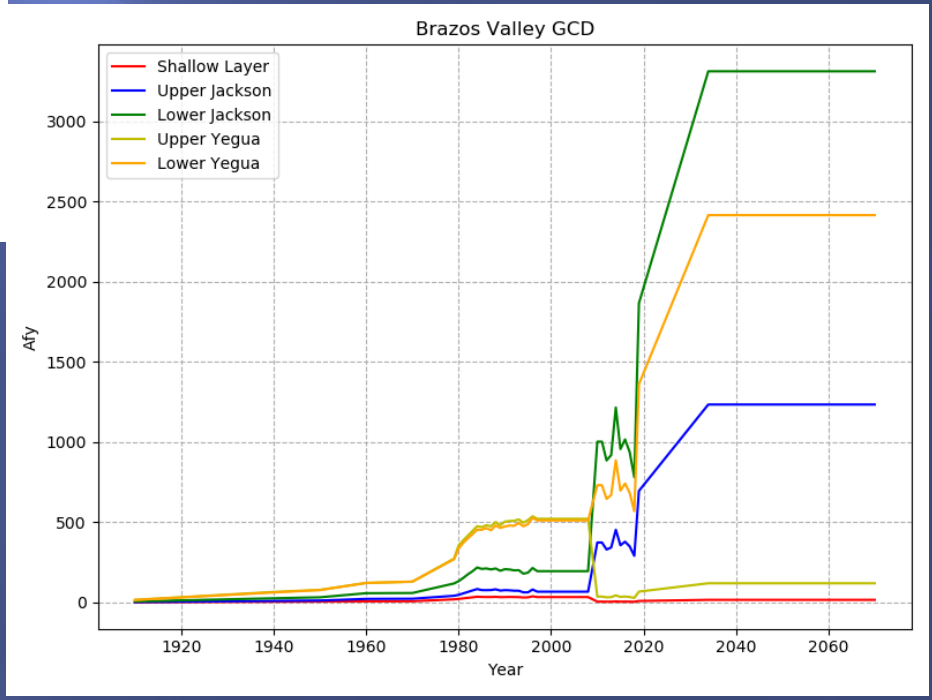
Yegua-Jackson Run (YJ-PS2)

- GMA 12 Districts revised
  - historical pumping from 2010 to 2018
  - revised estimates for future pumping

GCD	Total 2070 YJ Pumping AFY
FCGCD	10,000
BVGCD	7,100
POSGCD	7,000
METGCD	1,121
LPGCD	661

YJ-PS2 for POSGCD & BVGCD





Average Drawdowns

GCD	Existing DFC, ft			Drawdown 2010-2070, ft
	Yegua	Jackson	Yegua-Jackson	PS2
Brazos Valley	70	114	-	61
Fayette	-	-	77	81
Lost Pines	-	-	-	39
Mid-East	-	-	7	8
PostOak	-	-	100	61

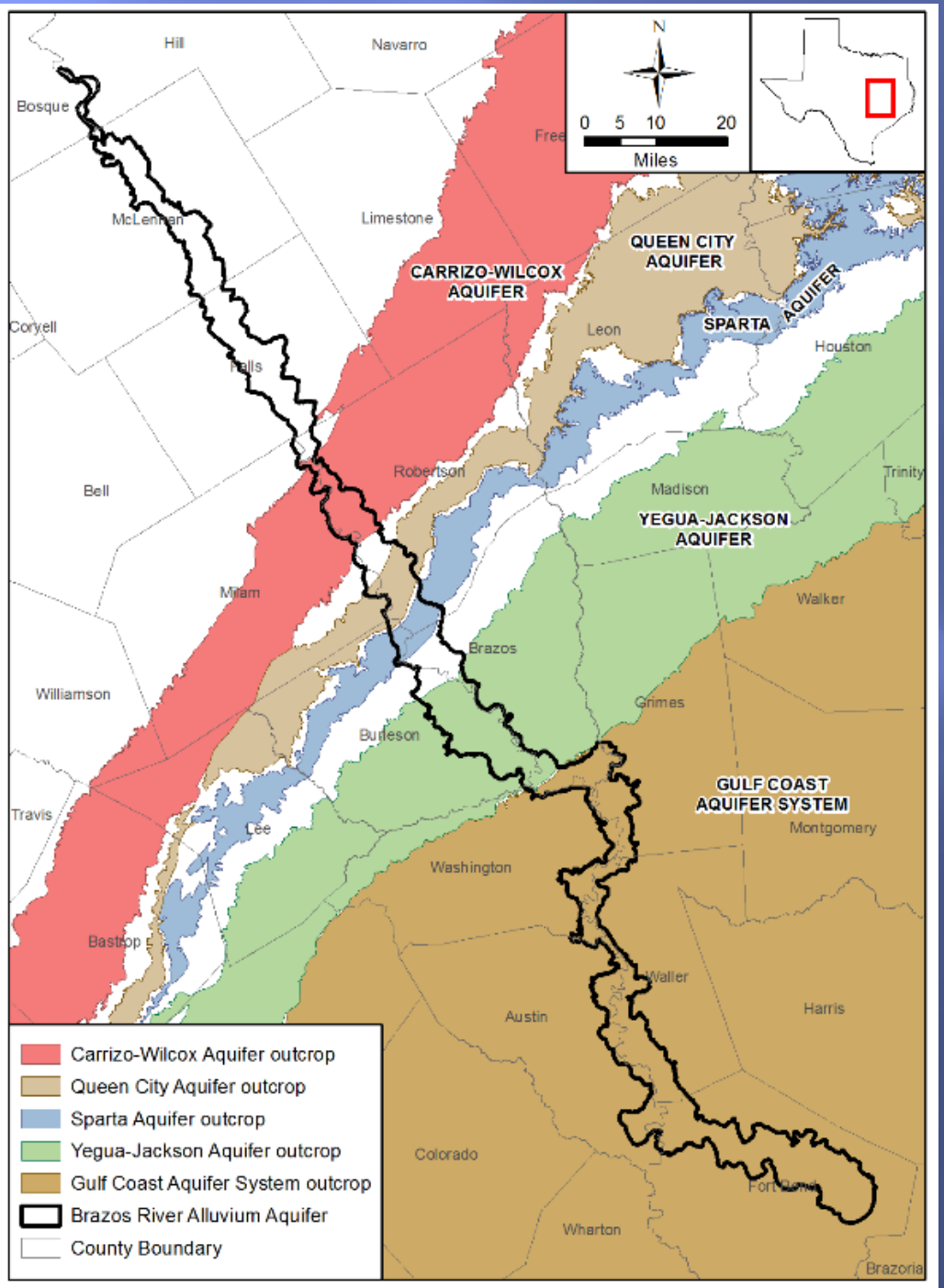
Yegua-Jackson DFCs

- Simulation results on previous slide presented to GMA 12 on January 29, 2020 and a preview presented to board on January 9, 2020
- Results accepted by GMA 12 at January 29, 2020 meeting as proposed DFCs for submission to the TWDB

Brazos River Alluvium Aquifer

Development of BRAA DFCs

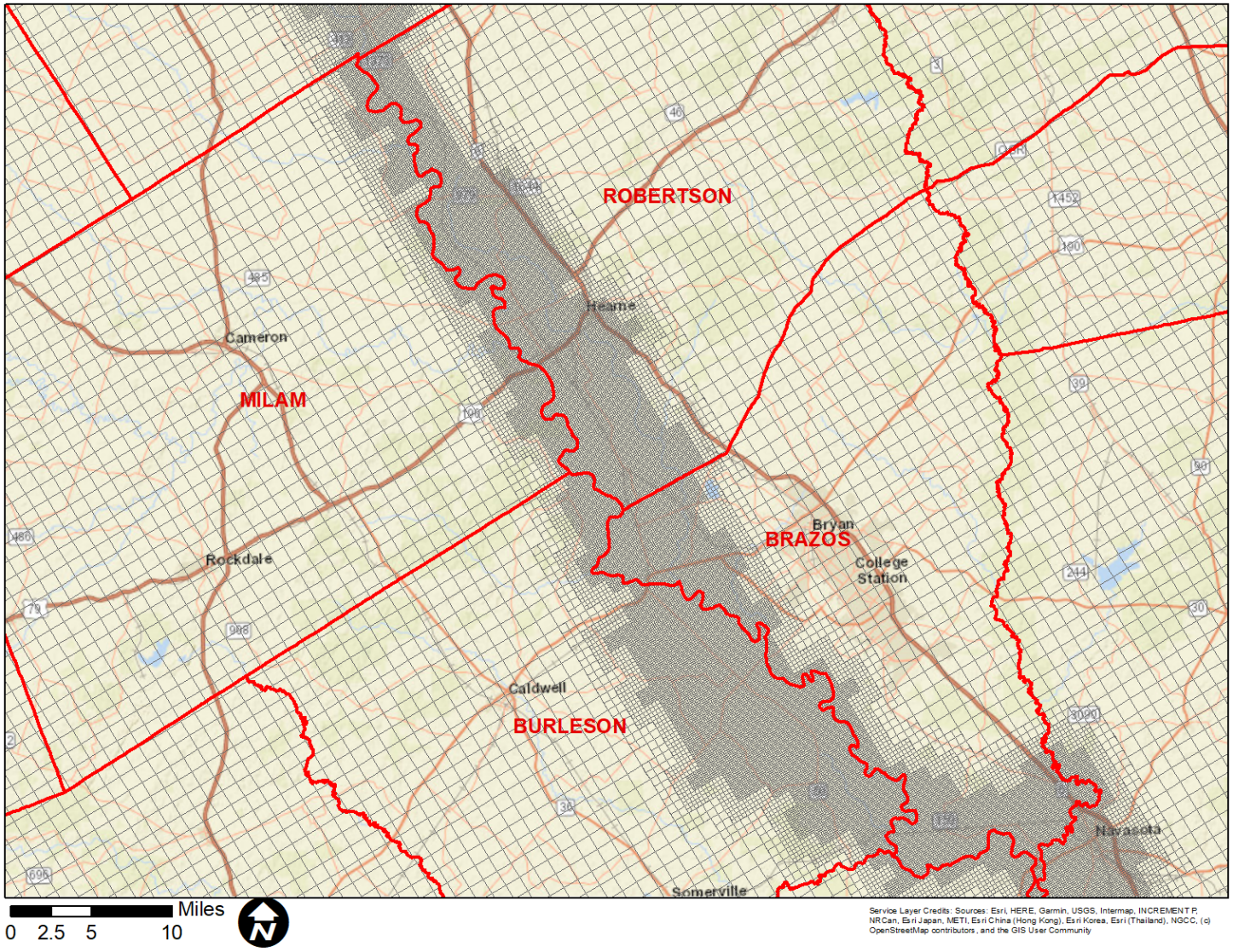
- Use the Brazos River Alluvium Aquifer GAM completed in 2016 by the TWDB, the same GAM used to develop MAGS in the GMA 12 2016 planning cycle
- Develop distribution of pumping consistent with areas of irrigated agriculture in Milam, Burleson, Robertson and Brazos counties. Moved some pumping away from the river
- Consider pumping history in the counties and past effects of pumping when developing future DFCs
- Results in this presentation the same as provided to the board on 12-5-19 and 1-9-20



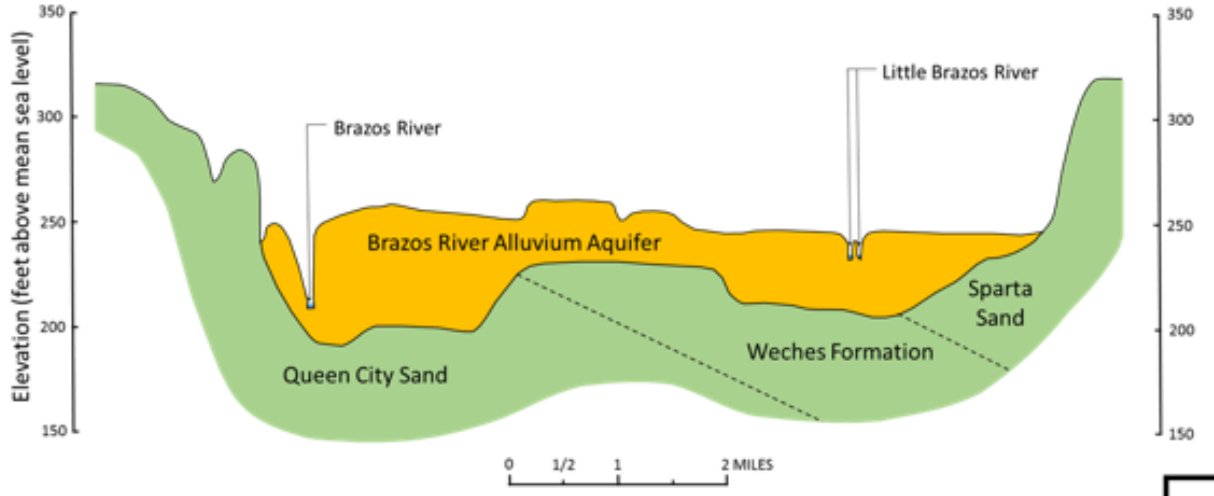
Extent of Brazos River Alluvium Model

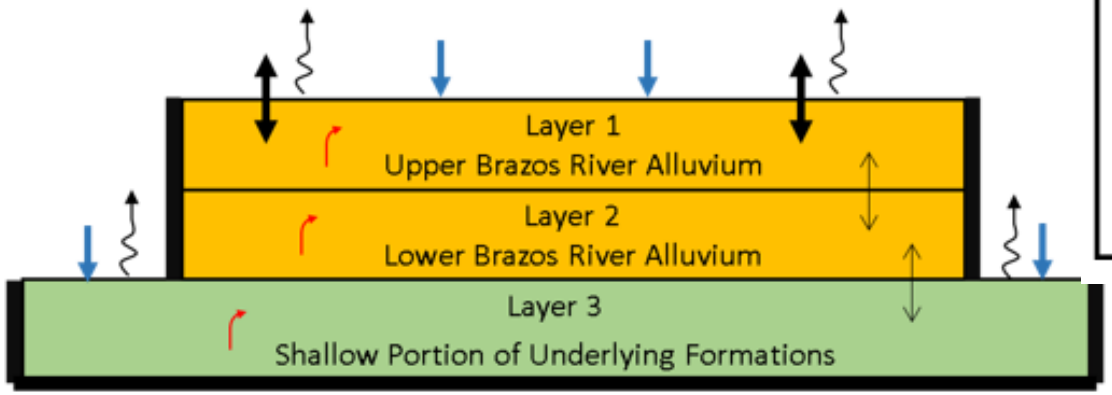
From: Final Numerical Model Report for the Brazos River Alluvium Aquifer Groundwater Availability Model, August 2016

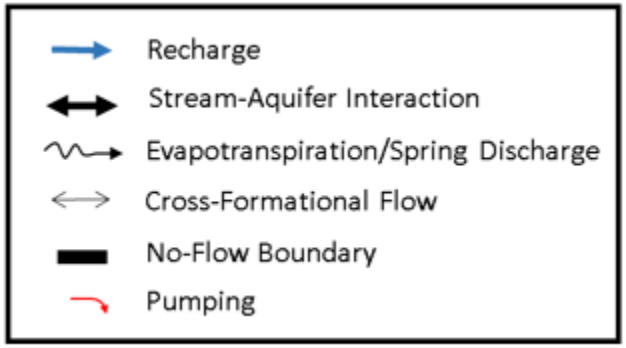
Model Grid for the BRAA GAM



Model Layer in BRAA GAM



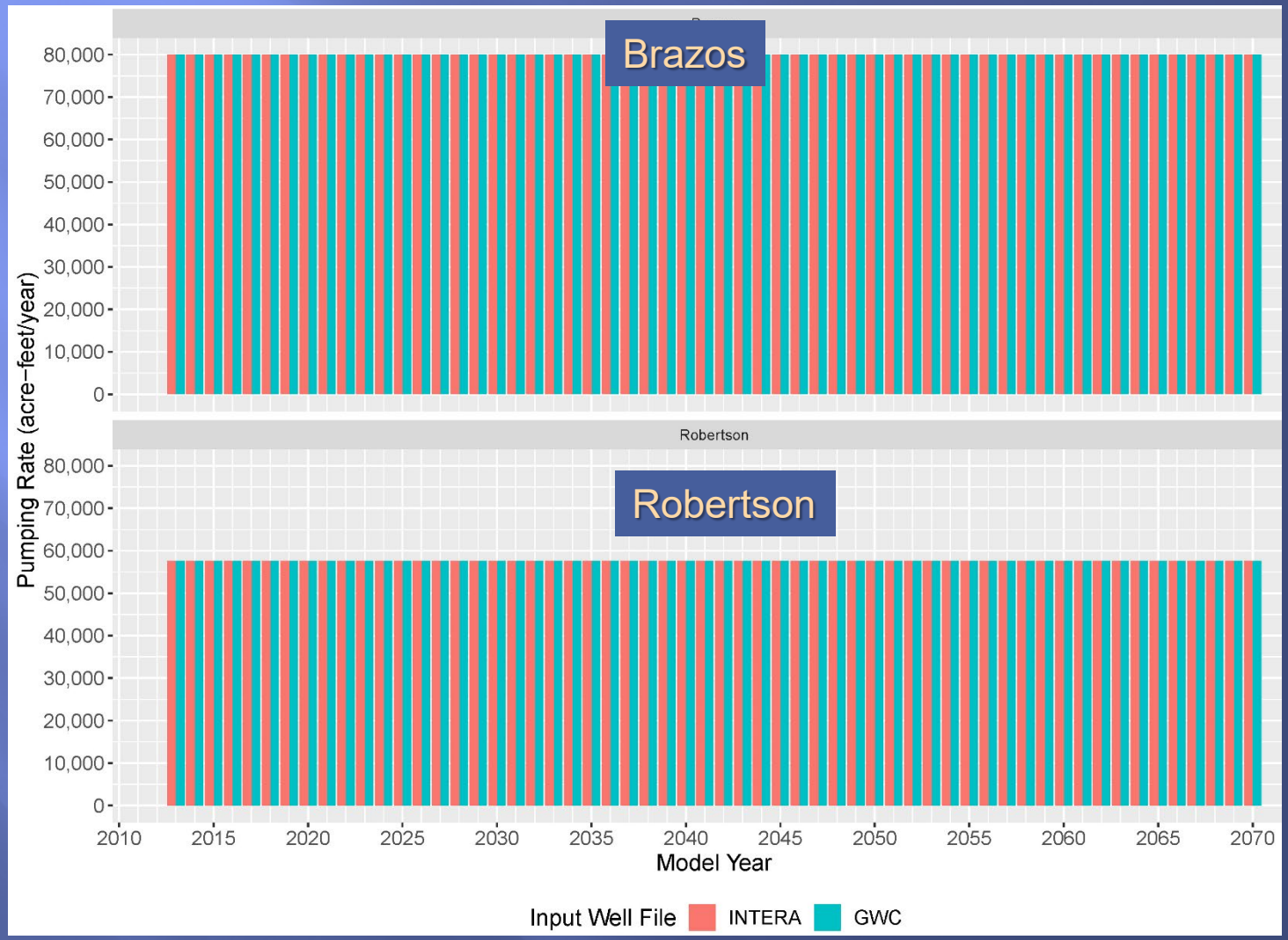




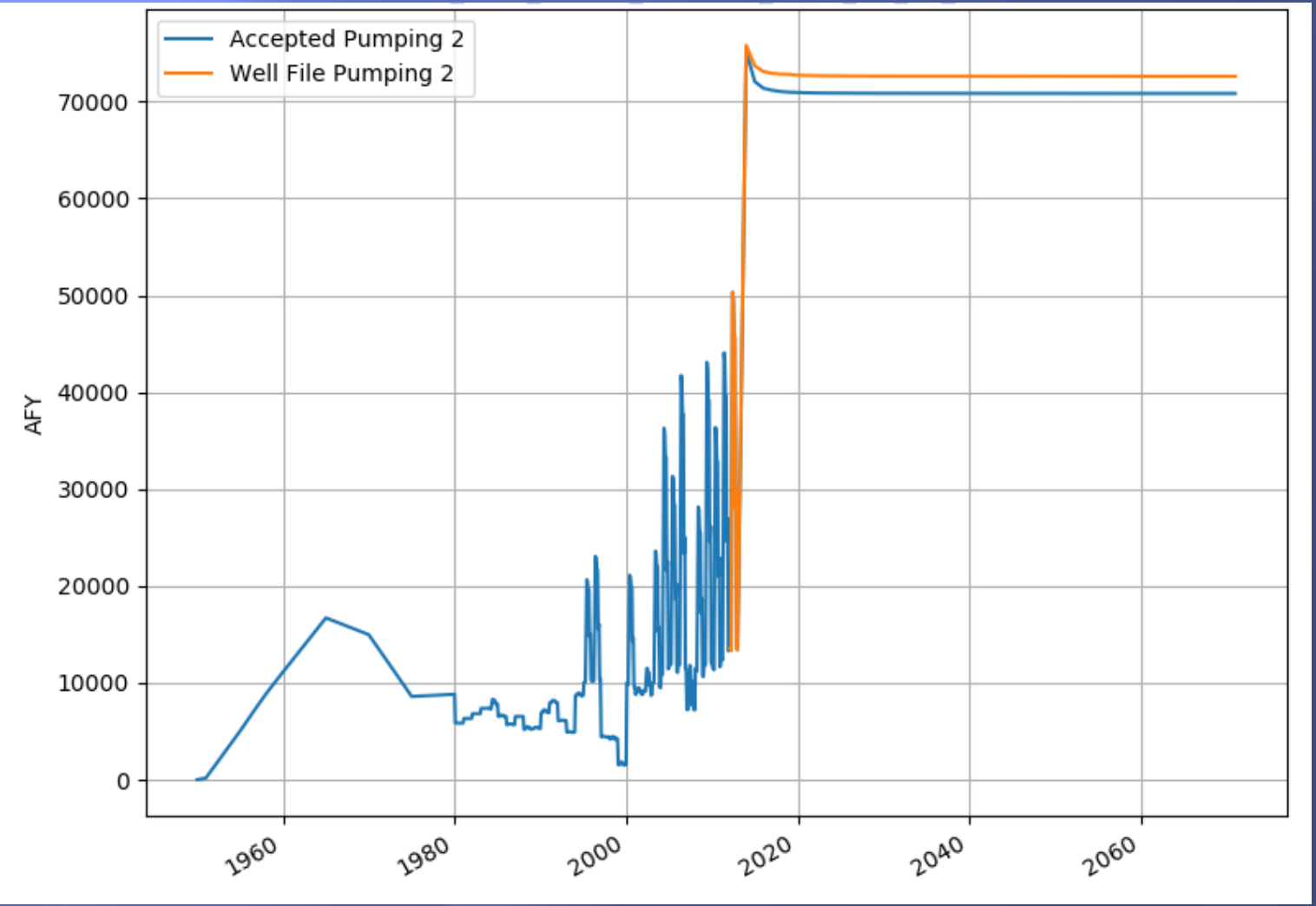
Modified TWDB MAG Run

- Reduced pumping in wells in Milam County where initial pumping rates could not be sustained
- Avoided adding future pumping in same grid cells that include a river node
- Keep all the same hydraulic boundaries used by TWDB MAG Run for 2016 planning cycle

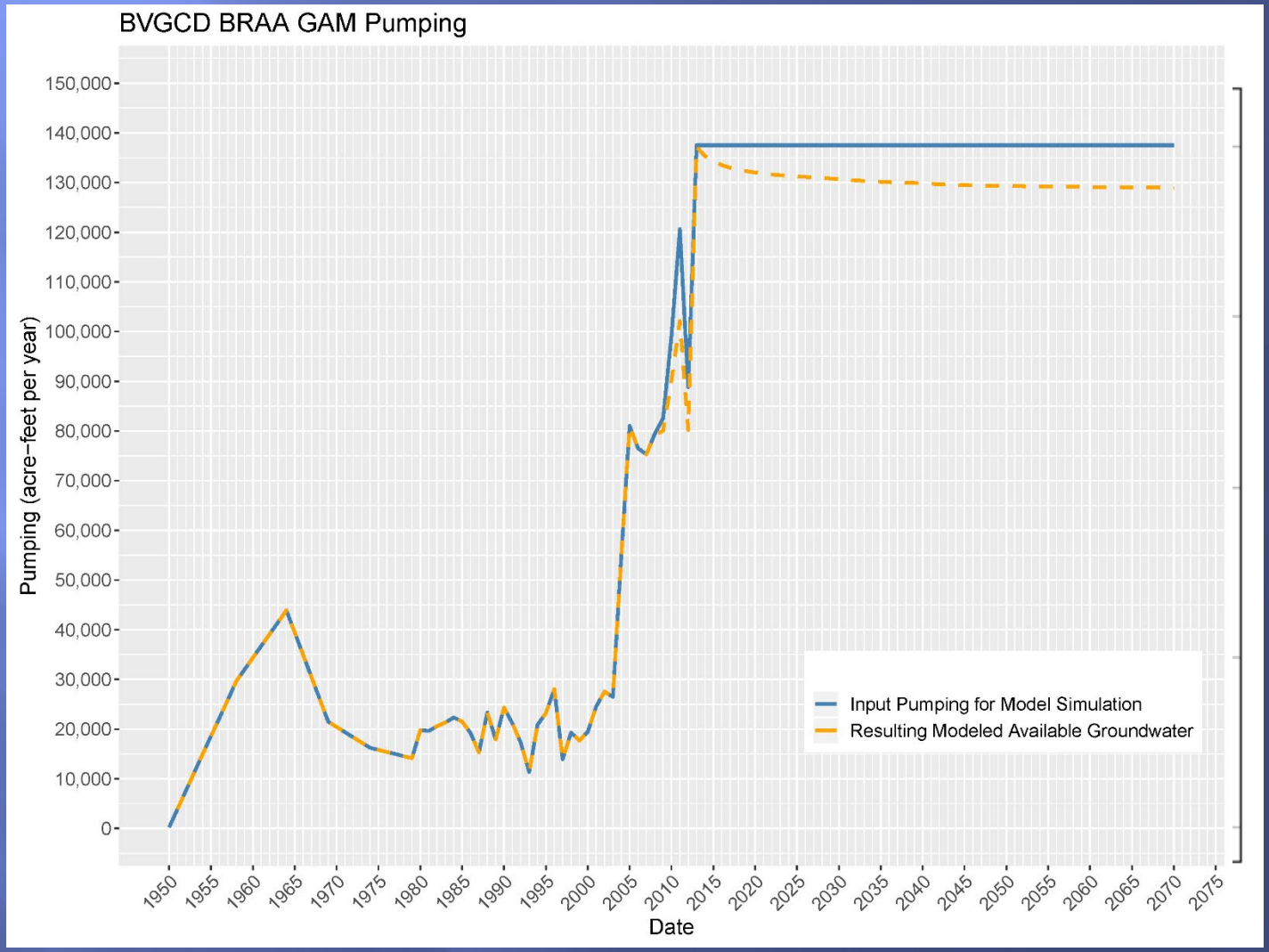
Comparison of Input Well Files For BVGCD



Comparison of Input and Output Pumping by District: POSGCD

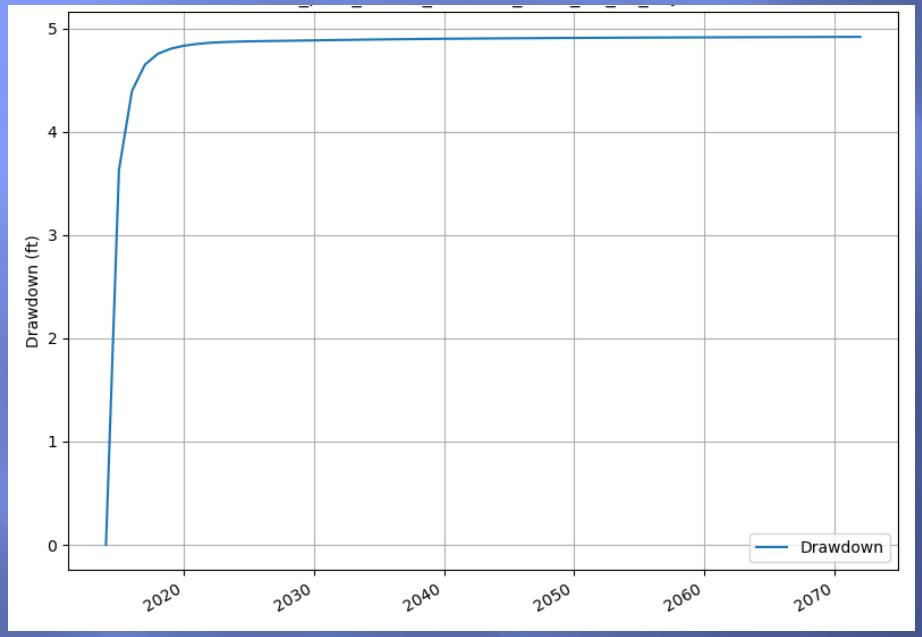


Comparison of Input and Output Pumping by District: BVGCD

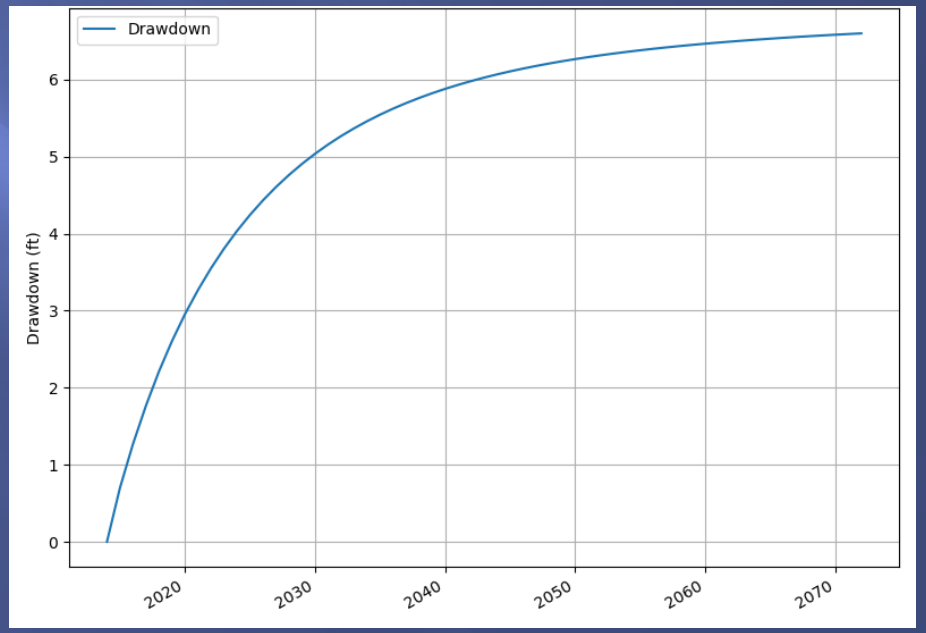


Average Drawdown in Alluvium: POSGCD

Milam

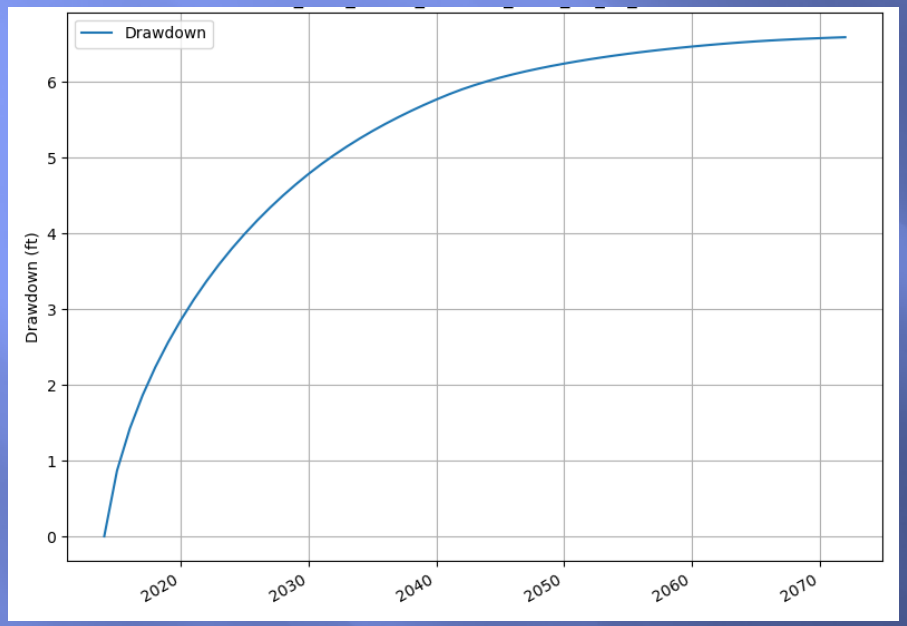


Burleson

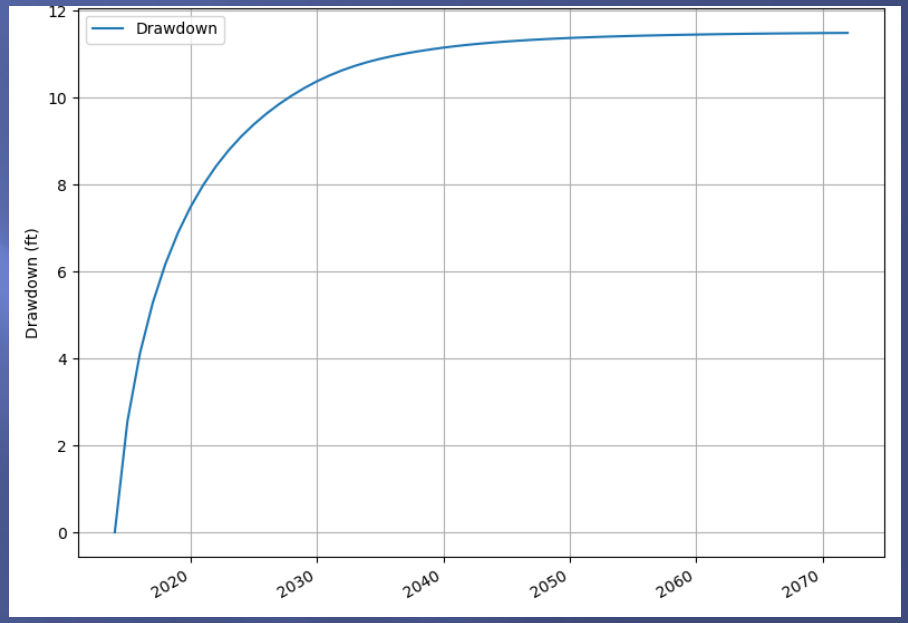


Average Drawdown in Alluvium: BVGCD

Robertson



Brazos



Resulting Saturated Thickness

North Zone: 30%

South Zone: 44%

Summary

- Current Simulation Closely Reproduces DFCs from 2016 planning cycle
- Resulting MAGs
  - Milam – 38,626 AFY
  - Burleson – 32,306 AFY
  - Robertson – 52,903 AFY
  - Brazos -76,038 AFY
- Based on model results approximately 37,500 AFY of the 200,000 AFY pumped in 2070 is from increased flow from river to alluvium compared to 2012 flows

QUESTIONS?