GAM Run 10-040 MAG Version 2

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Edited and finalized by Wade Oliver to reflect statutory changes
effective September 1, 2011

Updated to Version 2 by Shirley Wade to reflect refined modeled available groundwater estimates

Texas Water Development Board
Groundwater Availability Modeling Section
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Cynthia K. Ridgeway, the Manager of the Groundwater Availability Modeling Section, is responsible for oversight of work performed by employees under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G. 471 on June 22, 2012.

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EXECUTIVE SUMMARY:

The modeled available groundwater for the Dockum Aquifer as a result of the desired future conditions adopted by the districts of Groundwater Management Area 7 is approximately 21,700 acre-feet per year. The estimates were extracted from the "base" scenario in Groundwater Availability Model Run 10-001, which meets the desired future conditions adopted by the districts of Groundwater Management Area 7. These desired future conditions are drawdown limits set for the upper and lower portions of the Dockum Aquifer in Ector, Midland, Mitchell, Nolan, Pecos, Scurry, and Upton counties. The Dockum Aquifer is deemed not relevant in the remaining counties in Groundwater Management Area 7.

The first version of this report showed modeled available groundwater for areas declared not relevant for joint planning purposes. In this report version we show modeled available groundwater only in areas specified as relevant by Groundwater Management Area 7 in their resolution.

REQUESTOR:

Mr. Allan J. Lange of the Lipan-Kickapoo Water Conservation District on behalf of Groundwater Management Area 7.

DESCRIPTION OF REQUEST:

In a letter dated August 13, 2010, Mr. Allan J. Lange provided the Texas Water Development Board (TWDB) with the desired future conditions of the Dockum Aquifer adopted by the districts of Groundwater Management Area 7. The desired future conditions for the Dockum Aquifer in Groundwater Management Area 7, as described in Resolution No. 07-29-10-1, are:

> *"Upper Dockum, as delineated in Figure 1 of TWDB GAM Run 10-001: net total drawdown not to exceed 29 feet in Midland County; and*
>
> *Lower Dockum Aquifer, as delineated in Figure 1 of TWDB GAM Run 10-001: net total drawdown not to exceed 4 feet in Ector, Mitchell, Pecos, Scurry, and Upton Counties (Lone Wolf GCD, Middle Pecos GCD); and*
>
> *Lower Dockum Aquifer as delineated in Figure 1 of TWDB GAM Run 10-001: Drawdown not to exceed a net total of 39 feet in Nolan County (West-Tex GCD); and*
>
> *The Dockum Aquifer is not relevant for joint planning purposes in all other areas of GMA 7."*

In response to receiving the adopted desired future conditions, the TWDB has estimated the modeled available groundwater for the Dockum Aquifer in Groundwater Management Area 7.

METHODS:

The TWDB previously completed several predictive groundwater availability model simulations of the Dockum Aquifer to assist the districts of Groundwater Management Area 7 in defining desired future conditions. The location of Groundwater Management Area 7, the Dockum Aquifer, and the groundwater availability model cells that represent the aquifer are shown in Figure 1. As stated in Resolution No. 07-29-10-1, the groundwater management area considered Groundwater Availability Model (GAM) Run 10-001 (Oliver, 2010) when defining desired future conditions. Since each of the desired future conditions above is met in the "base" scenario in GAM Run 10-001, the estimated pumping for Groundwater Management Area 7 presented here was taken directly from that simulation. The pumping was then divided by county, regional water planning area, river basin, and groundwater conservation district.

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the model run using the groundwater availability model for the Dockum Aquifer are described below:

- The results presented in this report are taken from the "base" scenario in GAM Run 10-001 (Oliver, 2010). See GAM Run 10-001 for a full description of the methods, assumptions, and results for the groundwater availability model run.

- The modified groundwater availability model for the Dockum Aquifer described in Oliver and Hutchison (2008) was used for this analysis. This model is a modification of the previously developed groundwater availability model for the Dockum Aquifer described in Ewing and others (2008). This model was modified in order to more effectively simulate predictive conditions. See Oliver and Hutchison (2010) and Ewing and others (2008) for assumptions and limitations of the model.

- Layers 2 and 3 of the model represent the upper and lower portions of the Dockum Aquifer, respectively. Layer 1, which is active in version 1.01 of the model documented in Ewing and others (2008), was inactivated in the modified model as described in Oliver and Hutchison (2010).

- Cells were assigned to individual counties and groundwater conservation districts as shown in the September 14, 2009, version of the model grid for the Dockum Aquifer. Because this model grid predates the development of the modified model, care was taken to ensure that only those fields in the model grid that were valid for the modified model were used for analyzing model results.

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code, "modeled available groundwater" is the estimated average amount of groundwater that may be produced annually to achieve a desired

future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits. The estimated amount of pumping exempt from permitting, which the TWDB is required to develop after soliciting input from applicable groundwater conservation districts, will be provided in a separate report.

RESULTS:

The modeled available groundwater for the Dockum Aquifer in Groundwater Management Area 7 consistent with the desired future conditions is approximately 21,700 acre-feet per year. This has been divided by county, regional water planning area, and river basin for each decade between 2010 and 2060 for use in the regional water planning process (Table 1).

The modeled available groundwater is also summarized by county, regional water planning area, river basin, and groundwater conservation district as shown in tables 2, 3, 4, and 5, respectively.

LIMITATIONS:

The groundwater model used in developing estimates of modeled available groundwater is the best available scientific tool that can be used to estimate the pumping that will achieve the desired future conditions. Although the groundwater model used in this analysis is the best available scientific tool for this purpose, it, like all models, has limitations. In reviewing the use of models in environmental regulatory decision-making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

A key aspect of using the groundwater model to develop estimates of modeled available groundwater is the need to make assumptions about the location in the aquifer where future pumping will occur. As actual pumping changes in the future, it will be necessary to evaluate the amount of that pumping as well as its location in the context of the assumptions associated with this analysis. Evaluating the amount and location of future pumping is as important as evaluating the changes in groundwater levels, spring flows, and other metrics that describe the condition of the groundwater resources in the area that relate to the adopted desired future condition(s).

Given these limitations, users of this information are cautioned that the modeled available groundwater numbers should not be considered a definitive, permanent description of the amount of groundwater that can be pumped to meet the adopted desired future condition. Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor future groundwater pumping as well as whether or not they are achieving their desired future conditions. Because of the limitations of the model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine the modeled available groundwater numbers given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future.

REFERENCES:

Ewing, J.E., Jones, T.L., Yan, T., Vreugdenhil, A.M., Fryar, D.G., Pickens, J.F., Gordon, K., Nicot, J.P., Scanlon, B.R., Ashworth, J.B., Beach, J., 2008, Groundwater Availability Model for the Dockum Aquifer – Final Report: contract report to the Texas Water Development Board, 510 p.

National Research Council, 2007, Models in Environmental Regulatory Decision Making. Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p.

Oliver, W., 2010, GAM Run 10-001: Texas Water Development Board, GAM Run 10-001 Report, 36 p.

Oliver, W., Hutchison, W.R., 2010, Modification and recalibration of the Groundwater Availability Model of the Dockum Aquifer: Texas Water Development Board, 114 p.

Smith, R., 2009, GAM Run 09-001: Texas Water Development Board, GAM Run 09-001 Draft Report, 28 p.

Table 1: Modeled available groundwater for the Dockum Aquifer in Groundwater Management Area 7. Results are in acre-feet per year and are divided by county, regional water planning area, and river basin.

County	Regional Water Planning	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Ector	F	Colorado	13	13	13	13	13	13
		Rio Grande	515	515	515	515	515	515
Midland	F	Colorado	0	0	0	0	0	0
Mitchell	F	Colorado	14,018	14,018	14,018	14,018	14,018	14,018
Nolan	G	Brazos	2,824	2,824	2,824	2,824	2,824	2,824
		Colorado	2,926	2,926	2,926	2,926	2,926	2,926
Pecos	F	Rio Grande	3	3	3	3	3	3
Scurry	F	Brazos	306	306	306	306	306	306
		Colorado	903	903	903	903	903	903
Upton	F	Colorado	0	0	0	0	0	0
		Rio Grande	219	219	219	219	219	219
Total			**21,727**	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**

Table 2: Modeled available groundwater for the Dockum Aquifer summarized by county in Groundwater Management Area 7 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Ector	528	528	528	528	528	528
Midland	0	0	0	0	0	0
Mitchell	14,018	14,018	14,018	14,018	14,018	14,018
Nolan	5,750	5,750	5,750	5,750	5,750	5,750
Pecos	3	3	3	3	3	3
Scurry	1,209	1,209	1,209	1,209	1,209	1,209
Upton	219	219	219	219	219	219
Total	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**

Table 3: Modeled available groundwater for the Dockum Aquifer summarized by regional water planning area in Groundwater Management Area 7 for each decade between 2010 and 2060. Results are in acre-feet per year.

Regional Water Planning Area	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
F	15,977	15,977	15,977	15,977	15,977	15,977
G	5,750	5,750	5,750	5,750	5,750	5,750
Total	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**

Table 4: Modeled available groundwater for the Dockum Aquifer summarized by river basin in Groundwater Management Area 7 for each decade between 2010 and 2060. Results are in acre-feet per year.

Basin	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Brazos	3,130	3,130	3,130	3,130	3,130	3,130
Colorade	17,860	17,860	17,860	17,860	17,860	17,860
Rio Grande	737	737	737	737	737	737
Total	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**

Table 5: Modeled available groundwater for the Dockum Aquifer summarized by groundwater conservation district in Groundwater Management Area 7 for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	**Year**					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Lone Wolf	14,018	14,018	14,018	14,018	14,018	14,018
Middle Pecos	3	3	3	3	3	3
Wes-Tex	5,750	5,750	5,750	5,750	5,750	5,750
No District	1,956	1,956	1,956	1,956	1,956	1,956
Total	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**	**21,727**

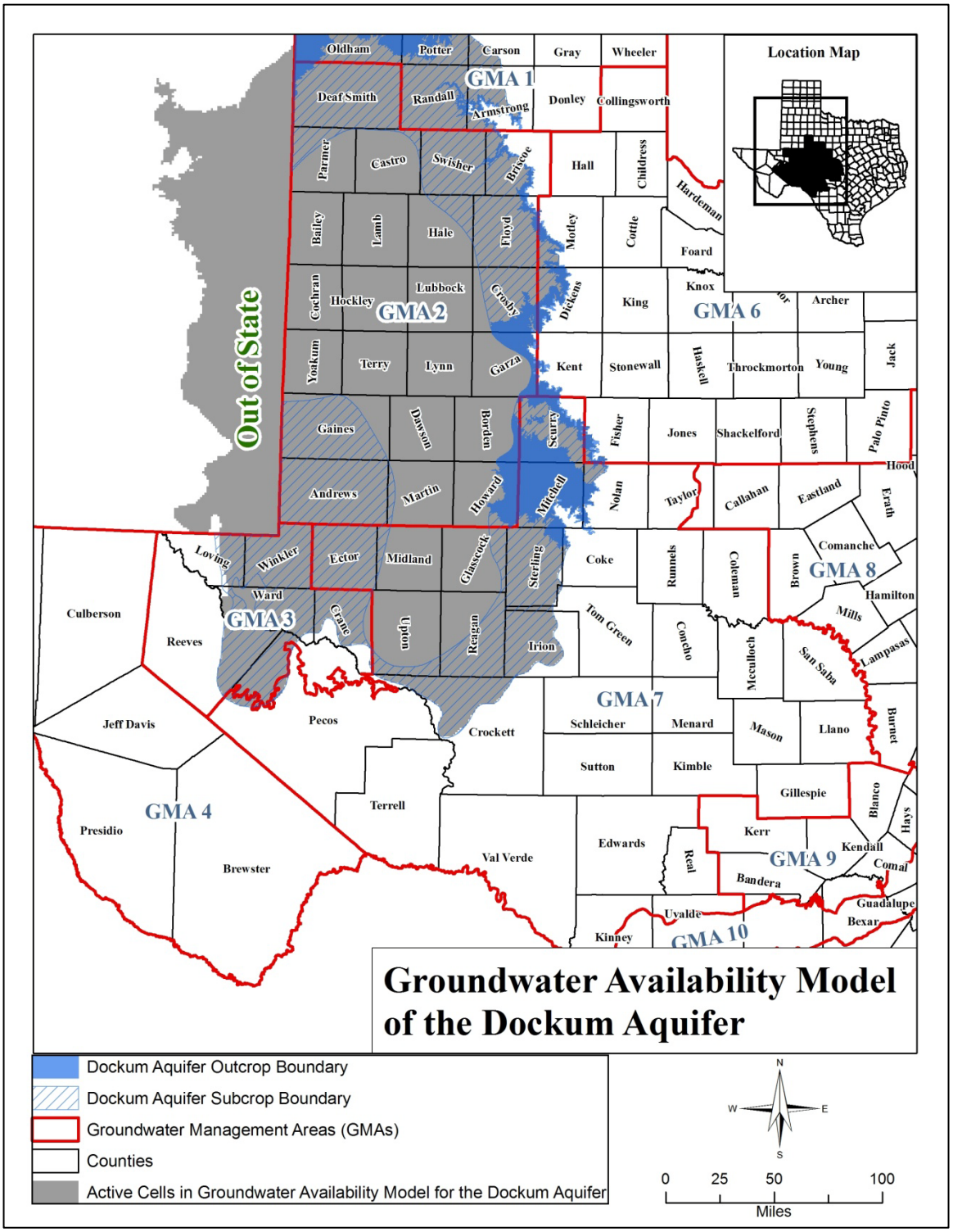

Figure 1: Map showing the areas covered by the groundwater model for the Dockum Aquifer.

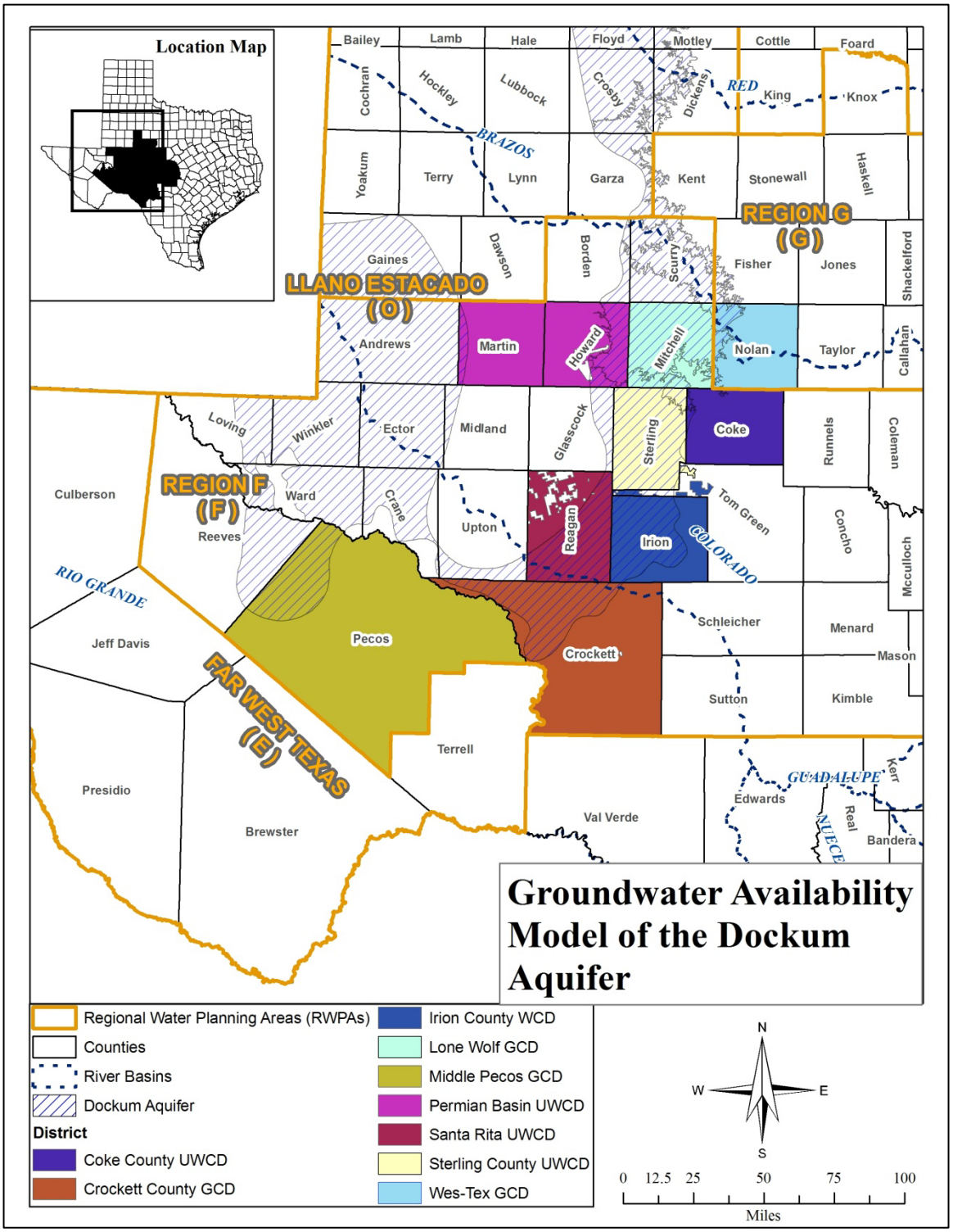

Figure 2: Map showing regional water planning areas (RWPAs), groundwater conservation districts (GCDs), counties, and river basins in Groundwater Management Area 7.