ATTACHMENT 5

Selected References

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Attachment F –
Supplemental Modeling Information
Added 12/9/2022

LRE WATER

THORNHILL GROUP, INC.
Professional Hydrogeologists • Water Resources Specialists

September 1, 2022

Mr. Alan M. Day, General Manager
Brazos Valley Groundwater Conservation District
112 West 3rd Street
Hearne, Texas 77859

Re: Supplemental Modeling Information –
Hydrogeological Report:
Brazos Valley Farm Permit Application – Proposed Simsboro Wells
To Be Completed on the Barton, Goodland, and Harlan Farms
Robertson County, Texas

Dear Mr. Day:

Thornhill Group, Inc. (TGI), on behalf of Brazos Valley Farm (BVF) and per requests from Mr. W. John Seifert, Jr., P.E. of Ground Water Consultants, LLC (GWC) and you, provides herewith to the Brazos Valley Groundwater Conservation District (BVGCD) supplemental maps and associated information illustrating the modeled differences in artesian pressures (i.e., aquifer water levels in wells) in the Simsboro aquifer between the following two scenarios:

- The baseline run (Run S-19) used by Groundwater Management Area 12 (GMA 12) and BVGCD to derive desired future conditions (DFCs) in the most recent joint-planning process, with the exception that the entirety of the modeled Simsboro pumping on the BVF properties, including that representing historic use (HU) permit pumping, was set to zero; and,
- A supplemental run (BVFD_Scenario12.7z) in which total pumping from BVF properties totals 49,999 acre-feet per year from the proposed new wells for which production permits either have been granted (i.e., 15,483 acre-feet per year approved on April 17, 2019) or has been requested per the subject permit application (i.e., an additional 34,516 acre-feet per year) submitted to BVGCD on May 11, 2022.

The supplemental information is provided additional to the modeling results submitted with the subject permit application that you declared administratively complete on May 23, 2022. The simulations were conducted utilizing the most recently approved groundwater availability (GAM) run for Groundwater Management Area 12 (GMA 12), modified appropriately to illustrate the requested comparisons for the subject permit application. The supplemental modeling, like the modeling reported in the permit application, was conducted by R.W. Harden & Associates, Inc. (RWH&A). The modeled pumping scenarios and methodologies were discussed and agreed to by RWH&A, TGI, GWC, and Advanced Groundwater Solutions, LLC (AGS), who is engaged by GWC and/or BVGCD to assist the BVGCD in conducting and assessing the modeling scenarios proposed

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Texas Professional Geoscience Firm Registration No. 50346

by BVF. RWH&A provided to GWC and AGS via e-mail on July 1, 2022 the digital pumping files for the supplemental pumping scenario (i.e., 49,999 acre-feet per year from BVF properties) and the base well file (i.e., Run S-19 with no Simsboro pumping from BVF properties). This letter provides an attachment containing maps and tabulations generated by TGI and illustrating the simulation results to allow for direct comparison with the modeling simulations provided in the administratively complete permit application. Note that the original GAM runs for the permit application included 65,938 acre-feet per year of pumping from wells on BVF properties, including 10,000 acre-feet per year of HU pumping, production of 15,483 acre-feet per year based on 2019 production permits, and additional proposed production permits totaling 40,455 acre-feet per year. Also note that the total requested pumping for production permit application is 49,999 acre-feet per year, or 5,939 acre-feet per year (about 10.6 percent) less than the amount reflected in the modeling for the original application.

Supplemental Figure 1 and Supplemental Figure 2 illustrate the contoured differences in simulated head values with 49,999 acre-feet of BVF pumping from the Simsboro aquifer as opposed to no pumping from the BVF properties after one (1) and ten (10) years, respectively. Supplemental Table 1 provides the modeled water-level differences for the revised GAM-run comparison herein at identified wells within one (1) mile of the proposed wells after one (1) and ten (10) years. Supplemental Table 1 also includes analytical modeling results as provided in the original permit application. To assess the differences between the modeling results provided with original permit application and the supplemental results, Supplemental Figure 1 can be compared to Figure 12 in the subject permit application, and Supplemental Figure 2 can be compared to Figure 13 in the permit application. Based on the supplemental simulations, TGI provides the following:

- The supplemental model run illustrates the differences in water levels (i.e., aquifer head) for the Simsboro aquifer between a run with no pumping from BVF properties and pumping of 49,999 acre-feet per year of pumping from new (i.e., 2019 permits) and proposed wells. The contoured values do not represent drawdown additional to that already considered by the BVGCD and GMA 12 during joint-planning modeling;
- Projected drawdown after 10 years of pumping from wells on the BVF properties as shown in the original GAM runs for the proposed permit application is typically 30 to 40 feet more than the water-level differences shown in the supplemental simulations. Note that the simulated pumping in the GAM run for the original permit application was about 10.6 percent more for the BVF properties than in the supplemental runs represented herein (see Figure 12 and Figure 13 provided in the subject permit application); and,
- Projected Simsboro water levels at and near the BVF properties will remain above the top of the aquifer (i.e., under artesian conditions) based on results of all GAM simulations used for the subject permit application.

If you have any questions, please call me directly or e-mail me at mthornhill@tgi-water.com.

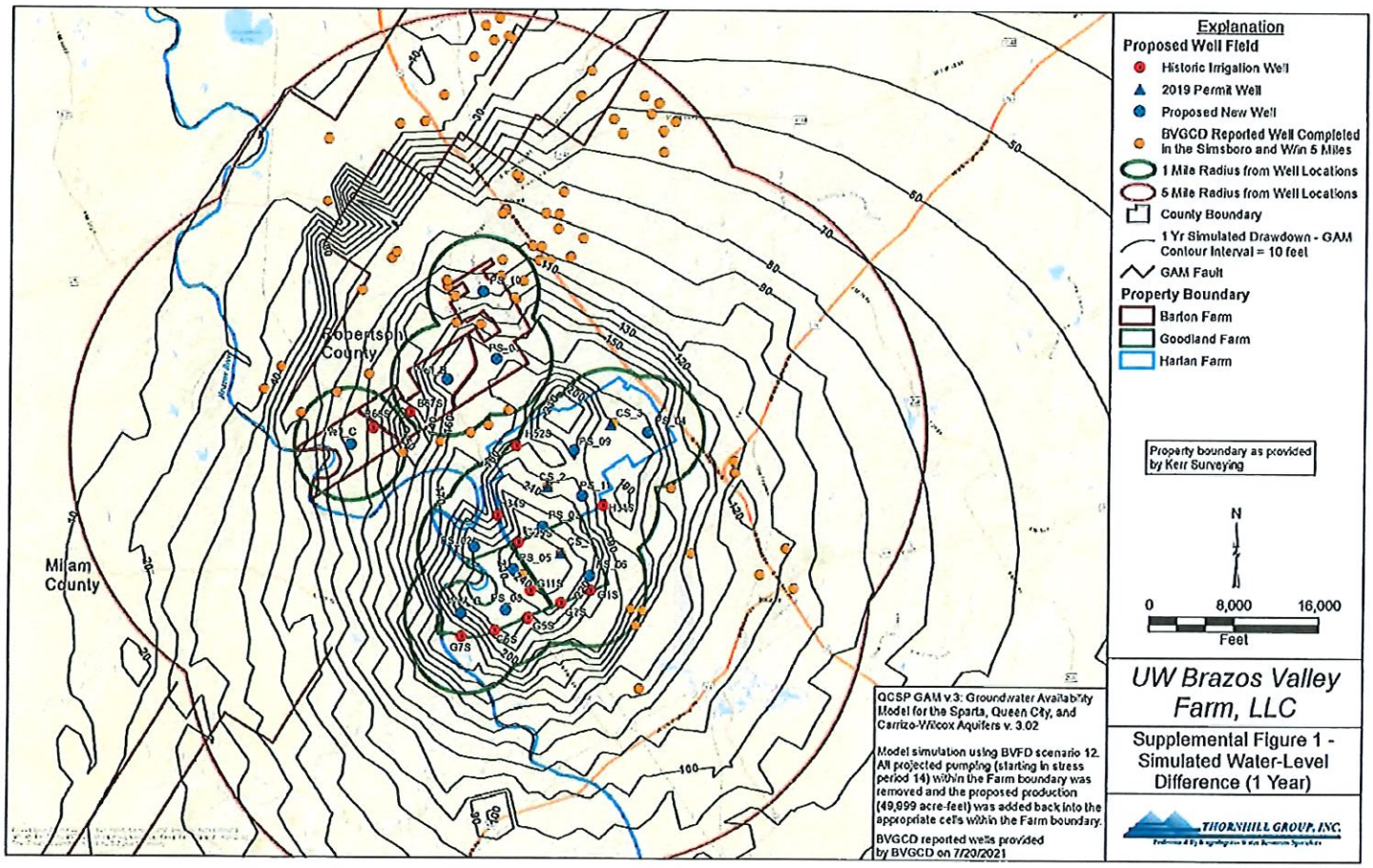
The seal appearing on this document was authorized by Michael R. Thornhill, P.G. on September 1, 2022.

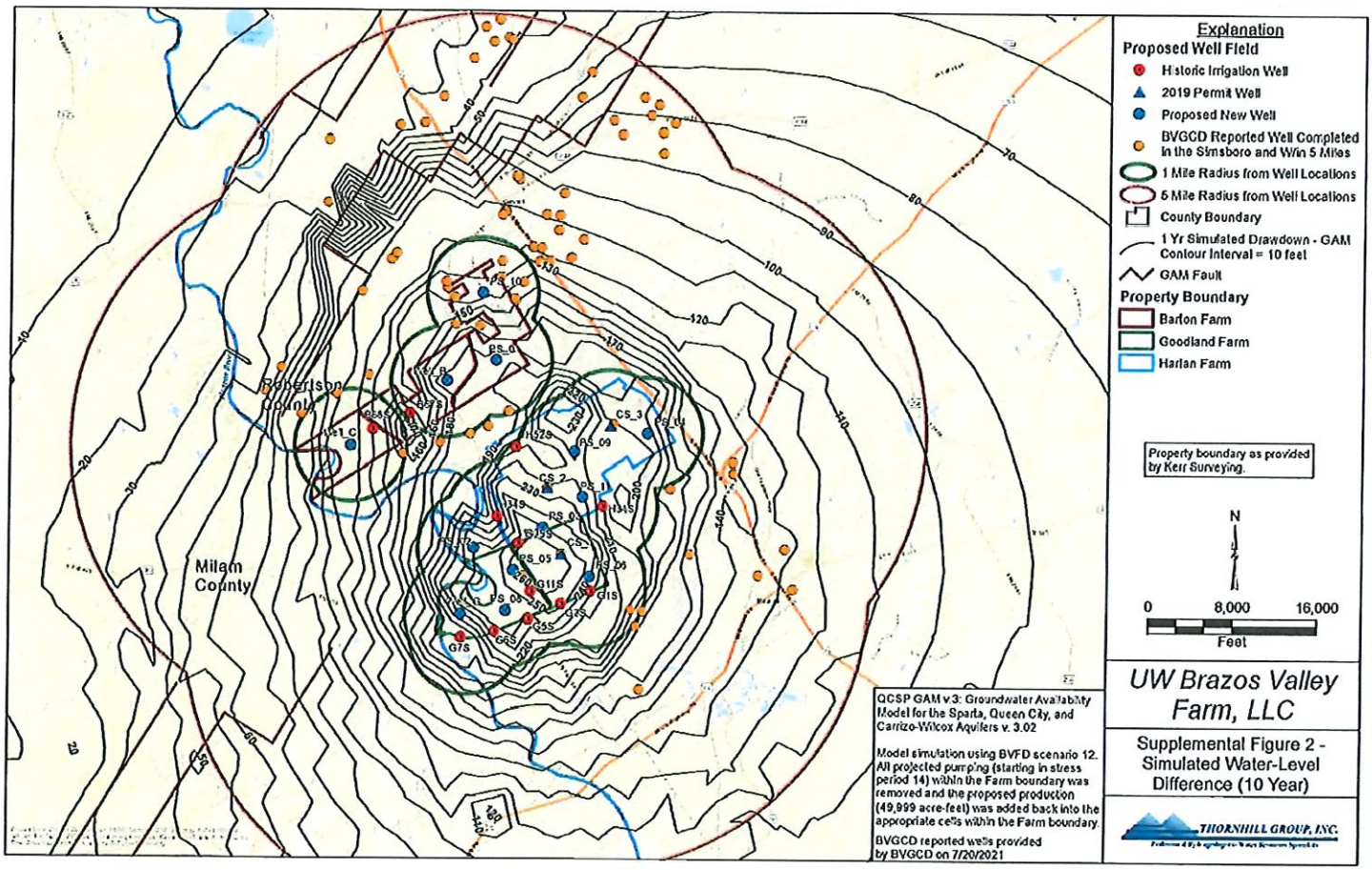
Sincerely,
THORNHILL GROUP, INC.

Michael R. Thornhill, P.G.
President

cc: Mr. David Lynch, UW/BVF, LLC
Mr. Ron Yair, UW/BVF, LLC

ATTACHMENTS


Explanation
Proposed Well Field
Historic Irrigation Well
2019 Permit Well
Proposed New Well
BVGCD Reported Well Completed in the Simsboro and Wilcox Aquifers within 5 Miles
1 Mile Radius from Well Locations
5 Mile Radius from Well Locations
County Boundary
1 Yr Simulated Drawdown - GAM Contour Interval = 10 feet
GAM Fault
Property Boundary
Barton Farm
Goodland Farm
Harlan Farm
Property boundary as provided by Kerr Surveying
N
0
8,000
16,000
Feet
Robertson County
Milam County
QCSP GAM v.3: Groundwater Availability Model for the Sparta, Queen City, and Carrizo-Wilcox Aquifers v. 3.02
Model simulation using BVFD scenario 12. All projected pumping (starting in stress period 14) within the Farm boundary was removed and the proposed production (49,999 acre-feet) was added back into the appropriate cells within the Farm boundary.
BVGCD reported wells provided by BVGCD on 7/20/2021
UW Brazos Valley Farm, LLC
Supplemental Figure 1 - Simulated Water-Level Difference (1 Year)
THORNHILL GROUP, INC.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Barton Farm
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GCSP GAM v.3: Groundwater Availability Model for the Sparta, Queen City, and Carrizo-Wilcox Aquifers v. 3.02
Model simulation using BVFD scenario 12. All projected pumping (starting in stress period 14) within the Farm boundary was removed and the proposed production (49,999 acre-feet) was added back into the appropriate cells within the Farm boundary.
BVGCD reported wells provided by BVGCD on 7/20/2021
UW Brazos Valley Farm, LLC
Supplemental Figure 2 - Simulated Water-Level Difference (10 Year)
THORNHILL GROUP, INC.

Supplemental Table 1. Modeled Water-Level Changes at Registered and Permitted Wells Within 1 Mile of the Proposed Permit Wells

Owner	Registration or Permit Number	Aquifer	Well Depth (feet)	Casing Diameter (inches)	Latitude	Longitude	GAM* 1 Year Modeled Drawdown (feet)	GAM* 10 Year Modeled Darwdown (feet)	Analytical** 1 Year Modeled Drawdown (feet)	Analytical** 10 Year Modeled Drawdown (feet)
Barton Farm										
UW Brazos Valley Farm, LLC	BVHU-1058K	Simsboro	720	16	30.924333	-96.702966	139	155	210	360
UW Brazos Valley Farm, LLC	BVHU-1058L	Simsboro	691	16	30.920417	-96.714283	114	130	225	375
Harlan Farm										
UW Brazos Valley Farm, LLC	BVDO-0255	Simsboro	0	0	30.903856	-96.662094	215	224	320	470
UW Brazos Valley Farm, LLC	BVDO-0256	Simsboro	0	0	30.919825	-96.641585	181	202	275	425
UW Brazos Valley Farm, LLC	BVHU-1058G	Simsboro	964	16	30.898588	-96.645434	182	212	290	450
UW Brazos Valley Farm, LLC	BVHU-1058J	Simsboro	875	16	30.914647	-96.671122	187	206	280	430
UW Brazos Valley Farm, LLC	BVHU-1058	Simsboro	930	16	30.896850	-96.677267	199	215	300	450
Goodland Farm										
UW Brazos Valley Farm, LLC	BVDO-0254	Simsboro	0	0	30.886626	-96.658433	241	261	318	468
UW Brazos Valley Farm, LLC	BVR-0240	Simsboro	1,065	4	30.881350	-96.670083	242	263	310	460
UW Brazos Valley Farm, LLC	BVHU-1058A	Simsboro	1,095	16	30.866028	-96.689233	177	197	250	400
UW Brazos Valley Farm, LLC	BVHU-1058B	Simsboro	1,090	16	30.867349	-96.678991	215	235	260	410
UW Brazos Valley Farm, LLC	BVHU-1058C	Simsboro	1,100	16	30.870200	-96.668713	219	238	273	423
UW Brazos Valley Farm, LLC	BVHU-1058D	Simsboro	1,131	16	30.873824	-96.658706	231	241	280	430
UW Brazos Valley Farm, LLC	BVHU-1058E	Simsboro	1,175	16	30.876867	-96.649833	212	232	280	430
UW Brazos Valley Farm, LLC	BVHU-1058F	Simsboro	1,065	16	30.877300	-96.667783	238	256	300	450
UW Brazos Valley Farm, LLC	BVHU-1058H	Simsboro	979	16	30.889917	-96.671117	236	255	319	470
Off Property										
Bland, Andy	BVR-1304	Simsboro	560	4	30.946609	-96.681066	146	165	218	369
Broadus, Shirley L.	BVR-2975	Simsboro	654	4	30.952630	-96.670163	130	149	205	355
Triple C Ranch	BVR-0846	Simsboro	590	4	30.958966	-96.674405	110	129	191	340
Deason, Jack	BVR-0023	Simsboro	510	4	30.953885	-96.688707	121	138	195	345
Dixon, Kimona K.	BVR-3043	Simsboro	482	4	30.956639	-96.690810	117	135	190	339
Fleming, Nancy	BVR-1894	Simsboro	515	4	30.958068	-96.691089	115	133	175	335
Howard, Shirley J.	BVR-3044	Simsboro	660	4	30.953124	-96.670470	129	148	204	354
Manterola, Jane Anderson	BVR-0434	Simsboro	400	0	30.913686	-96.705731	138	155	228	379
Mears, Jeffrey L.	BVR-3049	Simsboro	620	4	30.957417	-96.667598	122	142	193	342
Miles, Roger	BVR-1574	Simsboro	530	4	30.947231	-96.688573	140	159	210	360
Sandra Ryan & Bernadette Sloat	BVDO-0091	Simsboro	565	24	30.929765	-96.725049	92	108	182	332
Sandra Ryan & Bernadette Sloat	BVR-0985	Simsboro	735	4	30.923989	-96.673093	168	188	261	412
Sosa, Hilario Jr.	BVR-3042	Simsboro	450	4	30.963100	-96.673970	115	125	181	330
Mears, Frank	BVR-1506	Simsboro	1,250	2	30.870019	-96.669033	218	138	272	422
Wallace, Zane & Virginia	BVR-1845	Simsboro	1,100	4	30.871595	-96.637759	175	195	238	388

Notes: An asterisk (*) indicates modeled drawdown using the Queen City, Sparta, and Carrizo-Wilcox Aquifers GAM. See Supplement Figures 1 and 2 for a map with drawdown contours. A double asterisk (**) indicates modeled drawdown estimated using an analytical model applying the Theis equation. See Figures 14 and 15 for a map with drawdown contours.