

# Section 16

## Regional Groundwater Modeling for Prioritized Aquifer Sustainable Yield Assessment

### 16.1 Groundwater Modeling Objectives

As discussed in Sections 12 through 15 of this report, the prioritized aquifer sustainable yields were evaluated individually using three sub-regional groundwater models. The estimated ranges of sustainable yields for these aquifers were discussed in these sections. The sustainable yields for the prioritized aquifers, including the Upper Floridan Aquifer, Claiborne Aquifer, and Cretaceous Aquifer, are summarized in **Table 16-1**. This table represents the sustainable yield of each aquifer if all the other aquifers are limited to their current levels of pumping. As shown in this table, the sum of the sustainable yields for the individual prioritized aquifers ranged from approximately from 1,166 mgd to 1,433 mgd. The minimum sum of additional withdrawals from the individual prioritized aquifers was 500 mgd and the maximum additional withdrawal from the individual prioritized aquifers was approximately 767 mgd.

**Table 16-1 Estimated Sustainable Yields for the Upper Floridan Aquifer, Claiborne Aquifer and Cretaceous Aquifer from the Individual Sub-Regional Groundwater Models**

Aquifer	Existing Pumping Conditions (Baseline)	Sustainable Yield	
		Minimum	Maximum
	(mgd)	(mgd)	(mgd)
Upper Floridan	475	868	982
Claiborne	67	100	250
Cretaceous	124	198	201
Total	666	1,166	1,433
Additional Withdrawals from the Prioritized Aquifers	-	<b>500</b>	<b>767</b>

It is possible that increased withdrawals could occur in multiple prioritized aquifers. Therefore, groundwater modeling simulations that increased pumping in all the prioritized aquifers at the same time was completed to assess the impact of combined pumping on the overall sustainable yield numbers.

## **16.2 Regional Groundwater Modeling Approach for Sustainable Yield Assessment**

Consistent with Section 11 of this report, two criteria were used to evaluate the sustainable yield in the prioritized aquifers of the Coastal Plain Aquifer System in Georgia. These criteria were groundwater level drawdown and reduction to groundwater contributions to stream baseflow. Reasonable metrics, which have been applied elsewhere, for these two criteria are no more than 30 feet of drawdown in the targeted aquifer and no more than a 40 percent reduction to groundwater contributions to stream baseflow.

As discussed in Section 11.3, groundwater modeling simulations should be performed under a steady-state condition in order to evaluate whether the groundwater withdrawals from the aquifers are sustainable and to estimate the ultimate groundwater level drawdown and streamflow loss due to increased pumping once the aquifer has reached a new equilibrium. Therefore, the steady-state regional Georgia EPD groundwater model, developed and calibrated as described in Sections 5 and 6, was updated with the calibrated aquifer hydraulic parameters from the sub-regional models.

The lower end of the range of sustainable yield of each of the prioritized aquifers was simulated in the sub-regional models by increasing withdrawals from existing wells only. The sum of the lower end of the sustainable yield ranges for the aquifers pumping individually was 1,166 mgd. The regional model was used to simulate the same pumping increases used in the individual sub-regional models with the increases occurring simultaneously in all prioritized aquifers. It was found that drawdowns between pumping wells in the simultaneous simulation exceeded 30 feet. Simulated simultaneous pumping was uniformly decreased until the drawdown criterion was met, resulting in a sustainable yield of 1,066, 100 mgd lower than the sum of the individual prioritized aquifer simulations. Results are given in **Table 16-2**.

The results of this analysis show that if pumping in each prioritized aquifer is increased simultaneously, the regional sustainable yield in the Coastal Plain of Georgia is lower than when pumping is increased in each sub-regional area while pumping in the other aquifers is held steady. Comparison of the estimated regional sustainable yields in Table 16-2 with estimated sub-regional sustainable yields using the individual sub-regional models in Table 16-1 demonstrates this point. When pumping is increased simultaneously in each prioritized aquifer, there is hydraulic interference between well pumping on a larger scale that limits the aquifer yield by exceeding the two limiting criteria (groundwater level drawdown and baseflow reduction to the rivers) at the lower combined rates.

Table 16-2 Summary of Sustainable Yields for the Upper Floridan, Claiborne, and Cretaceous Aquifers under Different Withdrawal Conditions for an Average Rainfall Year using the Steady-State Regional Coastal Plain Aquifer Groundwater Model

Pumping Conditions and Potential Impacts	Existing Pumping Conditions (Baseline)				Uniform Increased Pumping from All Existing Wells (Simulation 1)				Non-Uniform Increased Pumping from Existing Wells (Simulation 2) <sup>1</sup>			
	Aquifer				Aquifer				Aquifer			
	UFA	Claiborne	Cretaceous	Total	UFA	Claiborne	Cretaceous	Total	UFA	Claiborne	Cretaceous	Total
No. of Existing Pumping Wells	5,718	760	631	7,109	5,718	760	631	7,109	5,718	760	631	7,109
No. of Simulated New Pumping Wells	0	0	0	0	0	0	0	0	0	0	0	0
Prioritized Aquifer												
Pumping from Upper Floridan Aquifer (mgd)	475	-	-		768	-	-		859	-	-	-
Pumping from Claiborne Aquifer (mgd)	-	67	-		-	100	-		-	183	-	-
Pumping from Cretaceous Aquifer (mgd)	-	-	124		-	-	198		-	-	187	
Pumping from other aquifers (mgd)	1,022				1,022				1,022			
Total Pumping from Prioritized Aquifers (mgd)				666				1,066				1,229
Total Pumping from all aquifers in model domain (mgd)				1,688				2,088				2,064
Additional withdrawals from Priortized Coastal Plain Aquifers (mgd)	-	-	-	-	293	33	74	400	384	116	63	563
% Increase in withdrawals from Prioritized Coastal Plain Aquifers	-				60				85			
Simulated groundwater level drawdown (ft)	-				30				30			
Simulated river baseflow reduction (%) <sup>2</sup>	-				29				40			

<sup>1</sup> Pumping from existing wells is increased uniformly except for existing large users, which are capped at existing pumping rates.

<sup>2</sup> The baseflow reduction was estimated for the streams in rivers in the outcrop area from a model-wide water budget for each simulation.

Note: The addition of simulated new wells in the prioritized aquifers was considered in these analyses since both the baseflow reduction and drawdown criteria were already exceeded under the existing wells pumping increase scenarios

UFA indicates Upper Floridan Aquifer.