Comments concerning LSGCD's DFC proposal

There are four areas for which I have prepared comments:

- Regional modeling for GMA 14 DFCs,
- Definition of available remaining drawdown by 2080,
- 70% limit of available drawdown in a monitoring well in Mongomery County, and
- Access to available groundwater in current or future wells.

Regional modeling for GMA 14 DFCs

All participating districts agreed that the groundwater model to be used for DFCs should be based on the GMA 14 Proposed DFC Run, previously called the GMA 14 Model Scenario 14.3 SD 6. This model was updated by LSGCD consultants from the GULF model developed by the USGS and published in 2023. The model included updates following a review by Dr. William Hutchinson (consultant for a subset of districts in GMA 14). This additional update accounted for revised groundwater pumping and conversion scenarios in subsidence districts.

My understanding is that Dr. Hutchison conducted the necessary model run(s) and provided the results to GMA 14 participants. A further model, Adjusted Scenario 14.3 SD B6, was also run. This model included limitation of pumping in number of counties within GMA 14.

It appears that this additional model was the one used to finalize the proposed DFCs for each county in GMA 14. All but two of the proposed DFCs in the GMA 14 statement correspond to Dr. Hutchinson's average MPRAD summary. The two different DFCs for Galveston and Newton Counties are highlighted on the statement and table below. On the other hand, the MPRAD averages for the model scenario 14.3 SD B6's DFCs are significantly different from those in the DFC statement for nearly all counties.

STATEMENT OF PROPOSED DESIRED FUTURE CONDITIONS FOR GROUNDWATER MANAGEMENT AREA 14

The Member Districts of Groundwater Management Area 14 ("GMA 14") propose the following Desired Future Conditions ("DFCs") for each county in GMA 14 in the Gulf Coast Aquifer[1] in 2080 from 2018 to 2080:[2]

- **Austin County**: no less than 82 median percent remaining available drawdown
- **Brazoria County**: no less than 83 median percent remaining available drawdown
- **Chambers County**: no less than 82 median percent remaining available drawdown
- **Fort Bend County**: no less than 56 median percent remaining available drawdown
- **Galveston County**: no less than 91 median percent remaining available drawdown
- **Grimes County**: no less than 75 median percent remaining available drawdown
- **Hardin County**: no less than 82 median percent remaining available drawdown
- **Harris County**: no less than 67 median percent remaining available drawdown
- **Jasper County**: no less than 72 median percent remaining available drawdown
- **Jefferson County**: no less than 88 median percent remaining available drawdown
- **Liberty County**: no less than 80 median percent remaining available drawdown
- **Montgomery County**: no less than 70 median percent remaining available drawdown
- **Newton County**: no less than 71 median percent remaining available drawdown
- **Orange County**: no less than 88 median percent remaining available drawdown
- **Polk County**: no less than 91 median percent remaining available drawdown
- **San Jacinto**: no less than 87 median percent remaining available drawdown
- **Tyler County**: no less than 79 median percent remaining available drawdown
- **Walker County**: no less than 70 median percent remaining available drawdown
- **Waller County**: no less than 72 median percent remaining available drawdown
- **Washington County**: no less than 85 median percent remaining available drawdown

Any supporting materials, such as the documentation of factors and groundwater availability model run results are available at https://www.dropbox.com/scl/fo/4xqap864k4ujk7czyt55f/h?rlkey=6s1d8z5nw6zrrx93zexur8gcx&e=2&st=e8cjen4c&dl=0.

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[1] Excludes Catahoula in Montgomery, Walker, and Grimes Counties
[2] Using cleaned up version of GMA 14 Model Scenario "14.3 SD B6" renamed as "GMA 14 Proposed DFC Run 2026."

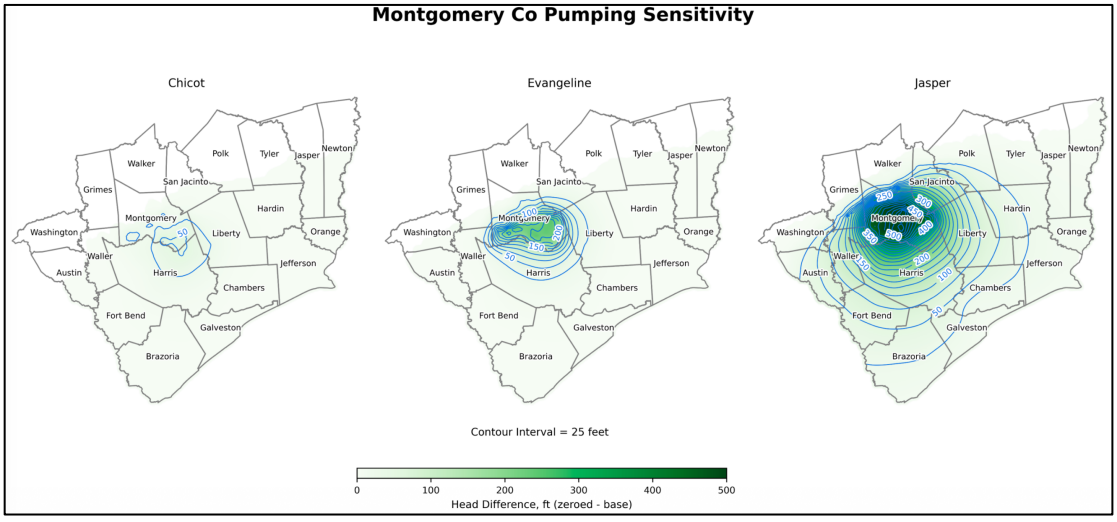
It would be helpful to have confirmation of the final model used to determine the proposed DFCs as well as an explanation of the two instances of differences in DFCs.

Adjusted Scenario 14.3 SD B6 Summary Values in 2080

County	2080 Pumping (AF/yr)	Average Drawdown in 2018 to 2080 (ft)			MPRAD* in 2080 (2018 Baseline)	Dry Well % in 2080	Additional Subsidence 2018 to 2080 (ft)	
		Chicot	Evangeline	Jasper			Average	Maximum
Austin	35,706	36	37	64	82	2	0.5	1.1
Brazoria	54,886	41	40	29	83	6	0.8	1.7
Chambers	22,388	24	24	32	82	4	0.9	2.7
FortBend	174,352	73	66	59	56	11	0.9	1.7
Galveston	2,629	18	18	19	90	7	0.6	1.5
Grimes	12,555	9	20	110	75	7	0.4	2.0
Hardin	37,721	37	39	55	82	5	0.8	3.5
Harris	207,269	51	55	135	67	9	1.2	3.5
Jasper	73,365	51	44	42	72	3	0.6	4.1
Jefferson	9,222	17	17	28	88	1	0.4	1.3
Liberty	37,425	37	46	107	80	2	1.0	2.3
Montgomery	199,069	37	112	310	70	9	2.4	5.4
Newton	36,539	43	41	52	86	3	0.4	1.7
Orange	25,206	41	41	33	88	2	1.0	1.7
Polk	7,843	17	12	51	91	1	0.2	0.6
SanJacinto	9,476	14	32	132	87	3	0.8	1.9
Tyler	34,384	25	25	70	79	6	0.2	0.8
Walker	5,971	NA	8	54	70	14	0.3	2.2
Waller	56,238	39	60	121	72	7	1.2	2.3
Washington	9,518	NA	20	34	85	2	0.1	0.7

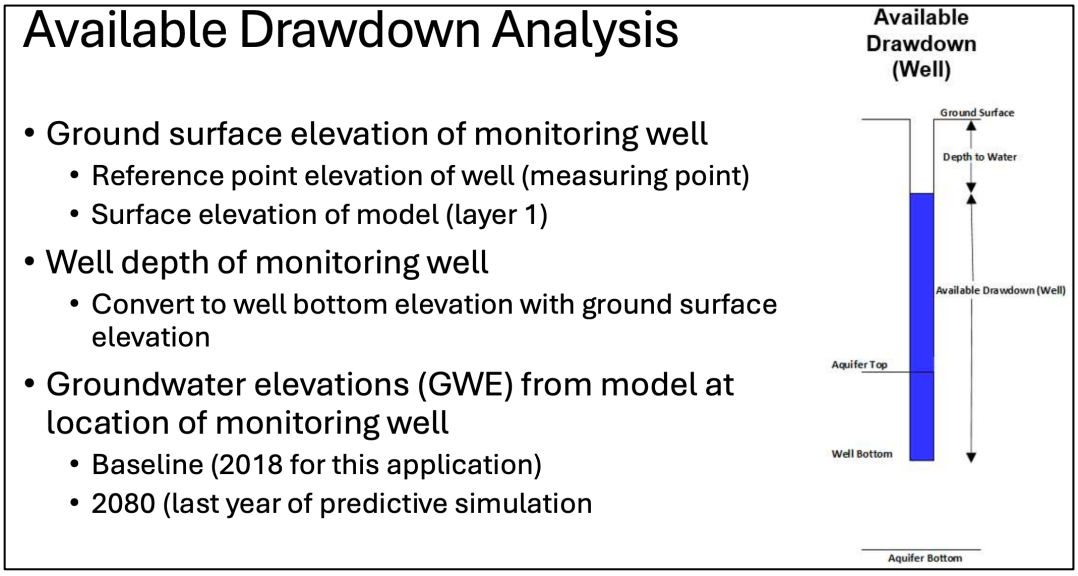
*MPRAD = Median Percentage Remaining Available Drawdown

Finally, all data output should be documented, preferably with a user-friendly viewer, for the model actually used for the proposed DFCs. The illustrated pumping sensitivity assessment for Montgomery County is a good example for update to an interactive viewer.

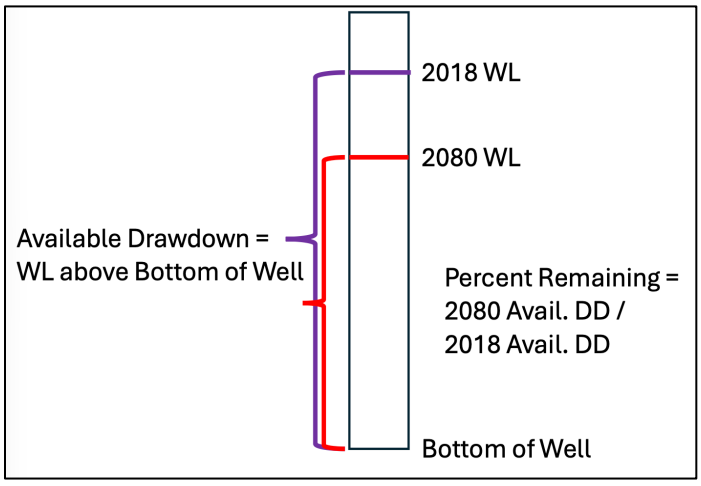


Definition of available remaining drawdown by 2080

Dr. Hutchinson's review of the LSGCD consultant's model clarified the meaning of available remaining drawdown. As shown in this slide from Dr. Hutchison's available drawdown analysis presentation, the available drawdown is that from a 2018 baseline water depth measured from ground surface to the bottom of a monitoring well.



This characterization is consistent with the LSGCD consultant's representation of available drawdown from the 2018 baseline to the end of model simulation in 2080, shown below. However, the LSGCD consultant's representation did not specify in the conceptual diagram that the drawdown analysis was only for a monitoring well.

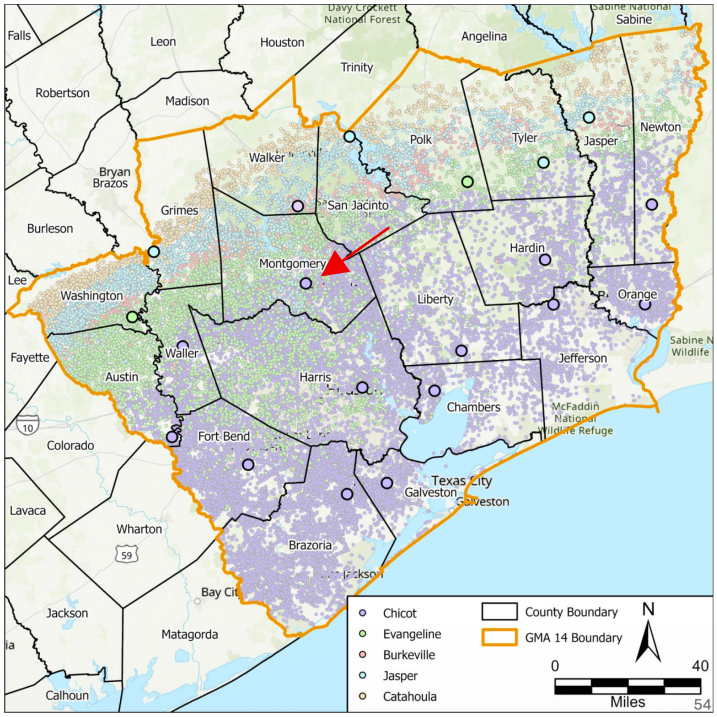


The important aspect of the definition of available drawdown is that this number is linked to wells not cells. I believe I am understanding the definition correctly. If not, please have your consultants advise. As indicated in the DFC statement for LSGCD, the limit for

proposed available remaining drawdown is a median of 70% of the available drawdown in 2018.

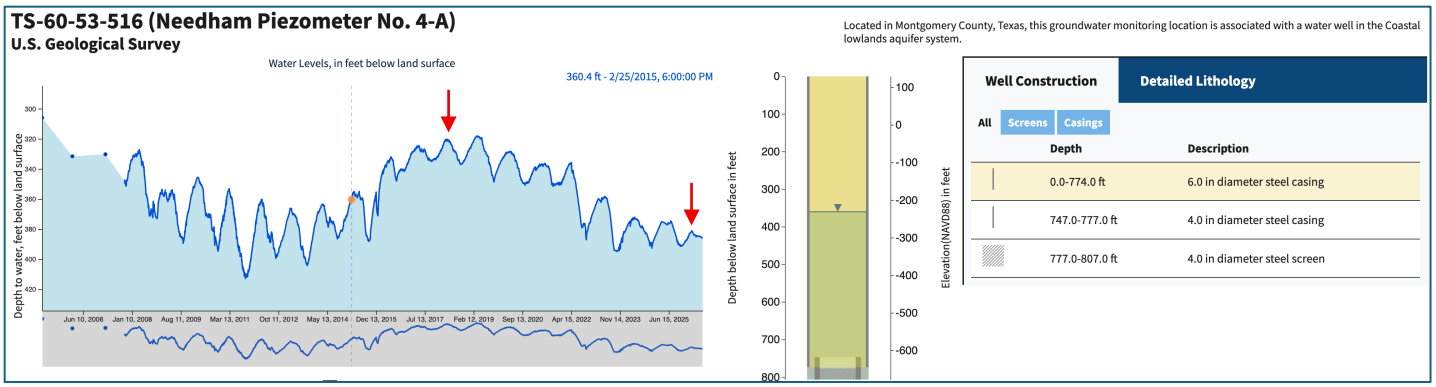
Remaining Evangeline available drawdown in a monitoring well in Mongomery County

The simulation results, which are regional, do not provide useful information about drawdown in a specific well. The USGS Evangeline aquifer observation well, Needham Piezometer 4-A, seems to be a reasonable candidate to test the 70% drawdown scenario. This well is only for monitoring and has a long, relatively continuous water level record and is located in south-central Mongomery County and is west of a "median" well (arrowed on map). [Does LSGCD know if there are other observation wells with continuous water level measurements? I have not been able locate another well to date.]



Water level and other data for Needham 4-A well were downloaded from the USGS National Groundwater Monitoring Network website via the link:

https://www.usgs.gov/apps/ngwmn/provider/USGS/site/301228095272501/



This well was originally drilled in 1991, but only limited water level data were available prior to an upgrade for continuous monitoring in 2007. The well has a 6-inch steel casing from surface to 774 ft, with a 30 ft of 4-inch steel casing from 747 ft. Connection to the aquifer is via a 4-inch steel screen from 777 ft to the total well depth of 807 ft. The first continuous monitoring water depth was recorded at a depth from surface of 347.43 ft on October 15, 2007. Continuous monitoring shows seasonal fluctuations in water levels, with a general decline until the mid-2010s. This general decline was followed by a short-lived recovery in water levels between 2015 and early 2022, followed by another decline later in 2022.

The average decline in the Evangeline water level was tied to the simulation reference year of 2018, starting April 9, 2018 and ending on April 9, 2026 (arrowed above), April was chosen as the month when there was seasonal water level recovery. The computed decline rate (ft/year) was then used to determine when the water level in this observation well would reach the proposed median 70% drawdown DFC by the end of the simulation period of 2080. The results are shown in the table below.

Well	Date	Depth to Water BLS ft	Bottom of Well BLS ft	Avail DD ft	N yr	Rate of decline ft/y	70% avail DD ft	N yr to 70% DD	Yr at DD limit
TS-60-53-516	4/9/18	320.65	807	486.35			340.45	42.92	**2061**
TS-60-53-516	4/9/26	384.11	807	422.89	8	7.93			

Provided there are no computational errors or misunderstandings of terminology, the 70% median available drawdown (referenced to the available drawdown for 2018) in the Needham 4-A well is forecast to be reached in 2061. This forecast assumes the linear rate of decline in water level remains at 7.93 ft/year. It follows that the rate of decline seen in the well should be smaller to match the proposed percentage remaining available drawdown in 2080, nineteen years later. However, even for allowing for spatial and layer averaging of input and output data in a regional simulation, it is very difficult to reconcile a lower rate of decline with the simulated higher pumping proposed for Montgomery County. It would be helpful to provide more information on the drawdown simulation, such as large maps of “dry” well locations or areas where wells have reached the 70% available drawdown, decade by decade.

Access to available groundwater in current producing wells in the future

Wells developed for groundwater production are subject to drawdown due to pumping in addition to the documented general decrease in static water levels (unconfined water table or piezometric surface depending on aquifer type). These wells represent considerable capital investment and were all drilled and put into operation prior to the development of the proposed DFCs. With proper maintenance and periodic rehabilitation, water wells should last for several decades.

The definition of remaining drawdown refers to water level above the bottom of a well. Of course, a municipal or large utility operating water well has well screens, pump and intake some distance above the bottom of the well. Given the geometry of the well pump intake in relation to the bottom of the well, there is far less distance below the static water level. With drawdown in the well and surrounding aquifer due to pumping, managing the standoff or submergence at the pump inlet is critical.

Can the LSGCD consultants extract decadal maps of simulated static water elevations in the aquifers to assist operators plan capital investments for well rehabilitation or replacement to ensure that future demands can be met? If well operators do not have the information to plan for a higher aquifer pumping scenario, then their access to groundwater could be impaired.

Thank you,

Neil Gaynor

Montgomery County resident