GAM Run 7-18

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EXECUTIVE SUMMARY

The groundwater availability model for the Hill Country portion of the Trinity Aquifer developed by Mace and others (2000) has been updated and modified since its conception and the publication of TWDB Report 353. Some of the modifications were done to ensure structural consistencies between the top and bottom elevations of the model layers. Conductance of a few drain and general head boundary cells in this model were also updated to reduce water budget errors. Lake Medina was updated from drains to a constant head. Because of these adjustments, a direct comparison of current model results to TWDB Report 353 (Mace and others, 2000) is not possible. To assist The University of Texas at Austin Department of Geological Sciences, on behalf of the Groundwater Management Area 9, we ran the current model version (1.03) to document the flow components and water level declines in the Middle Trinity Aquifer. We compared differences in the results from this model run with results reported in TWDB Report 353 (Mace and others, 2000). We specifically identified the drain cells in the model as either spring or river cells. We included a water budget showing simulated discharges to rivers and springs as requested.

REQUESTOR:

Mr. Michael Ciarleglio of the University of Texas at Austin Department of Geological Sciences, on behalf of the Groundwater Management Area 9.

DESCRIPTION OF REQUEST:

Mr. Ciarleglio requested a model run to (1) document the locations and discharges to the springs and rivers, which are both represented as drain cells in the groundwater availability model for the Hill Country portion of the Trinity Aquifer (Mace and others, 2000) and (2) document the water budget, simulated water levels, and water-level declines from 2010 through 2050 based on 2002 State Water Plan estimates of pumpage compared to simulated water levels in 1997.

METHODS:

The groundwater availability model for the Hill Country portion of the Trinity Aquifer was modified for this model run. We changed the drain conductance for two cells representing springs in order to lower the water budget errors observed earlier and to more reasonably reflect ranges of conductance found in other cells representing springs. We changed the original drain conductance for cell 22, 24, 1 (column, row, layer) from 7.5×10^9 to 100,000 and cell 38, 25, 1 (column, row, layer) from 10^9 to 100,000. In addition, conductance values for two general head boundary cells (93, 43, 3 and 73, 60, 3; column, row, layer; respectively) were changed from -64.65 to 18.35 and -29.77 to 7.44 after publication of the TWDB report 353.

The model has a total of 79 stress periods with 2 stress periods representing pre-development conditions, 24 stress periods for representing transient conditions (1996 to 1997) and 53 predictive stress periods (1998 to 2050). Drought-of-record recharge (as existed during the 1950s drought) was assigned in the last seven stress periods to simulate future water levels under a drought condition.

We also updated pumpage in the Edwards Aquifer for stress period 72 (2043). The pumpage for this stress period showed a sudden decrease for 1 year not observed in the Upper Trinity or the Middle Trinity Aquifers. We updated this pumpage by copying the pumpage file from stress period 73 to stress period 72 as the pumpage for this period followed the general trend.

Springs and rivers were simulated in the model using MODFLOW Drain package. Spring cells were differentiated from the river cells in the model by comparing their respective locations on geographical information system (GIS) shapefiles for springs and rivers.

This report includes predictive run results for 2010, 2020, 2030, 2040, and 2050. Water-level declines in the Middle Trinity Aquifer were calculated by subtracting the predicted water levels at the end of each decade (2010 through 2050) from the simulated water levels at the end of 1997. Drought-of-record recharge was assigned in the last seven stress periods for 2010, 2020, 2030, 2040, and 2050 model runs. For example, (1) for 2010 run, average recharge was assigned through 2003 and drought-of-record recharge was assigned for 2004-2010; (2) for 2020 run, average recharge was assigned through 2013 and drought-of-record recharge was assigned for 2014-2020; (3) for 2030 run, average recharge was assigned through 2023 and drought-of-record recharge was assigned for 2024-2030; (4) for 2040 run, average recharge was assigned through 2033 and drought-of-record recharge was assigned for 2034-2040; (5) for 2050 run, average recharge was assigned through 2043 and drought-of-record recharge was assigned for 2044-2050.

When the model was run with 69 stress periods (2040) with the drought-of-record recharge in the last seven stress periods, the run was completed with no convergence problem.

The model run with 59 stress periods (2030) with the drought-of-record recharge in the last seven stress periods failed to converge. Two cells in the model were oscillating (68, 57, 2; 66, 56, 2; column, row, layer; respectively). The bottom elevations of the cells were adjusted from 1040 feet to 1010 feet and 1165 to 1158 feet to allow model convergence. This adjustment was within a reasonable range as would be expected from interpolation between points during kriging.

The model with 49 stress periods (2020) with the drought-of-record recharge in the last seven stress periods similarly failed to converge. In addition to changes to two bottom cell elevations as in run 2030, bottom elevation of cell 56, 65, 2 was adjusted from 1178 to 1170 feet to allow model convergence.

The model with 39 stress periods (2010) with the drought-of-record recharge in the last seven stress periods completed with no convergence problem.

PARAMETERS AND ASSUMPTIONS:

- The model has three layers: layer 1 represents the Edwards Aquifer, layer 2 represents the Upper Trinity Aquifer, and layer 3 represents the Middle Trinity Aquifer.

- The rivers, streams, and springs were simulated in the model using MODFLOW Drain package.

- MODFLOW Drain package was also utilized to simulate flow along bedding contacts of the Edwards Aquifer and the Upper Trinity Aquifer in the northwestern parts of the model area. This resulted in the assignment of numerous drain cells along this outcrop contact.

- Reservoirs/lakes in the model area were simulated using constant heads.

- The transient model was calibrated for 1996 through 1997 when the climate varied from dry to wet period.

- The model is projected in Shackleford feet coordinates and has 69 rows and 115 columns.

- Minor changes to the bottom and top elevations in the model layers have occurred since the conception of the initial model; however, given the structure surfaces are interpolated over 1 mile grid cells, from limited number of known measured elevations using kriging algorithm, these minor changes probably lie within the interpolation error.

RESULTS:

We present below maps showing simulated water levels from the current steady-state model and compared them with the measured water levels (Figure 1). We also compared the simulated water levels from this model run with the simulated water levels presented in the TWDB report 353 (Figure 2). We describe various flow components of the water budget from this model run (Table 1). We compared the water budget results from this model run with those presented in TWDB report 353. The electronic files for the rivers/streams, springs, and models were also delivered to the requestor.

The current model (version 1.03) reasonably reproduces spatial distribution of the measured water levels in the Middle Trinity Aquifer (Figure 1). We note that both the measured and simulated water levels bend upstream along certain segments of the rivers suggesting streamflow gains along these segments (Figure 1). When we compared the simulated water levels in the Middle Trinity Aquifer (Figure 1) with the simulated water levels presented in the TWDB report (Figure 2), we observe that spatial distribution of the water levels remain similar.

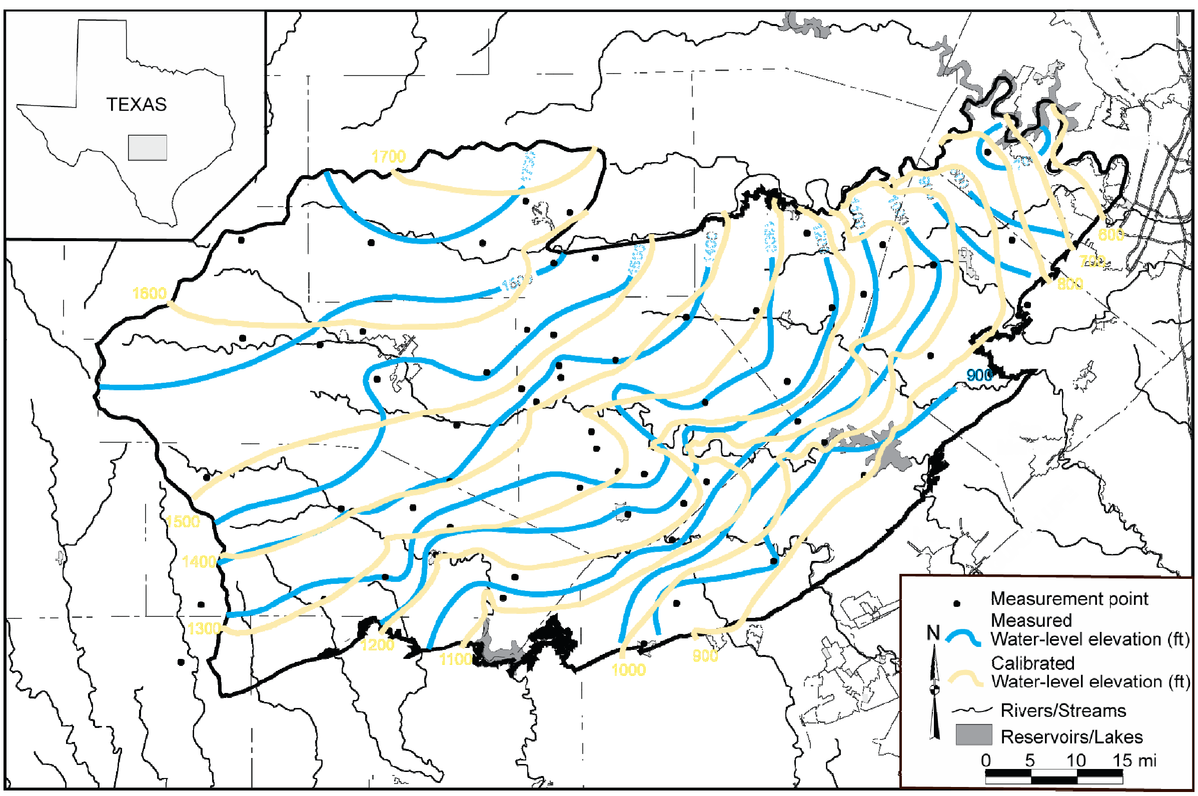

Figure 1. Comparison of simulated and measured water levels for the Middle Trinity Aquifer for the steady-state model from this model run.

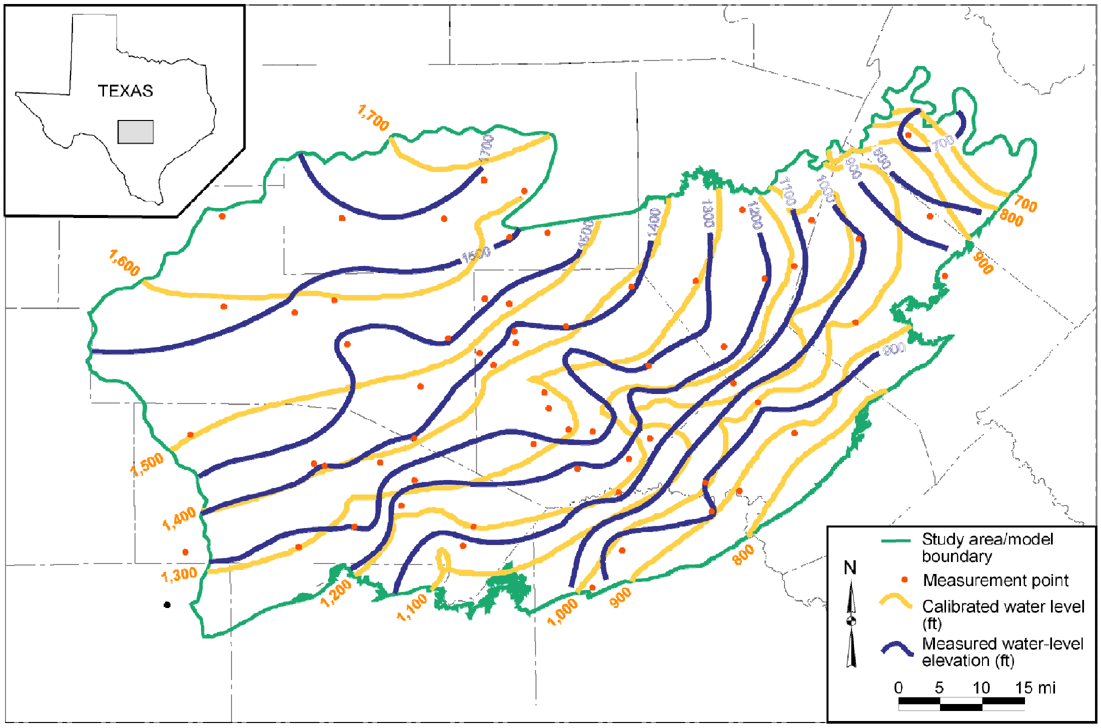

Figure 2. Comparison of simulated and measured water levels for the Middle Trinity Aquifer for the steady-state model as presented in TWDB report 353 (from Mace and others, 2000).

Predictive simulations indicate an increase in water-level decline with time. The largest water level decline area is located along northern Bexar, western Comal, and southern Kendall counties (Figures 3 through 12).

We compared water-level decline obtained from this model run with water-level decline presented in the TWDB report 353 (Figures 3 through 12). This was done to estimate changes between the two model versions. We observed that the water-level decline maps produced from this model run (Figures 3, 5, 7, 9 and 11) are generally similar to water-level decline presented in the TWDB report 353. Although the drawdown and their lateral extent from this model run are largely coincidental with the drawdown in Mace and others (2000) (Figures 4, 6, 8, 10, and 12), there are subtle differences between them. For example, the 50 and 100 feet drawdown areas in northern Bexar, western Comal, and southern Kendall counties are slightly larger in 2020 from this model run (Figure 5) compared to results presented in the TWDB report 353 (Figure 6). The 25 feet drawdown areas in the western part of the model are also smaller (Figures 5 and 6). For the 2030 run, the overall drawdown areas obtained from both the models have similar lateral extent. However, the 50 feet drawdown in northern Bexar County from this model run is slightly larger (Figure 7). No noticeable changes were observed in the 2050 drawdown between the two models (Figures 11 and 12)

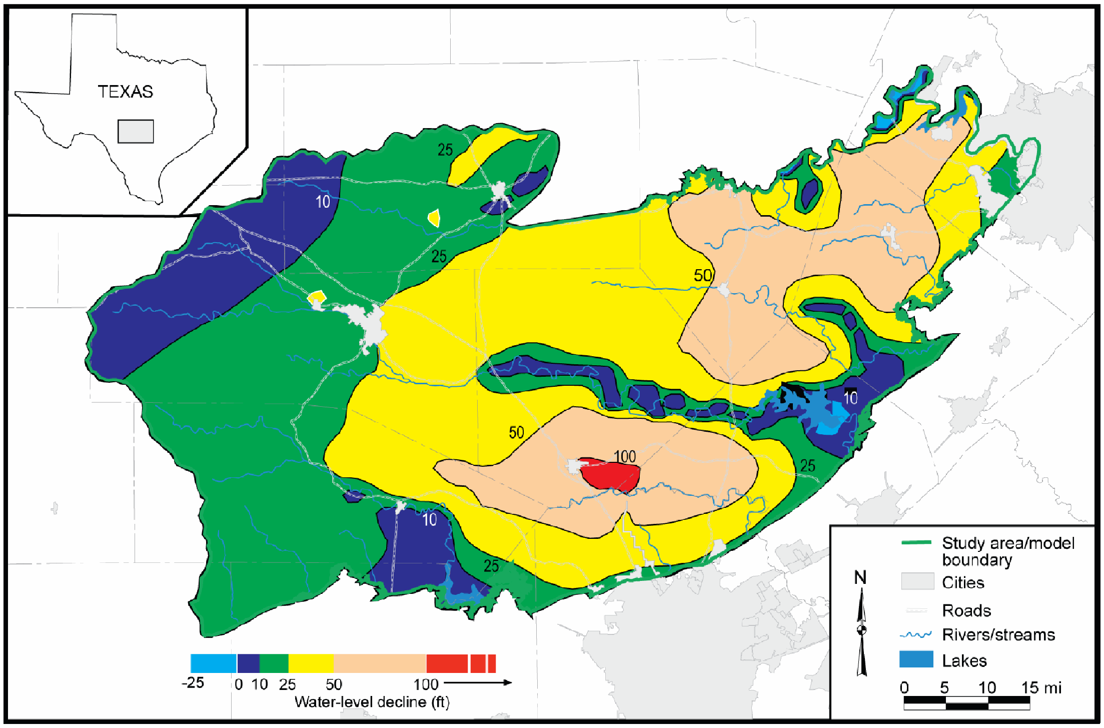

Figure 3. Simulated water-level declines in 2010 (relative to 1997 water levels) using the average recharge through 2003 and drought-of-record recharge from 2004 to 2010 from this model run.

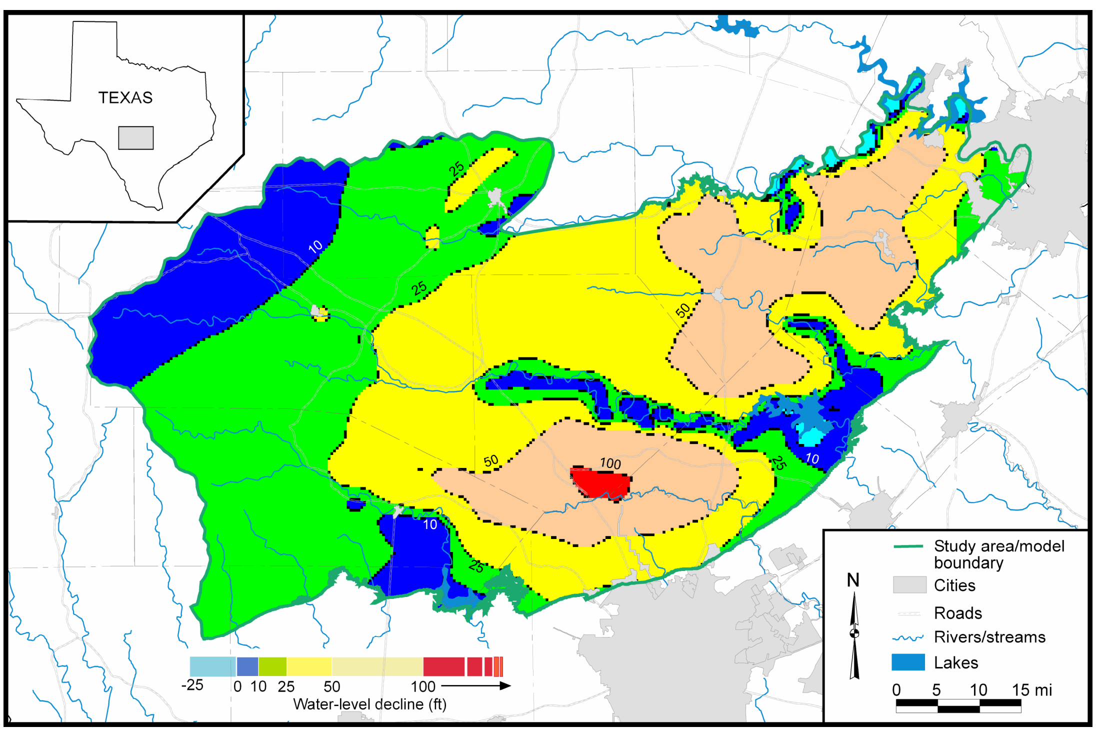

Figure 4. Simulated water-level declines in 2010 (relative to 1997 water levels) using the average recharge through 2003 and drought-of-record recharge from 2004 to 2010. (from Mace and others, 2000).

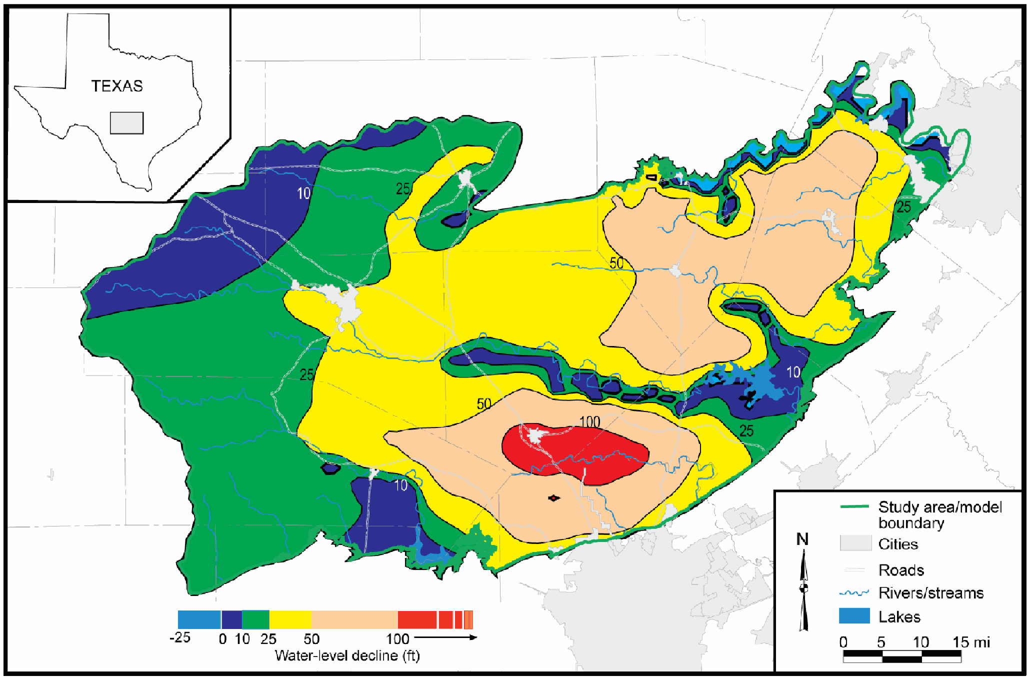

Figure 5. Simulated water-level declines in 2020 (relative to 1997 water levels) using average recharge through 2013 and drought-of-record recharge from 2014 to 2020 from this model run.

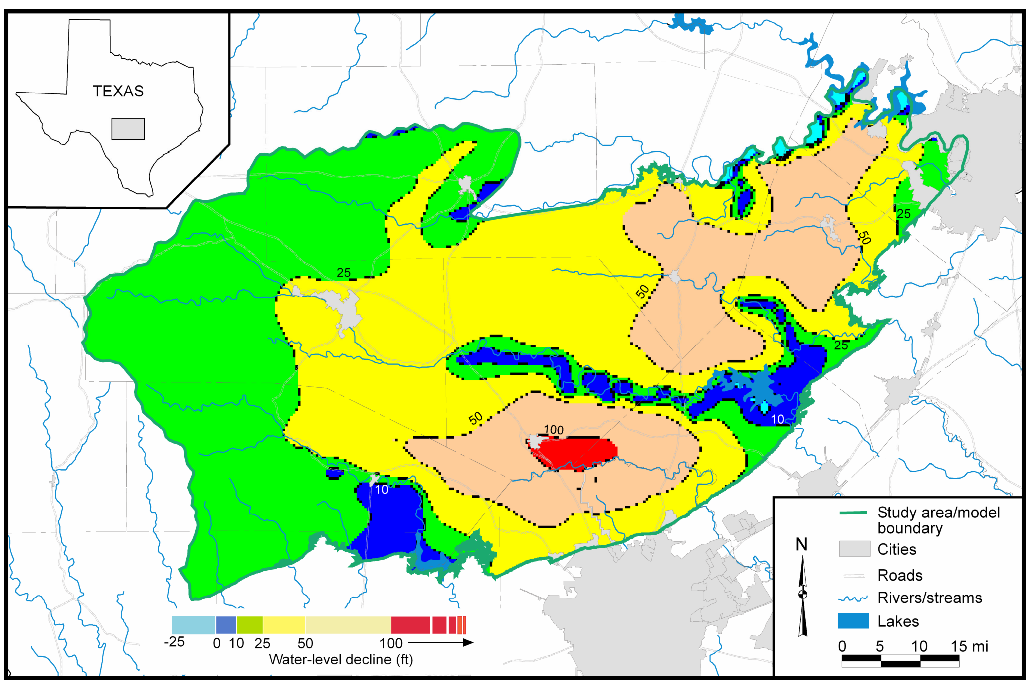

Figure 6. Simulated water-level declines in 2020 (relative to 1997 water levels) using average recharge through 2013 and drought-of-record recharge from 2014 to 2020 (from Mace and others, 2000).

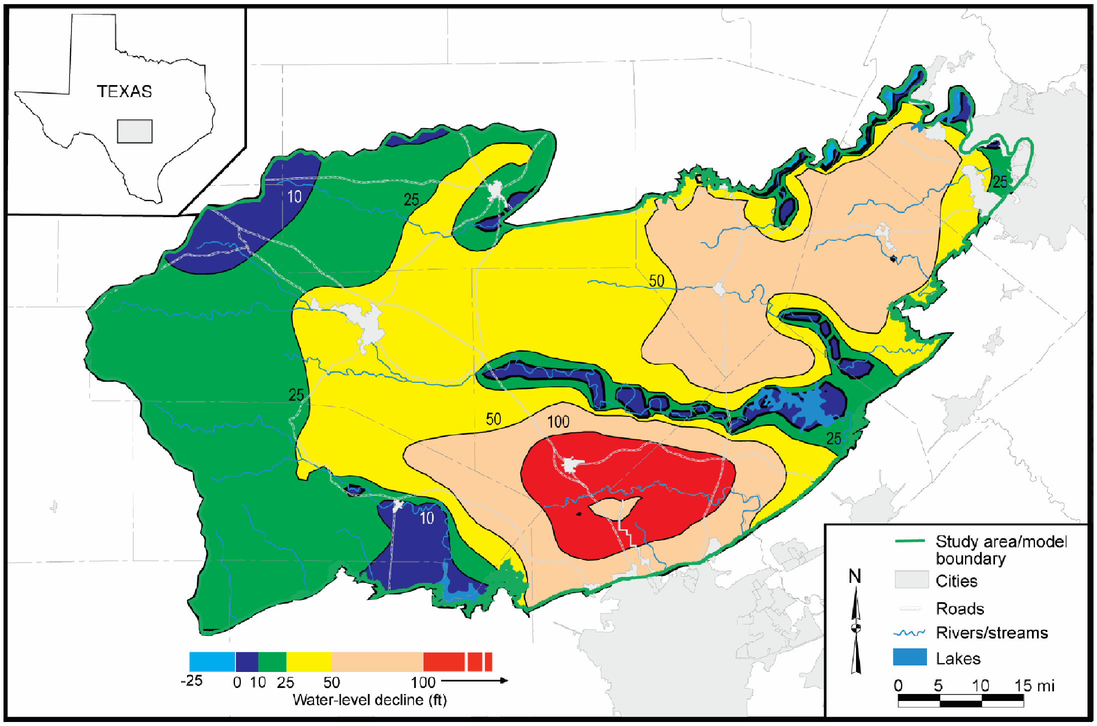

Figure 7. Simulated water-level declines in 2030 (relative to 1997 water levels) using average recharge through 2023 and drought-of-record recharge from 2024 to 2030 from this model run.

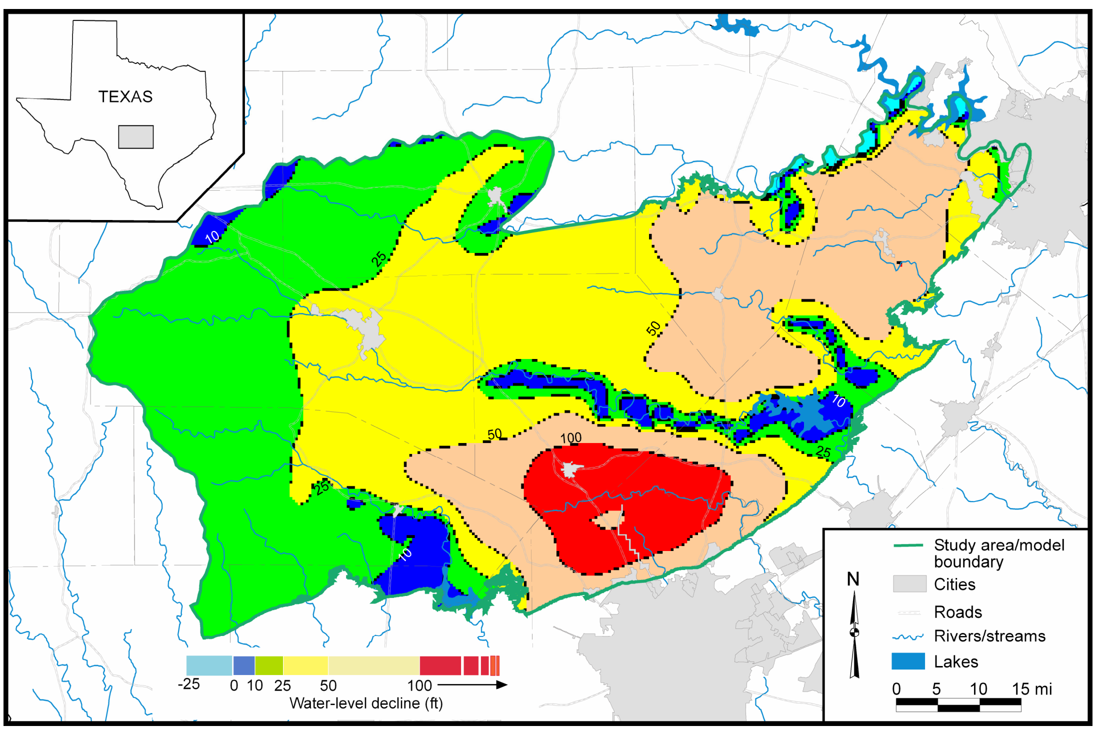

Figure 8. Simulated water-level declines in 2030 (relative to 1997 water levels) using average recharge through 2023 and drought-of-record recharge from 2024 to 2030 as presented in TWDB report 353 (from Mace and others, 2000).

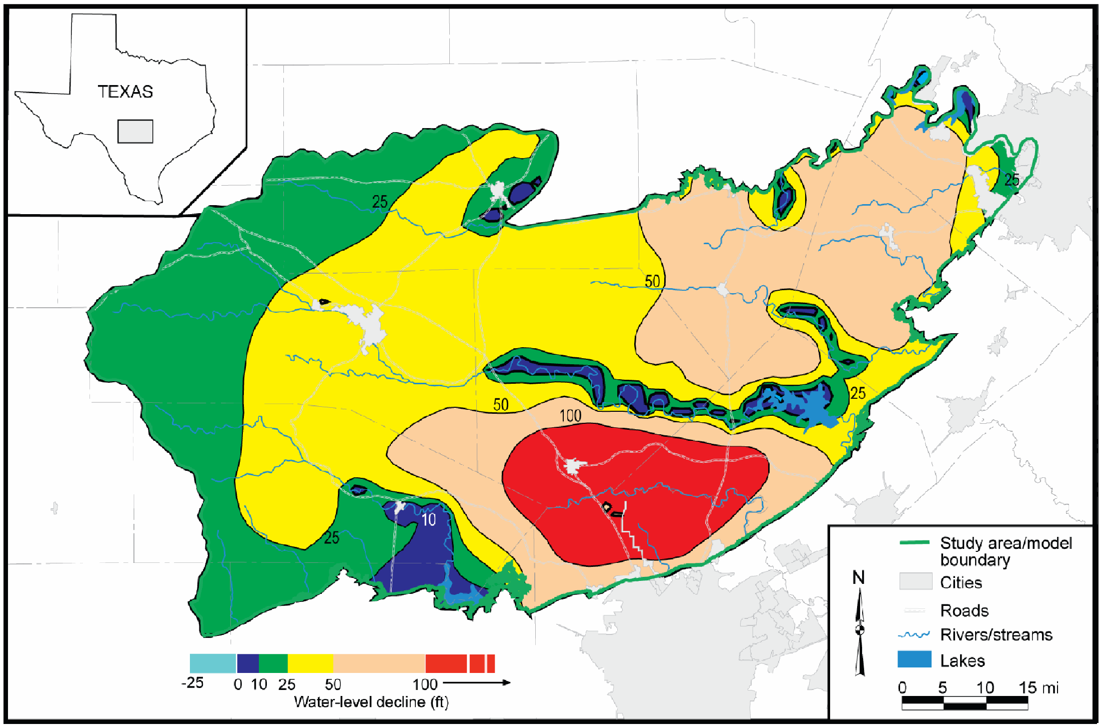

Figure 9. Simulated water-level declines in 2040 (relative to 1997 water levels) using average recharge through 2033 and drought-of-record recharge from 2034 to 2040 from this model run.

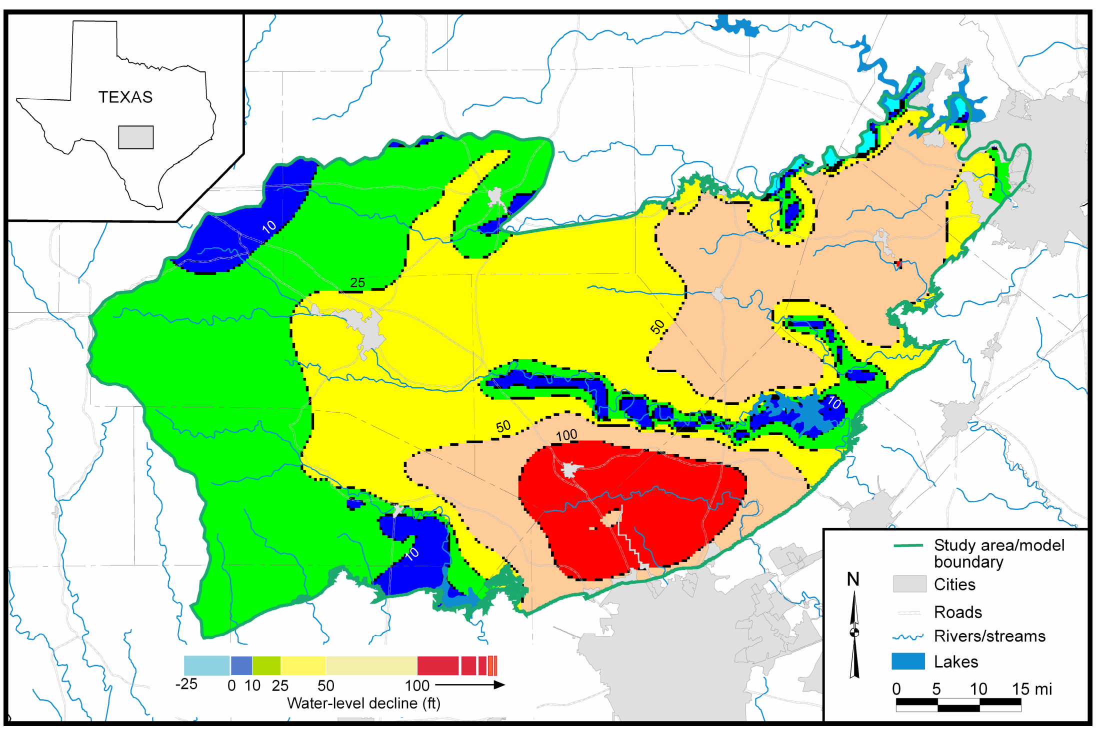

Figure 10. Simulated water-level declines in 2040 (relative to 1997 water levels) using average recharge through 2033 and drought-of-record recharge from 2034 to 2040 as presented in TWDB report 353 (from Mace and others, 2000).

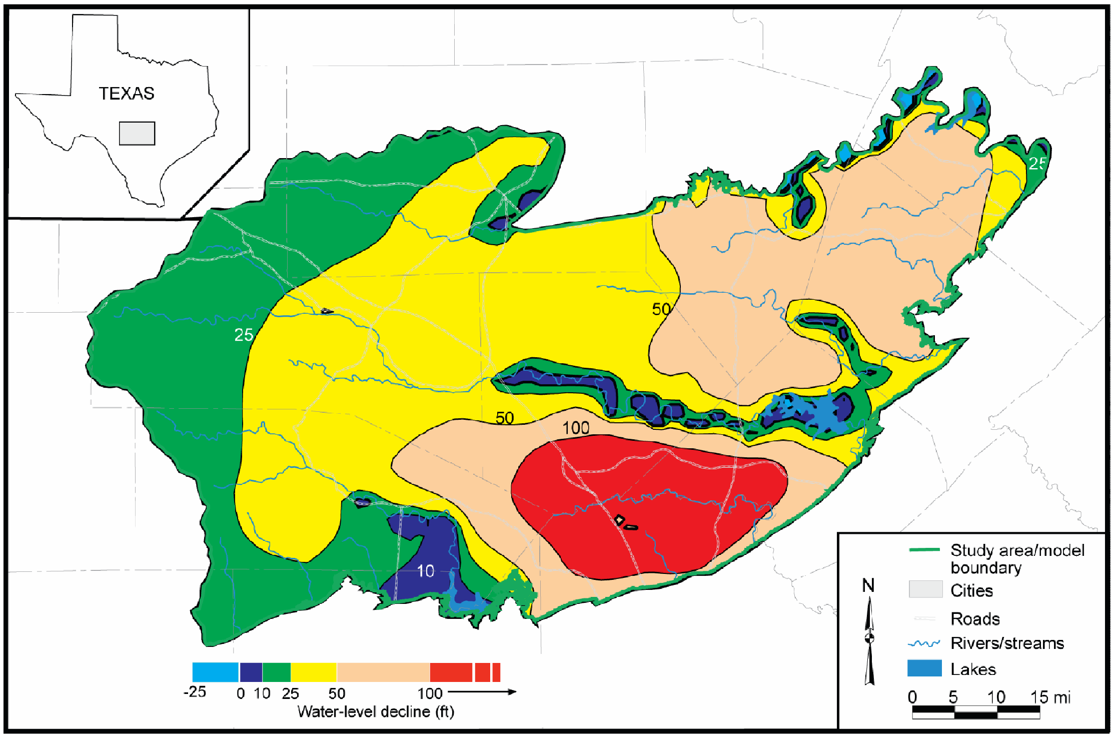

Figure 11. Simulated water-level declines in 2050 (relative to 1997 water levels) using average recharge through 2043 and drought-of-record recharge from 2044 to 2050 from this model run.

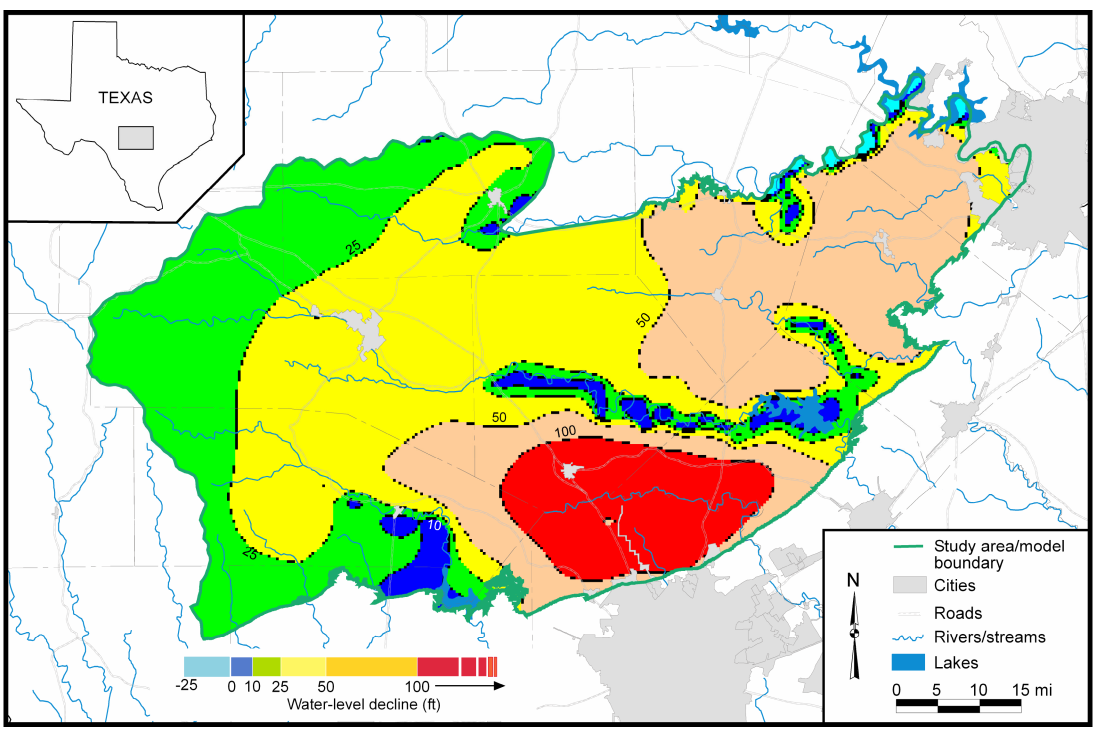

Figure 12. Simulated water-level declines in 2050 (relative to 1997 water levels) using the average recharge through 2043 and drought-of-record recharge from 2044 to 2050 (from Mace and others, 2000).

Locations of the springs are presented by aquifer (Figure 13) and by their estimated discharge volumes (Figure 14). Model cell locations of the springs and rivers are presented in Appendix 1. Numerous springs occur along bedding contacts in the Edwards and the Upper Trinity aquifers. Some of the springs issue along the river beds as baseflow and serves as major contributors to streamflow. However, a large number of the springs in the area have very low discharges (1 to 50 gallons per minute). In addition, little data exists on discharge volumes of most of the springs in the area. Therefore, only nineteen springs with adequate discharge measurements were simulated in the model (Figure 14). Even though other springs were assigned in the model, their simulated discharges were not reported due to an absence of measured data (Appendix 1).

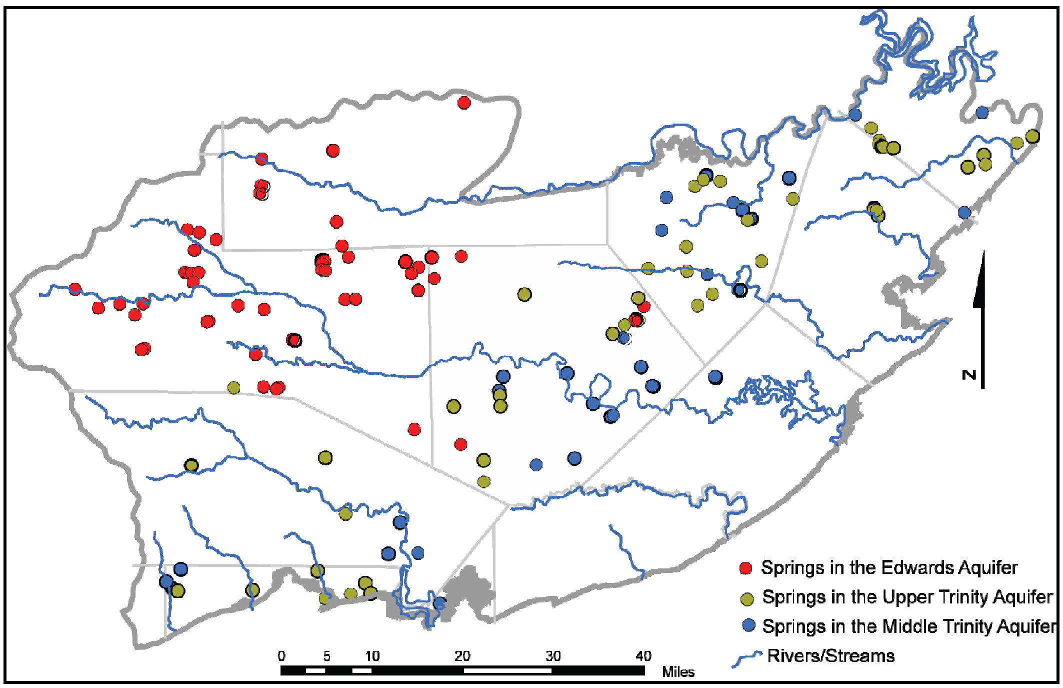

Figure 13. Map showing locations of the springs in the Edwards, Upper, and Middle Trinity Aquifers of the Hill Country area. Note that many of the springs follow along the rivers and issue from the river beds as baseflow.

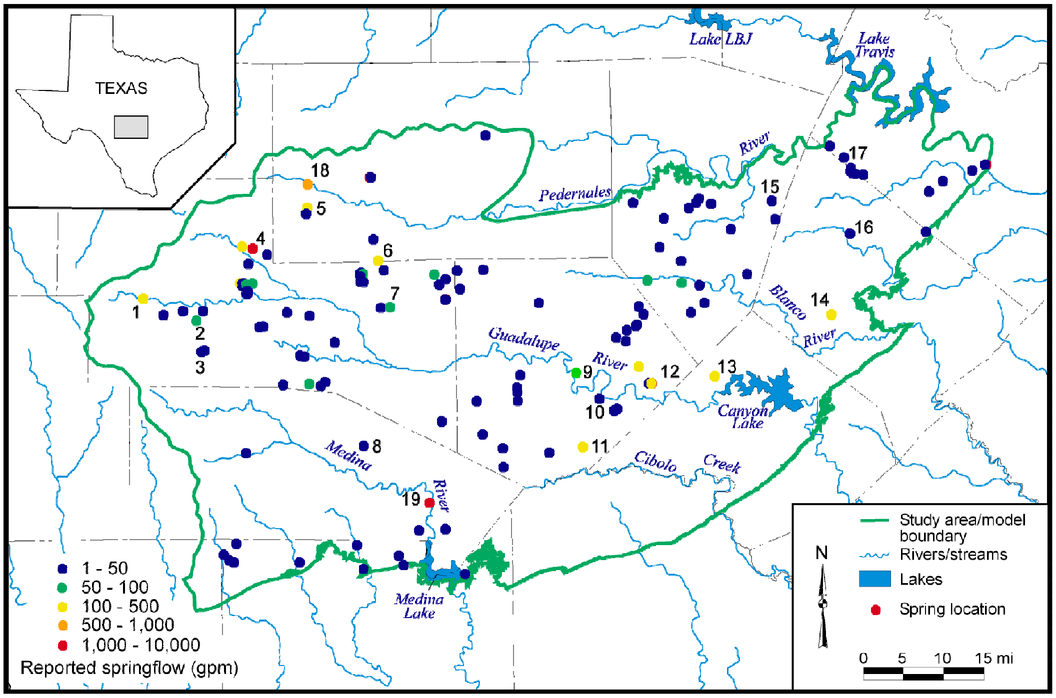

Figure 14. Map showing estimated spring discharges in the model area (from Mace and others, 2000). Springs simulated in the model are numerically labeled.

Water budget results from the model run for the steady-state (1975), transient (1996 to1997), and predictive models (2010, 2020, 2030, 2040 and 2050) are presented in Table 1. In the description of the water budget, all flow components are considered with respect to the aquifer. For example, water that enters an aquifer (recharge) is considered positive and water that discharges from an aquifer through artificial withdrawal (pumping) or natural processes (baseflow) is considered negative. Various components of flow from the water budget (Table 1) are further described below:

- Layer —Describes model layers for which the flow components are calculated.

- Recharge—Describes amount of water that infiltrates into the aquifer from rainfall in the outcrop and leakage from rivers and lakes. Recharge is always positive as water is added into the aquifer.

- River—Describes amount of water that flows between the rivers and an aquifer. When the water levels in an aquifer lie at a higher elevation than the river stage, water discharges (negative) from the aquifer into the river as baseflow. Conversely, if the water levels in an aquifer lie at a lower elevation than the river stage, water leaks into the aquifer (positive) from the river. Rivers are simulated in the model using the MODFLOW Drain package. The Drain package was utilized because the rivers in the Hill Country area are gaining and assigning the drains will only allow the rivers to receive water from the aquifer. The Drain package requires a drain elevation and a conductance term.

- GHB—General head boundary was assigned in the east of the model area in model layers 2 and 3 to estimate movement of water from the Upper and Middle Trinity aquifers into the Edwards Aquifer (Balcones Fault Zone). The General head boundary package requires a hydraulic head and a conductance term to allow flow across the boundary.

- Springs—Describes flow through the springs simulated in the model using the MODFLOW Drain package.

- Lakes—Describes flow through the lakes/reservoirs simulated in the model using the MODFLOW Constant head package.

- Pumping—Describes amount of water produced from wells in each aquifer. This component of flow is reported negative as water is withdrawn from the aquifer. Pumping is represented in the model using the MODFLOW Well package.

- Cross-flow (Upper and Lower)— Describes amount of cross-formational flow along the contacts of the model layers between two aquifers. This flow is controlled by the water level elevations in each aquifer and aquifer properties of each aquifer.

- Storage—Describes net water stored in the aquifer. This component of the budget is often seen as water both going into and out of the aquifers. Positive sign indicate that water levels will rise (water added to storage) and negative sign indicates water level will decline (water removed from storage).

Water budget results indicate that about 300,000 acre-feet of water recharges into the aquifers under steady-state conditions (Table 1). Baseflow to the rivers and cross-formational flow between the aquifers are significant components of the water budget. The recharge amount and baseflow is significantly reduced in the predictive runs under drought-of-record recharge conditions (Table 1).

We compared the water budget from this model run with water budget reported in TWDB report 353. Only minor differences exist between the water budget values with the exception of river and spring discharge amounts (Table 1 and 2). However, when the springs and the river discharges are added together (Table 1), the discharge amount sums up nearly equal to the total for springs and river discharge amount (Table 1). For example, the springs and the rivers together comprise about 215,000 ac-ft for the steady-state model compared to 218,000 ac-ft in TWDB report 353. Therefore, this difference in the amount of discharge is attributed to the differences in the number of springs considered and/or changes to the model. If the springs located along the river were not specifically included in the calculation for spring discharges, they were included in the calculation of river discharges.

A much larger discrepancy was however noted for the water budget values in 1996 and 1997 (Table 1).This difference in the water budget may be attributed to the changes in the model that allowed more recharge to occur that shifted the other flow components in the water budget. However, these changes were not observed in the predictive runs.

Results presented in this model run including water budget, simulated water levels, and drawdown suggest that version 1.03 of the groundwater availability model for the Hill Country portion of the Trinity Aquifer used for this groundwater availability model run 7-18 is generally similar to results presented in the TWDB report 353. However, differences in the water budget results were observed between the two models for 1996 and 1997.

REFERENCES:

Mace, R. E., Chowdhury, A. H., Anaya, R., and Shao-Chih (Ted) Way, 2000, Groundwater availability of the Trinity Aquifer , Hill Country Area, Texas: Numerical simulations through 2050, Texas Water Development Board Report 353, 119 p.

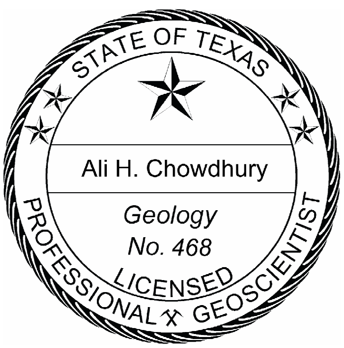

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Table 1. Water budget for the steady-state (1975), transient (1996 and 1997) and predictive drought-of record recharge runs (2010 through 2050). All values are in acre-feet per year. X-flow refers to cross formational flow. Report 353 is TWDB report 353. For detailed description of the terms used to explain the water budget see Results section.

Year	Layer	Recharge		Rivers		GHB		Springs		Lakes		Wells		X-flow		Storage	
		Report 353	This run	Report 353	This run	Report 353	This run	Report 353	This run	Report 353	This run	Report 353	This run	Report 353	This run	Report 353	This run
1975	1	59,100	59,141	-14,400	-14,618	0	0	-37,400	-37,238	0	0	-1,200	-1,199	-6,300	-6,307	-200	-208
	2	184,400	183,601	-79,700	-80,643	-34,700	-30,746	-2,800	-576	-1,100	-7,217	-1,400	-1,364	-64,800	63,161	-100	-91
	3	60,200	60,067	-78,500	-79,808	-29,800	-28,956	-5,200	-3,028	-10,200	-10,187	-7,400	-7,351	71,100	69,468	100	77
All		303,700	302,810	-172,600	-175,069	-64,500	-59,702	-45,400	-40,842	-11,300	-17,404	-9,900	-9,913	0	0	-200	-222
1996	1	45,900	56,258	-12,500	-12,320	0	0	-32,100	-30,898	0	0	-3,500	-3,737	-6,000	-5,891	-8,200	-3,404
	2	135,200	139,742	-64,600	-54,891	-28,500	-22,430	-2,100	-345	-900	-5,489	-3,500	-3,661	-60,600	-51,669	-24,800	-1,252
	3	55,600	47,812	-60,300	-54,517	-18,900	-17,998	-3,100	-1,219	-5,500	-4,363	-28,400	-31,881	66,600	57,560	5,800	3,387
All		236,700	243,812	-137,400	-121,728	-47,400	-40,428	-37,300	-32,462	-6,300	-9,852	-35,400	-39,279	0	0	-27,300	-1,269
1997	1	54,700	84,114	-13,400	-14,477	0	0	-35,900	-42,324	0	0	-3,700	-3,865	-6,100	-6,046	-4,400	-17,395
	2	214,400	248,431	-87,900	-102,922	-37,900	-33,845	-2,900	-742	-1,400	-8,555	-3,300	-3,421	-73,300	-77,786	7,800	-21,155
	3	73,500	86,348	-78,000	-84,256	-22,000	-19,876	-4,100	-2,736	-7,200	-6,928	-30,800	-34,564	79,400	83,832	10,700	-21,753
All		342,600	418,893	-179,300	-201,654	-59,900	-53,720	-42,900	-45,802	-8,600	-15,483	-37,800	-41,851	0	0	14,100	-60,304
2010	1	24,900	25,202	-8,900	-9,298	0	0	-19,900	-19,602	0	0	-5,400	-5,470	-5,500	-5,503	-14,900	-14,967
	2	76,700	76,055	-30,500	-30,810	-16,900	-14,120	-1,000	-175	-200	-3,759	-3,800	-3,783	-37,700	-36,564	-13,500	-13,146
	3	27,300	27,584	-32,600	-33,184	-15,200	-14,784	-1,800	-682	-2,200	-2,128	-32,100	-32,129	43,300	42,087	-13,100	-13,098
All		128,900	128,841	-71,900	-73,291	-32,100	-28,903	-22,700	-20,459	-2,400	-5,888	-41,400	-41,382	0	20	-41,500	-41,212
2020	1	24,900	24,887	-8,800	-9,213	0	0	-19,700	-19,332	0	0	-5,700	-5,749	-5,500	-5,517	-14,900	-14917
	2	76,600	76,167	-30,300	-30,572	-16,600	-13,900	-1,000	-174	-200	-3738	-4,600	-4,548	-37,500	-36,472	-13,500	-13230
	3	27,400	27,435	-32,000	-31,424	-14,100	-11,910	-1,800	-645	-1,800	-1358.7	-37,900	-37,811	43,000	41,990	-17,000	-13608
All		128,900	128,488	-71,100	-71,209	-30,700	-25,810	-22,400	-20,151	-1,900	-5,097	-48,200	-48,107	0	1	-45,400	-41,754
2030	1	24,900	24,887	-8,800	-9,121	0	0	-19,400	-19,064	0	0	-6,300	-6,292	-5,500	-5,504	-15,100	-15,085
	2	76,500	76,115	-30,000	-30,294	-15,900	-13,325	-1,000	-174	-100	-3,706	-5,500	-5,488	-37,600	-36,406	-13,500	-13,270
	3	27,300	27,332	-28,500	-29,136	-8,800	-8,285	-1,700	-591	-500	-414	-45,000	-44,971	43,100	41,910	-14,100	-14,041
All		128,700	128,335	-67,300	-68,551	-24,700	-21,610	-22,100	-19,829	-600	-4,120	-56,800	-56,752	0	0	-42,700	-42,396
2040	1	24,800	24,777	-8,500	-8,994	0	0	-19,300	-18,807	0	0	-6,700	-6,754	-5,500	-5,483	-15,300	-15,252
	2	76,500	76,150	-29,700	-30,029	-15,200	-12,723	-1,000	-173	-100	-3,675	-6,400	-6,396	-37,500	-36,292	-13,400	-13,131
	3	27,100	27,245	-26,200	-27,022	-5,600	-5,007	-1,800	-536	500	558	-51,000	-51,173	43,000	41,775	-13,900	-14,070
All		128,400	128,173	-64,400	-66,045	-20,800	-17,730	-22,100	-19,516	400	-3,117	-64,200	-64,322	0	0	-42,600	-42,453
2050	1	24,500	24,531	-8,500	-8,832	0	0	-19,000	-18,542	0	0	-6,900	-6,939	-5,500	-5,450	-15,400	-15,225
	2	76,800	76,454	-29,500	-29,870	-15,300	-12,989	-1,000	-172	-100	-3,659	-6,600	-6,664	-37,300	-36,104	-13,100	-12,998
	3	26,600	26,683	-24,900	-25,554	-5,700	-5,018	-1,600	-496	1,500	1,519	-51,200	-51,317	42,800	41,554	-12,500	-12,521
All		127,900	127,668	-62,900	-64,257	-21,000	-18,008	-21,600	-19,210	1,400	-2,140	-64,800	-64,920	0	0	-41,000	-40,744

Table 2. Comparison between estimated and simulated flows of selected springs for the steady-state model. Note simulated discharges match reasonably well to estimated flows for several springs. However, flows for a few springs are not accurately simulated due to the regional scale of the model.

Springs	Name	Estimated flow (gpm)	Simulated flow (gpm) from this run	Simulated flow (gpm) Report 353	Formation*	Model layer	Model cell (column, row, layer)
1		150	264	146	EDRDA	1	(9,30,1)
2	Bee Caves Spring	100	199	128	EDRDA	1	(15,33,1)
3	Lynx Haven Springs	100	111	110	EDRDA	1	(16,37,1)
4	Ellebracht Springs	2,500	532	612	EDRDA	1	(22,24,1)
5		310	366	356	EDRDA	1	(29,19,1)
6		480	324	447	EDRDA	1	(38,25,1)
7		100	136	24	EDRDA	1	(40,31,1)
8		20	253	23	GLRSU	2	(36,48,2)
9		75	110	107	GLRSL	3	(63,39,3)
10		50	0	108	GLRSL	3	(66,43,3)
11	Kenmore Ranch Spring #9	150	163	171	GLRSL	3	(64,49,3)
12	Edge falls Springs	300	364	318	GLRSL	3	(71,38,3)
13	Rebecca Springs	300	280	280	GLRSL	3	(80,40,3)
14	Jacob's Well Spring	500	433	427	GLRSL	3	(95,32,3)
15		25	20	20	GLRSL	3	(88,18,3)
16	Bassett Spring	50	53	54	GLRSU	2	(97,21,2)
17		50	51	51	GLRSU	2	(97,12,2)
18		9,000	324	351	EDRDA	1	(29,16,1)
19	Cold Spring	5,000	506	265	GLRSL	3	(44,56,3)

***Formation description as per TWDB Groundwater Database.**
EDRDA = Edwards Group and associated limestone
GLRSL = Lower Member of the Glen Rose Limestone
GLRSU = Upper Member of the Glen Rose Limestone
CCRK = Cow Creek Limestone

Appendix 1: Springs and river locations in the model (Model layer 1- Edwards Aquifer, Model layer 2 – Upper Trinity Aquifer, Model layer 3 – Middle Trinity Aquifer).

Column	Row	Model layer	Modflow package	River, outcrop, or springs
4	31	1	Drain package for river	Guadalupe River
5	30	1	Drain package for river	Guadalupe River
6	30	1	Drain package for river	Guadalupe River
7	30	1	Drain package for river	Guadalupe River
8	30	1	Drain package for river	Guadalupe River
9	29	1	Drain package for river	Guadalupe River
9	30	1	Drain package for spring	Guadalupe river bed (spring)
10	31	1	Drain package for river	Guadalupe River
10	42	1	Drain package for river	Medina River
11	31	1	Drain package for river	Guadalupe River
11	43	1	Drain package for river	Medina River
11	44	1	Drain package for river	Medina River
12	31	1	Drain package for river	Guadalupe River
12	44	1	Drain package for river	Medina River
13	31	1	Drain package for river	Guadalupe River
13	44	1	Drain package for river	Medina River
14	23	1	Drain package for river	Guadalupe River
14	31	1	Drain package for river	Guadalupe River
14	45	1	Drain package for river	Medina River
15	23	1	Drain package for river	Guadalupe River
15	31	1	Drain package for river	Guadalupe River
15	33	1	Drain package for springs	Spring
15	45	1	Drain package for river	Medina River
15	55	1	Drain package for springs	Seepage along Edwards outcrop
16	22	1	Drain package for river	Guadalupe River
16	31	1	Drain package for river	Guadalupe River
16	37	1	Drain package for springs	Springs
16	45	1	Drain package for river	Medina River
16	51	1	Drain package for springs	Seepage along Edwards outcrop
16	55	1	Drain package for springs	Seepage along Edwards outcrop
17	22	1	Drain package for river	Guadalupe River
17	31	1	Drain package for river	Guadalupe River
17	44	1	Drain package for springs	Seepage along Edwards outcrop
17	50	1	Drain package for springs	Seepage along Edwards outcrop
17	52	1	Drain package for springs	Seepage along Edwards outcrop
17	55	1	Drain package for springs	Seepage along Edwards outcrop
18	23	1	Drain package for river	Guadalupe River
18	31	1	Drain package for river	Guadalupe River
18	43	1	Drain package for springs	Seepage along Edwards outcrop
18	45	1	Drain package for springs	Seepage along Edwards outcrop
18	50	1	Drain package for springs	Seepage along Edwards outcrop
18	52	1	Drain package for springs	Seepage along Edwards outcrop
18	54	1	Drain package for springs	Seepage along Edwards outcrop
19	23	1	Drain package for river	Guadalupe River
19	31	1	Drain package for river	Guadalupe River
19	43	1	Drain package for springs	Seepage along Edwards outcrop
19	45	1	Drain package for springs	Seepage along Edwards outcrop
19	46	1	Drain package for springs	Seepage along Edwards outcrop
19	50	1	Drain package for springs	Seepage along Edwards outcrop
19	52	1	Drain package for springs	Seepage along Edwards outcrop
19	55	1	Drain package for springs	Seepage along Edwards outcrop
19	56	1	Drain package for springs	Seepage along Edwards outcrop
20	24	1	Drain package for river	Guadalupe River
20	31	1	Drain package for river	Guadalupe River
20	43	1	Drain package for springs	Seepage along Edwards outcrop
20	47	1	Drain package for springs	Seepage along Edwards outcrop
20	49	1	Drain package for springs	Seepage along Edwards outcrop
20	52	1	Drain package for springs	Seepage along Edwards outcrop
20	55	1	Drain package for springs	Seepage along Edwards outcrop
21	24	1	Drain package for springs	Seepage along Edwards outcrop
21	25	1	Drain package for river	Seepage along Edwards outcrop

Column	Row	Model layer	Modflow package	River, outcrop, or springs
21	30	1	Drain package for springs	Seepage along Edwards outcrop
21	31	1	Drain package for river	Guadalupe River
21	43	1	Drain package for springs	Seepage along Edwards outcrop
21	47	1	Drain package for springs	Seepage along Edwards outcrop
21	49	1	Drain package for springs	Seepage along Edwards outcrop
21	53	1	Drain package for springs	Seepage along Edwards outcrop
21	54	1	Drain package for springs	Seepage along Edwards outcrop
22	24	1	Drain package for springs	Springs
22	26	1	Drain package for river	Seepage along Edwards outcrop
22	29	1	Drain package for springs	Seepage along Edwards outcrop
22	31	1	Drain package for springs	Seepage along Edwards outcrop
22	43	1	Drain package for springs	Seepage along Edwards outcrop
22	46	1	Drain package for springs	Seepage along Edwards outcrop
22	48	1	Drain package for springs	Seepage along Edwards outcrop
22	49	1	Drain package for springs	Seepage along Edwards outcrop
22	52	1	Drain package for springs	Seepage along Edwards outcrop
23	26	1	Drain package for springs	Seepage along Edwards outcrop
23	27	1	Drain package for springs	Seepage along Edwards outcrop
23	29	1	Drain package for springs	Seepage along Edwards outcrop
23	32	1	Drain package for springs	Seepage along Edwards outcrop
23	42	1	Drain package for springs	Seepage along Edwards outcrop
23	47	1	Drain package for springs	Seepage along Edwards outcrop
23	52	1	Drain package for springs	Seepage along Edwards outcrop
24	15	1	Drain package for river	Pedernales River
24	25	1	Drain package for springs	Seepage along Edwards outcrop
24	28	1	Drain package for springs	Seepage along Edwards outcrop
24	29	1	Drain package for springs	Seepage along Edwards outcrop
24	32	1	Drain package for springs	Seepage along Edwards outcrop
24	41	1	Drain package for springs	Seepage along Edwards outcrop
24	42	1	Drain package for springs	Seepage along Edwards outcrop
24	43	1	Drain package for springs	Seepage along Edwards outcrop
25	15	1	Drain package for river	Pedernales River
25	26	1	Drain package for springs	Seepage along Edwards outcrop
25	29	1	Drain package for springs	Seepage along Edwards outcrop
25	32	1	Drain package for springs	Seepage along Edwards outcrop
25	40	1	Drain package for springs	Seepage along Edwards outcrop
26	15	1	Drain package for river	Pedernales River
26	27	1	Drain package for springs	Seepage along Edwards outcrop
26	31	1	Drain package for springs	Seepage along Edwards outcrop
26	40	1	Drain package for springs	Seepage along Edwards outcrop
27	16	1	Drain package for river	Pedernales River
27	27	1	Drain package for springs	Seepage along Edwards outcrop
27	32	1	Drain package for springs	Seepage along Edwards outcrop
27	35	1	Drain package for springs	Seepage along Edwards outcrop
27	37	1	Drain package for springs	Seepage along Edwards outcrop
27	41	1	Drain package for springs	Seepage along Edwards outcrop
27	42	1	Drain package for springs	Seepage along Edwards outcrop
28	16	1	Drain package for river	Pedernales River
28	28	1	Drain package for springs	Seepage along Edwards outcrop
28	32	1	Drain package for springs	Seepage along Edwards outcrop
28	35	1	Drain package for springs	Seepage along Edwards outcrop
28	37	1	Drain package for springs	Seepage along Edwards outcrop
28	38	1	Drain package for springs	Seepage along Edwards outcrop
28	43	1	Drain package for springs	Seepage along Edwards outcrop
28	44	1	Drain package for springs	Seepage along Edwards outcrop
28	45	1	Drain package for springs	Seepage along Edwards outcrop
29	16	1	Drain package for springs	Pedernales river bed (springs)
29	19	1	Drain package for springs	Springs
29	26	1	Drain package for springs	Seepage along Edwards outcrop
29	27	1	Drain package for springs	Seepage along Edwards outcrop
29	28	1	Drain package for springs	Seepage along Edwards outcrop
29	29	1	Drain package for springs	Seepage along Edwards outcrop
29	33	1	Drain package for springs	Seepage along Edwards outcrop
29	35	1	Drain package for springs	Seepage along Edwards outcrop
29	39	1	Drain package for springs	Seepage along Edwards outcrop

Column	Row	Model layer	Modflow package	River, outcrop, or springs
29	44	1	Drain package for springs	Seepage along Edwards outcrop
30	16	1	Drain package for river	Pedernales River
30	17	1	Drain package for river	Pedernales River
30	25	1	Drain package for springs	Seepage along Edwards outcrop
30	33	1	Drain package for springs	Seepage along Edwards outcrop
30	35	1	Drain package for springs	Seepage along Edwards outcrop
30	36	1	Drain package for springs	Seepage along Edwards outcrop
30	39	1	Drain package for springs	Seepage along Edwards outcrop
30	44	1	Drain package for springs	Seepage along Edwards outcrop
31	17	1	Drain package for springs	Seepage along Edwards outcrop
31	18	1	Drain package for springs	Seepage along Edwards outcrop
31	19	1	Drain package for springs	Seepage along Edwards outcrop
31	25	1	Drain package for springs	Seepage along Edwards outcrop
31	32	1	Drain package for springs	Seepage along Edwards outcrop
31	33	1	Drain package for springs	Seepage along Edwards outcrop
31	34	1	Drain package for springs	Seepage along Edwards outcrop
31	35	1	Drain package for springs	Seepage along Edwards outcrop
31	39	1	Drain package for springs	Seepage along Edwards outcrop
31	40	1	Drain package for springs	Seepage along Edwards outcrop
31	44	1	Drain package for springs	Seepage along Edwards outcrop
32	16	1	Drain package for springs	Seepage along Edwards outcrop
32	20	1	Drain package for springs	Seepage along Edwards outcrop
32	26	1	Drain package for springs	Seepage along Edwards outcrop
32	27	1	Drain package for springs	Seepage along Edwards outcrop
32	28	1	Drain package for springs	Seepage along Edwards outcrop
32	35	1	Drain package for springs	Seepage along Edwards outcrop
32	41	1	Drain package for springs	Seepage along Edwards outcrop
32	42	1	Drain package for springs	Seepage along Edwards outcrop
32	43	1	Drain package for springs	Seepage along Edwards outcrop
32	44	1	Drain package for springs	Seepage along Edwards outcrop
32	45	1	Drain package for springs	Seepage along Edwards outcrop
32	46	1	Drain package for springs	Seepage along Edwards outcrop
33	16	1	Drain package for springs	Seepage along Edwards outcrop
33	19	1	Drain package for springs	Seepage along Edwards outcrop
33	26	1	Drain package for springs	Seepage along Edwards outcrop
33	41	1	Drain package for springs	Seepage along Edwards outcrop
33	45	1	Drain package for springs	Seepage along Edwards outcrop
34	17	1	Drain package for springs	Seepage along Edwards outcrop
34	19	1	Drain package for springs	Seepage along Edwards outcrop
34	26	1	Drain package for springs	Seepage along Edwards outcrop
34	41	1	Drain package for springs	Seepage along Edwards outcrop
34	45	1	Drain package for springs	Seepage along Edwards outcrop
34	46	1	Drain package for springs	Seepage along Edwards outcrop
35	20	1	Drain package for springs	Seepage along Edwards outcrop
35	21	1	Drain package for springs	Seepage along Edwards outcrop
35	22	1	Drain package for springs	Seepage along Edwards outcrop
35	27	1	Drain package for springs	Seepage along Edwards outcrop
35	29	1	Drain package for springs	Seepage along Edwards outcrop
35	41	1	Drain package for springs	Seepage along Edwards outcrop
35	45	1	Drain package for springs	Seepage along Edwards outcrop
36	17	1	Drain package for springs	Seepage along Edwards outcrop
36	20	1	Drain package for springs	Seepage along Edwards outcrop
36	23	1	Drain package for springs	Seepage along Edwards outcrop
36	29	1	Drain package for springs	Seepage along Edwards outcrop
37	17	1	Drain package for springs	Seepage along Edwards outcrop
37	22	1	Drain package for springs	Seepage along Edwards outcrop
37	30	1	Drain package for springs	Seepage along Edwards outcrop
38	17	1	Drain package for springs	Seepage along Edwards outcrop
38	22	1	Drain package for springs	Seepage along Edwards outcrop
38	25	1	Drain package for springs	Springs
38	31	1	Drain package for springs	Seepage along Edwards outcrop
38	32	1	Drain package for springs	Seepage along Edwards outcrop
38	34	1	Drain package for springs	Seepage along Edwards outcrop
39	15	1	Drain package for springs	Seepage along Edwards outcrop
39	16	1	Drain package for springs	Seepage along Edwards outcrop

Column	Row	Model layer	Modflow package	River, outcrop, or springs
39	17	1	Drain package for springs	Seepage along Edwards outcrop
39	21	1	Drain package for springs	Seepage along Edwards outcrop
39	24	1	Drain package for springs	Seepage along Edwards outcrop
39	26	1	Drain package for springs	Seepage along Edwards outcrop
39	31	1	Drain package for springs	Seepage along Edwards outcrop
39	33	1	Drain package for springs	Seepage along Edwards outcrop
39	34	1	Drain package for springs	Seepage along Edwards outcrop
40	14	1	Drain package for springs	Seepage along Edwards outcrop
40	22	1	Drain package for springs	Seepage along Edwards outcrop
40	23	1	Drain package for springs	Seepage along Edwards outcrop
40	24	1	Drain package for springs	Seepage along Edwards outcrop
40	26	1	Drain package for springs	Seepage along Edwards outcrop
40	31	1	Drain package for springs	Springs
40	32	1	Drain package for springs	Seepage along Edwards outcrop
40	33	1	Drain package for springs	Seepage along Edwards outcrop
40	35	1	Drain package for springs	Seepage along Edwards outcrop
41	15	1	Drain package for springs	Seepage along Edwards outcrop
41	16	1	Drain package for springs	Seepage along Edwards outcrop
41	26	1	Drain package for springs	Seepage along Edwards outcrop
41	30	1	Drain package for springs	Seepage along Edwards outcrop
42	15	1	Drain package for springs	Seepage along Edwards outcrop
42	17	1	Drain package for springs	Seepage along Edwards outcrop
42	25	1	Drain package for springs	Seepage along Edwards outcrop
42	29	1	Drain package for springs	Seepage along Edwards outcrop
43	12	1	Drain package for springs	Seepage along Edwards outcrop
43	13	1	Drain package for springs	Seepage along Edwards outcrop
43	14	1	Drain package for springs	Seepage along Edwards outcrop
43	16	1	Drain package for springs	Seepage along Edwards outcrop
43	24	1	Drain package for springs	Seepage along Edwards outcrop
43	29	1	Drain package for springs	Seepage along Edwards outcrop
44	11	1	Drain package for springs	Seepage along Edwards outcrop
44	16	1	Drain package for springs	Seepage along Edwards outcrop
44	23	1	Drain package for springs	Seepage along Edwards outcrop
44	25	1	Drain package for springs	Seepage along Edwards outcrop
44	26	1	Drain package for springs	Seepage along Edwards outcrop
44	30	1	Drain package for springs	Seepage along Edwards outcrop
44	45	1	Drain package for springs	Seepage along Edwards outcrop
45	12	1	Drain package for springs	Seepage along Edwards outcrop
45	24	1	Drain package for springs	Seepage along Edwards outcrop
45	27	1	Drain package for springs	Seepage along Edwards outcrop
45	30	1	Drain package for springs	Seepage along Edwards outcrop
45	45	1	Drain package for springs	Seepage along Edwards outcrop
45	46	1	Drain package for springs	Seepage along Edwards outcrop
46	12	1	Drain package for springs	Seepage along Edwards outcrop
46	13	1	Drain package for springs	Seepage along Edwards outcrop
46	26	1	Drain package for springs	Seepage along Edwards outcrop
46	30	1	Drain package for springs	Seepage along Edwards outcrop
46	31	1	Drain package for springs	Seepage along Edwards outcrop
46	32	1	Drain package for springs	Seepage along Edwards outcrop
46	45	1	Drain package for springs	Seepage along Edwards outcrop
47	11	1	Drain package for springs	Seepage along Edwards outcrop
47	26	1	Drain package for springs	Seepage along Edwards outcrop
47	30	1	Drain package for springs	Seepage along Edwards outcrop
47	43	1	Drain package for springs	Seepage along Edwards outcrop
47	44	1	Drain package for springs	Seepage along Edwards outcrop
47	46	1	Drain package for springs	Seepage along Edwards outcrop
47	47	1	Drain package for springs	Seepage along Edwards outcrop
48	10	1	Drain package for springs	Seepage along Edwards outcrop
48	11	1	Drain package for springs	Seepage along Edwards outcrop
48	23	1	Drain package for springs	Seepage along Edwards outcrop
48	24	1	Drain package for springs	Seepage along Edwards outcrop

Column	Row	Model layer	Modflow package	River, outcrop, or springs
48	26	1	Drain package for springs	Seepage along Edwards outcrop
48	28	1	Drain package for springs	Seepage along Edwards outcrop
48	29	1	Drain package for springs	Seepage along Edwards outcrop
48	30	1	Drain package for springs	Seepage along Edwards outcrop
48	43	1	Drain package for springs	Seepage along Edwards outcrop
48	44	1	Drain package for springs	Seepage along Edwards outcrop
48	47	1	Drain package for springs	Seepage along Edwards outcrop
49	9	1	Drain package for springs	Seepage along Edwards outcrop
49	23	1	Drain package for springs	Seepage along Edwards outcrop
49	24	1	Drain package for springs	Seepage along Edwards outcrop
49	25	1	Drain package for springs	Seepage along Edwards outcrop
49	28	1	Drain package for springs	Seepage along Edwards outcrop
49	30	1	Drain package for springs	Seepage along Edwards outcrop
49	31	1	Drain package for springs	Seepage along Edwards outcrop
49	32	1	Drain package for springs	Seepage along Edwards outcrop
49	45	1	Drain package for springs	Seepage along Edwards outcrop
49	47	1	Drain package for springs	Seepage along Edwards outcrop
50	9	1	Drain package for springs	Seepage along Edwards outcrop
50	25	1	Drain package for springs	Seepage along Edwards outcrop
50	28	1	Drain package for springs	Seepage along Edwards outcrop
50	45	1	Drain package for springs	Seepage along Edwards outcrop
50	48	1	Drain package for springs	Seepage along Edwards outcrop
51	9	1	Drain package for springs	Seepage along Edwards outcrop
51	25	1	Drain package for springs	Seepage along Edwards outcrop
51	28	1	Drain package for springs	Seepage along Edwards outcrop
51	45	1	Drain package for springs	Seepage along Edwards outcrop
51	46	1	Drain package for springs	Seepage along Edwards outcrop
51	47	1	Drain package for springs	Seepage along Edwards outcrop
51	48	1	Drain package for springs	Seepage along Edwards outcrop
51	49	1	Drain package for springs	Seepage along Edwards outcrop
51	50	1	Drain package for springs	Seepage along Edwards outcrop
52	9	1	Drain package for springs	Seepage along Edwards outcrop
52	24	1	Drain package for springs	Seepage along Edwards outcrop
52	25	1	Drain package for springs	Seepage along Edwards outcrop
52	26	1	Drain package for springs	Seepage along Edwards outcrop
52	28	1	Drain package for springs	Seepage along Edwards outcrop
52	44	1	Drain package for springs	Seepage along Edwards outcrop
52	45	1	Drain package for springs	Seepage along Edwards outcrop
52	49	1	Drain package for springs	Seepage along Edwards outcrop
52	50	1	Drain package for springs	Seepage along Edwards outcrop
52	51	1	Drain package for springs	Seepage along Edwards outcrop
53	27	1	Drain package for springs	Seepage along Edwards outcrop
53	28	1	Drain package for springs	Seepage along Edwards outcrop
53	45	1	Drain package for springs	Seepage along Edwards outcrop
53	49	1	Drain package for springs	Seepage along Edwards outcrop
53	51	1	Drain package for springs	Seepage along Edwards outcrop
54	27	1	Drain package for springs	Seepage along Edwards outcrop

Column	Row	Model layer	Modflow package	River, outcrop, or springs
54	28	1	Drain package for springs	Seepage along Edwards outcrop
54	48	1	Drain package for springs	Seepage along Edwards outcrop
54	49	1	Drain package for springs	Seepage along Edwards outcrop
55	26	1	Drain package for springs	Seepage along Edwards outcrop
55	27	1	Drain package for springs	Seepage along Edwards outcrop
55	28	1	Drain package for springs	Seepage along Edwards outcrop
55	29	1	Drain package for springs	Seepage along Edwards outcrop
55	30	1	Drain package for springs	Seepage along Edwards outcrop
56	25	1	Drain package for springs	Seepage along Edwards outcrop
56	28	1	Drain package for springs	Seepage along Edwards outcrop
56	30	1	Drain package for springs	Seepage along Edwards outcrop
57	26	1	Drain package for springs	Seepage along Edwards outcrop
57	28	1	Drain package for springs	Seepage along Edwards outcrop
58	27	1	Drain package for springs	Seepage along Edwards outcrop
59	27	1	Drain package for springs	Seepage along Edwards outcrop
60	26	1	Drain package for springs	Seepage along Edwards outcrop
60	27	1	Drain package for springs	Seepage along Edwards outcrop
60	28	1	Drain package for springs	Seepage along Edwards outcrop
61	24	1	Drain package for springs	Seepage along Edwards outcrop
61	25	1	Drain package for springs	Seepage along Edwards outcrop
61	29	1	Drain package for springs	Seepage along Edwards outcrop
62	25	1	Drain package for springs	Seepage along Edwards outcrop
62	26	1	Drain package for springs	Seepage along Edwards outcrop
62	27	1	Drain package for springs	Seepage along Edwards outcrop
62	28	1	Drain package for springs	Seepage along Edwards outcrop
62	29	1	Drain package for springs	Seepage along Edwards outcrop
63	24	1	Drain package for springs	Seepage along Edwards outcrop
63	25	1	Drain package for springs	Seepage along Edwards outcrop
63	26	1	Drain package for springs	Seepage along Edwards outcrop
63	29	1	Drain package for springs	Seepage along Edwards outcrop
63	30	1	Drain package for springs	Seepage along Edwards outcrop
64	26	1	Drain package for springs	Seepage along Edwards outcrop
64	29	1	Drain package for springs	Seepage along Edwards outcrop
64	30	1	Drain package for springs	Seepage along Edwards outcrop
65	26	1	Drain package for springs	Seepage along Edwards outcrop
65	30	1	Drain package for springs	Seepage along Edwards outcrop
65	31	1	Drain package for springs	Seepage along Edwards outcrop
65	32	1	Drain package for springs	Seepage along Edwards outcrop
66	32	1	Drain package for springs	Seepage along Edwards outcrop
17	51	2	Drain package for river	Medina River
17	58	2	Drain package for river	Sabinal River
17	59	2	Drain package for river	Sabinal River
17	60	2	Drain package for river	Sabinal River
17	61	2	Drain package for river	Sabinal River
18	44	2	Drain package for river	Medina River
18	51	2	Drain package for river	Medina River
18	62	2	Drain package for river	Sabinal River

Column	Row	Model layer	Modflow package	River, outcrop, or springs
18	63	2	Drain package for river	Sabinal River
18	64	2	Drain package for river	Sabinal River
18	65	2	Drain package for river	Sabinal River
18	66	2	Drain package for river	Sabinal River
18	67	2	Drain package for river	Sabinal River
19	44	2	Drain package for river	Medina River
19	51	2	Drain package for river	Medina River
20	44	2	Drain package for river	Medina River
20	50	2	Drain package for river	Medina River
21	44	2	Drain package for river	Medina River
21	50	2	Drain package for river	Medina River
21	56	2	Drain package for creek	Seco Creek
21	57	2	Drain package for creek	Seco Creek
22	30	2	Drain package for river	Guadalupe River
22	44	2	Drain package for river	Medina River
22	50	2	Drain package for river	Medina River
22	58	2	Drain package for creek	Seco Creek
23	31	2	Drain package for river	Guadalupe River
23	45	2	Drain package for river	Medina River
23	50	2	Drain package for river	Medina River
23	59	2	Drain package for river	Seco Creek
24	27	2	Drain package for river	Guadalupe River
24	31	2	Drain package for river	Guadalupe River
24	45	2	Drain package for river	Medina River
24	49	2	Drain package for river	Medina River
24	59	2	Drain package for creek	Seco Creek
25	28	2	Drain package for river	Guadalupe River
25	31	2	Drain package for river	Guadalupe River
25	46	2	Drain package for river	Medina River
25	49	2	Drain package for river	Medina River
25	59	2	Drain package for creek	Seco Creek
26	29	2	Drain package for river	Guadalupe River
26	30	2	Drain package for river	Guadalupe River
26	47	2	Drain package for river	Medina River
26	49	2	Drain package for river	Medina River
26	60	2	Drain package for creek	Seco Creek
27	30	2	Drain package for river	Guadalupe River
27	36	2	Drain package for river	Guadalupe River
27	48	2	Drain package for river	Medina River
27	49	2	Drain package for river	Medina River
27	61	2	Drain package for creek	Seco Creek
27	62	2	Drain package for creek	Seco Creek
27	63	2	Drain package for creek	Seco Creek
28	30	2	Drain package for river	Guadalupe River
28	36	2	Drain package for river	Guadalupe River
28	49	2	Drain package for river	Medina River
29	30	2	Drain package for river	Guadalupe River

Column	Row	Model layer	Modflow package	River, outcrop, or springs
29	37	2	Drain package for river	Guadalupe River
29	38	2	Drain package for river	Guadalupe River
30	30	2	Drain package for river	Guadalupe River
30	38	2	Drain package for river	Guadalupe River
31	30	2	Drain package for river	Guadalupe River
31	31	2	Drain package for river	Guadalupe River
31	38	2	Drain package for river	Guadalupe River
31	57	2	Drain package for creek	Elm Creek
32	17	2	Drain package for river	Pedernales River
32	31	2	Drain package for river	Guadalupe River
32	38	2	Drain package for river	Guadalupe River
32	57	2	Drain package for creek	Elm Creek
33	18	2	Drain package for river	Pedernales River
33	32	2	Drain package for river	Guadalupe River
33	38	2	Drain package for river	Guadalupe River
33	58	2	Drain package for creek	Elm Creek
34	18	2	Drain package for river	Pedernales River
34	32	2	Drain package for river	Guadalupe River
34	38	2	Drain package for river	Guadalupe River
34	59	2	Drain package for creek	Elm Creek
34	60	2	Drain package for creek	Elm Creek
35	19	2	Drain package for river	Pedernales River
35	33	2	Drain package for river	Guadalupe River
35	34	2	Drain package for river	Guadalupe River
35	38	2	Drain package for river	Guadalupe River
35	61	2	Drain package for creek	Elm Creek
36	35	2	Drain package for river	Guadalupe River
36	36	2	Drain package for river	Guadalupe River
36	37	2	Drain package for river	Guadalupe River
36	38	2	Drain package for river	Guadalupe River
36	48	2	Drain package for springs	Springs
37	38	2	Drain package for river	Guadalupe River
37	39	2	Drain package for river	Guadalupe River
38	39	2	Drain package for river	Guadalupe River
39	39	2	Drain package for river	Guadalupe River
40	39	2	Drain package for river	Guadalupe River
41	39	2	Drain package for river	Guadalupe River
42	39	2	Drain package for river	Guadalupe River
43	39	2	Drain package for river	Guadalupe River
44	40	2	Drain package for river	Guadalupe River
45	40	2	Drain package for river	Guadalupe River
46	39	2	Drain package for river	Guadalupe River
47	39	2	Drain package for river	Guadalupe River
48	38	2	Drain package for river	Guadalupe River
56	54	2	Drain package for creek	Cibolo Creek
57	54	2	Drain package for creek	Cibolo Creek
58	54	2	Drain package for creek	Cibolo Creek

Column	Row	Model layer	Modflow package	River, outcrop, or springs
59	54	2	Drain package for creek	Cibolo Creek
60	54	2	Drain package for creek	Cibolo Creek
63	27	2	Drain package for river	Blanco River
64	28	2	Drain package for river	Blanco River
65	28	2	Drain package for river	Blanco River
66	28	2	Drain package for river	Blanco River
67	28	2	Drain package for river	Blanco River
68	28	2	Drain package for river	Blanco River
68	57	2	Drain package for river	San Antonio River
68	58	2	Drain package for river	San Antonio River
69	28	2	Drain package for river	Blanco River
69	59	2	Drain package for river	San Antonio River
69	60	2	Drain package for river	San Antonio River
70	28	2	Drain package for river	Blanco River
70	61	2	Drain package for river	San Antonio River
71	28	2	Drain package for river	Blanco River
72	28	2	Drain package for river	Blanco River
73	28	2	Drain package for river	Blanco River
74	28	2	Drain package for river	Blanco River
75	28	2	Drain package for river	Blanco River
76	23	2	Drain package for creek	Miller Creek
76	28	2	Drain package for river	Blanco River
76	53	2	Drain package for creek	Cibolo Creek
76	54	2	Drain package for creek	Cibolo Creek
77	21	2	Drain package for creek	Miller Creek
77	22	2	Drain package for creek	Miller Creek
77	23	2	Drain package for creek	Miller Creek
77	28	2	Drain package for river	Blanco River
77	53	2	Drain package for creek	Cibolo Creek
77	54	2	Drain package for creek	Cibolo Creek
78	21	2	Drain package for creek	Miller Creek
78	29	2	Drain package for river	Blanco River
78	52	2	Drain package for creek	Cibolo Creek
79	21	2	Drain package for creek	Miller Creek
79	29	2	Drain package for river	Blanco River
79	52	2	Drain package for creek	Cibolo Creek
80	53	2	Drain package for creek	Cibolo Creek
80	55	2	Drain package for creek	Cibolo Creek
80	56	2	Drain package for creek	Cibolo Creek
81	53	2	Drain package for creek	Cibolo Creek
81	55	2	Drain package for creek	Cibolo Creek
82	53	2	Drain package for creek	Cibolo Creek
82	54	2	Drain package for creek	Cibolo Creek
89	23	2	Drain package for creek	Onion Creek
90	22	2	Drain package for creek	Onion Creek
91	22	2	Drain package for creek	Onion Creek
91	44	2	Drain package for river	Guadalupe River

Column	Row	Model layer	Modflow package	River, outcrop, or springs
92	22	2	Drain package for creek	Onion Creek
92	44	2	Drain package for river	Guadalupe River
93	19	2	Drain package for creek	Slaughter Creek
93	22	2	Drain package for creek	Onion Creek
94	18	2	Drain package for creek	Slaughter Creek
94	22	2	Drain package for creek	Onion Creek
95	18	2	Drain package for creek	Slaughter Creek
95	22	2	Drain package for creek	Onion Creek
95	36	2	Drain package for river	Blanco River
95	37	2	Drain package for river	Blanco River
96	18	2	Drain package for creek	Slaughter Creek
96	22	2	Drain package for creek	Onion Creek
96	35	2	Drain package for river	Blanco River
97	12	2	Drain package for springs	Springs
97	18	2	Drain package for creek	Slaughter Creek
97	21	2	Drain package for springs	Springs
97	23	2	Drain package for creek	Onion Creek
97	24	2	Drain package for creek	Onion Creek
97	35	2	Drain package for river	Blanco River
98	18	2	Drain package for creek	Slaughter Creek
98	24	2	Drain package for creek	Onion Creek
98	36	2	Drain package for river	Blanco River
99	19	2	Drain package for creek	Slaughter Creek
99	25	2	Drain package for creek	Onion Creek
99	35	2	Drain package for river	Blanco River
100	18	2	Drain package for creek	Slaughter Creek
100	24	2	Drain package for creek	Onion Creek
100	35	2	Drain package for river	Blanco River
101	18	2	Drain package for creek	Slaughter Creek
101	24	2	Drain package for creek	Onion Creek
101	25	2	Drain package for creek	Onion Creek
101	35	2	Drain package for river	Blanco River
102	17	2	Drain package for creek	Slaughter Creek
102	35	2	Drain package for river	Blanco River
103	16	2	Drain package for creek	Slaughter Creek
104	16	2	Drain package for creek	Slaughter Creek
105	16	2	Drain package for creek	Slaughter Creek
106	15	2	Drain package for creek	Slaughter Creek
107	14	2	Drain package for creek	Slaughter Creek
108	13	2	Drain package for creek	Slaughter Creek
109	14	2	Drain package for creek	Slaughter Creek
110	14	2	Drain package for creek	Slaughter Creek
111	14	2	Drain package for creek	Slaughter Creek
111	15	2	Drain package for creek	Slaughter Creek
113	14	2	Drain package for springs	Springs
29	50	3	Drain package for river	Medina River
30	50	3	Drain package for river	Medina River

Column	Row	Model layer	Modflow package	River, outcrop, or springs
31	51	3	Drain package for river	Medina River
32	51	3	Drain package for river	Medina River
33	52	3	Drain package for river	Medina River
34	52	3	Drain package for river	Medina River
35	52	3	Drain package for river	Medina River
35	53	3	Drain package for river	Medina River
36	18	3	Drain package for river	Pedernales River
36	53	3	Drain package for river	Medina River
37	19	3	Drain package for river	Pedernales River
37	54	3	Drain package for river	Medina River
38	19	3	Drain package for river	Pedernales River
38	54	3	Drain package for river	Medina River
39	20	3	Drain package for river	Pedernales River
39	54	3	Drain package for river	Medina River
40	20	3	Drain package for river	Pedernales River
40	54	3	Drain package for river	Medina River
41	20	3	Drain package for river	Pedernales River
41	55	3	Drain package for river	Medina River
42	21	3	Drain package for river	Pedernales River
42	54	3	Drain package for river	Medina River
43	21	3	Drain package for river	Pedernales River
43	54	3	Drain package for river	Medina River
44	22	3	Drain package for river	Pedernales River
44	55	3	Drain package for river	Medina River
44	56	3	Drain package for springs	Medina river bed (springs)
44	57	3	Drain package for river	Medina River
44	58	3	Drain package for river	Medina River
44	59	3	Drain package for river	Medina River
45	22	3	Drain package for river	Pedernales River
46	21	3	Drain package for river	Pedernales River
47	20	3	Drain package for river	Pedernales River
48	20	3	Drain package for river	Pedernales River
49	20	3	Drain package for river	Pedernales River
49	38	3	Drain package for river	Guadalupe River
50	20	3	Drain package for river	Pedernales River
50	38	3	Drain package for river	Guadalupe River
51	19	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
51	38	3	Drain package for river	Guadalupe River
52	18	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
52	37	3	Drain package for river	Guadalupe River
53	17	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
53	37	3	Drain package for river	Guadalupe River
54	17	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
54	38	3	Drain package for river	Guadalupe River
55	15	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose

Column	Row	Model layer	Modflow package	River, outcrop, or springs
55	16	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
55	38	3	Drain package for river	Guadalupe River
56	13	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
56	14	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
56	38	3	Drain package for river	Guadalupe River
57	10	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
57	11	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
57	12	3	Drain package for seepage along outcrop	Outcrop, Lower Glen Rose
57	38	3	Drain package for river	Guadalupe River
58	38	3	Drain package for river	Guadalupe River
59	38	3	Drain package for river	Guadalupe River
60	38	3	Drain package for river	Guadalupe River
61	38	3	Drain package for river	Guadalupe River
61	53	3	Drain package for creek	Cibolo Creek
62	38	3	Drain package for river	Guadalupe River
62	39	3	Drain package for river	Guadalupe River
62	40	3	Drain package for river	Guadalupe River
62	41	3	Drain package for river	Guadalupe River
62	42	3	Drain package for river	Guadalupe River
62	53	3	Drain package for creek	Cibolo Creek
63	39	3	Drain package for springs	Guadalupe river bed (springs)
63	42	3	Drain package for river	Guadalupe River
63	52	3	Drain package for creek	Cibolo Creek
64	42	3	Drain package for river	Guadalupe River
64	49	3	Drain package for springs	Springs
64	52	3	Drain package for creek	Cibolo Creek
65	40	3	Drain package for river	Guadalupe River
65	41	3	Drain package for river	Guadalupe River
65	42	3	Drain package for river	Guadalupe River
65	52	3	Drain package for creek	Cibolo Creek
66	40	3	Drain package for river	Guadalupe River
66	42	3	Drain package for river	Guadalupe River
66	43	3	Drain package for springs	Guadalupe river bed (springs)
66	53	3	Drain package for creek	Cibolo Creek
67	40	3	Drain package for river	Guadalupe River
67	41	3	Drain package for river	Guadalupe River
67	43	3	Drain package for river	Guadalupe River
67	52	3	Drain package for creek	Cibolo Creek
68	43	3	Drain package for river	Guadalupe River
68	52	3	Drain package for creek	Cibolo Creek
69	41	3	Drain package for river	Guadalupe River
69	42	3	Drain package for river	Guadalupe River
69	52	3	Drain package for creek	Cibolo Creek
70	41	3	Drain package for river	Guadalupe River
70	42	3	Drain package for river	Guadalupe River

Column	Row	Model layer	Modflow package	River, outcrop, or springs
70	51	3	Drain package for creek	Cibolo Creek
71	38	3	Drain package for springs	Springs
71	43	3	Drain package for river	Guadalupe River
71	52	3	Drain package for creek	Cibolo Creek
72	43	3	Drain package for river	Guadalupe River
72	52	3	Drain package for creek	Cibolo Creek
73	43	3	Drain package for river	Guadalupe River
73	53	3	Drain package for creek	Cibolo Creek
74	42	3	Drain package for river	Guadalupe River
74	43	3	Drain package for river	Guadalupe River
74	53	3	Drain package for creek	Cibolo Creek
75	42	3	Drain package for river	Guadalupe River
75	53	3	Drain package for creek	Cibolo Creek
76	15	3	Drain package for river	Pedernales River
76	43	3	Drain package for river	Guadalupe River
77	15	3	Drain package for river	Pedernales River
77	43	3	Drain package for river	Guadalupe River
78	15	3	Drain package for river	Pedernales River
78	44	3	Drain package for river	Guadalupe River
78	45	3	Drain package for river	Guadalupe River
79	16	3	Drain package for river	Pedernales River
79	44	3	Drain package for river	Guadalupe River
80	16	3	Drain package for river	Pedernales River
80	21	3	Drain package for creek	Miller Creek
80	29	3	Drain package for river	Blanco River
80	40	3	Drain package for springs	Springs
80	42	3	Drain package for river	Guadalupe River
80	43	3	Drain package for river	Guadalupe River
80	44	3	Drain package for river	Guadalupe River
81	16	3	Drain package for river	Pedernales River
81	20	3	Drain package for creek	Miller Creek
81	29	3	Drain package for river	Blanco River
82	16	3	Drain package for river	Pedernales River
82	20	3	Drain package for creek	Miller Creek
82	28	3	Drain package for river	Blanco River
83	15	3	Drain package for river	Pedernales River
83	20	3	Drain package for creek	Miller Creek
83	29	3	Drain package for river	Blanco River
83	30	3	Drain package for river	Blanco River
83	31	3	Drain package for river	Blanco River
84	14	3	Drain package for river	Pedernales River
84	15	3	Drain package for river	Pedernales River
84	16	3	Drain package for creek	Miller Creek
84	18	3	Drain package for creek	Miller Creek
84	19	3	Drain package for creek	Miller Creek
84	20	3	Drain package for creek	Miller Creek
84	31	3	Drain package for river	Blanco River

Column	Row	Model layer	Modflow package	River, outcrop, or springs
85	13	3	Drain package for river	Pedernales River
85	17	3	Drain package for creek	Miller Creek
85	18	3	Drain package for creek	Miller Creek
85	31	3	Drain package for river	Blanco River
86	11	3	Drain package for river	Pedernales River
86	12	3	Drain package for river	Pedernales River
86	31	3	Drain package for river	Blanco River
87	11	3	Drain package for river	Pedernales River
87	31	3	Drain package for river	Blanco River
88	12	3	Drain package for river	Pedernales River
88	18	3	Drain package for springs	Springs
88	31	3	Drain package for river	Blanco River
89	13	3	Drain package for river	Pedernales River
89	32	3	Drain package for river	Blanco River
89	33	3	Drain package for river	Blanco River
90	11	3	Drain package for river	Pedernales River
90	12	3	Drain package for river	Pedernales River
90	34	3	Drain package for river	Blanco River
90	35	3	Drain package for river	Blanco River
90	36	3	Drain package for river	Blanco River
91	10	3	Drain package for river	Pedernales River
91	37	3	Drain package for river	Blanco River
92	11	3	Drain package for river	Pedernales River
92	37	3	Drain package for river	Blanco River
93	11	3	Drain package for river	Pedernales River
93	37	3	Drain package for river	Blanco River
94	8	3	Drain package for river	Pedernales River
94	9	3	Drain package for river	Pedernales River
94	10	3	Drain package for river	Pedernales River
94	37	3	Drain package for river	Blanco River
95	7	3	Drain package for river	Pedernales River
95	32	3	Drain package for springs	Springs
96	7	3	Drain package for river	Pedernales River