

Annual Aquifer Recharge From Precipitation, Volume of Water Discharging from Aquifers to Springs and Surface Water Bodies, Including Lakes, Streams, and Rivers, and Volume of Flow Into/Out of GCD Within Aquifers and Between Aquifers

**GMA-9 Groundwater Conservation Districts
(By GCD and Major Aquifer)**

September 28, 2015

Table 1A. Summarized Information for Edwards-Trinity (Plateau) Aquifer Needed for Bandera County River Authority and Groundwater District (BCRAGD) Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau) Aquifer	2,524
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards-Trinity (Plateau) Aquifer	1,377
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	9,516
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	12,319
Estimated net annual volume of flow between each aquifer in the district	From the Edwards-Trinity (Plateau) Aquifer to the Trinity Aquifer	332

Source: TWDB, GAM Run 12-009, July 20, 2012, p. 8 of 12.

Table 1B. Summarized Information for Trinity Aquifer Needed for BCRAGD Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	23,480
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer	17,781
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	20,094
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	24,360
Estimated net annual volume of flow between each aquifer in the district	From the Edwards-Trinity (Plateau) Aquifer to the Trinity Aquifer	332

Source: TWDB, GAM Run 12-009, July 20, 2012, p. 10 of 12.

Table 2. Summarized Information for Needed for Barton Springs Edwards Aquifer Conservation District (BSEACD) Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot, Negative values indicate water leaving aquifer system using parameters or boundaries listed in table).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards and associated limestones	42,858 ^a
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards and associated limestones	-39,723
Estimated annual volume of flow into the district within each aquifer in the district	Edwards and associated limestones	3,191 ^b
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards and associated limestones	-2,651 ^b
Estimated net annual volume of flow between each aquifer in the district	Edwards into Trinity	0 ^c

^aRecharge value includes concentrated infiltration of water from stream channels. Scanlon and others (2001) postulated that approximately 15 percent of recharge in the model was due to diffuse inter-stream recharge, or direct precipitation, which equates to approximately 6,429 acre-feet per year.

^b The orientation of the model cells and the political boundaries of the district do not overlie perfectly, therefore even though the district is larger than the model boundaries, some flow into and out of the district is reported due to the method of data extraction from the model.

^c The model does not consider flow into or out of the Edwards (Balcones Fault Zone) Aquifer from other formations.

Source: TWDB, GAM Run 08-37, June 20, 2008, p. 4 of 4.

Table 3A. Summarized Information for Edwards-Trinity (Plateau) Aquifer Needed for Blanco-Pedernales Groundwater Conservation District (BPGCD) Groundwater Management Plan – (values in acre-feet/year and rounded to nearest one acre-foot; flows may include brackish waters).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau) Aquifer	571
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards-Trinity (Plateau) Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	0
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	204
Estimated net annual volume of flow between each aquifer in the district	From Trinity Aquifer into Edwards-Trinity (Plateau) Aquifer	164

Source: TWDB, GAM Run 13-001, January 24, 2013, p. 7 of 11.

Table 3B. Summarized Information for Trinity Aquifer Needed for BPGCD Groundwater Management Plan -(values in acre-feet/year and rounded to nearest one acre-foot; flows may include brackish waters).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	44,469
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer	25,450
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	4,461
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	19,416
Estimated net annual volume of flow between each aquifer in the district	From the Trinity Aquifer into the Edwards-Trinity (Plateau) Aquifer	164

Source: TWDB, GAM Run 13-001, January 24, 2013, p. 7 of 11.

Table 4A. Summarized Information for Hill Country Portion of Trinity Aquifer System Needed for Cow Creek Groundwater Conservation District (CCGCD) Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer System	48,037
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer System	29,249
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer System	7,908
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer System	30,880
Estimated net annual volume of flow between each aquifer in the district	From Edwards-Trinity (Plateau) Aquifer into Trinity Aquifer	6,414
Estimated net annual volume of flow between each aquifer in the district	From Edwards Group into Trinity Aquifer	58

Source: TWDB, GAM Run 13-029, November 15, 2013, p. 7 of 12.

Table 4B. Summarized Information for Edwards-Trinity (Plateau) Aquifer Needed for CCGCD Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau)	6,046
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards-Trinity (Plateau)	3,061
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau)	4,099
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau)	384
Estimated net annual volume of flow between each aquifer in the district	From Edwards-Trinity (Plateau) Aquifer into Trinity Aquifer	6,414

Source: TWDB, GAM Report 13-029, November 15, 2013, p. 9 of 12.

Table 5. Summarized Information for San Antonio Segment of Edwards (Balcones Fault Zone) Aquifer Needed for Edwards Aquifer Authority (EAA) Groundwater Management Plan – (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards (Balcones Fault Zone) Aquifer	592,213
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards (Balcones Fault Zone) Aquifer	142,248*
Estimated annual volume of flow into the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	548,682
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	442,998
Estimated net annual volume of flow between each aquifer in the district	From the Trinity Aquifer to the Edwards (Balcones Fault Zone) Aquifer	13,658
Estimated net annual volume of flow between each aquifer in the district	From the freshwater portion of the Edwards (Balcones Fault Zone) Aquifer to the brackish zone	131,743

*Note: The discharge term does not include model estimates of groundwater discharge from Comal Springs, 196,393 acre-feet per year (1980 through 2000 average) and Leona Springs, 49,422 acre-feet per year (1980 through 2000 average). The model locations of these springs are just outside of the official aquifer boundary.

Source: TWDB, GAM Run 15-009, March 18, 2015, p. 7 of 9.

Table 6A. Summarized Information for Edwards-Trinity (Plateau) Aquifer Needed for Headwaters Groundwater Conservation District (HGCD) Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau) Aquifer	26,325
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards-Trinity (Plateau) Aquifer	17,646
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	19,805
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	37,378
Estimated net annual volume of flow between each aquifer in the district	From the Trinity Aquifer to the Edwards-Trinity (Plateau) Aquifer	5,846

Source: TWDB, GAM Run 12-021, September 4, 2012, p. 8 of 12.

Table 6B. Summarized Information for Trinity Aquifer Needed for HGCD Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	21,243
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer	18,291
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	19,547
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	19,745
Estimated net annual volume of flow between each aquifer in the district	From the Trinity Aquifer into the Edwards-Trinity (Plateau) Aquifer	27,213

Source: TWDB, GAM Run 12-021, September 4, 2012, p. 10 of 12.

Table 7. Summarized Information for Hill Country Portion of Trinity Aquifer System Needed for Hays Trinity Groundwater Conservation District (HTGCD) Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	26,105
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer	22,439
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	17,716
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	11,610
Estimated net annual volume of flow between each aquifer in the district	From the Trinity Aquifer to the Edwards (Balcones Fault Zone) Aquifer	7,440*

* in the Hays Trinity Groundwater Conservation District, groundwater generally flows east from the Trinity Aquifer to the Edwards (Balcones Fault Zone) Aquifer and the confined parts of the Trinity Aquifer that underlie the Edwards (Balcones Fault Zone) Aquifer.

Source: TWDB, GAM Run 15-005, March 6, 2015, p. 7 of 10.

Table 8. Summarized Information for Trinity Aquifer Needed for Medina County Groundwater Conservation District (MCGCD) Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	6,918
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer	6,412
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	24,023
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	23,176
Estimated net annual volume of flow between each aquifer in the district	Not Applicable*	Not Applicable*

* Not applicable because flow leaving the Trinity Aquifer and entering the Edwards (Balcones Fault Zone) Aquifer is considered flow leaving the district (from Medina County Groundwater Conservation District to the Edwards Aquifer Authority). The model also assumes a no flow barrier at the base of the Lower Trinity unit of the Trinity Aquifer.

Source: TWDB, GAM Run 15-002, June 30, 2015, p. 8 of 13.

Table 9. Summarized Information for Hill Country Portion of Trinity Aquifer System Needed for Trinity Glen Rose Groundwater Conservation District (TGRGCD) Groundwater Management Plan - (values in acre-feet/year and rounded to nearest one acre-foot).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Trinity Aquifer	42,171
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Trinity Aquifer	9,892
Estimated annual volume of flow into the district within each aquifer in the district	Trinity Aquifer	35,193
Estimated annual volume of flow out of the district within each aquifer in the district	Trinity Aquifer	26,170
Estimated net annual volume of flow between each aquifer in the district	From the Trinity Aquifer to the Edwards (Balcones Fault Zone) Aquifer	37,272

Source: TWDB, GAM Run 15-001, February 17, 2015, p. 8 of 10.