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 Henderson Itasca Blum Rι Corsicana Cuney Frost Dublin. Navarro LAKE MAP LEGEND LAKE Walnut Springs Hillsboro LAKE STRIKER Jacksonville Morgan PALESTINE Hill GMA #12 Iredell Hico LAKE Angus FAIRFIELD JACKSONVILLE CherokeeReklaw Bosque Abbott Dawson Anderson Aguilla Rusk LAKE River Basin West Northam Palestine Clifton Cranfills Gap Coolidge LAKE Reservoir Leroy WACO Ross Alto Mexia Hamilton Cities TRADINGHOUSE Elkhart Valley Mills Teague CREEK RESERVOIR Bellmead Counties Hallsburg Limestone Line Crawford McLennan Hamilton Wells Grapeland Major Aquifers Groesbeck Waco Riesel Cenozoic Pecos Alluvium Evant Latexo Gatesville Thornton Robinson McGregor Seymour Coryell HOUSTON Crocket Houston Lorena Gulf Coast osse. Moody BELTON Carrizo - Wilcox (outcrop) LAKE Lott Falls Carrizo - Wilcox (downdip) Troy Trinity ampasas Bremond Lovelady Hueco - Mesilla Bolson Groveton Copperas Cove Killeen Temple Rosebud Madison Ogallala Robertson BellBelton Lampasas STILLHOUSE Edwards - Trinity Plateau (outcrop) Madisonville OAE RES Salado Rogers Edwards - Trinity Plateau (downdip) Po Hearne Holland Cameron Edwards BFZ (outcrop) GEORGETOWN Florence Point Blank Kurten Huntsville BUCHANAN Jarrell 79 SEPAN Edwards BFZ (downdip) Bartlett CREEK RESERVOIR Walker Burne (Bertram Trinity (outcrop) Milano GRANGER LAKE CIBBONS Burnet Liberty Hill Williamson CREEK RESERVOIS Trinity (downdip) Coldspring Georgetown ollege Station Grimes Leander San Jacinto Marble Falls New Waverly Taylor Burlesors Shepherd LAKE Cedar Park Round Rock No claims are made to the accuracy or completeness CONROR Willis of the data nor to its suitability for a particular use. he scale and compilation of all information shown here Pflugerville Navasota Lexington approximate: Montgomery Cleveland IRAVIS Map prepared by Mark Hayes Texas Waler Development Board GIS Section LAKE Montgomery lgin Manor Lakeway Travis Plum Grove Magnolia LAKE Shenandoah Washington Austin BASTROP **Dripping Springs** Daytor Tomball Pine Island Hays LAKE Waller Round Top Mustang Ridge Humble ADDICES Hays RESERVOIR Austin Austin Wimberley Uhland Jersey Village Harris SHELDON RESERVOIR CANTON Mont Belvieu Fayetteville Pattison Lockhart San Marcos Caldwell Comal Sealy Houston La Porte Bellaire Columbus Fulshear Pasadena Waelder 1 inch equals 26 miles **New Braunfels** Luling LAKE Sugar Land

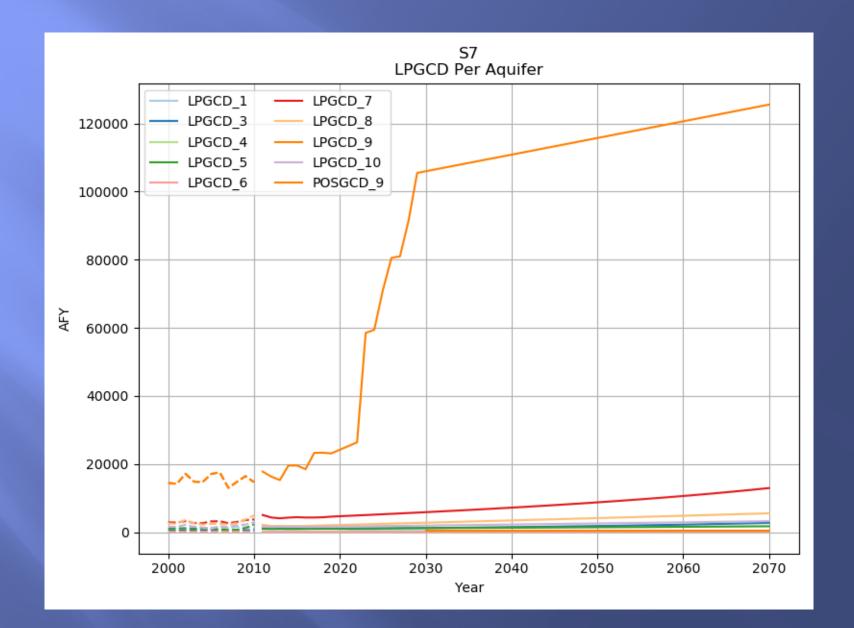
Model Layers- Aquifer

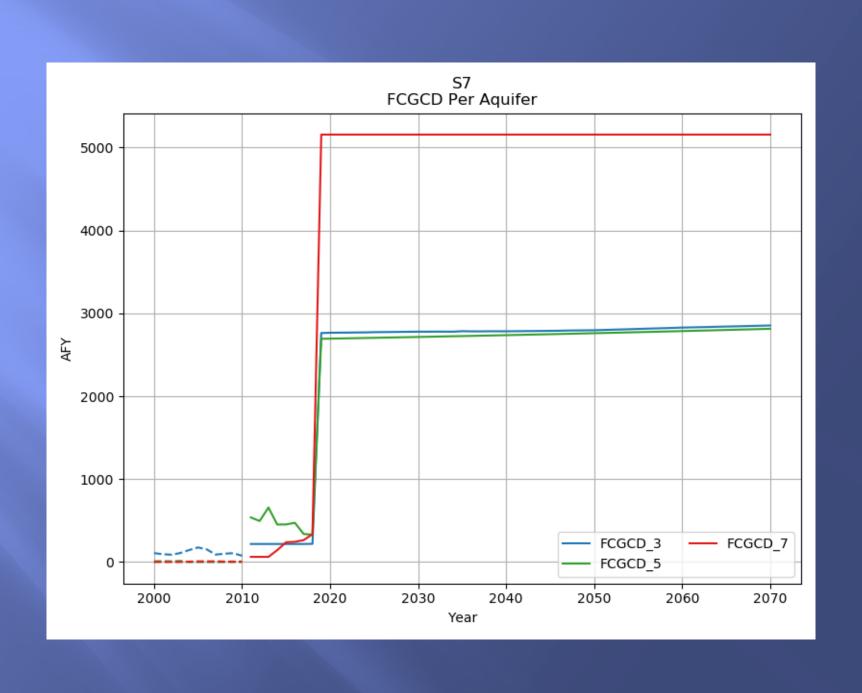
- Layer 1- Colorado and Brazos River Alluvium
- Layer 2- Shallow flow systems
- Layer 3- Sparta Aquifer
- Layer 4- Weches Formation
- Layer 5- Queen City Aquifer
- Layer 6- Reklaw Formation
- Layer 7- Carrizo Aquifer
- Layer 8- Calvert Bluff Aquifer
- Layer 9- Simsboro Aquifer
- Layer 10- Hooper Aquifer

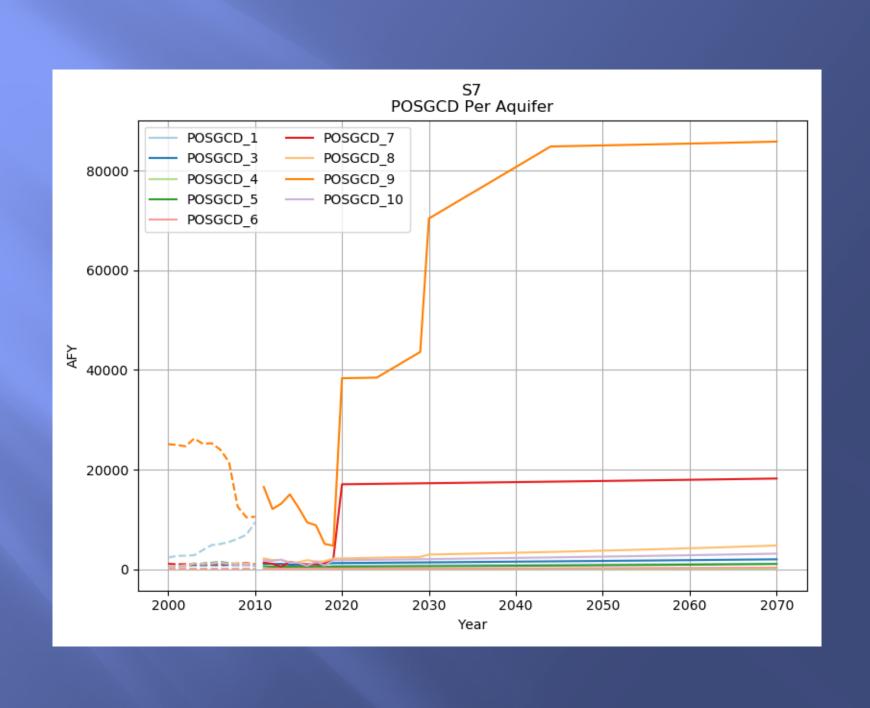
Model Run S-7 and S-11

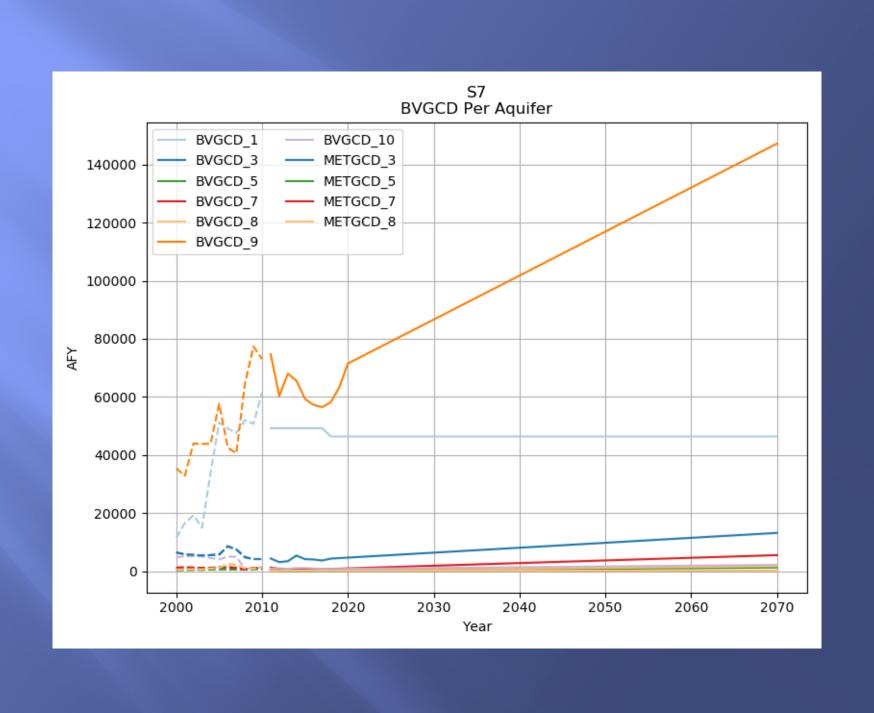
- Sparta(3), Queen City(5), Carrizo(7), Calvert Bluff(8), Simsboro(9) and Hooper Aquifers(10)
- Both runs- estimated historic pumping from each aquifer for 2011 to 2018
- S-7 and S-11 (anticipated ramp up of pumping for 2019 to 2070).
- S-7 results presented to board on 12-5-19 and 11-20-20 and S-11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

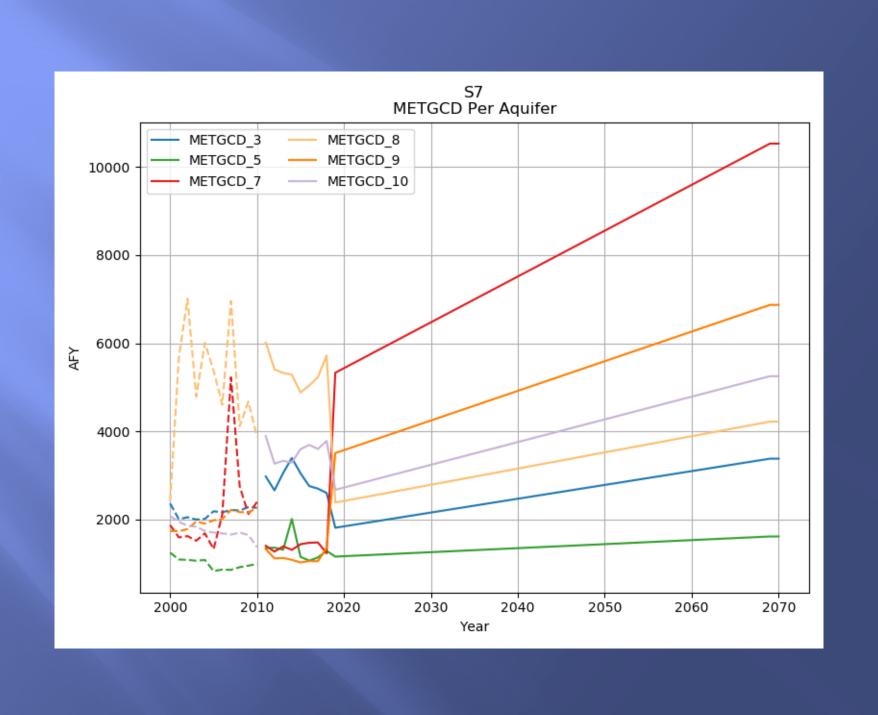
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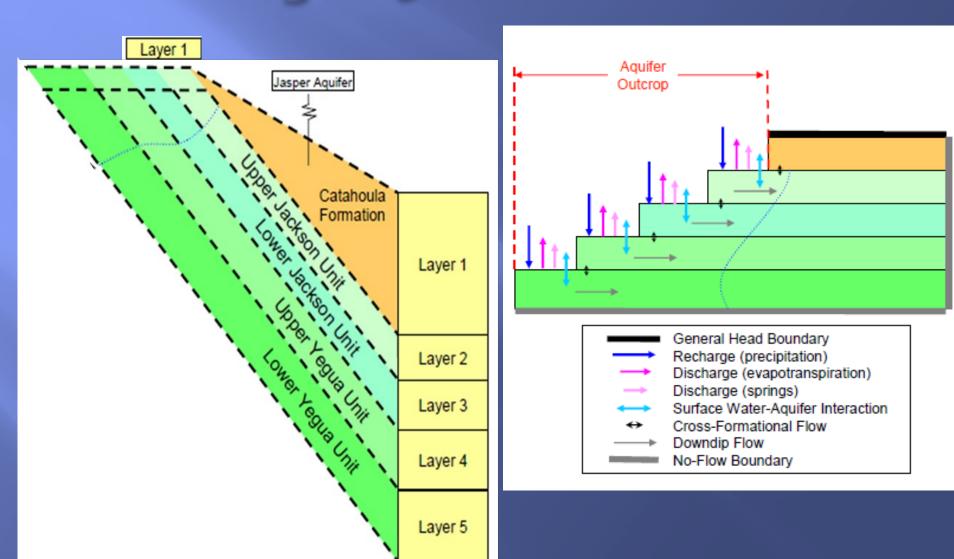
Average Drawdown From Runs S-7 and S-11 in the BVGCD

	Average Drawdown(ft) in BVGCD for S-7 and S-					
Aquifer	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

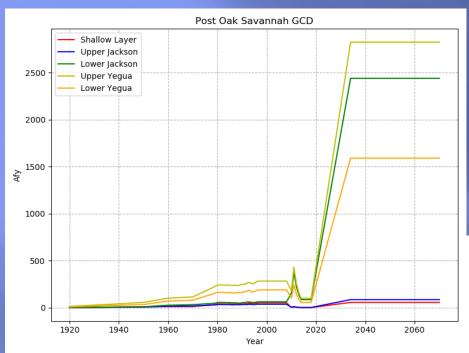


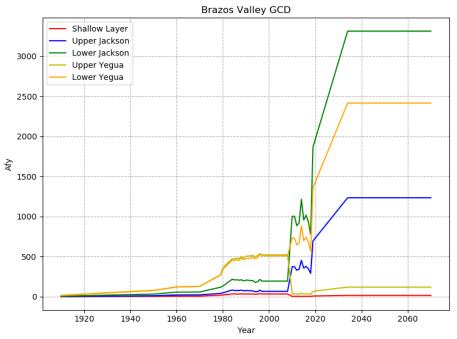
Yegua-Jackson Run (YJ-PS2)

- 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

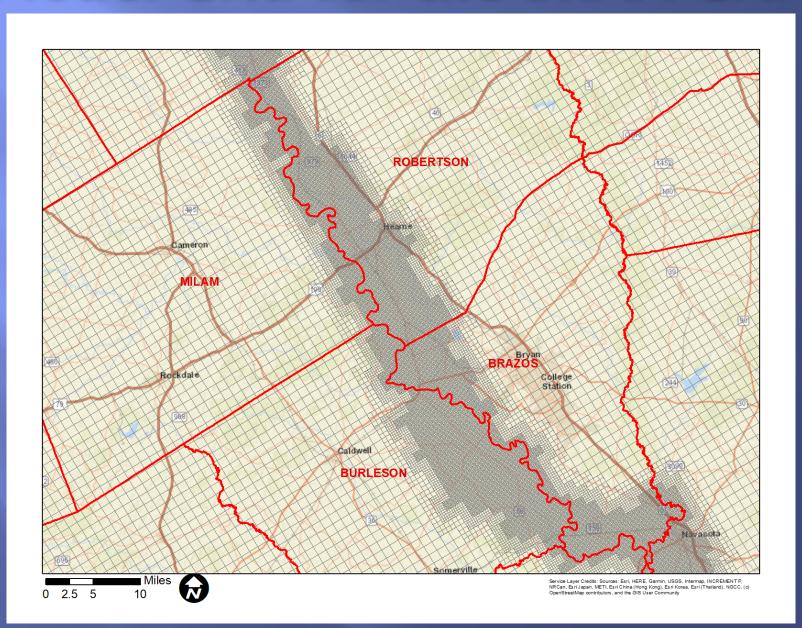
- Use the Brazos River Alluvium Aquifer GAM completed in 2016 by the TWDB, the same GAM used to develop MAGS in the GMA 12 2016 planning cycle
- Develop distribution of pumping consistent with areas of irrigated agriculture in Milam, Burleson, Robertson and Brazos counties. Moved some pumping away from 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

Navarro Miles Limestone QUEEN CITY AQUIFER CARRIZO-WILCOX AQUIFER SPARTA PO Madison Bell YEGUA-JACKSON AQUIFER Walker Williamson **GULF COAST** AQUIFER SYSTEM Travis Washington Carrizo-Wilcox Aquifer outcrop Queen City Aquifer outcrop Sparta Aquifer outcrop Yegua-Jackson Aquifer outcrop Colorado Gulf Coast Aquifer System outcrop Brazos River Alluvium Aquifer Wharton County Boundary

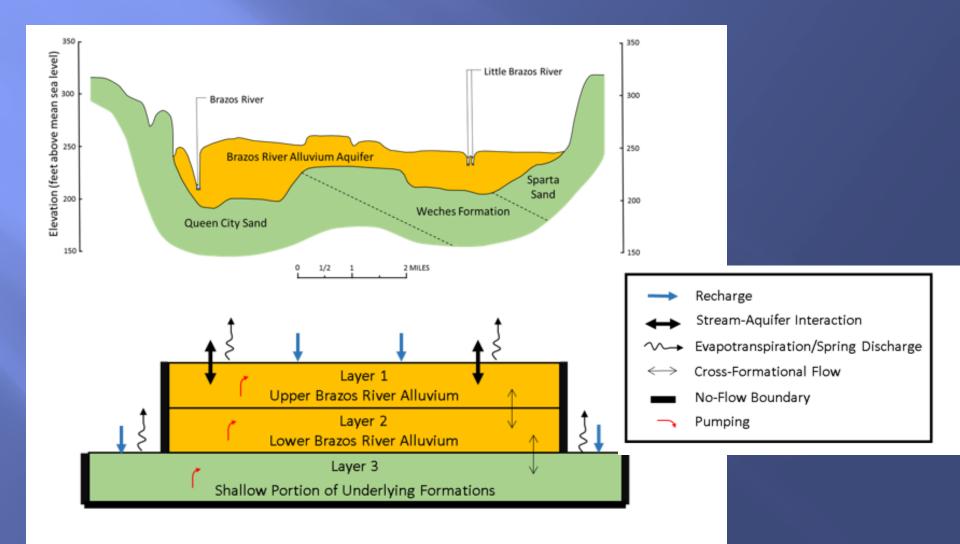
Extent of Brazos River Alluvium Model

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



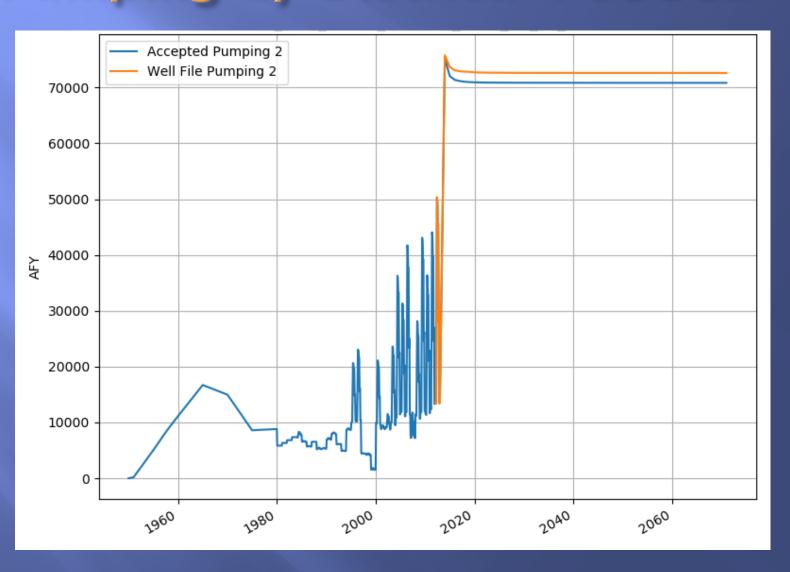
Modified TWDB MAG Run

- 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

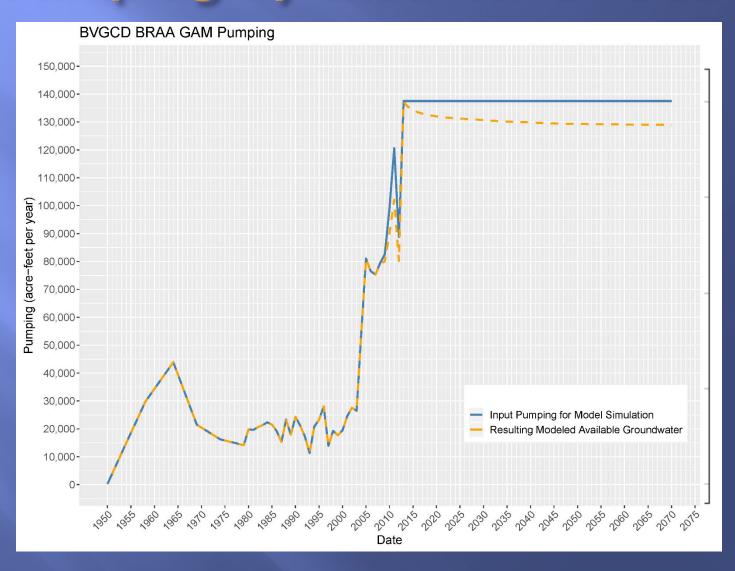
Comparison of Input Well Files For BVGCD



Comparison of Input and Output Pumping by District: POSGCD

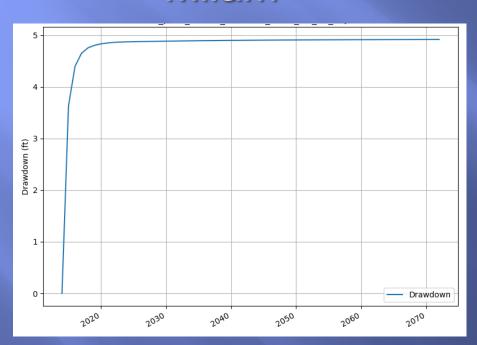


Comparison of Input and Output Pumping by District: BVGCD

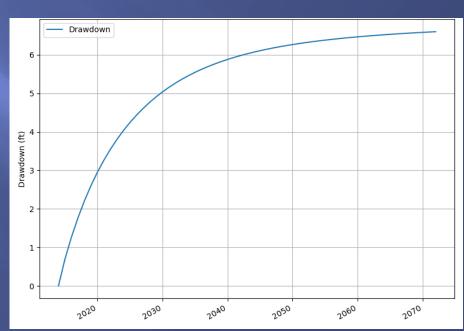


Average Drawdown in Alluvium: POSGCD

Milam

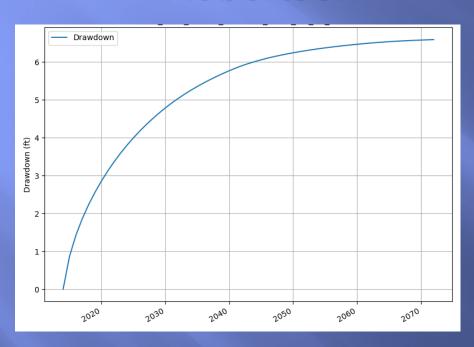


Burleson

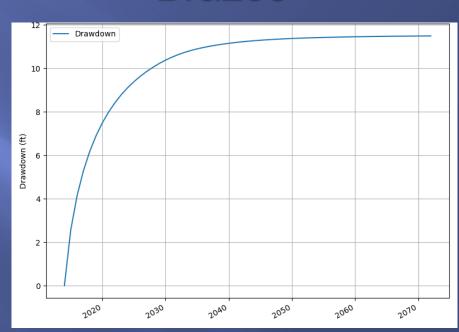


Average Drawdown in Alluvium: BVGCD

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?