CITY OF BRYAN
The Good Life, Texas Style.™

July 18, 2016

Via e-mail

Mr. Bill Harris
President, Brazos Valley Water Conservation District
1112 West 3rd St.
Hearne, TX 77859

Re: City of Bryan comments on proposed Desired Future Conditions

Dear Mr. Harris,

Pursuant to the notice published by the Brazos Valley Groundwater Conservation District (BVGCD) inviting public comments on the proposed Desired Future Conditions (DFC) through July 18, 2016, I am submitting to you the enclosed technical memo prepared and sealed by Mr. Bill Mullican P.G. on behalf of the City of Bryan. This memo constitutes Bryan's comments, suggested revisions, and the basis for those revisions. Because of the potential for the DFCs to adversely affect the property interests of the City of Bryan, we appreciate the opportunity to provide these comments to you and request that they be considered in developing the final DFC's. We would be glad to answer any questions you have concerning our comments.

Sincerely,

Jayson Barfknecht

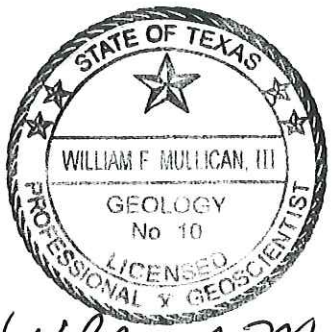
Jayson Barfknecht, Ph.D., P.E.
Public Works Director

Cc: Brazos Valley Groundwater District Board of Directors.
Mr. Alan Day, General Manager. BVGCD

CDM Smith

TBPE Firm No. F-3043

Memorandum



William F Mullican III 7/18/2016

To: *Jayson Barfnecht, Director of Utilities, City of Bryan*

From: *William F. Mullican, III, P.G.*

Date: *July 18, 2016*

Subject: *Technical review of proposed desired future conditions for Simsboro Aquifer in Brazos Valley Groundwater Conservation District adopted by Groundwater Management Area 12*

This technical memorandum presents a series of technical comments and requested revisions on the proposed Desired Future Conditions (DFCs), adopted by District Representatives in Groundwater Management Area 12 (GMA 12), specific to the area under the jurisdiction of the Brazos Valley Groundwater Conservation District (BVGCD). These comments and requested revisions have been prepared for your consideration and possible submission to the BVGCD Board of Directors, pursuant to BVGCD's notice inviting comment through July 18. In this technical comment and suggested revision letter, the following are discussed:

- Focus of City of Bryan's review,
- Discussion of use of "best available science,"
- Issues with distribution and amount of historic, current, and future pumping included in GMA 12 predictive simulation, referred to as PS6,
- Impact of incorrect distribution of current pumping in PS6 on cities in BVGCD,
- Modeling results utilizing PS6 in all areas of GMA 14 except for BVGCD, where corrections were made to major pumping centers, and
- Requested revisions.

Focus of City of Bryan's review

The focus of this technical review is on the Simsboro Aquifer, the distribution and rates or volume of pumping utilized in PS6 (the pumping scenario used by BVGCD is developing its DFC proposal), and current conditions in the BVGCD. Two primary outcomes that result from the joint-planning process as prescribed in Texas Water Code Section 36.108 (d) are DFCs and estimates of Modeled Available Groundwater (MAG). While we understand that the official estimates of MAG for all

relevant aquifers in GMA 12 will not be produced by the Texas Water Development Board (TWDB) until after final adoption of the DFCs, the practical reality is that the locations and rates of pumping prescribed by the District Representatives in PS6 for all relevant aquifers of the Carrizo-Wilcox Aquifer System also represent the ultimate estimates of MAG (to be produced by the TWDB) for each aquifer. Due to the ramifications that estimates of MAG now has on regional water planning, the Texas State Water Plan, and funding opportunities from the State Water Implementation Fund for Texas (SWIFT), administered by the TWDB, the distribution, rates, and timing of estimates of MAG are of critical concern to the City of Bryan, and thus are the focus of this technical review.

Use of "best available science" in GMA 12 joint-planning process

During the 84th Texas Legislature, House Bill 200 was passed and signed into law by Governor Abbott on June 19, 2015. House Bill 200, in part, amends Texas Water Code Section 36.0015 as follows:

> Sec. 36.0015. PURPOSE. (a) In this section, "best available science" means conclusions that are logically and reasonably derived using statistical or quantitative data, techniques, analyses, and studies that are publicly available to reviewing scientists and can be employed to address a specific scientific question.
>
> (b) In order to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions, consistent with the objectives of Section 59, Article XVI, Texas Constitution, groundwater conservation districts may be created as provided by this chapter. Groundwater conservation districts created as provided by this chapter are the state's preferred method of groundwater management in order to protect property rights, balance the conservation and development of groundwater to meet the needs of this state, and use the best available science in the conservation and development of groundwater through rules developed, adopted, and promulgated by a district in accordance with the provisions of this chapter.

This requirement for GCDs to utilize "best available science," although a new provision in the Texas Water Code, is certainly a standard that has been assumed to be an overarching principle for many GCDs prior to the passage of House Bill 200. As documented below, however, it is clear that when distributing current pumping in Brazos and Robertson counties in PS6, outdated and incorrect pumping information, both the location of current pumping and the rate of pumping, was utilized, rather than the readily available information obtained from the BVGCD during our review efforts. As such, it seems clear that in the execution of PS6 and derivation of the resulting proposed DFCs, the best science available to the District Representatives in GMA 12 was not utilized. This failure to utilize the best available science will become even more clear during the preparation of the explanatory report required by Texas Water Code Section 36.108 (d-3).

A review of the TWDB's Desired Future Condition Submission Packet Checklist - Groundwater Availability Model Administrative Elements (located at

http://www.twdb.texas.gov/groundwater/docs/DesiredFutureConditions-TWDB_Checklist_for_Submittals_Explanatory_Reports_and_Model_Files.pdf) clearly highlights that failure to utilize current, up-to-date information, including current pumping information, with a focus on the transition from the calibration period to the predictive period, will be important during the determination of administrative completeness by the TWDB. It is our understanding that if clearly identified flaws in pumping data is utilized in the modeling efforts of a GMA, then the modeling results may be deemed as administratively incomplete by the TWDB. As such, we believe it would be best for the BVGCD to request that GMA 12 District Representatives make the revisions recommended through this technical report to the pumping input files in order to ensure that the best available science is utilized.

Issues with distribution and amount of historic, current, and future pumping included in GMA 12 predictive simulation, referred to as PS6

The following analysis is based on the foundational premise of water resources planning and groundwater availability modeling that the more accurately observed/measured conditions are expressed in a groundwater availability model at the beginning of the predictive simulation, the better the predictive results will be in the end of the simulation (all other variables being the same). In other words, if one starts out a predictive simulation with significant (recognized or unrecognized) errors in the beginning of a predictive simulation, then the magnitude of error in subsequent results will be exacerbated.

In order to initiate this review, a copy of the pumping input file for PS6 was requested and obtained. In addition, copies of all reported Simsboro Aquifer pumping from 2008 – 2015 in the BVGCD were obtained, analyzed, and summarized. It is critical to establish and understand the correlation/relationship that exists between the PS6 pumping input file and the estimates of MAG (that will ultimately be provided by the TWDB). Simply put, the two sets of pumping estimates, (1) the PS6 pumping input file and (2) the estimates of MAG are, in fact, the same numbers. As such, any errors or mischaracterization of pumping in the pumping input file will also result in errors in the official estimates of MAG produced by the TWDB. It is noted that the BVGCD reported groundwater use estimates do not provide a specific breakdown by county for the location of pumping. Therefore, as part of this analysis, an additional dataset identifying well name and latitude and longitude, but not reported production, was obtained from the BVGCD and then correlated with reported groundwater production data to determine if reported pumping was located in Brazos County or Robertson County (Note – Annual BVGCD production reports do not include well locations. This absence of datasets that provide direct correlation between reported production and specific location, either by county or latitude/longitude, was confirmed by both the BVGCD and their consultant).

A summary of reported pumping (provided by BVGCD and located using the additional data obtained for this analysis), and volume of pumping utilized in PS6 for the Simsboro Aquifer within the BVGCD from 2011 – 2015 (provided by GMA 12 representative Gary Westbrook), is provided below in **Table 1**. Based on a comparison of these data, the following issues are quickly identified. First, pumping allocated in PS6 for Brazos County, on average, from 2011 – 2015, is 2,711 acre-feet

per year less than what BVGCD is recording/reporting as actual pumping for the same time period. It is noted that actual pumping reported by BVGCD does not include exempt use, whereas the pumping input file utilized in PS6 is required by law to include exempt use. As such, the actual delta between actual pumping, on average, from 2011 – 2015, is greater than the 2,711 acre feet recorded in **Table 1**. Conversely, pumping allocated in PS6 for Robertson County, on average, from 2011 – 2015, is 15,005 acre-feet per year more than what BVGCD is recording/reporting as actual pumping for the same time period. As part of our analysis of these numbers, it was observed that BVGCD reported pumping volumes from 2011-2015 do not include pumping from the Calvert Mine, located in Robertson County. It is assumed that this is because groundwater production for surface mining activities permitted by the Texas Railroad Commission (RRC) is exempt from GCD regulation (see Texas Water Code Section 36.117). **Table 2** includes reported annual groundwater production from the Simsboro Aquifer at the Calvert Mine (Permit No. 27G), located in Robertson County. From 2011 – 2014, the average production reported from the Simsboro Aquifer at the Calvert Mine is 5,088 acre-feet per year. As such, the combination of reported use (from the BVGCD) and exempt use from the Calvert Mine, as reported by the RRC, is approximately 31,319 acre-feet per year from 2011 – 2015 in Robertson County. Therefore an adjusted comparison is that the pumping allocated in PS6 for Robertson County, on average, from 2011 – 2015, is 9,917 acre-feet per year more than what the BVGCD and RRC are recording/reporting as actual pumping for the same time period. In summary, for the period from 2011 – 2015, pumping from the Simsboro Aquifer allocated in PS6 is 2,711 acre-feet per year **less than** actual reported pumping in Brazos County, whereas pumping from the Simsboro Aquifer allocated in PS6 is 9,917 acre-feet per year **more than** actual reported pumping in Robertson County. The result of these discrepancies is that predictions of declines in artesian pressure in the Simsboro Aquifer predicted by PS6 will inherently be less than actual declines in Brazos County and more than actual declines in Robertson County, under the assumption that pumping centers remain in the same locations.

Table 1 Estimates of reported pumping from the Simsboro Aquifer in the BVGCD from reported use and GMA 12 PS6 GAM predictive simulation

		Reported			PS6			Difference		
Year	Aquifer	Brazos	Robertson	Total	Brazos	Robertson	Total	Brazos	Robertson	Total
2011	Simsboro	39,143	28,416	67,558	31,117	41,123	72,240	8,026	-12,708	-4,682
2012	Simsboro	34,018	19,405	53,423	31,561	41,183	72,743	2,457	-21,778	-19,320
2013	Simsboro	35,528	28,730	64,258	32,005	41,232	73,237	3,523	-12,502	-8,979
2014	Simsboro	33,112	29,788	62,899	32,449	41,291	73,741	662	-11,504	-10,841
2015	Simsboro	31,778	24,818	56,595	32,894	41,351	74,245	-1,116	-16,533	-17,649
	Average	**34,716**	**26,231**	**60,947**	**32,005**	**41,236**	**73,241**	2,711	-15,005	-12,294

Table 2 Reported annual groundwater production from the Simsboro Aquifer for Calvert Mine, Permit No. 27G; located in Robertson County

Year	Production from Simsboro Aquifer (AFY)
2011	7,076
2012	6,387
2013	3,838
2014	3,051
2015	Not reported
Average	5,088

In addition to reviewing the differences in the volumes of actual pumping versus pumping used in PS6 on a county-by-county basis, another analysis was conducted to evaluate the locations of reported pumping versus location of pumping utilized in PS6 by GMA 12. In **Figures 1** and **2** below, the location and volume of pumping from the Simsboro Aquifer for 2011 and 2015 are illustrated. A close examination of these two maps documents three primary issues regarding the location and volume of pumping in BVGCD between actual reported pumping and simulated pumping used in PS6 by GMA 12. First, there are two areas of pumping in southern Robertson County (illustrated as individual square mile model cells colored orange) that are assumed to be associated with municipal production for Brazos County, and in particular for the City of Bryan. However, currently the City of Bryan does not have any groundwater production located in Robertson County. As such, to more accurately reflect what already is a matter of record, this production in southern Robertson County in a modified PS6 should be relocated to the general area of the current City of Bryan wellfield. Next, there is a very large amount of production in PS6 in Robertson County in the area of the Calvert Mine in PS6 that is not supported by any reported water use, either from the BVGCD or the RRC. Even accounting for reported water use at the Calvert Mine, the location and volume of pumping is not supported by any reported production, and this is confirmed by the number of high volume cells in the area with no well locations documented. Finally, there is a major discrepancy between reported groundwater use and groundwater pumping included in PS6 in the area of the Skiles Family Partnership. In both **Figure 1** and **2**, no pumping has been assigned to the cells in PS6 where the Skiles Family Partnership wells are located. However, actual reported production from the Skiles Family Partnership wells for the same time period represent approximately 20,000 acre feet per year of production from the Simsboro Aquifer. As a result, due to the location of the Skiles Family Partnership wells being farther from the Simsboro Aquifer outcrop, one could reasonably anticipate that if the actual production were to be moved from the Calvert Mine area, where no current production is occurring, to the actual location of this production in the Skiles Family Partnership area, then the predicted drawdowns will be greater than those currently reported from PS6, due to the more-downdip location of the Skiles Family Partnership wells.

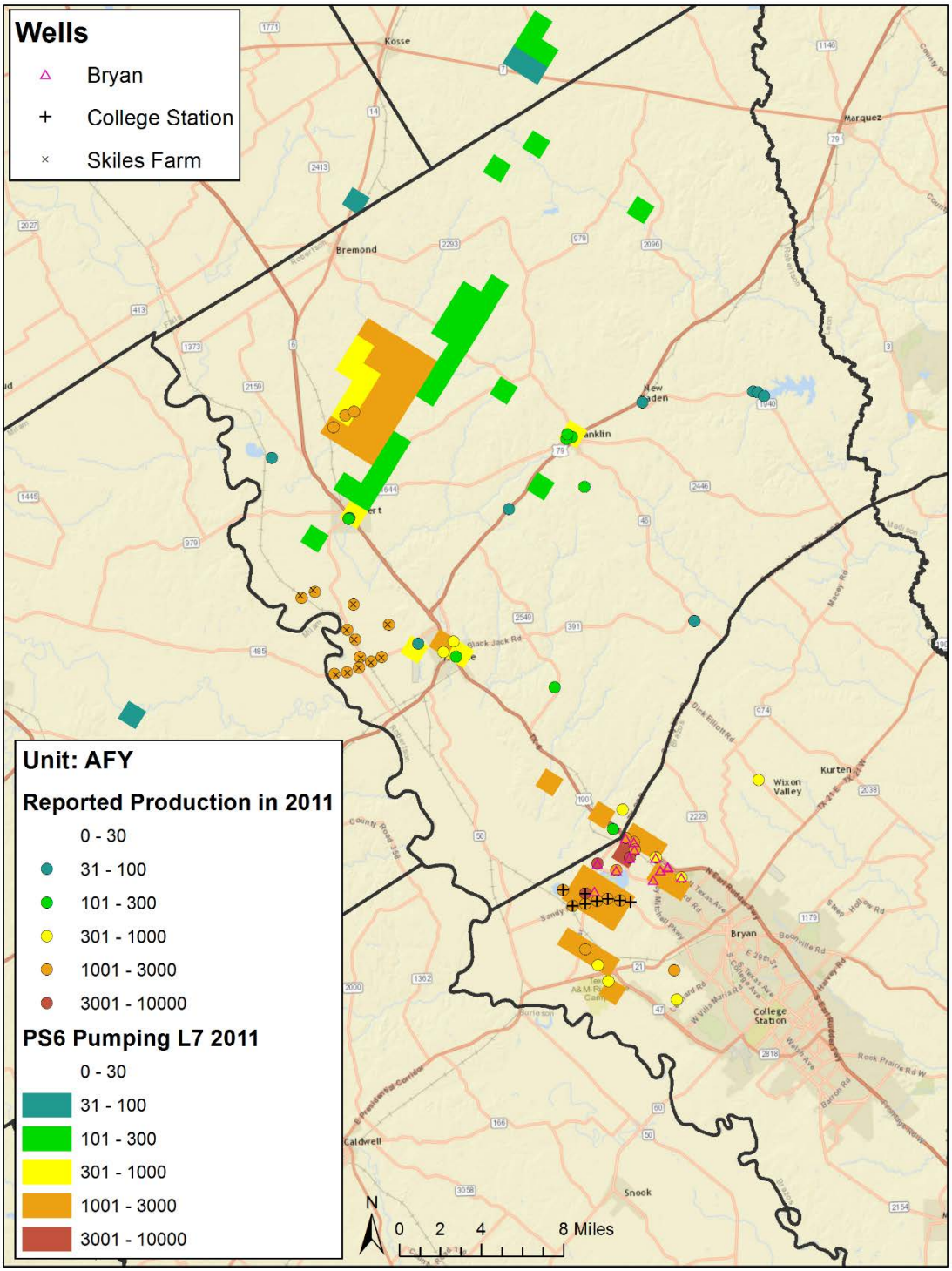


Figure 1. Map comparing location and annual volume of reported and simulated groundwater production from the Simsboro Aquifer in BVGCD in 2011. Reported production compiled from BVGCD reported water production data. PS6 pumping extracted from PS6 pumping input file.

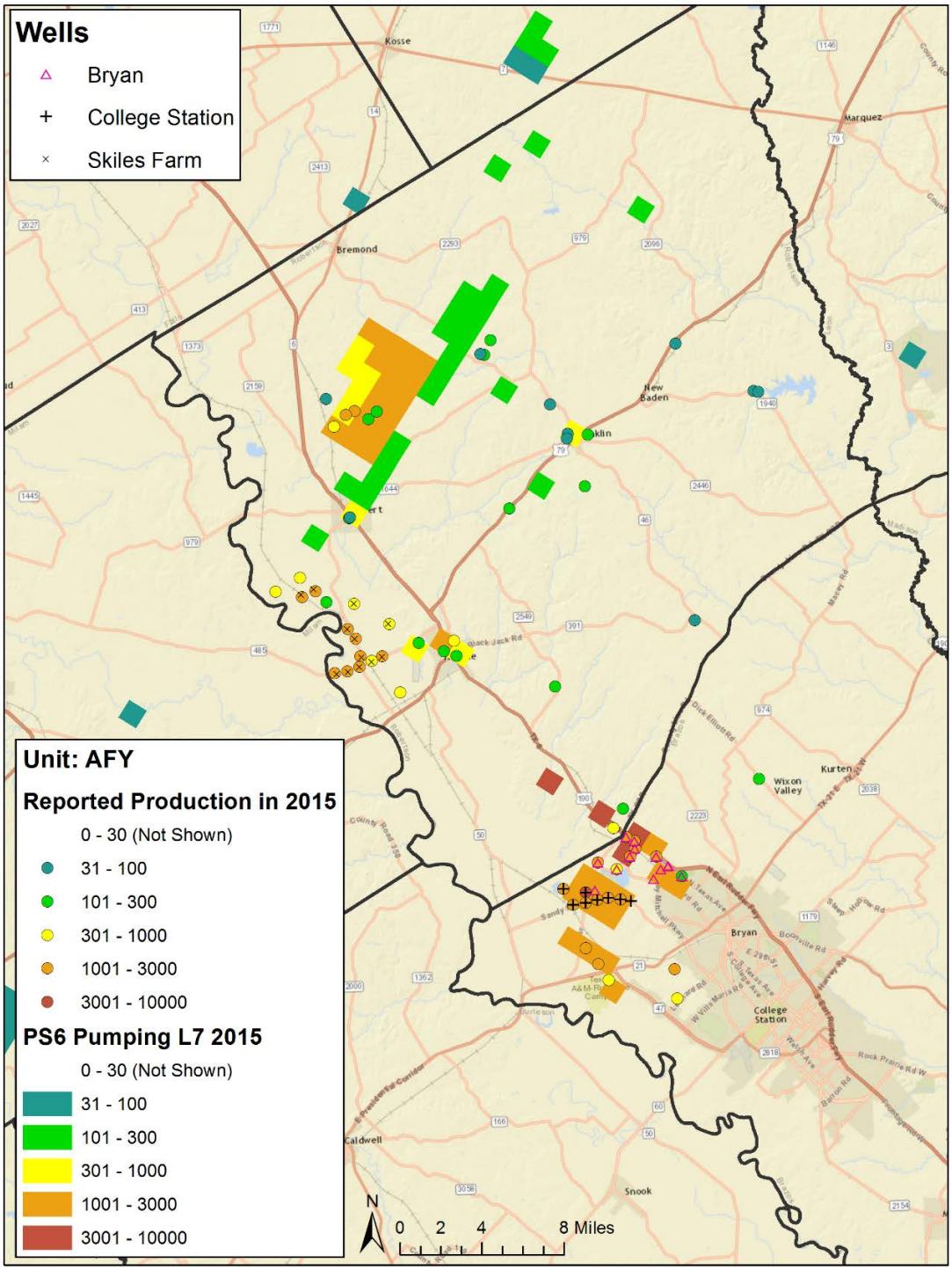


Figure 2. Map comparing location and annual volume of reported and simulated groundwater production from the Simsboro Aquifer in BVGCD in 2015. Reported production compiled from BVGCD reported water production data. PS6 pumping extracted from PS6 pumping input file.

Impact of incorrect distribution of current pumping in PS6 on cities in BVGCD

In summary, there are major issues with the distribution and rates of production used in PS6 by GMA 12 in the BVGCD that need to be addressed. The three most significant discrepancies are discussed in detail above. Resolution of errors made in the location and rates of production utilized in PS6 are critical to the City of Bryan and other groundwater users in the BVGCD for two primary reasons. First, the BVGCD is in the process of developing a methodology of evaluating progress made towards achieving DFCs that is predicated on the comparison of DFCs, which is an average of predicted water levels in the BVGCD versus measured water levels. As such, if the volume and location of actual pumping in Brazos County is already more than 2,500 acre-feet per year greater than the volume utilized in PS6, then the predicted drawdowns in Brazos County will be far less than what will occur in reality. As such, major groundwater producers in Brazos County such as the City of Bryan will be evaluated under what are incorrect and punitive criteria during any future regulatory proceedings.

Also, due to the current ramifications of MAG estimates, assigned on a county-by-county basis, with respect to state funding for municipal water supply projects through the SWIFT, it is imperative that at a minimum the assignment of estimates of MAG in Brazos and Robertson counties be realigned to reflect the location of current pumping. Otherwise, due to the limiting effect of estimates of MAG on the regional water planning process, there will be no groundwater development projects eligible for SWIFT funding in Brazos County until 2040. There needs to be a significant reallocation of pumping/MAG to Brazos County if it is the goal of the BVGCD to hold district-wide estimates of MAG at current levels. Otherwise, municipal water providers in Brazos County will have difficulty accessing funding from the SWIFT, which translates to citizens in the BVGCD being required to pay more for water infrastructure projects and upgrades than citizens residing in districts where MAG is properly allocated.

Modeling results utilizing PS6 in all areas of GMA 12 except for BVGCD, where corrections were made to major pumping centers – a modified PS6 "PS6_mod" DFC simulation

Simulation Setup

The GMA-12 PS6 DFC simulation formed the basis for what we refer to as "PS6_mod". The goal of the modified simulation was to maintain the same amount of pumping in BVGCD as in PS6, but to change where some of the pumping was located to better reflect BVGCD reported use records, City of Bryan pumping, and anticipated growth in pumping to meet demands within the region. PS6_mod pumping outside of BVGCD was identical to PS6, and modifications were made only to pumping in the Simsboro Aquifer (model layer 7).

Three primary modifications were made, starting in simulated year 2011:

1. City of Bryan pumping was modified to reflect reported production (based on BVGCD records) from 2011 to 2015. City of Bryan pumping from 2016 through 2070 was modified to reflect the estimates in the 2016 Region G Regional Water Plan. This modification included removing pumping in Robertson County that represented a hypothetical City of

Bryan wellfield near the county line, as discussed previously. Future pumping was distributed among the City of Bryan permitted wells based on their relative permitted amounts.

2. Skiles Family Partnership pumping was added for 2011-2070. For 2011 through 2015, reported pumping totals were used. From 2016 – 2070, the full permitted amount was used. The pumping was distributed to the permitted wells based on average yields from 2011-2015.

3. Pumping in the area of the Calvert Mine was reduced such that the total pumping in BVGCD was kept the same between PS6 and PS6_mod, given the changes described in #1 and #2. The pumping in the Calvert Mine area in PS6 was approximately 27,000 AFY from 2011 – 2014, and decreased to about 23,000 AFY by 2070. As discussed previously, this amount is considerably higher than water use reported to the RRC. RRC records indicate that reported pumping at the Calvert mine ranged from 7,000 – 8,000 AFY from 2000 to 2010, and averaged 5,088 AFY from 2011-2014. In PS6_mod, Calvert Mine pumping ranges from about 8,000 AFY in 2016 to 3,000 AFY in 2070.

Figure 3 shows the cell by cell pumping in PS6_mod in 2015 for the Simsboro Aquifer, for comparison to Figure 2, which shows the cell by cell pumping in 2015 for the original PS6 simulation. Note that simulated pumping now occurs at the Skiles Family Partnership wellfield, while less pumping occurs at the Calvert mine. Additionally, the pumping near the Brazos/Robertson county line, north of the City of Bryan that is not shown in BVGCD's records of reported pumping has been removed.

Figure 4 shows a temporal comparison between the simulated pumping in Robertson and Brazos counties for PS6 versus PS6_mod. Compared to PS6, PS6_mod pumping in Brazos County increases 8,700 acre-feet per year by 2070, while the pumping in Robertson County decreases 8,700 AFY by 2070.

Simulation Results

Figure 5 shows a comparison of the simulated head in the Simsboro Aquifer (model layer 7) between PS6 and PS6_mod in year 2070. The addition of pumping in the Skiles Family Partnership wells increases drawdown at that location, while the decreased pumping at the location of the Calvert Mine results in higher water levels at that location compared to PS6. The average drawdown in Robertson County increases by 14 feet in PS6 Mod compared to PS6. This increase in drawdown occurs despite an overall decrease in simulated pumping in the county. This result is partially due to the proximity of the outcrop to the mine, compared to the Skiles Family Partnership wells, and partially due to the simulated faulting in the area. As seen in Figure 5, there are many simulated faults in the area that act as barriers to flow. The actual sealing nature of these faults has been the subject of considerable discussion in GMA-12, and is currently being studied as part of an update to the groundwater model. In the case of PS6_mod, the simulated faults bracket the location of the Skiles Family Partnership wells, and cause an enhanced increase in drawdown due to the prevention of flow from the northwest and southeast.

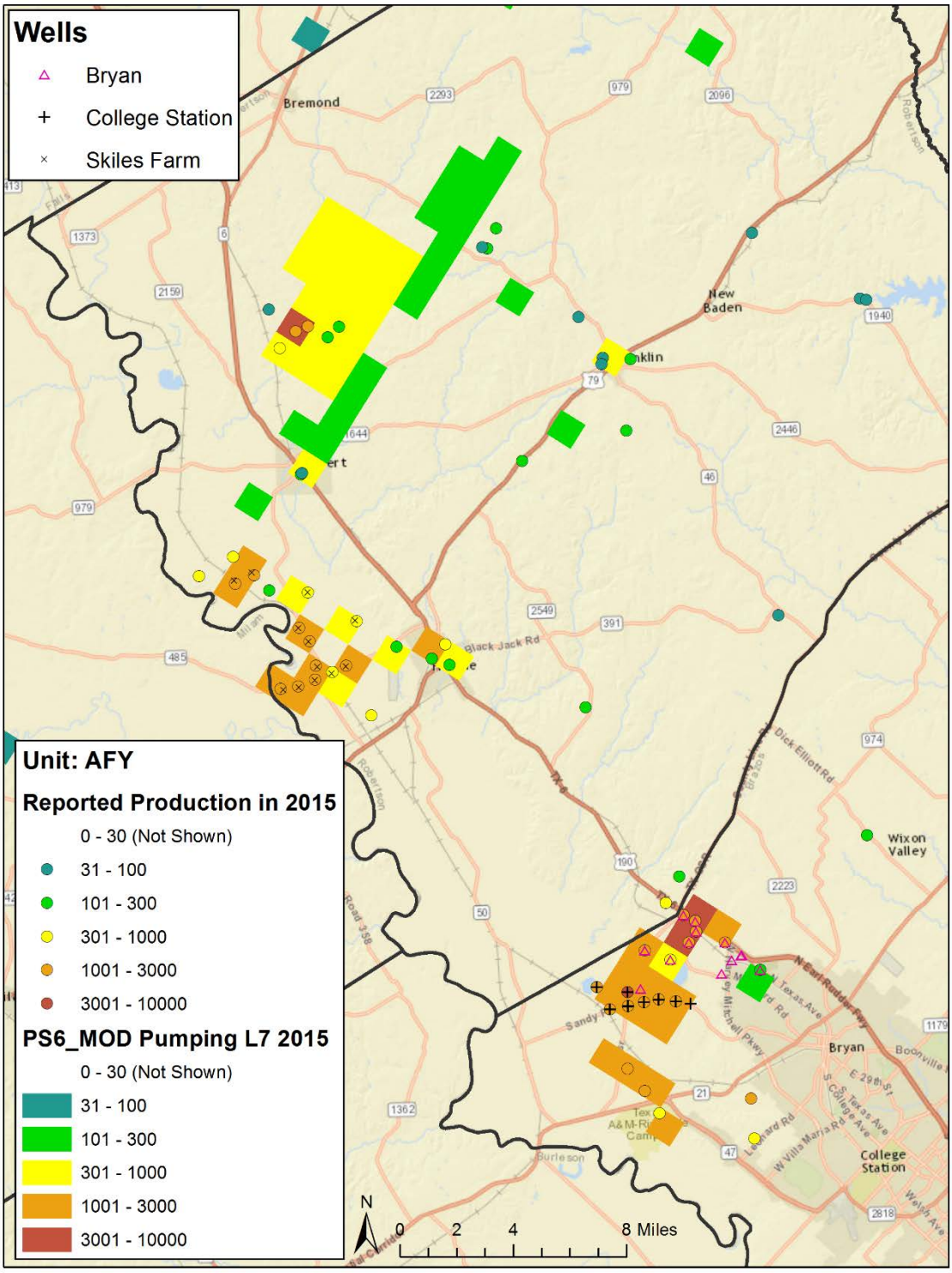


Figure 3. Map comparing location and annual volume of reported and modified simulated groundwater production from the Simsboro Aquifer in BVGCD in 2015. Reported production compiled from BVGCD reported water production data. PS6_mod pumping extracted from PS6_mod pumping input file.

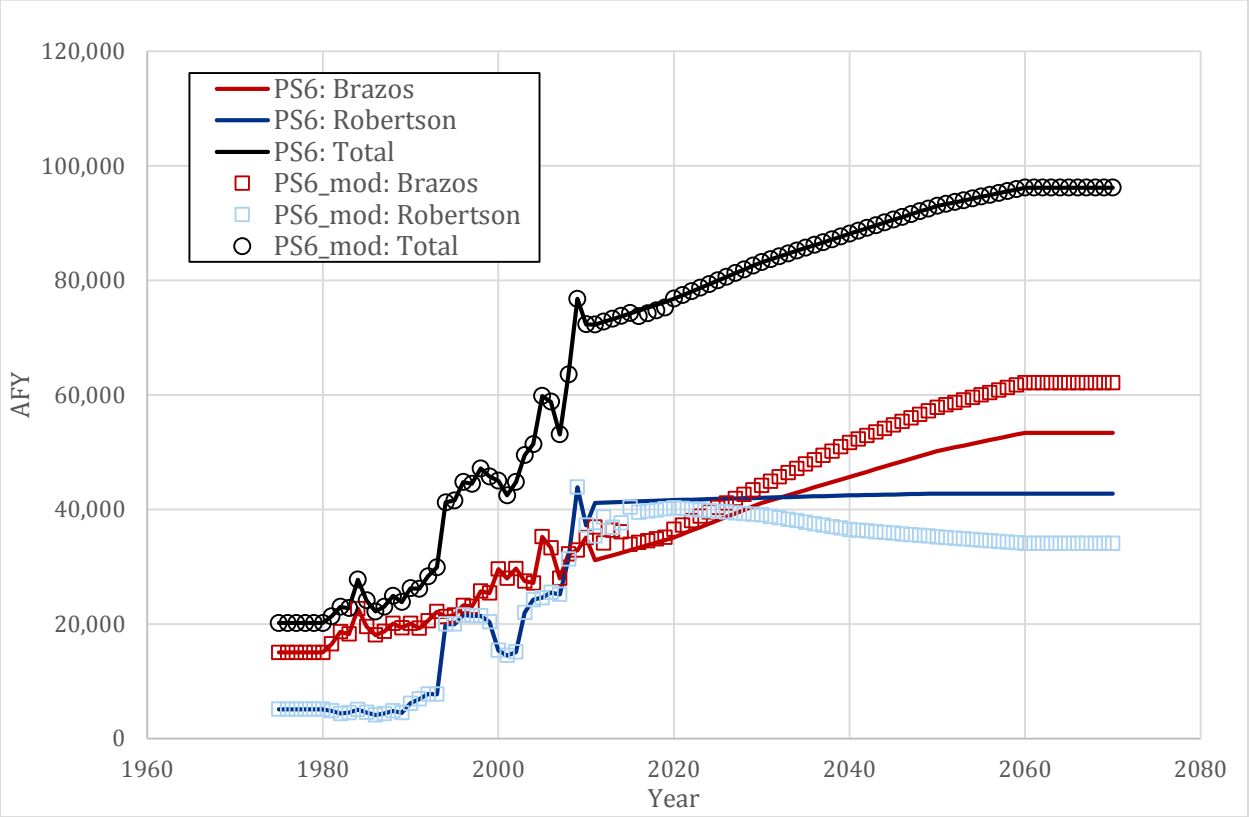


Figure 4 Simulated Simsboro pumping in PS6 and PS6_mod for Brazos and Robertson counties

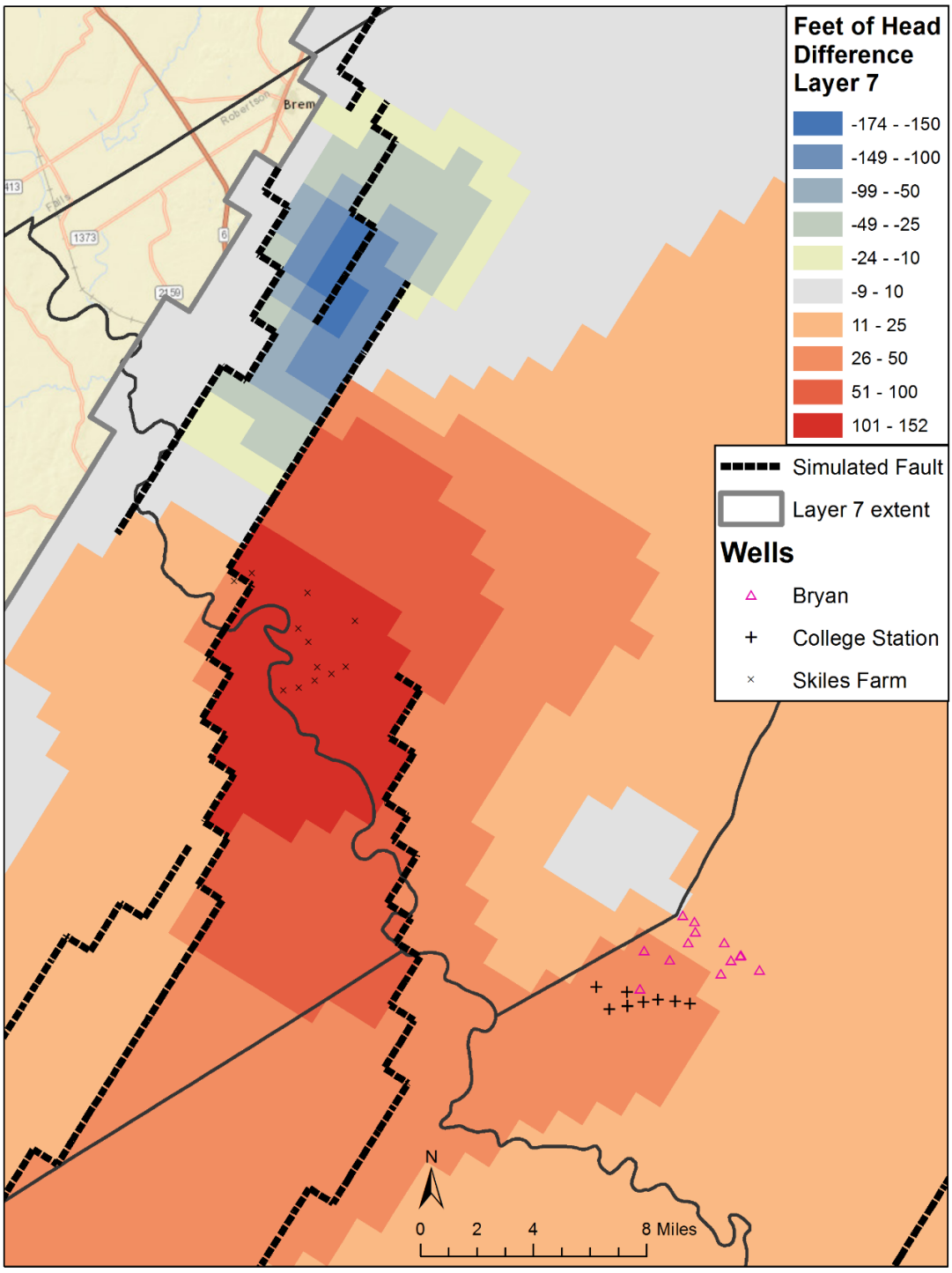


Figure 5. Map showing the difference between simulated Simsboro Aquifer heads in PS6 and PS6_mod in 2070. The values represent the difference between PS6 and PS6_mod, so that negative values indicate higher heads (less drawdown) in PS6_mod, while positive values indicate more drawdown in PS6_mod.

The simulated average drawdown in Brazos County increases by 18 feet due to the increased pumping at the City of Bryan wells in Brazos County. The combined average increase in Simsboro Aquifer drawdown in BVGCD for PS6_mod compared to PS6 is 16 feet.

Requested revisions

As a result of this review and analysis of the DFCs proposed by GMA 12 for the Simsboro Aquifer in the BVGCD, the City of Bryan respectfully requests the BVGCD consider the following changes for submission to the District Representatives of GMA 12 for their consideration. This request is based on the foundational principle of DFCs, as stated in Texas Water Code Section 36.1083 (b), that adopted DFCs are to be reasonable. The proposed DFCs for the Simsboro Aquifer in BVGCD, for the reasons stated above, are not based on best available science, do not reflect current pumping conditions, and as such, are not reasonable.

1. Modify the simulated pumping at the City of Bryan wellfield in Brazos County to reflect the reported values from 2011-2015, and to reflect anticipated growth in pumping to meet demands within the region from 2016-2070.

2. Remove the pumping in Robertson County apparently associated with the City of Bryan.

3. Modify the simulated pumping at Skiles Family Partnership to reflect the reported values in 2011-2015, and to reflect the permitted amount for 2016-2070.

4. Reduce the amount of predicted pumping at the Calvert Mine so that the overall MAG for Brazos and Robertson counties combined remains the same. This results in an 8,700 AFY increase in Brazos County, and a commensurate decrease in Robertson County.

The effect of making the revisions listed above in PS6_mod are that for the Simsboro Aquifer in 2070, there will be (1) a 14 foot increase in proposed DFCs in Robertson County, (2) an 18 foot increase in proposed DFCs in Brazos County, and (3) a 16 foot increase in proposed DFCs for BVGCD.