

Section 14

Sub-Regional Groundwater Modeling for Claiborne Aquifer Sustainable Yield Assessment

14.1 Groundwater Modeling Approach for Sustainable Yield Assessment

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

As discussed in Section 11.3, groundwater modeling simulations were 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 reduction of groundwater contribution to stream baseflow due to increased pumping once the aquifer has had time to reach a new equilibrium. Therefore, a steady-state sub-regional Claiborne Aquifer groundwater flow model was developed based on the calibrated sub-regional Claiborne Aquifer model discussed in Section 9. The steady-state model was used to estimate Claiborne Aquifer sustainable yields and to evaluate the potential effects of increasing pumping from the Claiborne Aquifer on the groundwater system and surface water system (rivers and streams).

Groundwater flow modeling simulations were performed using the steady-state sub-regional Claiborne Aquifer model. These simulations were conducted to estimate the range of sustainable yields that could occur from existing and simulated new wells in the Claiborne Aquifer without creating unacceptable impacts to the environment.

Figure 14-1 shows the locations of the existing and simulated new wells in the Claiborne Aquifer. Simulated new wells were placed in model grid cells in the Claiborne Aquifer in Georgia that did not already contain existing pumping wells. Most of the simulated new wells are in the southern portion of the aquifer where there are few, or no, existing production wells. As shown on the Figure 14-1, the distance between the simulated wells is approximately 10,000 feet. A total of 1,125 new wells were simulated for the Claiborne Aquifer.

For this analysis, simulation scenarios were performed, with pumping from the Claiborne Aquifer increasing until either the groundwater level drawdown criteria of 30 feet was exceeded over a large area, or reduction of groundwater contributions to stream baseflow exceeded 40 percent. In these simulations, pumping from both underlying and overlying aquifers was maintained at the baseline pumping rates.

These simulations are described below.

- **Simulation 1:** Pumping from the Claiborne Aquifer was uniformly increased in the existing wells (lower end of sustainable yield range);
- **Simulation 2:** Pumping from the Claiborne Aquifer was non-uniformly increased in the simulated new wells and uniformly increased in the existing wells (upper end of sustainable yield range).

14.2 Groundwater Modeling Results for Claiborne Aquifer Sustainable Yield Assessment

The results of the groundwater modeling for the Claiborne Aquifer sustainable yield assessment are summarized in **Table 14-1**. As shown in Table 14-1, the existing permitted pumping rate from the Claiborne Aquifer in Georgia is approximately 67 mgd. Uniformly increased pumping from the existing wells in the Claiborne Aquifer represents the low end of the range of sustainable yields, whereas non-uniformly increased pumping from simulated new wells and uniformly increased pumping from the existing wells represent the high end of the range of sustainable yields. Non-uniformly increased pumping from the simulated new wells in the Claiborne Aquifer in 20 counties in Georgia is presented in **Table 14-2**.

As indicated in Table 14-1, if pumping is uniformly increased from the existing wells in the Claiborne Aquifer (Simulation 1), the withdrawals can be increased by up to approximately 49 percent. Baseline pumping from the Claiborne Aquifer can be increased from 67 mgd to 100 mgd, resulting in an increased withdrawal of 33 mgd. This pumping scenario results in exceedance of the 30-foot groundwater level drawdown criterion and a corresponding reduction of groundwater contributions to stream baseflow of approximately 6 percent. This result suggests that pumping could be increased further if pumping is re-distributed before exceedance of the baseflow reduction criterion is reached. If pumping is non-uniformly increased from the simulated new wells and uniformly increased from the existing wells (Simulation 2), total pumping withdrawals could be increased further. As indicated in Table 14-1, withdrawals can be increased by up to approximately 273 percent, resulting in exceedance of the 30-foot groundwater level drawdown criterion and an exceedance of the baseflow reduction criterion of 40 percent. For this scenario, baseline pumping from the Claiborne Aquifer can be increased from 67 mgd to 250 mgd, resulting in an increased additional withdrawal of 183 mgd from the Claiborne Aquifer. The results of this analysis show that non-uniformly increased pumping from the simulated new wells, combined with uniformly increased pumping from the existing wells, results in the highest estimate of sustainable yield for the Claiborne Aquifer.

Table 14-1 Summary of Sustainable Yields in the Claiborne Aquifer under Different Withdrawal Conditions for an Average Rainfall Year using the Steady-State Claiborne Aquifer Sub-Regional Groundwater Model

Pumping Conditions and Potential Impacts	Existing Pumping Conditions (Baseline)	Uniform Increased Pumping from Existing Wells in Claiborne Aquifer (Simulation 1)			Uniform Increased Pumping from Existing Wells & Non-Uniform Increased Pumping from New Wells ¹ in Claiborne Aquifer (Simulation 2)		
		Additional Withdrawals	Total Increased Pumping	Percent Increase in Pumping	Additional Withdrawals	Total Increased Pumping	Percent Increase in Pumping
No. of Existing Pumping Wells	760	-	-	-	-	-	-
No. of Simulated New Pumping Wells	0	0	-	-	1,125	-	-
Claiborne Aquifer pumping (mgd)	67	33	100	!Zero Divide	183	0.4	!Zero Divide
Total pumping from all aquifers in the model domain (mgd)	589	33	622	-	772	!B9 Is Not In Table	-
Simulated groundwater level drawdown (ft) ²	-	30	-	-	30	-	-
Simulated river baseflow reduction (mgd) ³	-	6%	-	-	40%	-	-

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

²Simulated groundwater level drawdown was calculated from by subtracting the groundwater elevations for each simulation from the corresponding values in baseline condition.

³The reduction of groundwater contributions to stream baseflow was estimated for the streams and rivers in the outcrop areas from a model-wide water budget for each simulation. % increase is the additional withdrawals divided by the total existing withdrawals from the Claiborne Aquifer.

Table 14-2 Non-Uniformly Increased Pumping from Simulated New Wells in Different Counties within Claiborne Aquifer Model

County in Claiborne Aquifer Model Domain	Number of Simulated New Wells	Pumping Rate from Simulated New Wells per County
Dougherty	76	4.6
Worth	89	8.9
Early	96	19.2
Baker	92	9.2
Miller	75	4.5
Mitchell	124	7.4
Seminole	70	4.2
Decatur	154	6.9
Grady	24	1.4
Clay	51	10.2
Randolph	82	16.4
Sumter	21	10.5
Turner	3	0.6
Quitman	8	1.6
Terrell	41	12.3
Colquitt	2	0.4
Lee	44	8.8
Calhoun	49	17.2
Webster	10	3.5
Crisp	13	5.2
Total	1,124	153.0

A relatively good connection between the rivers and their tributaries to the Claiborne Aquifer in the outcrop areas provides significant quantities of water when a combination of the simulated new wells and existing wells is used. As shown in Table 14-2, increased pumping from the simulated new wells varied from approximately 0.4 mgd in Colquitt County to approximately 19.2 mgd in Early County

14.3 Potential Impacts on Groundwater Levels Due to Increased Groundwater Withdrawals in the Claiborne Aquifer

The results of the groundwater modeling for potential impacts due to increased groundwater withdrawals from the Claiborne Aquifer are presented in the form of groundwater level drawdown contours. The results of the sub-regional Claiborne Aquifer modeling simulations for Simulations 1 and 2, listed in Section 14.1. Groundwater elevation contours and groundwater level drawdown contours for the

Upper Floridan Aquifer (Layer 2) and Claiborne-Gordon Aquifers (Layer 3) through the Upper Atkinson Aquifer (Layer 7) are provided for each of the four simulations. For the sake of brevity, the simulated groundwater elevations and groundwater level drawdown contours for Simulation 1 (low end of sustainable yield range) and Simulation 2 (high end of sustainable yield range) are presented and discussed in this section.

14.3.1 Baseline Condition

For comparison, the groundwater elevations in the Upper Floridan Aquifer (Layer 2) and Claiborne-Gordon Aquifers (Layer 3) through the Upper Atkinson Aquifer (Layer 7) under existing baseline conditions are presented on **Figures 14-2 through 14-7**.

Figure 14-2 shows that the direction of regional groundwater flow in the Upper Floridan Aquifer in the Claiborne Aquifer model domain is primarily from north to south, and there is clear interaction with major rivers in the area (Chattahoochee and Flint Rivers and their tributaries).

As shown on Figure 14-3, the direction of regional groundwater flow in the Claiborne Aquifer is also from north to south, and there is interaction with major rivers in the area. There are very steep gradients near the Lee County wellfield in the Claiborne Aquifer, which is a large user of water from the Claiborne Aquifer.

Figure 14-4 illustrates that the direction of regional groundwater flow in the Clayton Aquifer is also from north to south, and there appears to be no interaction with major rivers in the area. There is a potentiometric low in the Clayton Aquifer near the Lee County wellfield, which is likely due to upward leakage to the Claiborne Aquifer.

14.3.2 Potential Impacts with the Lower End of the Range of Sustainable Yield

Figures 14-8 through 14-13 show the groundwater elevations in Layers 2 through 7 under uniformly increased pumping from existing wells in the Claiborne Aquifer (Simulation 1). As shown on Figure 14-9, the direction of regional groundwater flow in the Claiborne Aquifer is from north to south, and there are slight increases in hydraulic gradients due to an approximately 33 mgd increase in pumping from existing wells in the Claiborne Aquifer. There appears to be more recharge from the rivers to the Claiborne Aquifer, however the baseflow reduction criterion was not exceeded. As shown on Figure 14-9, there is steepening of the hydraulic gradient in the Clayton Aquifer due to the increased pumping, which suggests increased upward leakage to the Claiborne Aquifer. However, there is little change in the groundwater flow directions in the Upper Floridan Aquifer compared to baseline existing conditions (Figure 14-2). This result indicates that there is good confinement between the Upper Floridan Aquifer and the Claiborne Aquifer, which is consistent with available hydrogeologic data (Tables 8-6 and 9-6).

The groundwater level drawdown for Layers 2 through 7 under uniformly increased pumping from the existing wells in the Claiborne Aquifer (Simulation 1) are shown on **Figures 14-14** through **14-19**, respectively. As shown on Figure 14-15, increased pumping in the Claiborne Aquifer produces significant drawdown (approximately 30 feet) around the Lee County wellfield. As shown on Figures 14-16 and 14-17, there is increased groundwater level drawdown in both the Clayton Aquifer (approximately 1 to 11 feet) and the Upper Cretaceous Aquifer (approximately 1 to 6 feet), respectively, also centered around the Lee County wellfield. However, there is little impact due to increased pumping in the Claiborne Aquifer on the groundwater level in the Upper Floridan Aquifer and the Lower Cretaceous Aquifer. This result indicates that there is good confinement between the Upper Floridan Aquifer and the Claiborne Aquifer and between the Claiborne Aquifer and the Lower Cretaceous Aquifer, which is consistent with available hydrogeologic data (Tables 8-6 and 9-6).

Some simulated drawdowns may have been locally greater than 30 feet in the vicinity of pumping wells, which did not exceed the sustainable yield criterion that drawdowns not exceed 30 feet between pumping wells. The criterion of no more than 40 percent of groundwater contributions to baseflow was not exceeded in the simulations of the lower end of the range of sustainable yield.

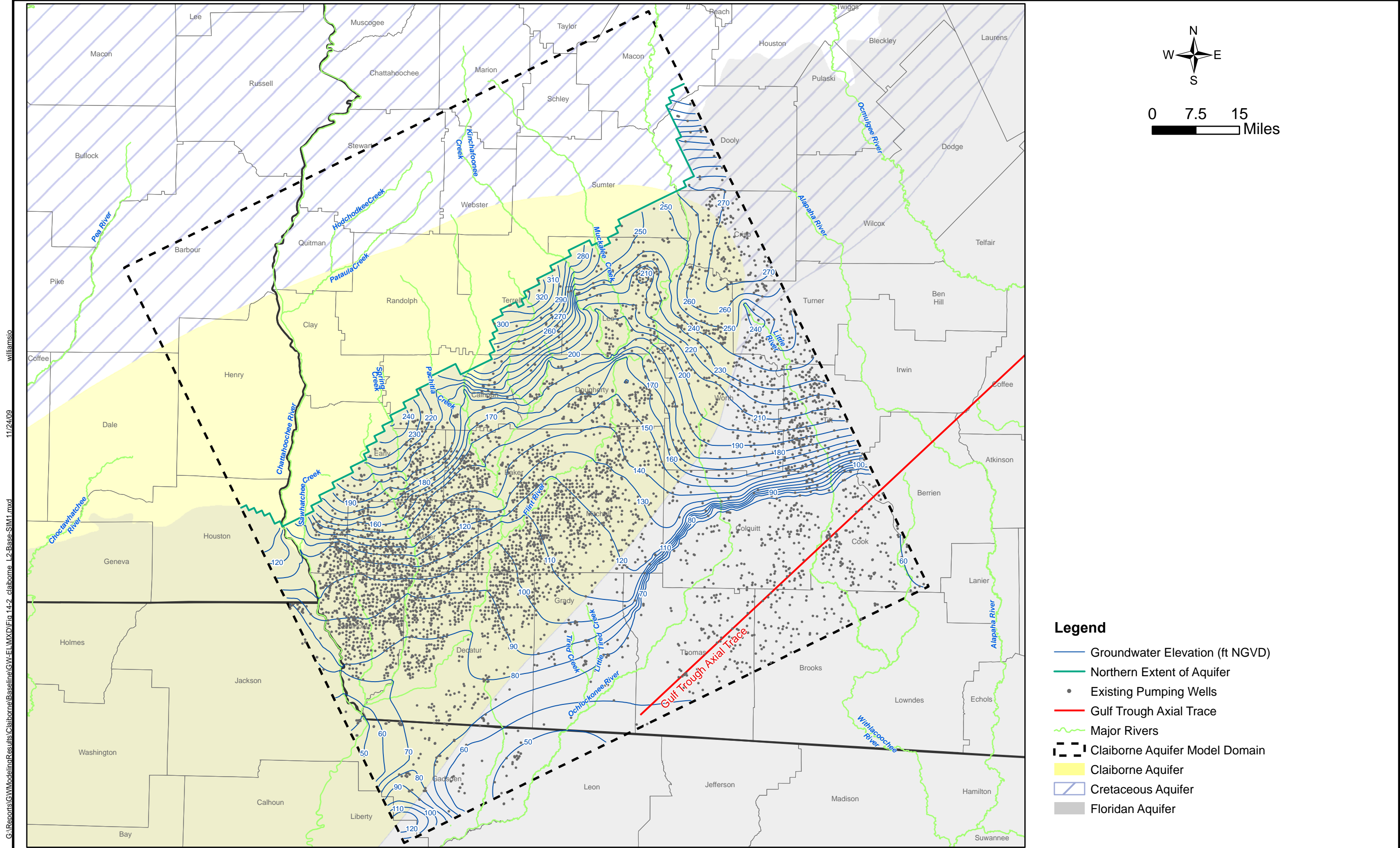
14.3.3 Potential Impacts with Upper End of the Range of Sustainable Yield

Figures 14-20 through **14-25** show the groundwater elevations in Layers 2 through 7 for non-uniformly increased pumping from new wells and uniformly increased pumping from the existing wells in the Claiborne Aquifer (Simulation 2). As shown on Figure 14-21, the direction of regional groundwater flow in the Claiborne Aquifer remains unaltered, but there are slight increases in hydraulic gradients due to an additional 183 mgd of uniformly increased pumping from the existing wells and non-uniformly increased pumping from the simulated new wells. There appears to be more recharge from the rivers to the Claiborne Aquifer under this condition, however the baseflow reduction criterion was not exceeded. There is steepening of the hydraulic gradient in the Clayton Aquifer due to increased pumping in the Claiborne Aquifer, which causes upward leakage from the Clayton Aquifer to the Claiborne Aquifer (Figure 14-22). However, there is little change in the potentiometric surface of the Upper Floridan Aquifer compared to baseline existing conditions (Figure 14-2). This result indicates that there is good confinement between the Upper Floridan Aquifer and the Claiborne Aquifer, which is consistent with available hydrogeologic data (Tables 8-6 and 9-6).

The groundwater level drawdown for Layers 2 through 7 under non-uniformly increased pumping from the simulated new wells and uniformly increased pumping from the existing wells in the Claiborne Aquifer (Simulation 2) are shown on **Figures 14-26** through **14-31**, respectively. As shown on Figure 14-27, increased pumping from the existing and simulated wells in the Claiborne Aquifer produces increased groundwater level drawdown in the Claiborne Aquifer of approximately 5 to 30 feet.

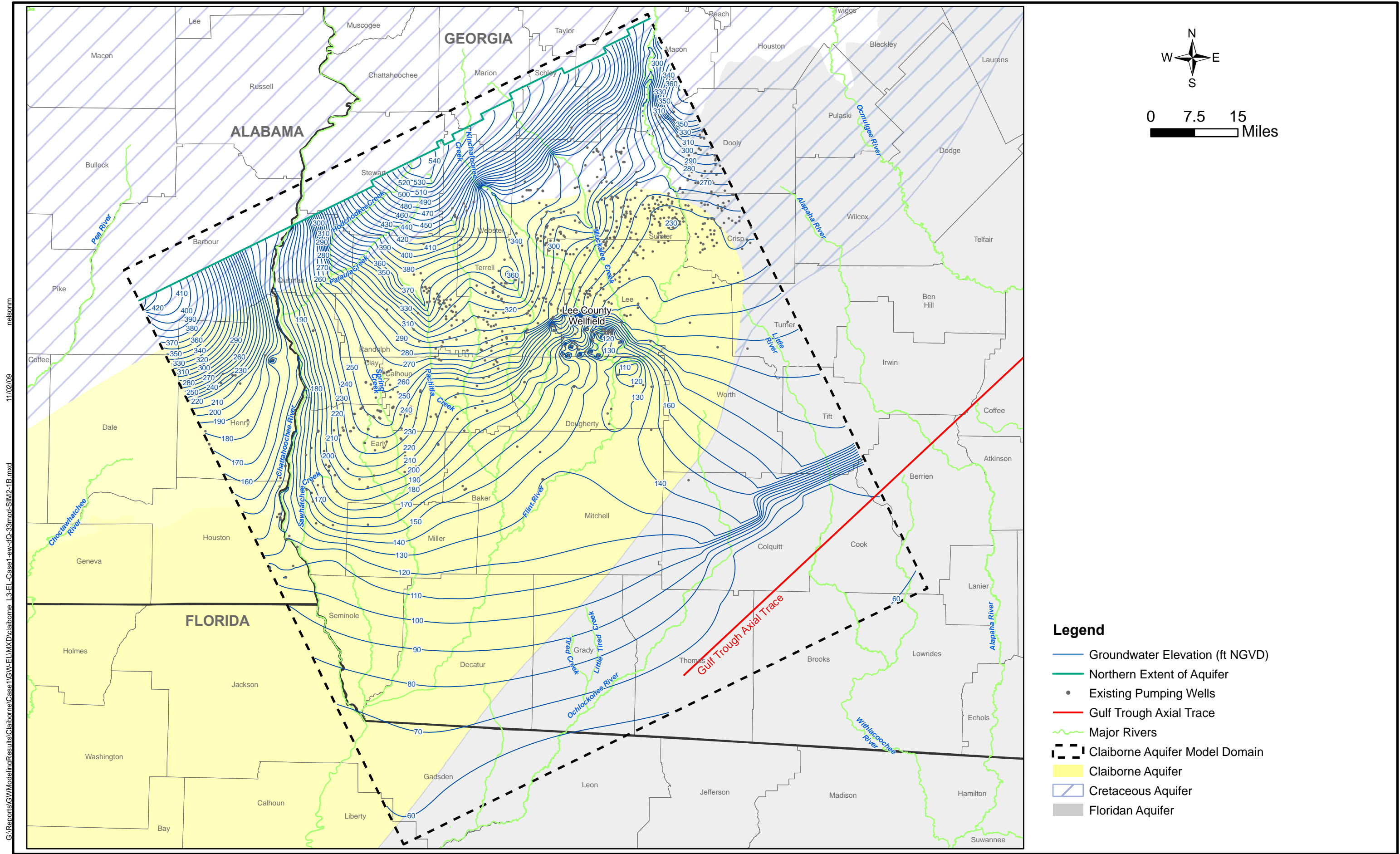
As shown on Figures 14-26 and 14-28 through 14-30, there is increased groundwater level drawdown in the Upper Floridan Aquifer (approximately 1 to 18 feet), Clayton Aquifer (approximately 5 to 30 feet), Upper Cretaceous Aquifer (approximately 5 to 25 feet), and Lower Cretaceous Aquifer (approximately 1 to 3 feet).

Some simulated drawdowns may have been locally greater than 30 feet in the vicinity of pumping wells, which did not exceed the sustainable yield criterion that drawdowns not exceed 30 feet between pumping wells. The criterion of no more than 40 percent of groundwater contributions to baseflow was reached in the simulations of the upper end of the range of sustainable yield.



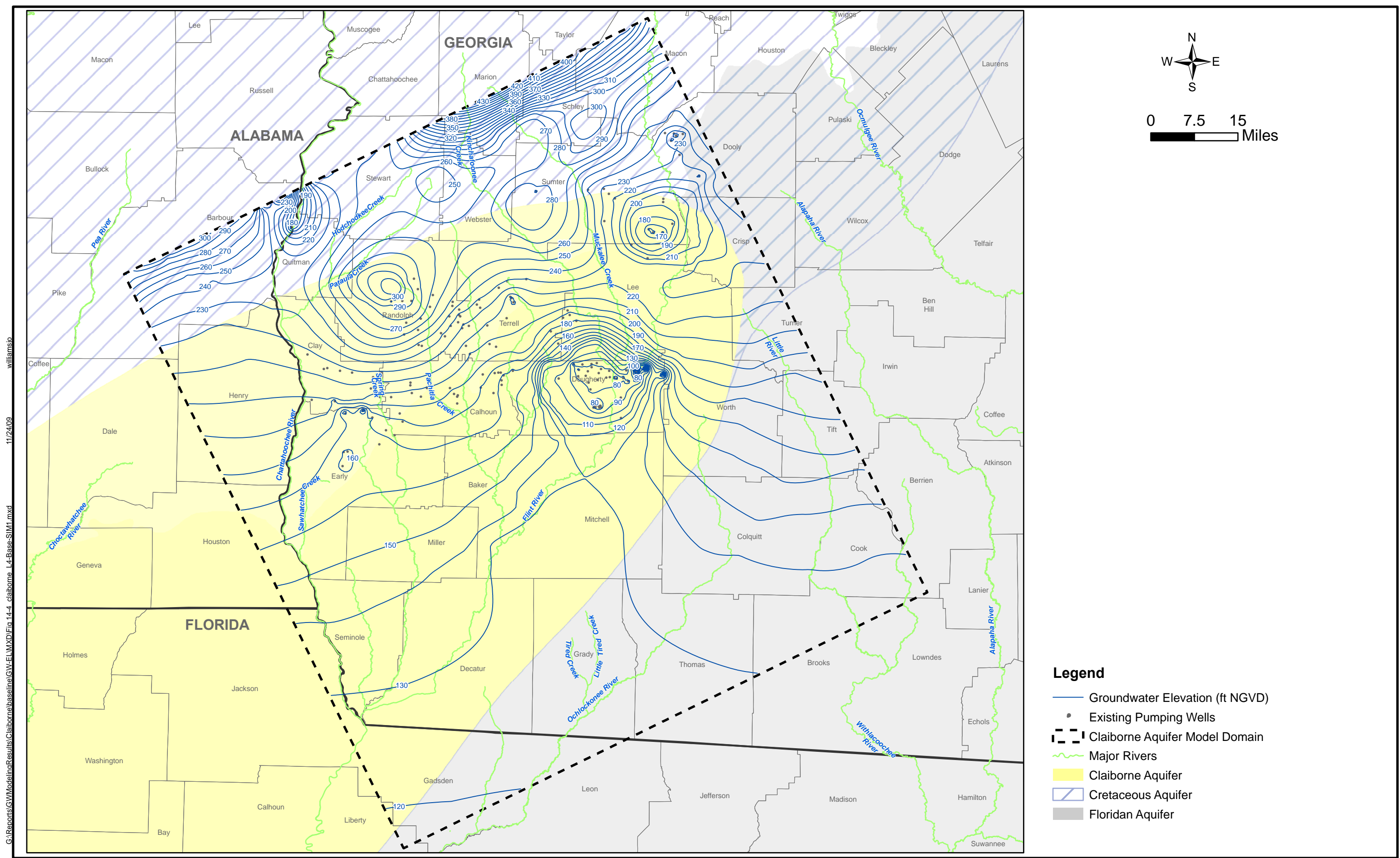
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Figure 14-2
Simulated Groundwater Elevations in Upper Floridan Aquifer (Layer 2)
At Current Pumping Conditions Using Sub-Regional Claiborne Aquifer Model



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CDM **Figure 14-3**
Simulated Groundwater Elevations in Claiborne/Gordon/Lower Floridan Aquifers (Layer 3)
At Current Pumping Conditions Using Sub-Regional Claiborne Aquifer Model



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CDM **Figure 14-4**
Simulated Groundwater Elevations in Clayton-Dublin Aquifers (Layer 4)
At Current Pumping Conditions Using Sub-Regional Claiborne Aquifer Model

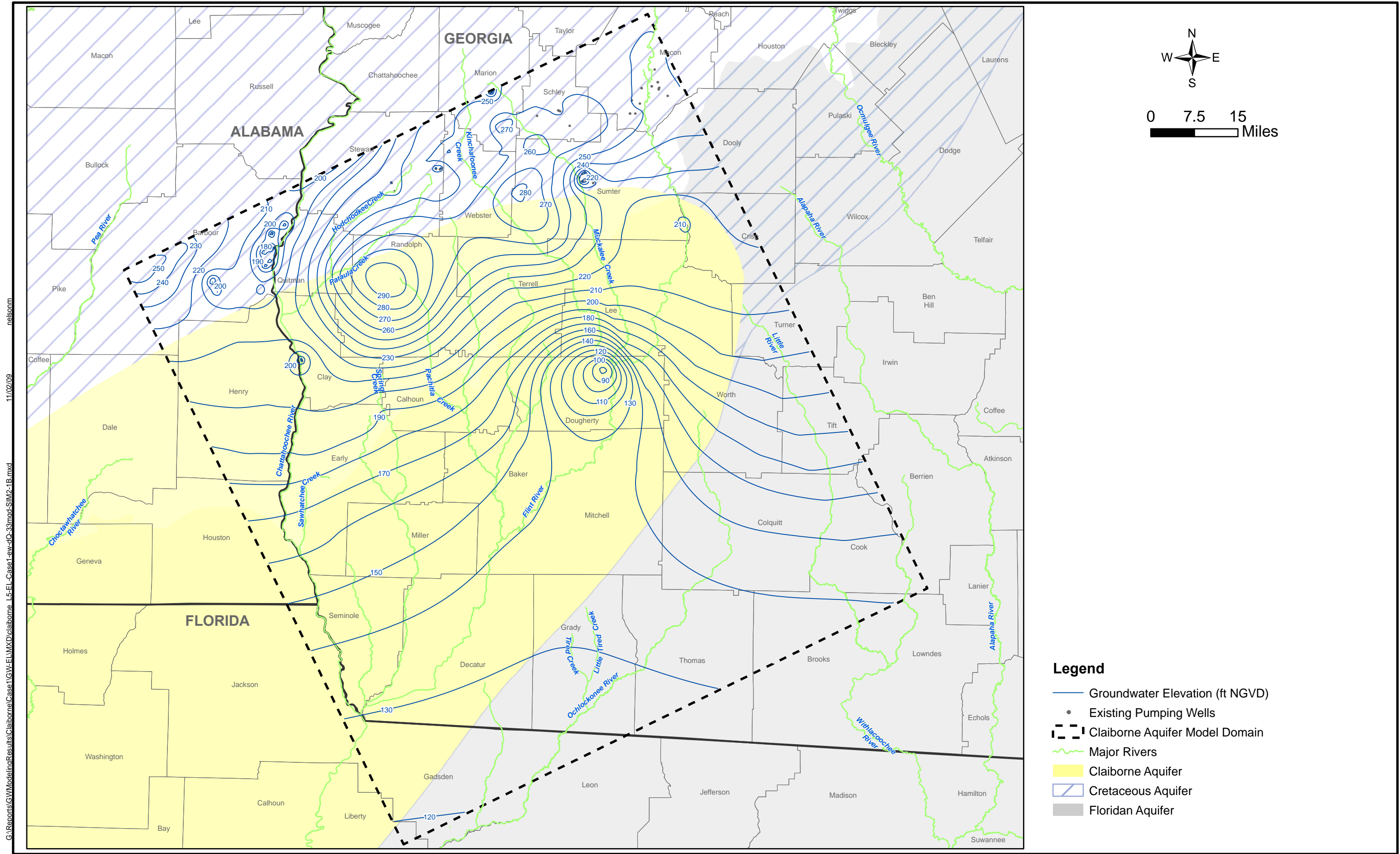


Figure 14-5
Simulated Groundwater Elevations in Providence Sand-Peedee-Dublin Aquifers (Layer 5)
At Current Pumping Conditions Using Sub-Regional Claiborne Aquifer Model

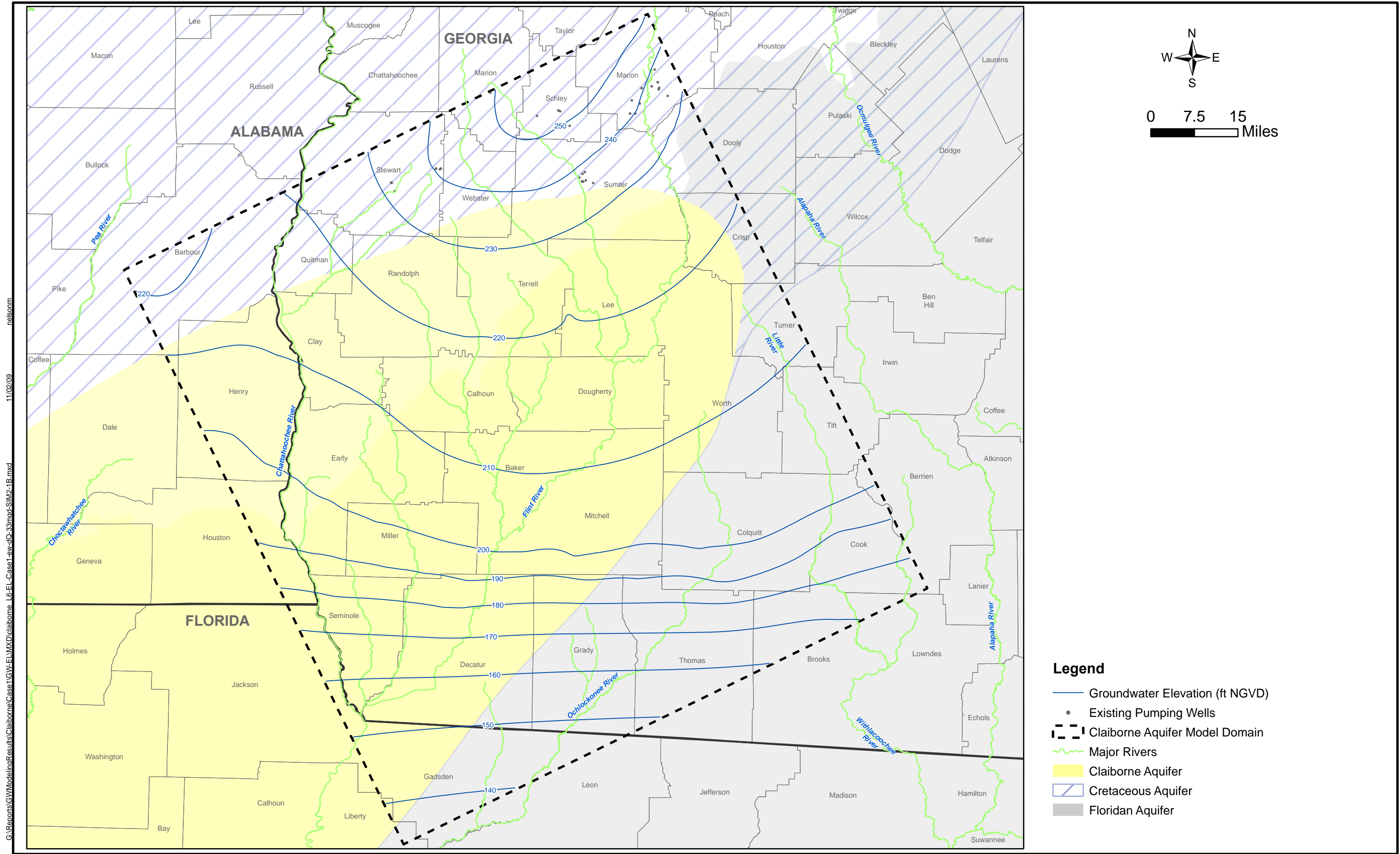
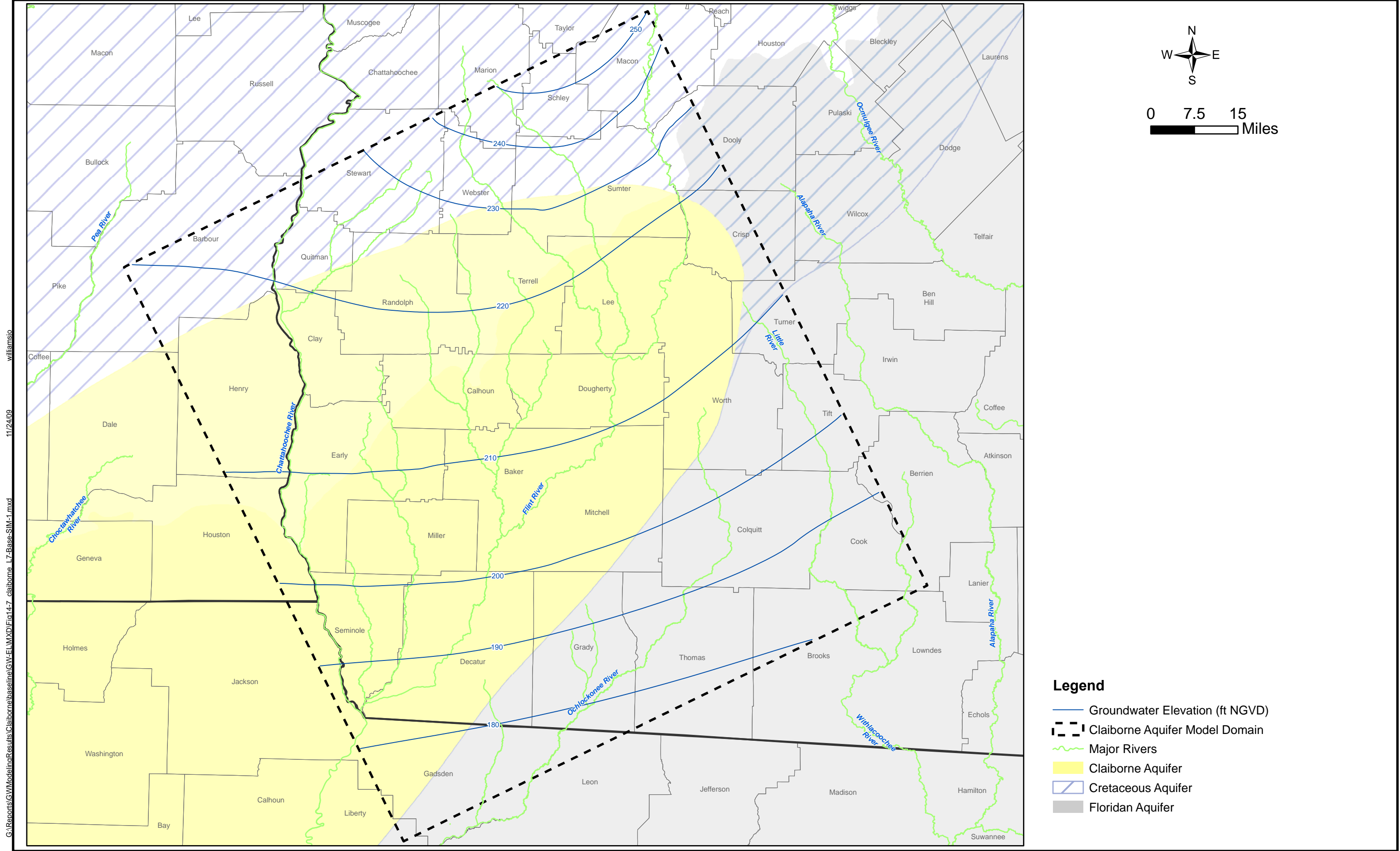
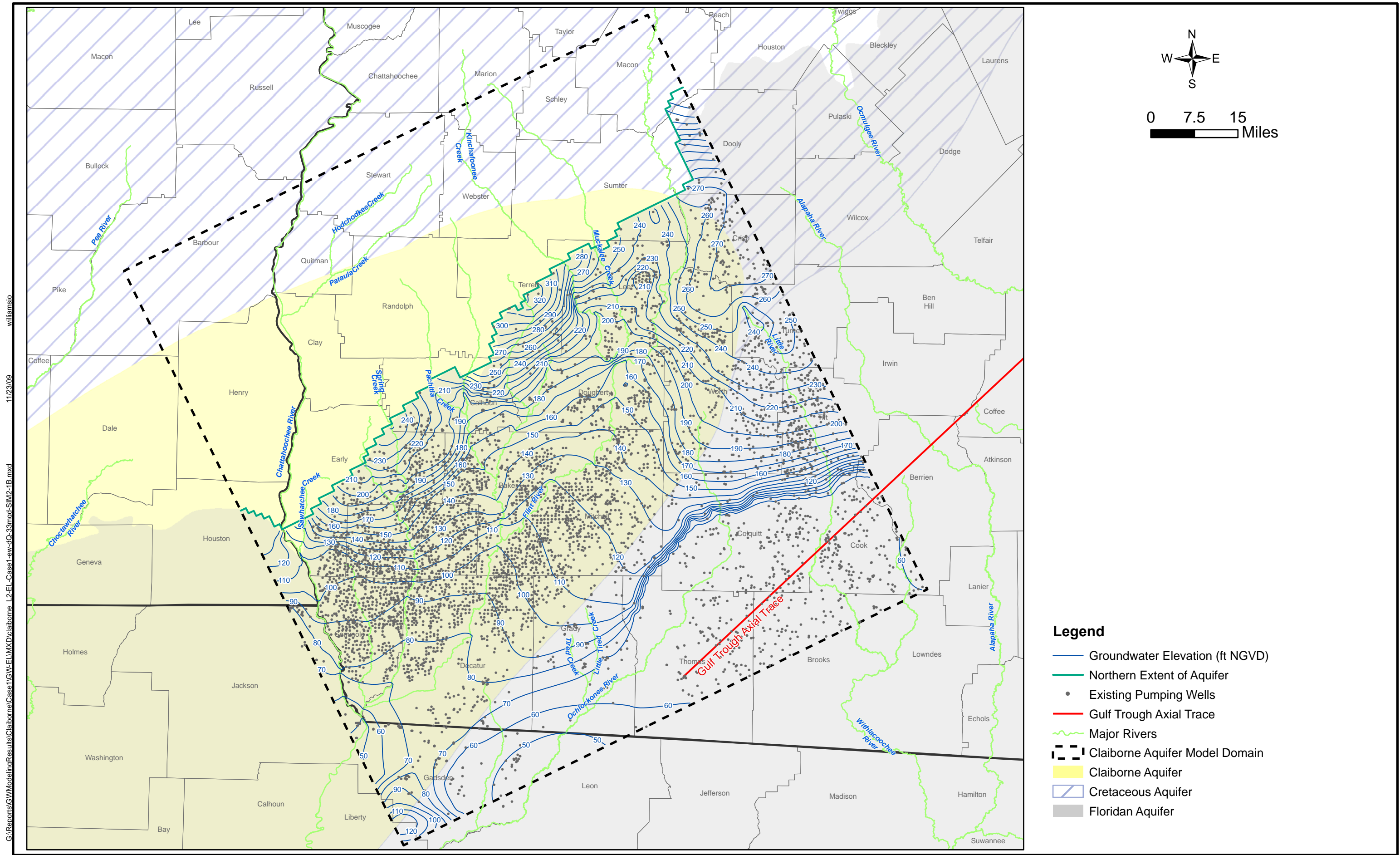


Figure 14-6
Simulated Groundwater Elevations in Eutaw-Midville Aquifer (Layer 6)
At Current Pumping Conditions Using Sub-Regional Claiborne Aquifer Model



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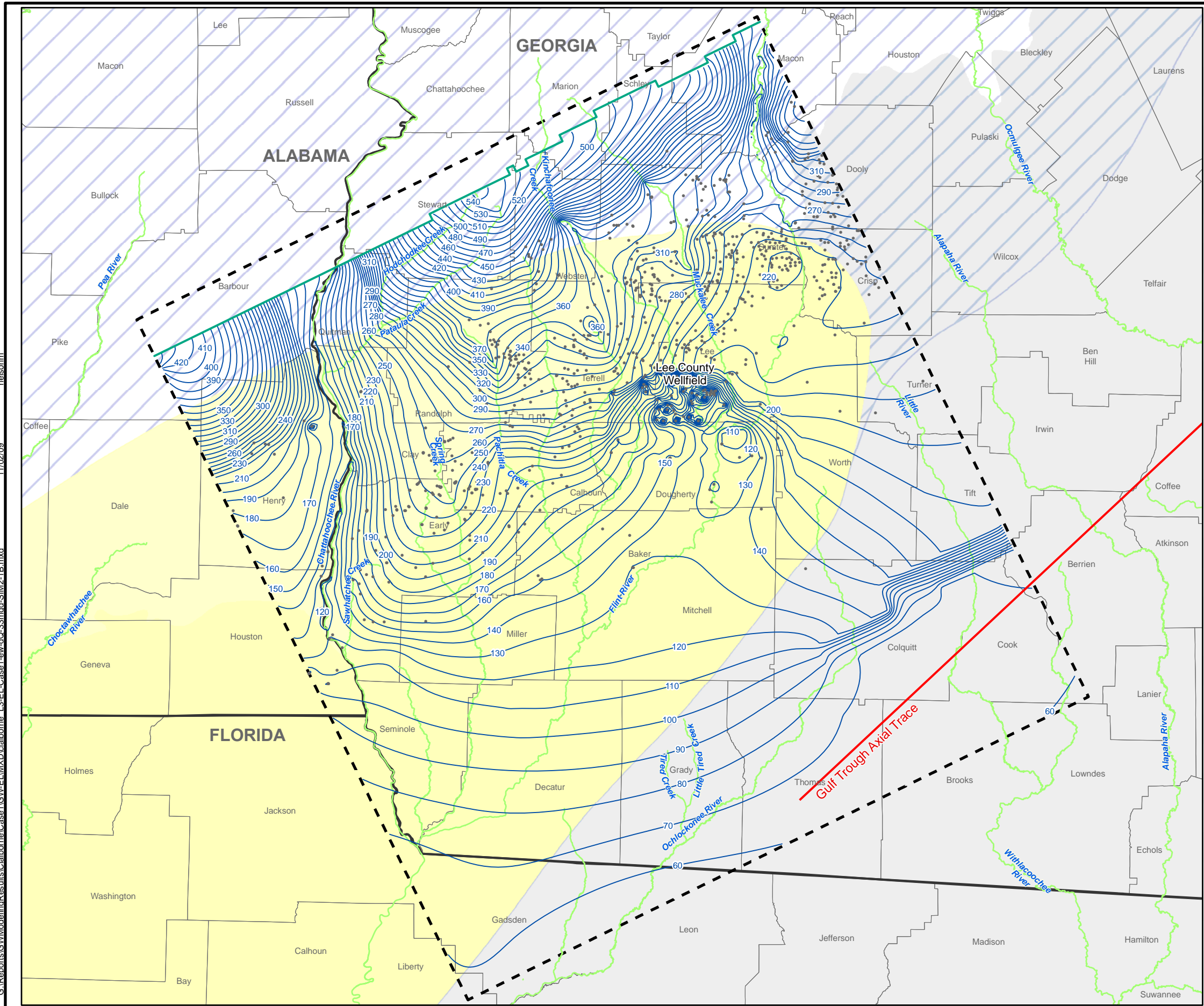
Figure 14-7
Simulated Groundwater Elevations in Upper Atkinson-Upper Tuscaloosa Aquifers (Layer 7)
At Current Pumping Conditions Using Sub-Regional Claiborne Aquifer Model



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CDM **Figure 14-8**
Simulated Groundwater Elevations in Upper Floridan Aquifer (Layer 2)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model

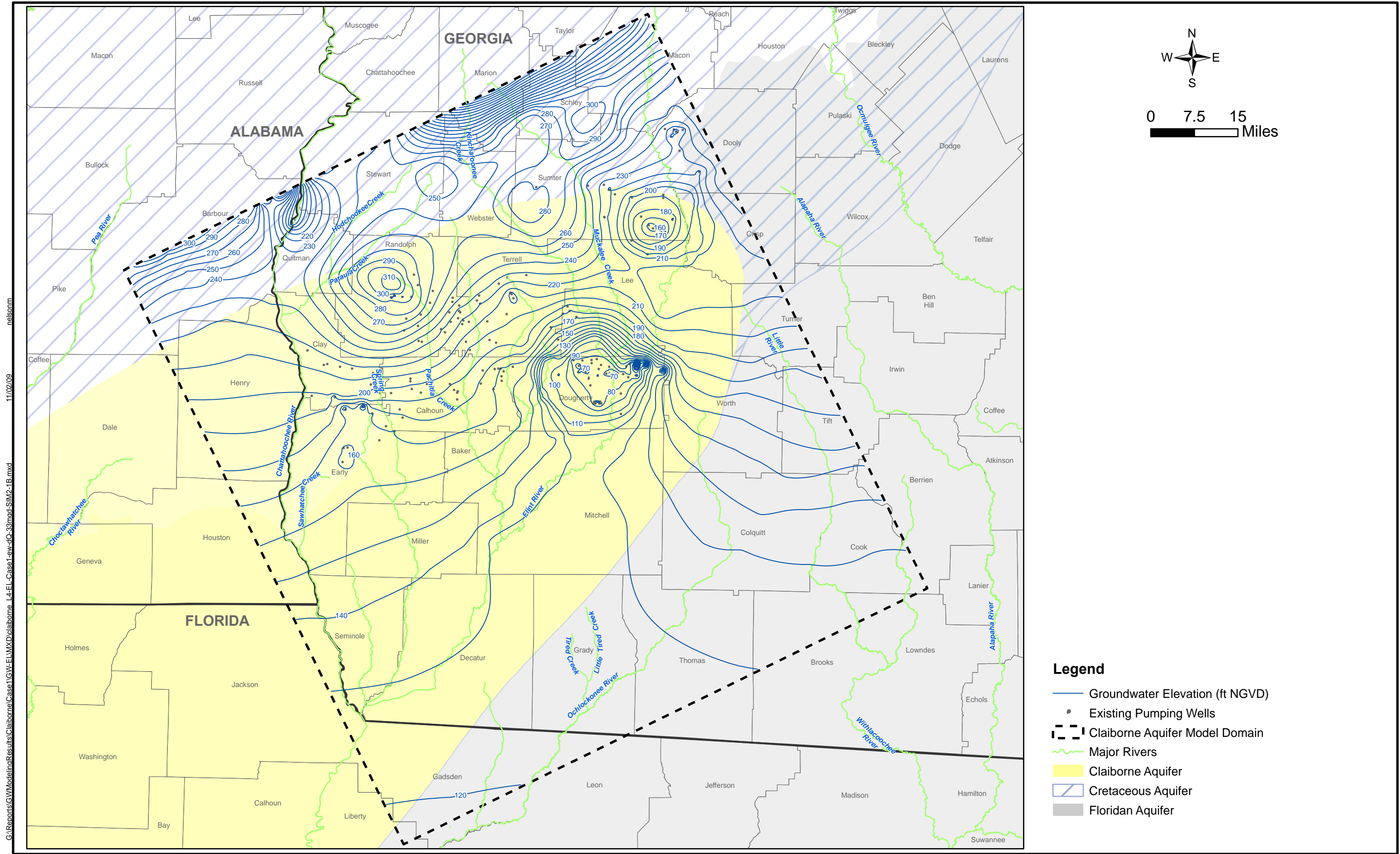
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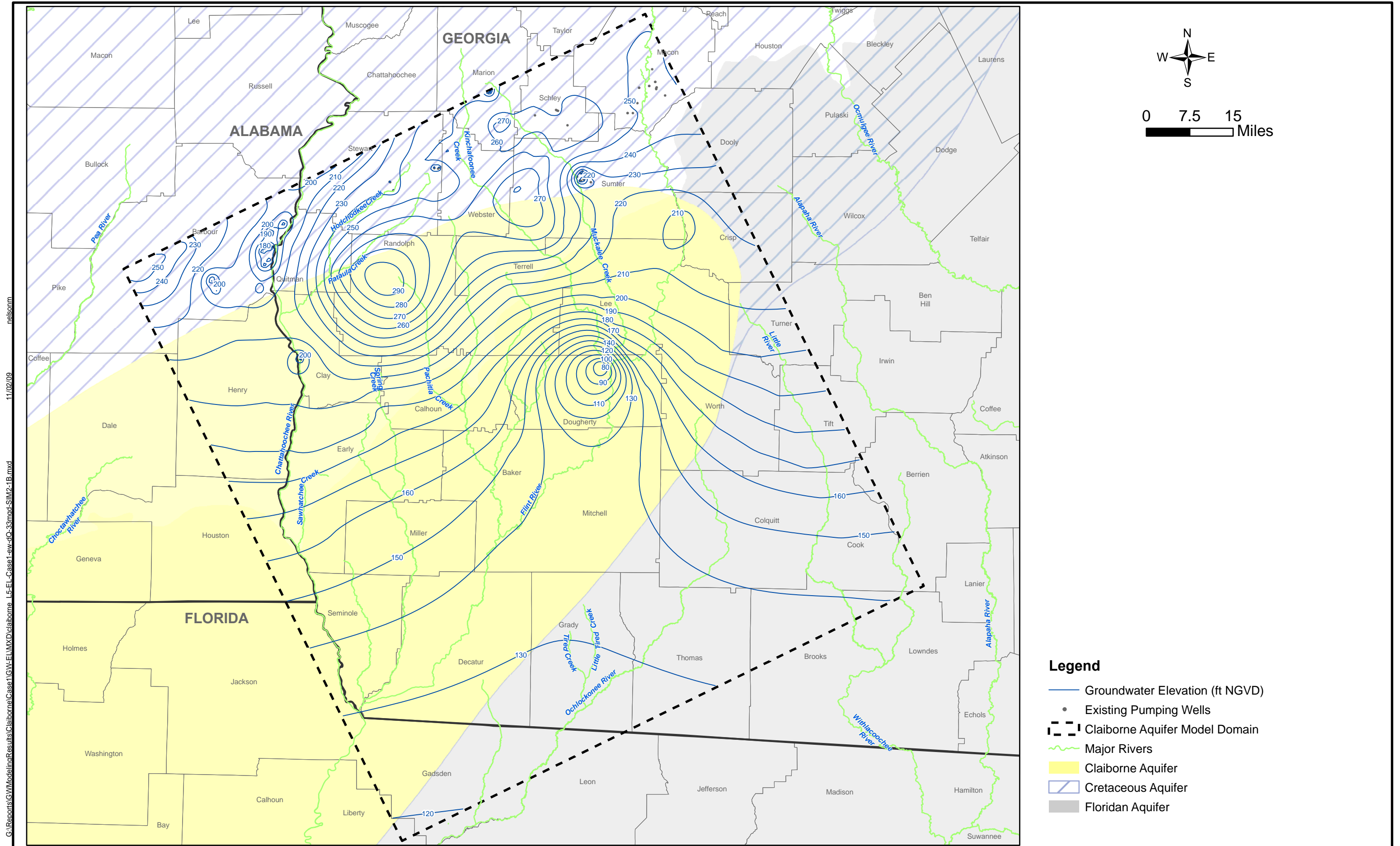
- Groundwater Elevation (ft NGVD)
- Northern Extent of Aquifer
- Existing Pumping Wells
- Gulf Trough Axial Trace
- Major Rivers
- Claiborne Aquifer Model Domain
- Claiborne Aquifer
- Cretaceous Aquifer
- Floridan Aquifer

Figure 14-9
Simulated Groundwater Elevations in Claiborne/Gordon/Lower Floridan Aquifers (Layer 3)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model



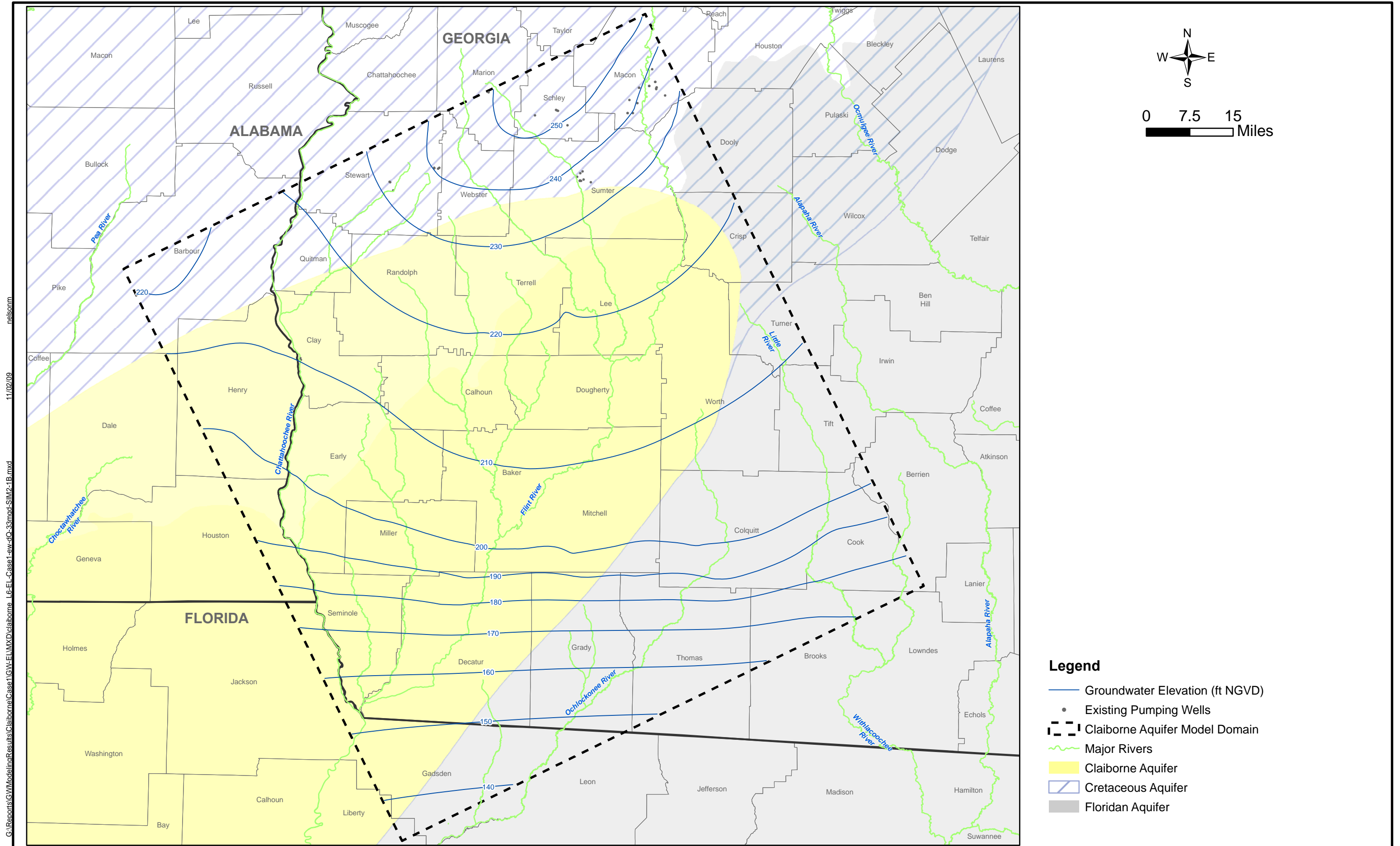
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CDM **Figure 14-10**
Simulated Groundwater Elevations in Clayton-Dublin Aquifers (Layer 4)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model



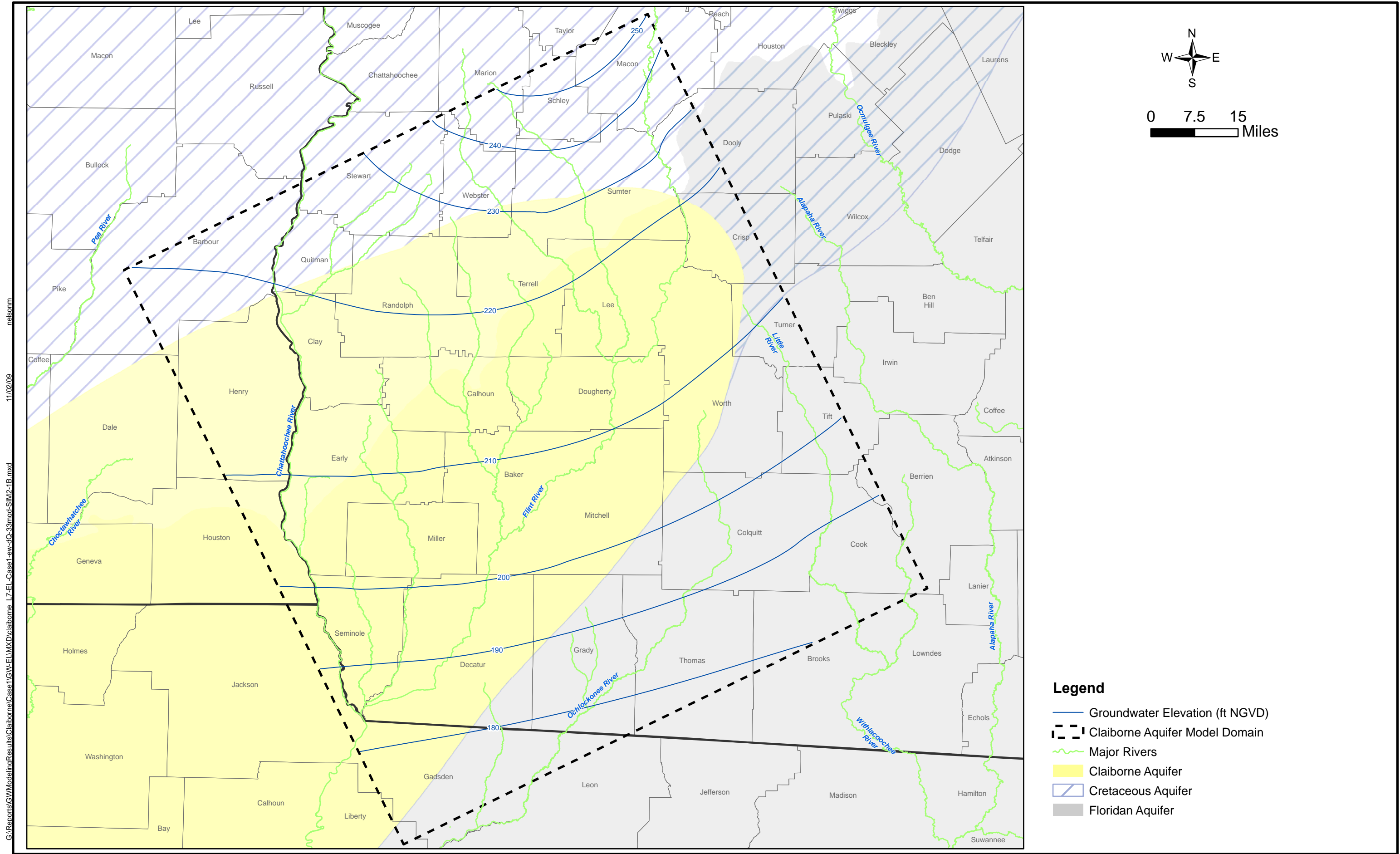
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Figure 14-11
Simulated Groundwater Elevations in Providence Sand-Peedee-Dublin Aquifers (Layer 5)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model



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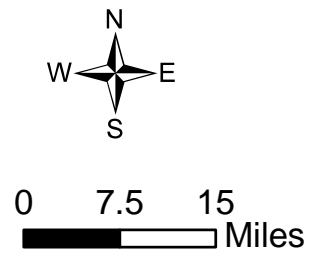
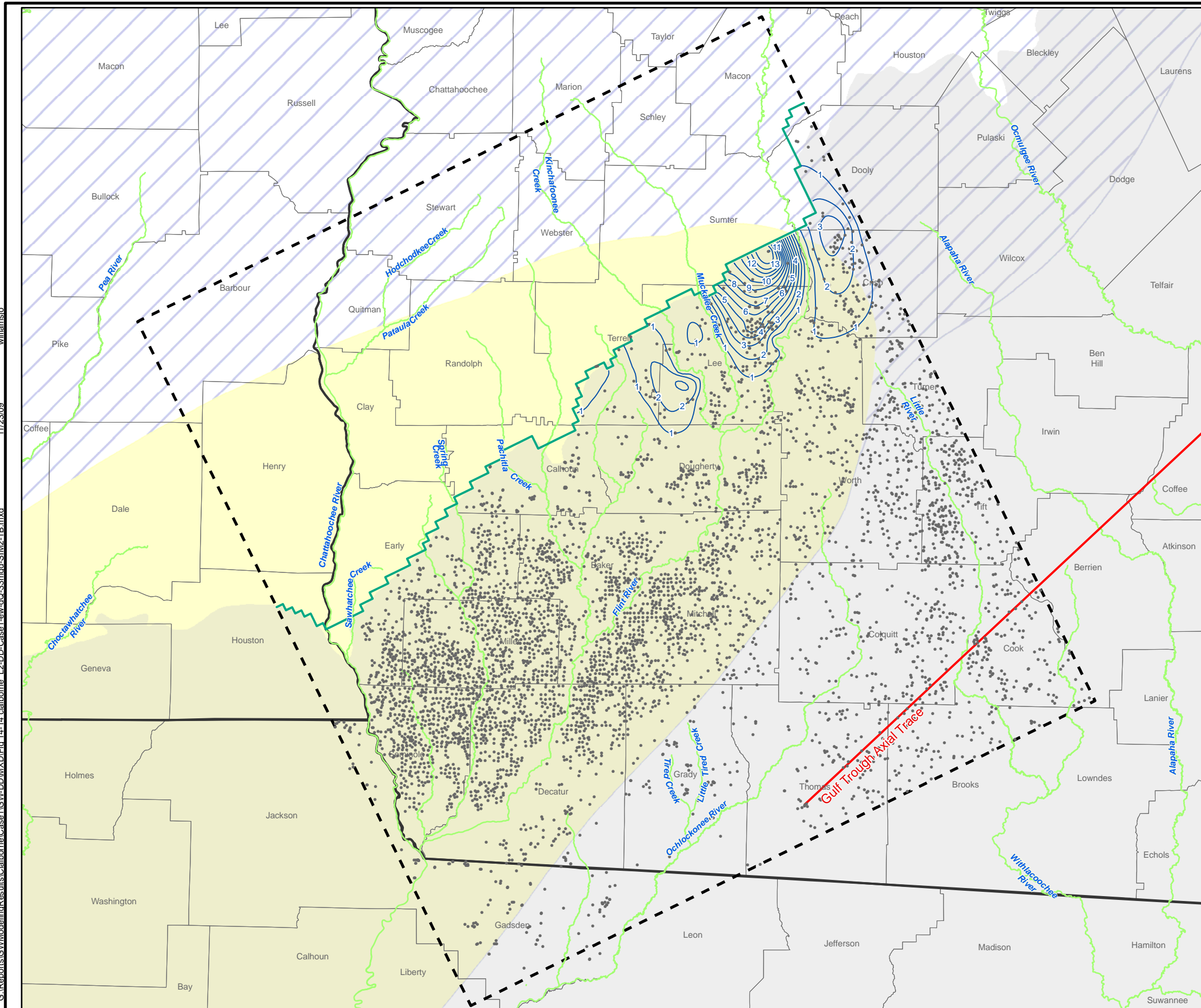
Figure 14-12
Simulated Groundwater Elevations in Eutaw-Midville Aquifer (Layer 6)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model



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Simulated Groundwater Elevations in Upper Atkinson-Upper Tuscaloosa Aquifers (Layer 7)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model

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Legend

- Groundwater Level Drawdown (ft)
- Northern Extent of Aquifer
- Existing Pumping Wells
- Gulf Trough Axial Trace
- Major Rivers
- Claiborne Aquifer Model Domain
- Claiborne Aquifer
- Cretaceous Aquifer
- Floridan Aquifer

Figure 14-14
Simulated Groundwater Level Drawdown in Upper Floridan Aquifer (Layer 2)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model

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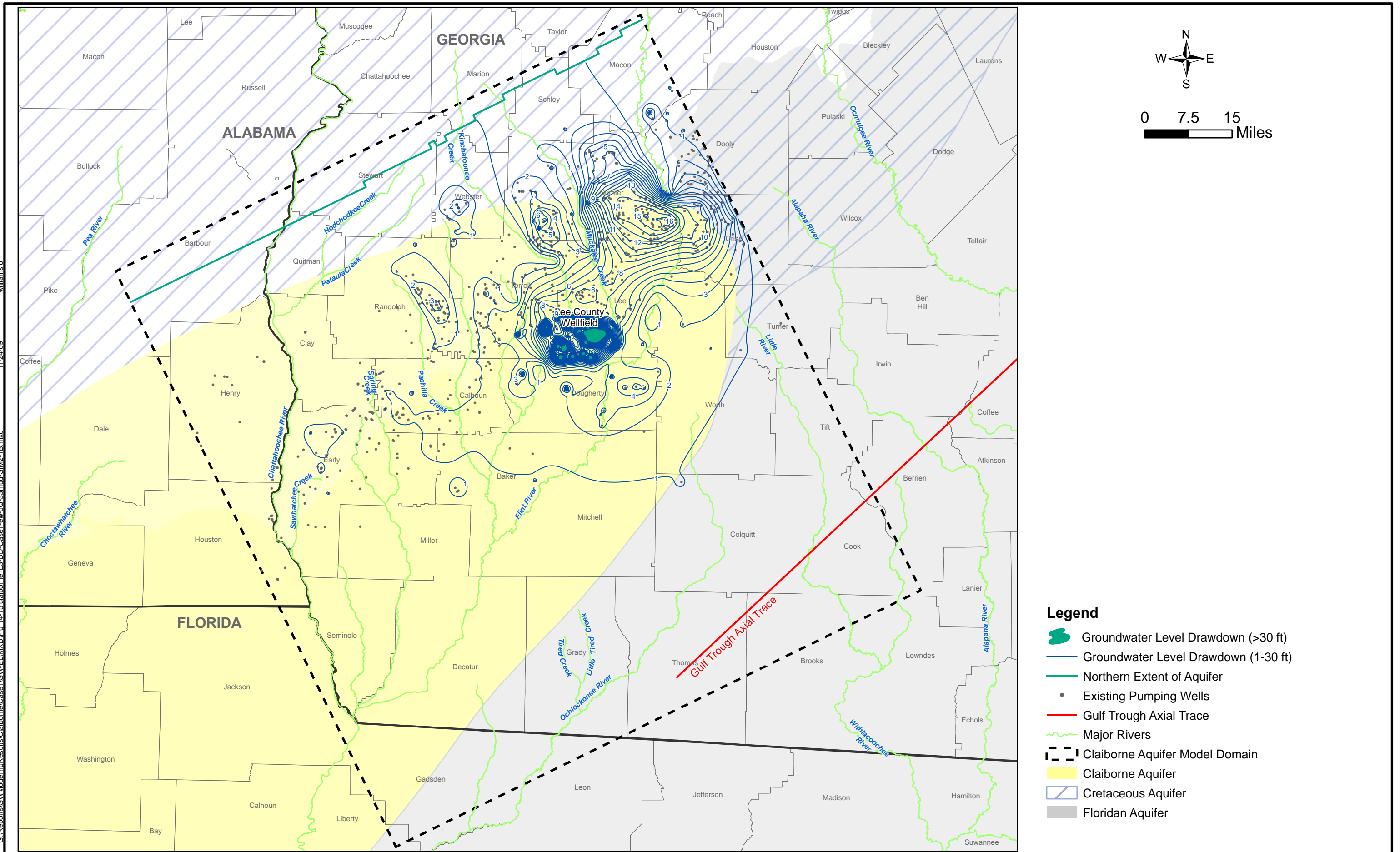


Figure 14-15
Simulated Groundwater Level Drawdown in Claiborne/Gordon/Lower Floridan Aquifers (Layer 3)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model

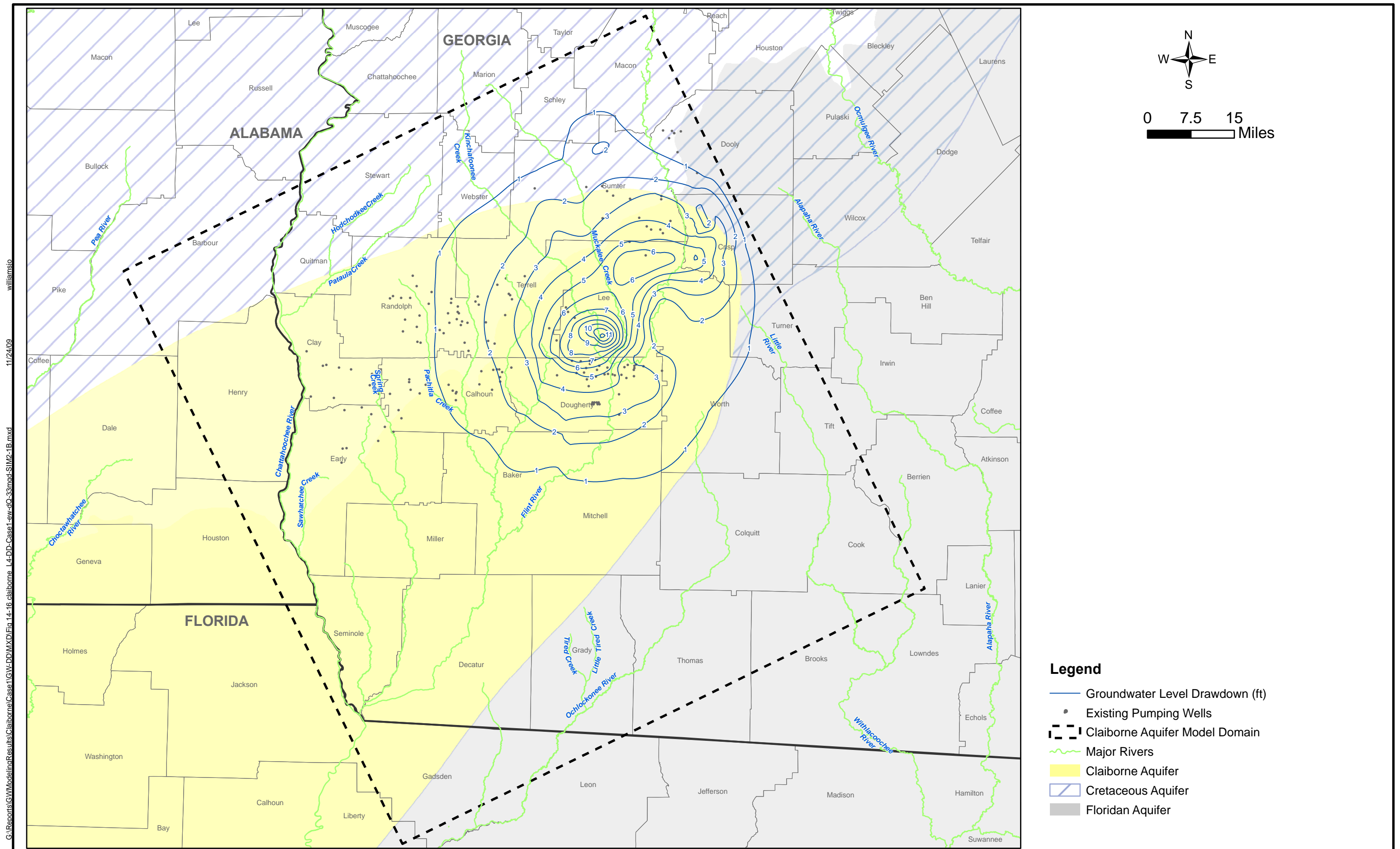


Figure 14-16

Simulated Groundwater Level Drawdown in Clayton-Dublin Aquifers (Layer 4)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model

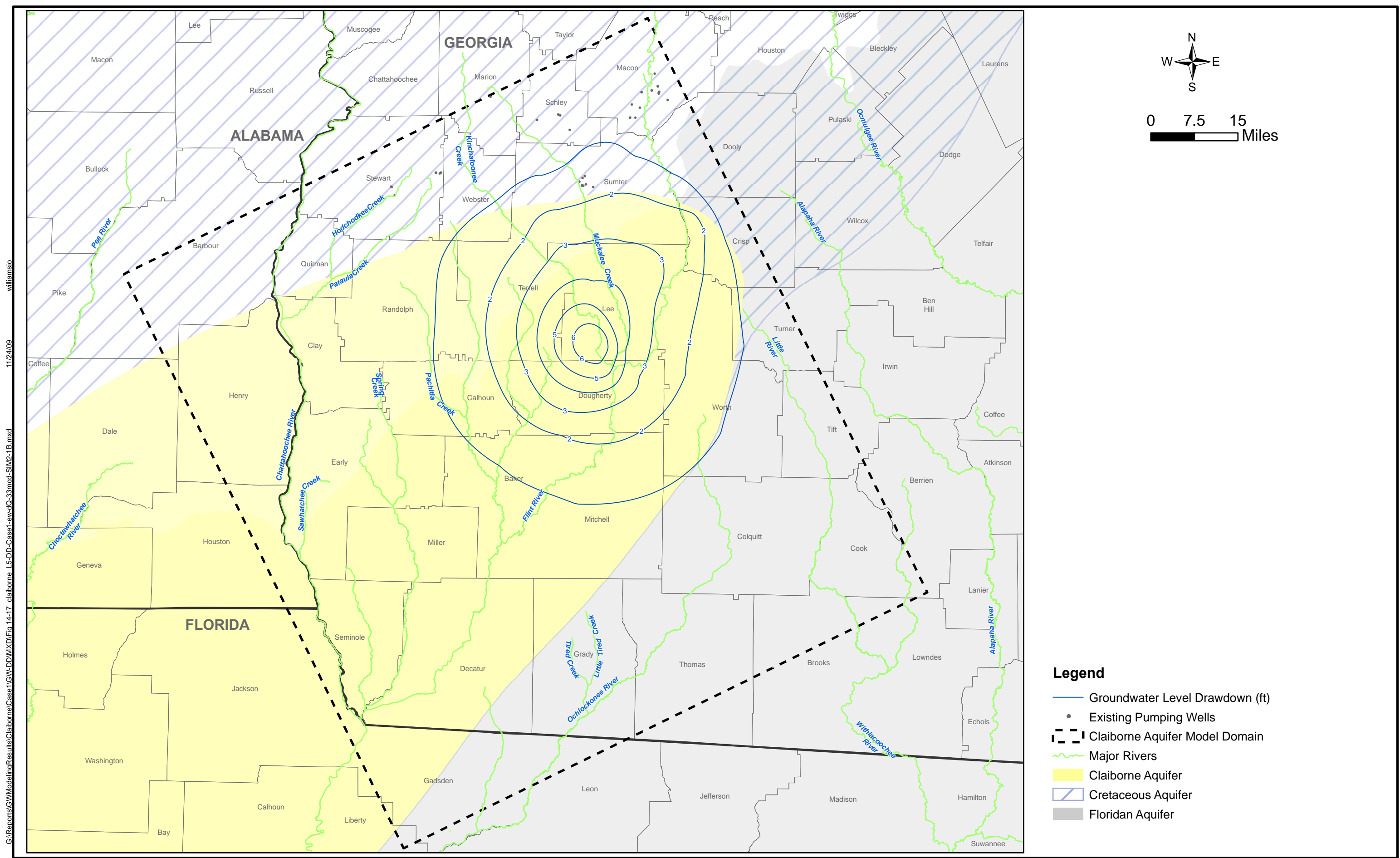
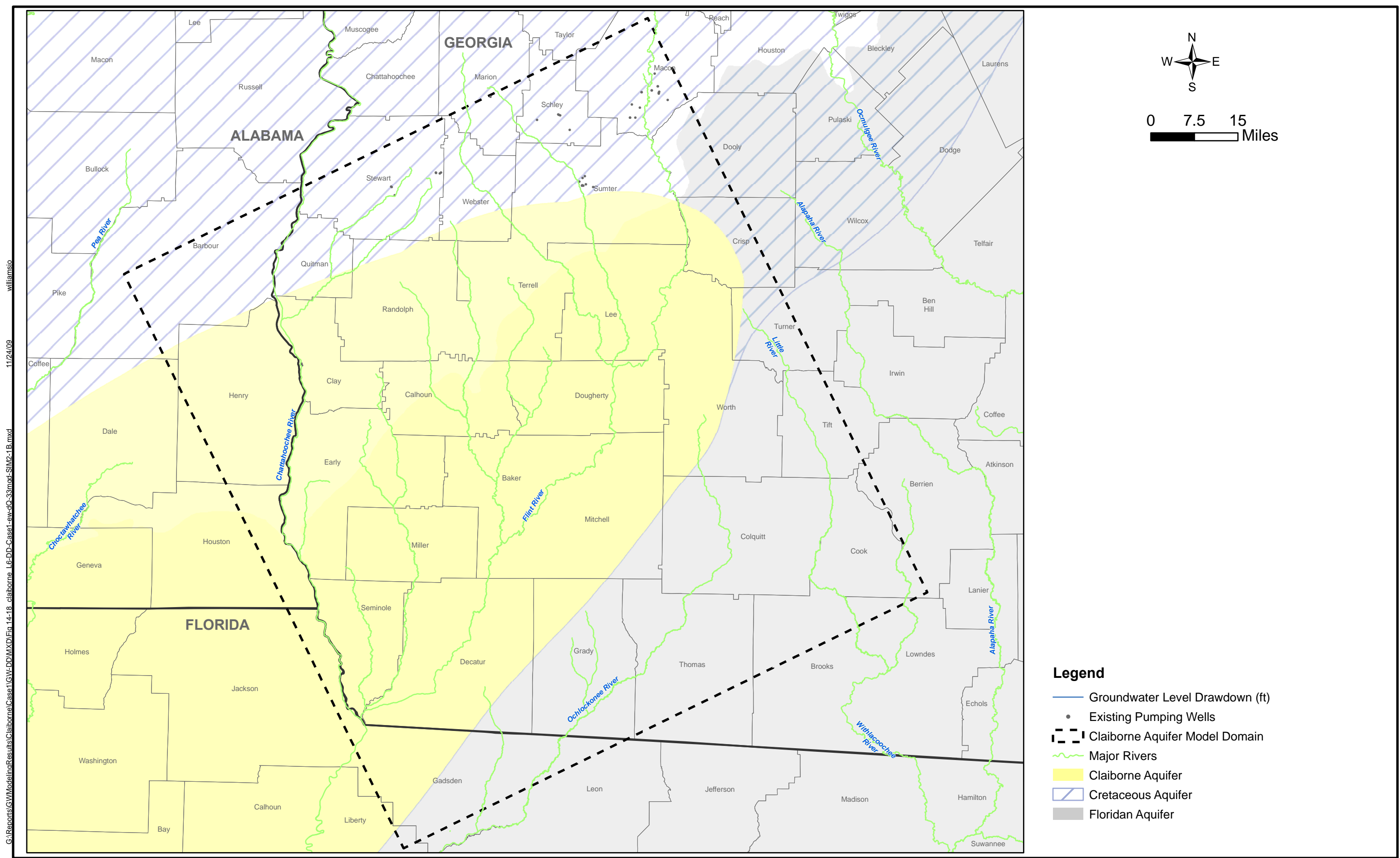
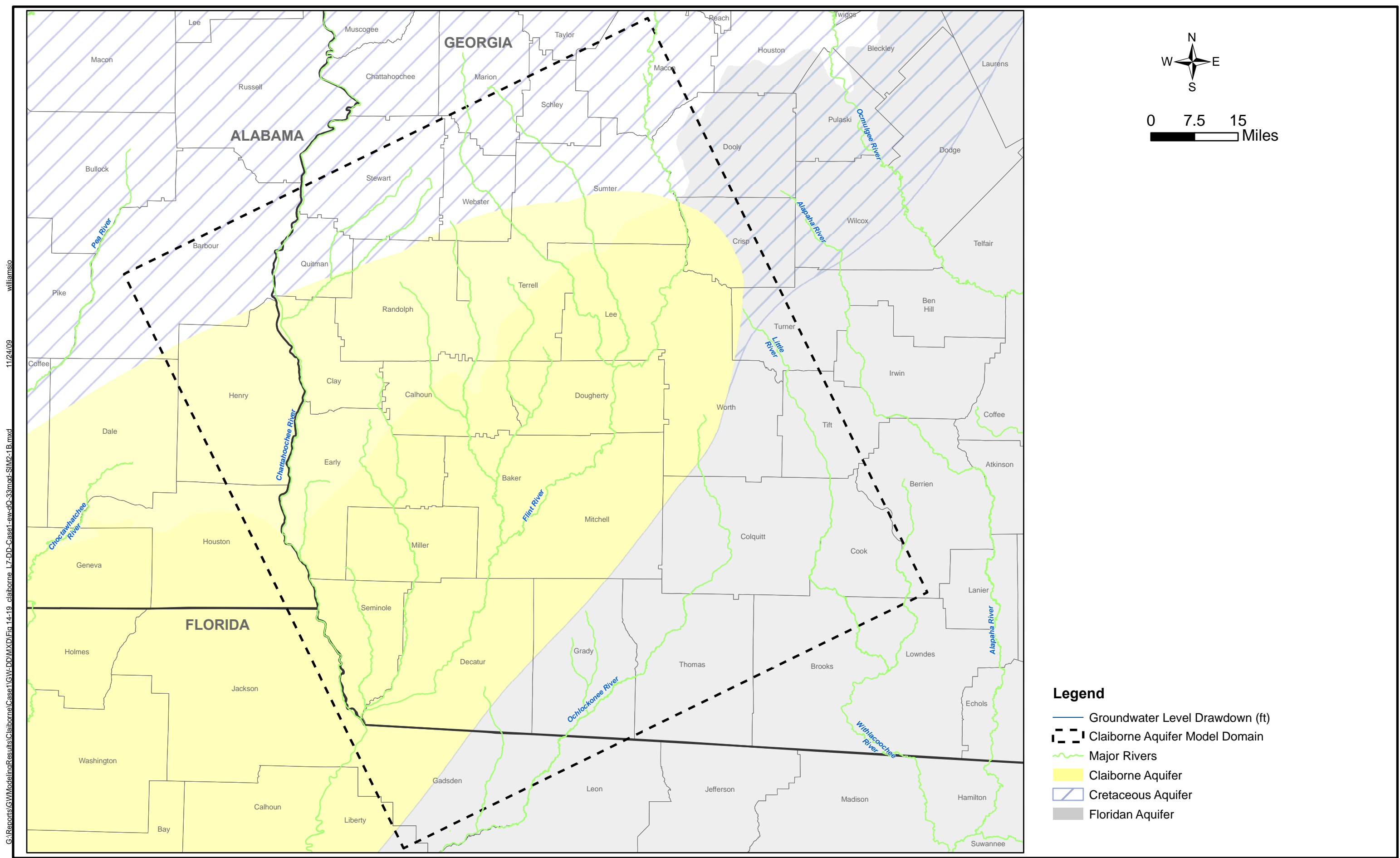
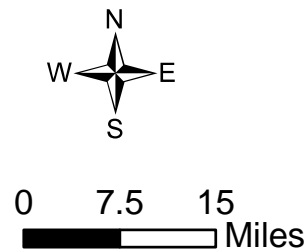
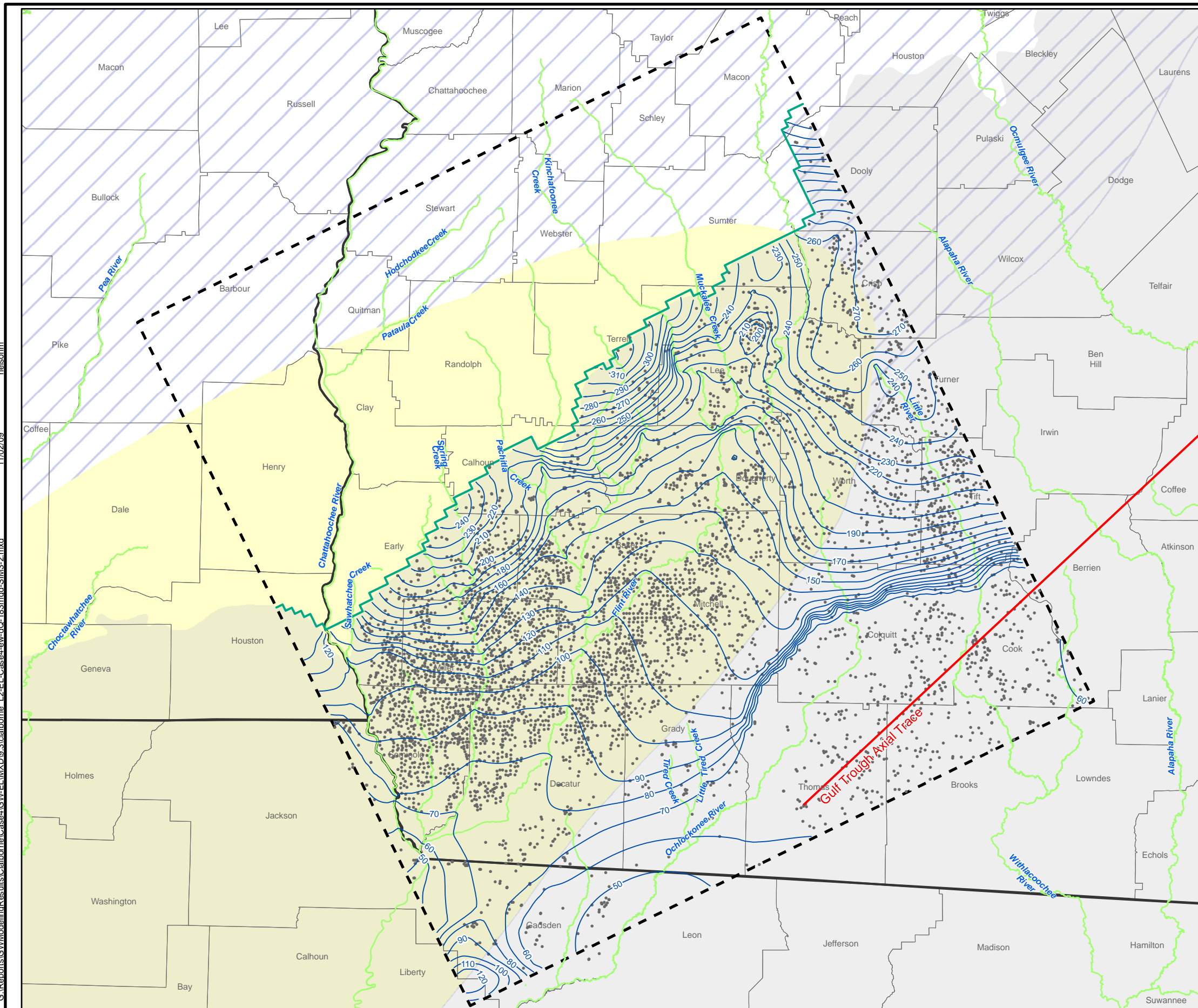


Figure 14-17
Simulated Groundwater Level Drawdown in Providence Sand-Peedee-Dublin Aquifers (Layer 5)
Due to Increasing Existing Well Pumping in Claiborne Aquifer ($\Delta Q = 33$ mgd) Using Sub-Regional Claiborne Aquifer Model





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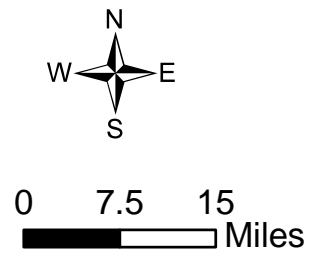
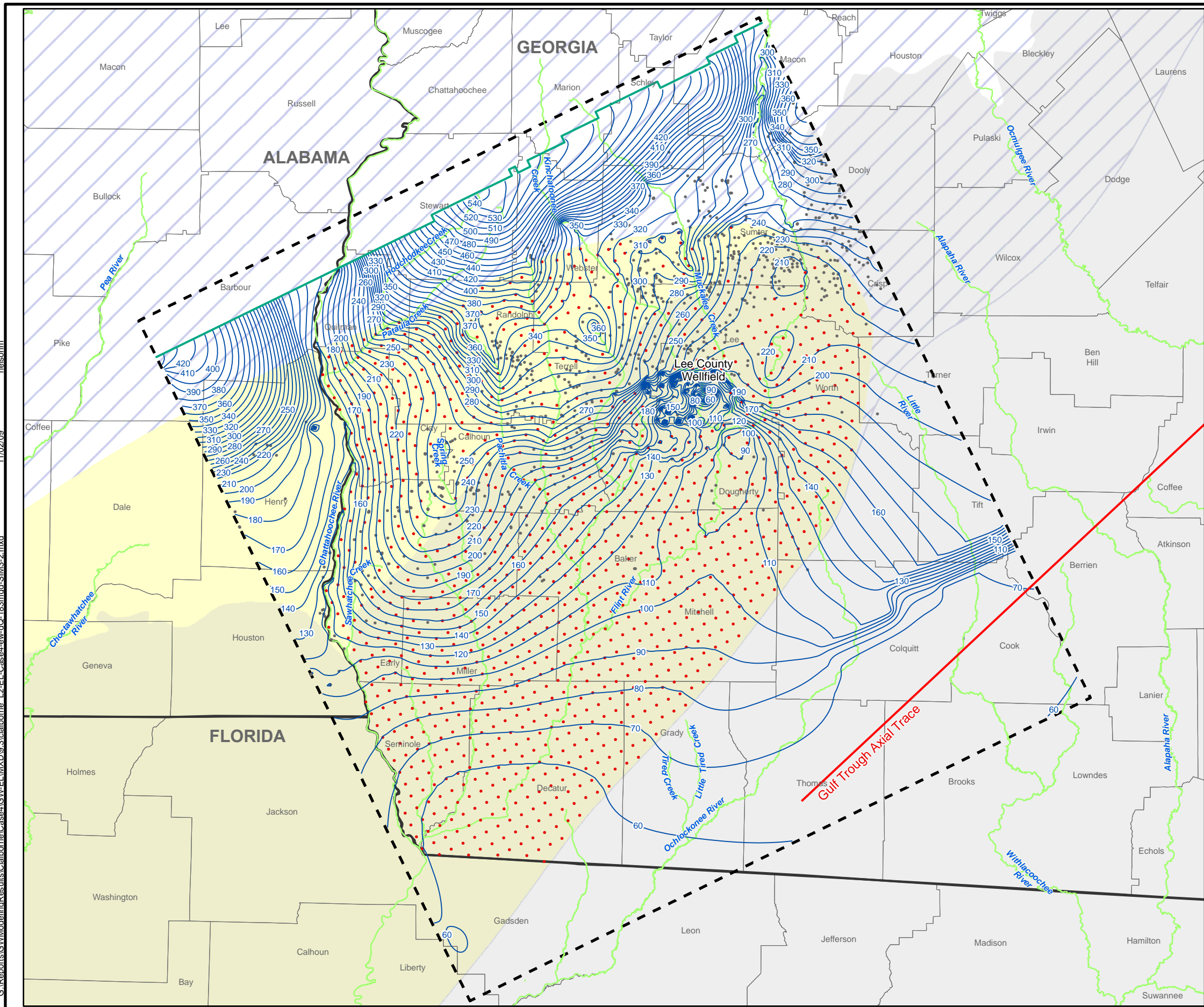


Legend

- Groundwater Elevation (ft NGVD)
- Northern Extent of Aquifer
- Existing Pumping Wells
- Gulf Trough Axial Trace
- Major Rivers
- Claiborne Aquifer Model Domain
- Claiborne Aquifer
- Cretaceous Aquifer
- Floridan Aquifer

Figure 14-20
Simulated Groundwater Elevations in Upper Floridan Aquifer (Layer 2)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model

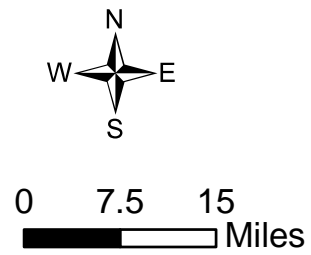
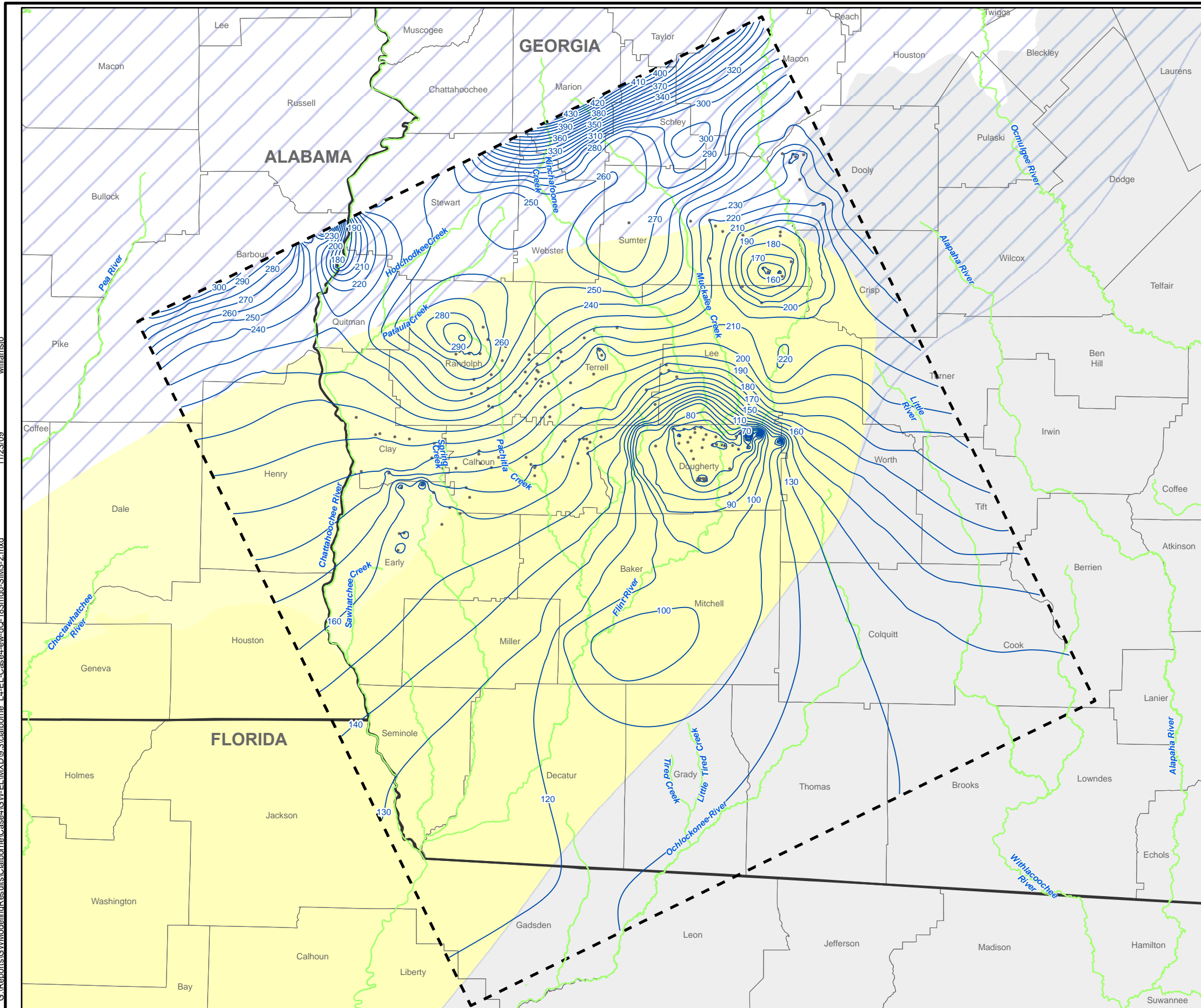
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- Legend**
- Groundwater Elevation (ft NGVD)
 - Northern Extent of Aquifer
 - Simulated New Wells
 - Existing Pumping Wells
 - Gulf Trough Axial Trace
 - Major Rivers
 - Claiborne Aquifer Model Domain
 - Claiborne Aquifer
 - Cretaceous Aquifer
 - Floridan Aquifer

Figure 14-21
Simulated Groundwater Elevations in Claiborne/Gordon/Lower Floridan Aquifers (Layer 3)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model

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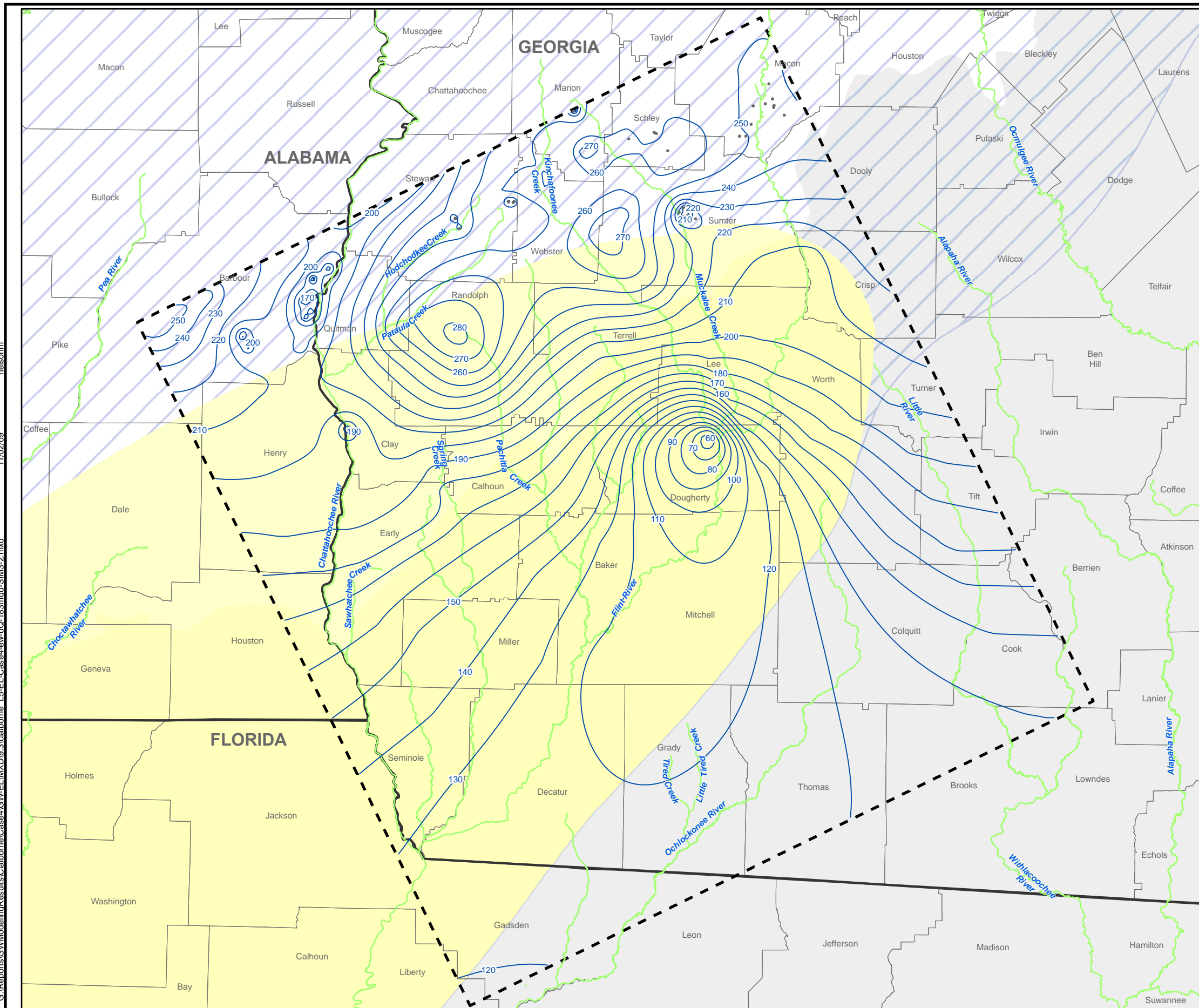
- Legend**
- Groundwater Elevation (ft NGVD)
 - Major Rivers
 - Existing Pumping Wells
 - Claiborne Aquifer Model Domain
 - Claiborne Aquifer
 - Cretaceous Aquifer
 - Floridan Aquifer

Figure 14-22
Simulated Groundwater Elevations in Clayton-Dublin Aquifers (Layer 4)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model

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0 7.5 15 Miles

Legend

- Groundwater Elevation (ft NGVD)
- Existing Pumping Wells
- Major Rivers
- Claiborne Aquifer Model Domain
- Claiborne Aquifer
- Cretaceous Aquifer
- Floridan Aquifer

Figure 14-23
Simulated Groundwater Elevations in Providence Sand-Peedee-Dublin Aquifers (Layer 5)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model

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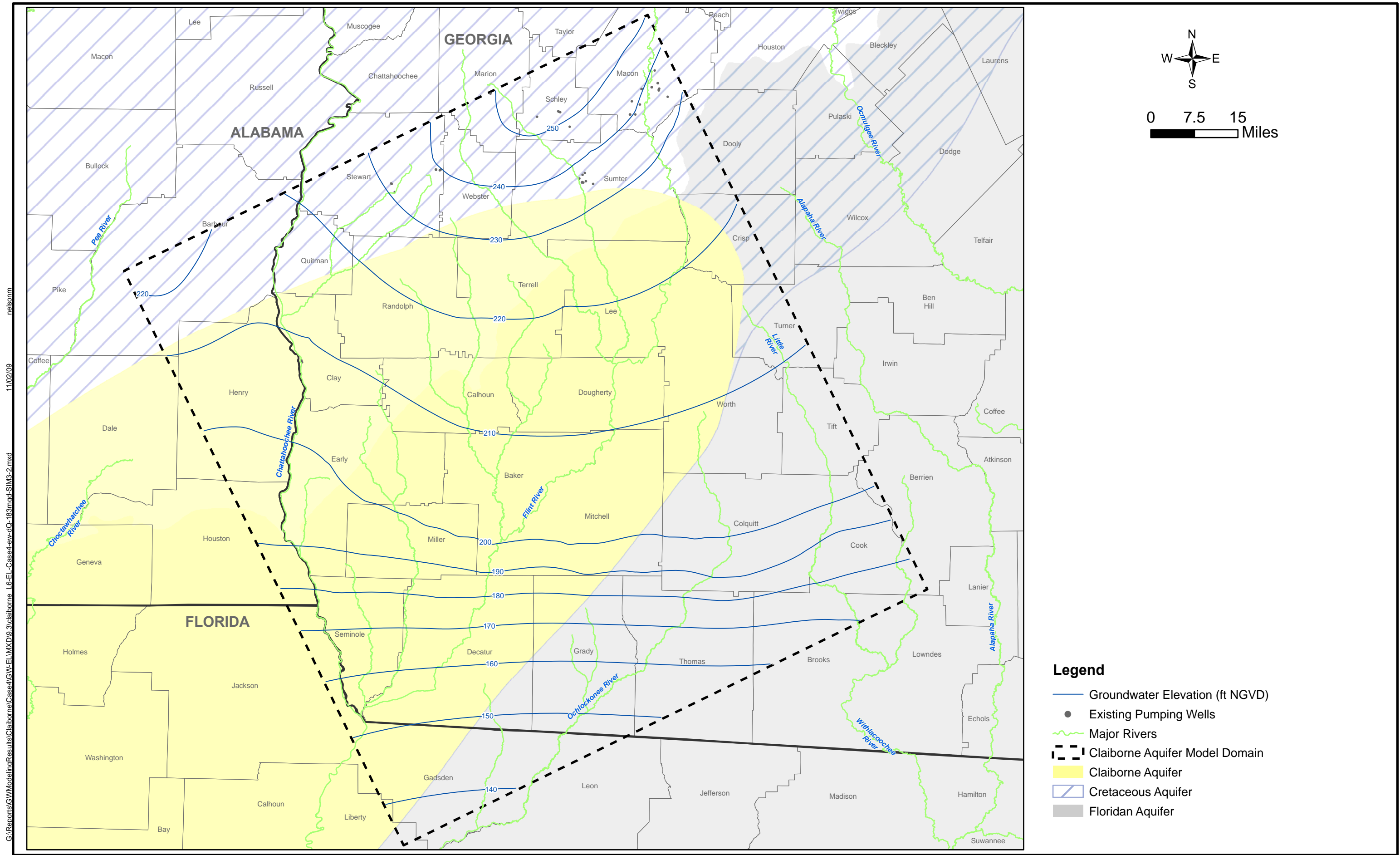
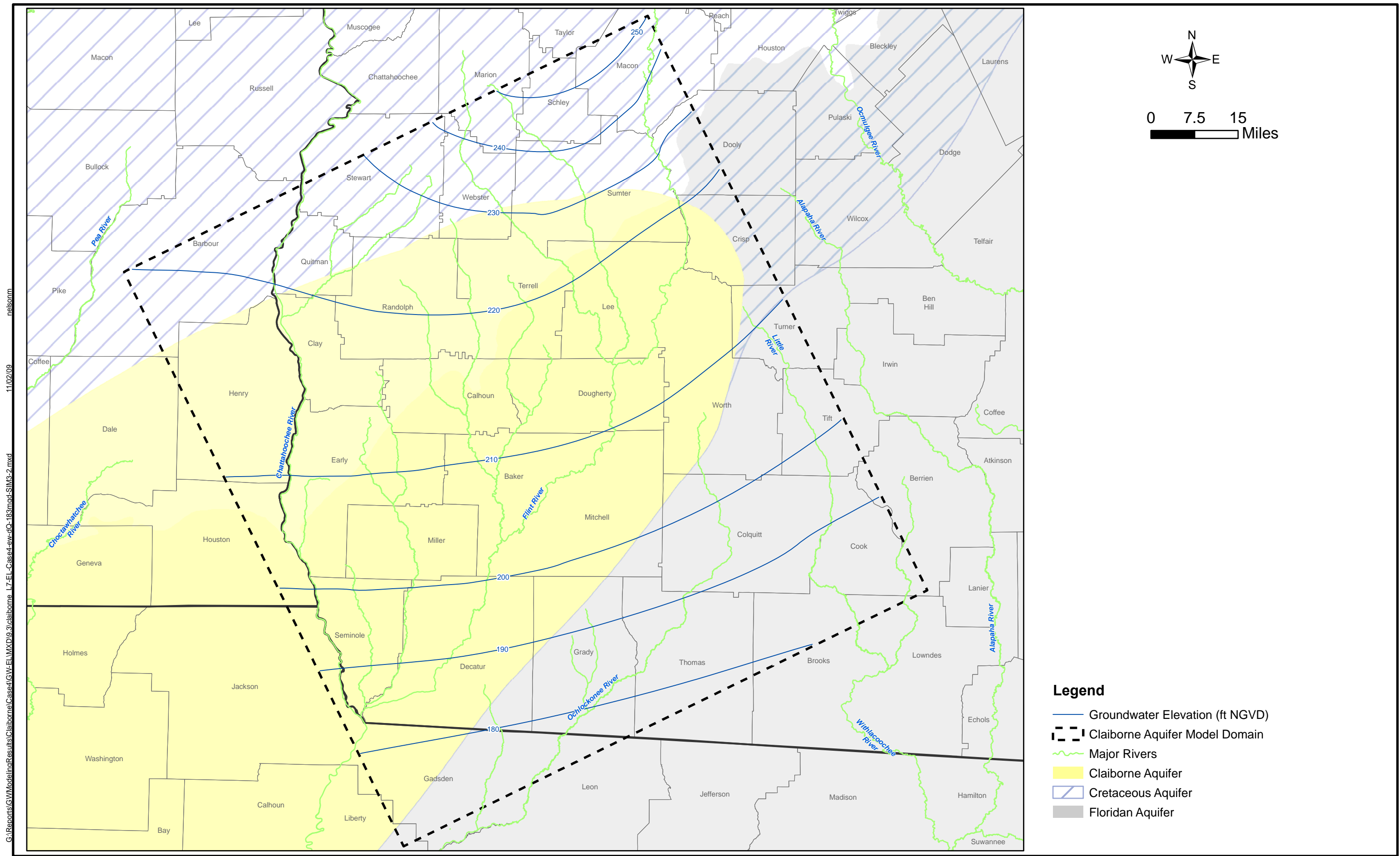
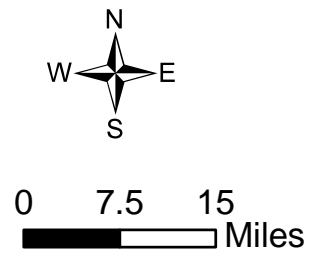
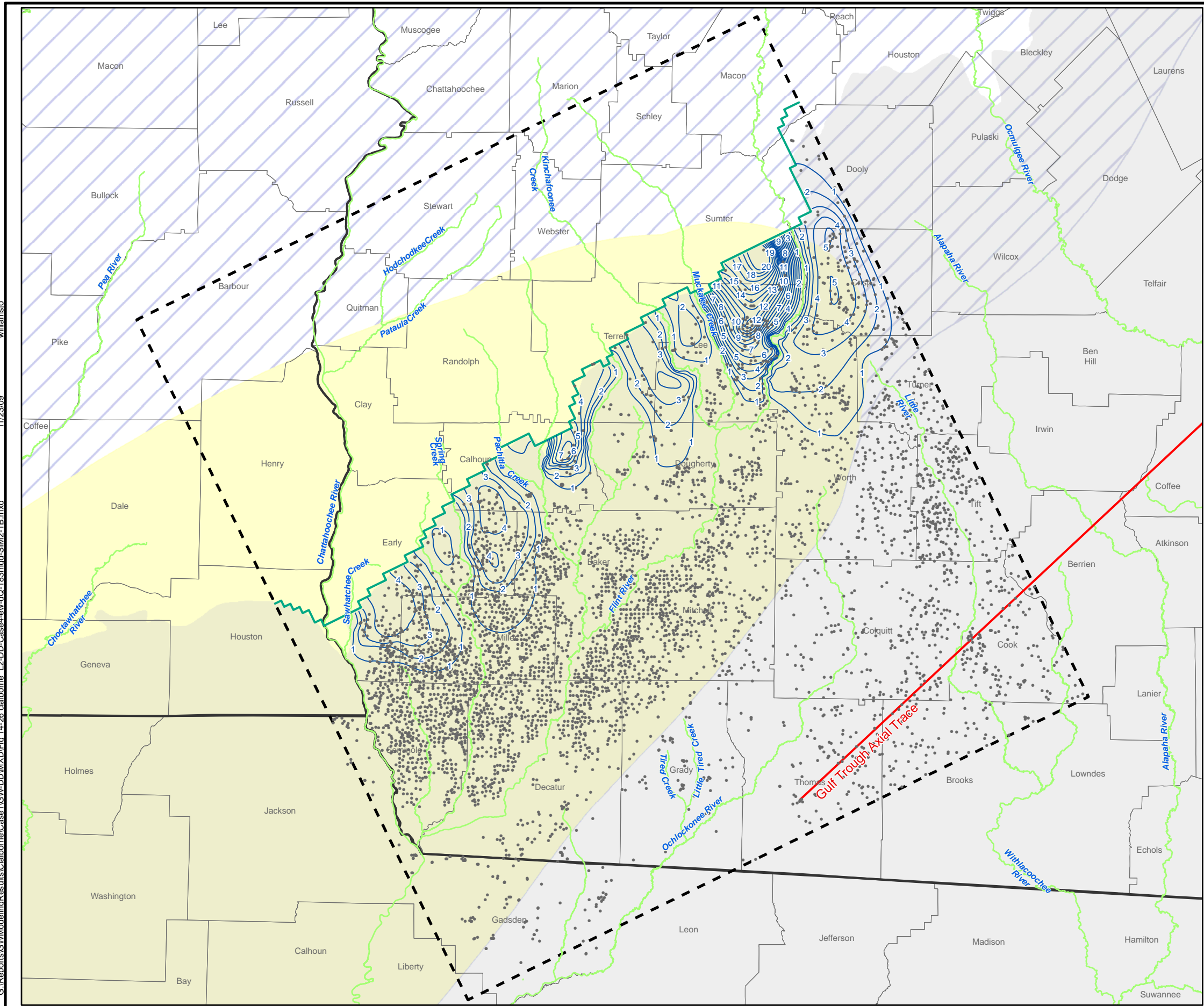


Figure 14-24
Simulated Groundwater Elevations in Eutaw-Midville Aquifer (Layer 6)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model



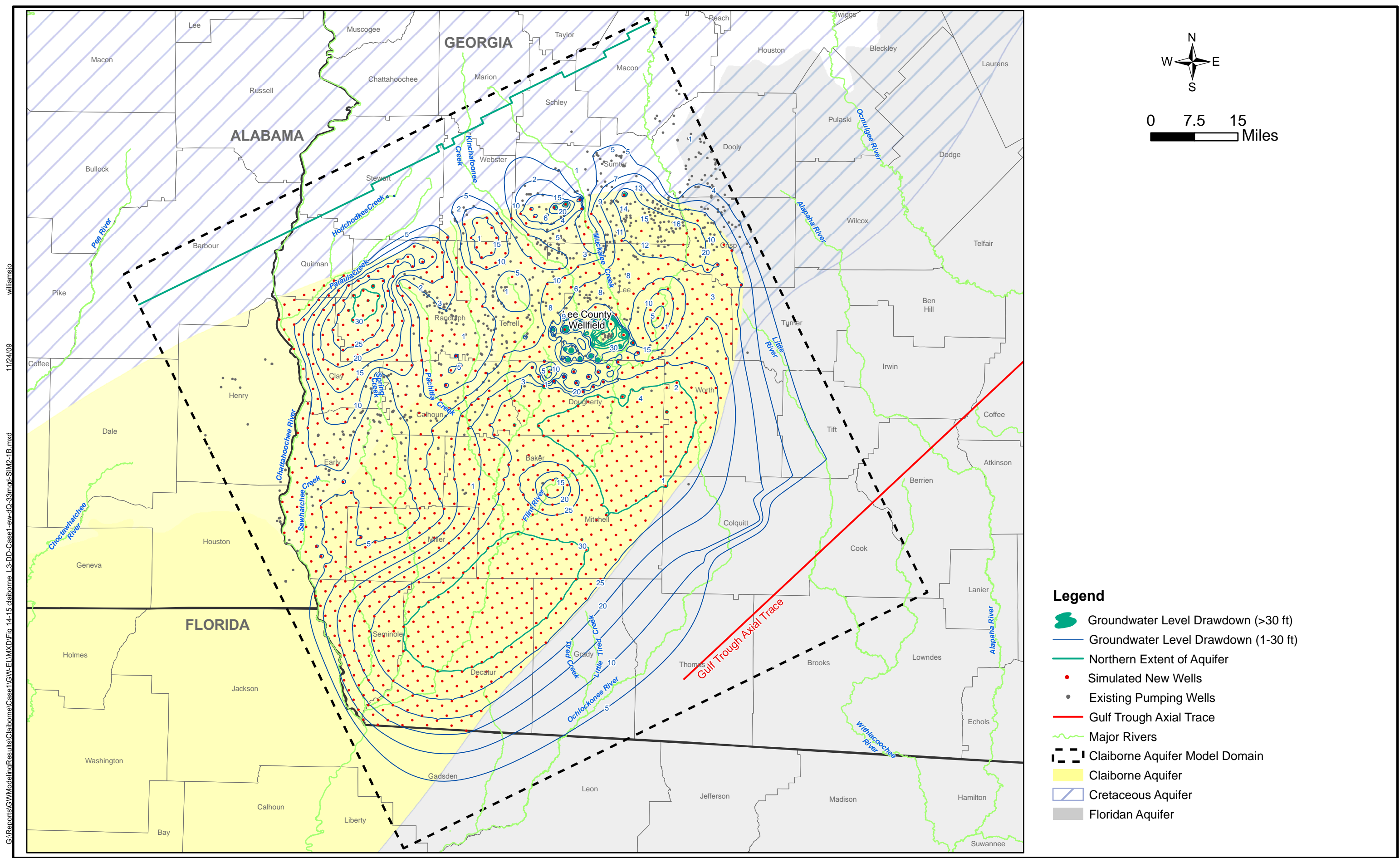
G:\Reports\GWM\ModellingResults\Claiborne\Case1\GWM\DDMXD\Fig 14-26 claiborne L2-DD-Case4-ew-dQ-183mod-SIM2-1B.mxd 11/23/09 williamsio



Legend

- Groundwater Level Drawdown (ft)
- Northern Extent of Aquifer
- Existing Pumping Wells
- Gulf Trough Axial Trace
- Major Rivers
- Claiborne Aquifer Model Domain
- Claiborne Aquifer
- Cretaceous Aquifer
- Floridan Aquifer

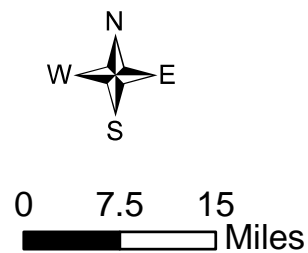
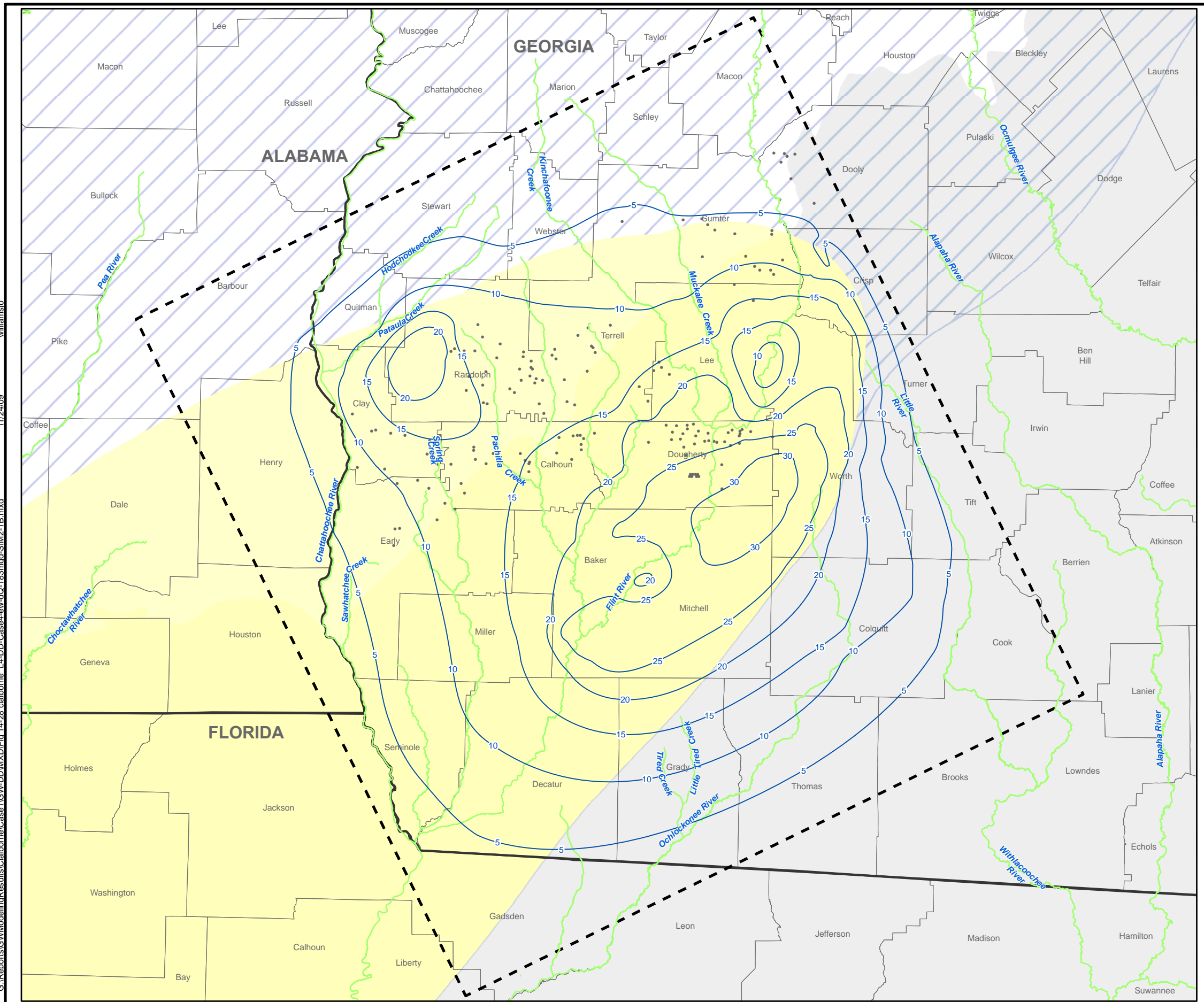
Figure 14-26
Simulated Groundwater Level Drawdown in Upper Floridan Aquifer (Layer 2)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model



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Figure 14-27
Simulated Groundwater Level Drawdown in Claiborne/Gordon/Lower Floridan Aquifers (Layer 3)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model

G:\Reports\GWM\ModellingResults\Claiborne\Case1\GWM\DDMXD\Fig 14-28 claiborne L4-DD-Case4-ew-dQ-183mod-SIM2-1B.mxd 11/24/09 williamsio

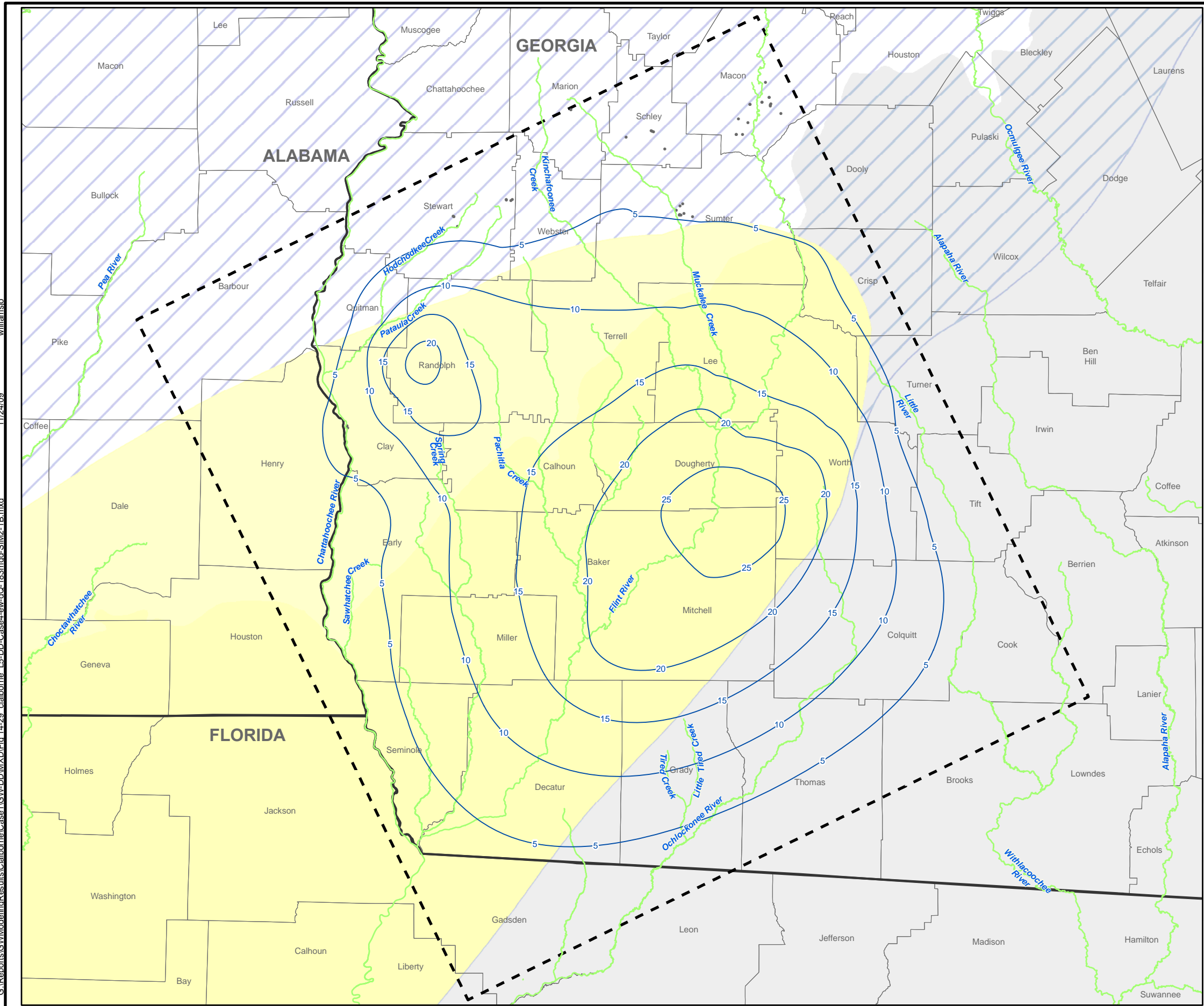


Legend

- Groundwater Level Drawdown (ft)
- Existing Pumping Wells
- Claiborne Aquifer Model Domain
- Major Rivers
- Claiborne Aquifer
- Cretaceous Aquifer
- Floridan Aquifer

Figure 14-28
Simulated Groundwater Level Drawdown in Clayton-Dublin Aquifers (Layer 4)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model

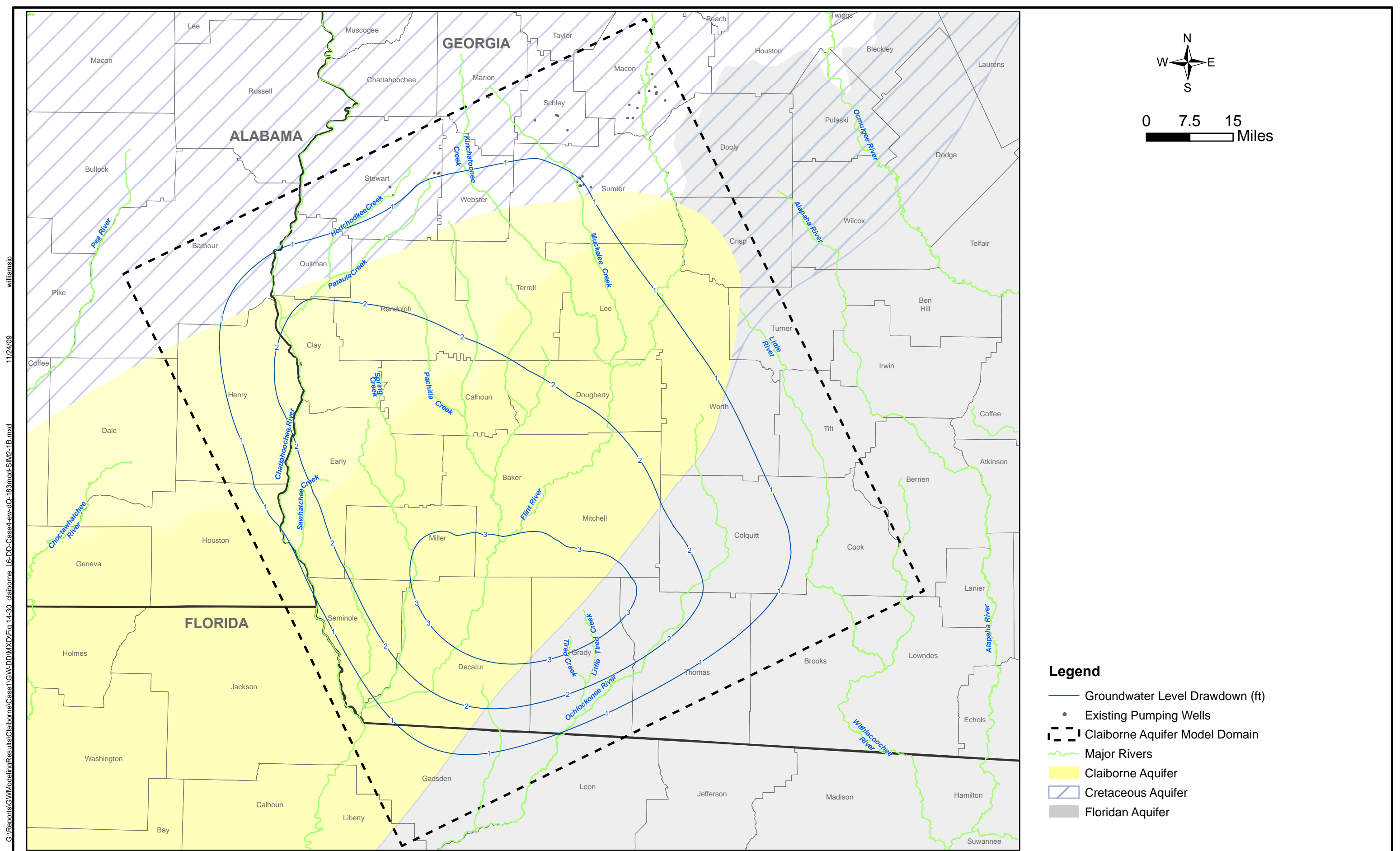
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Legend

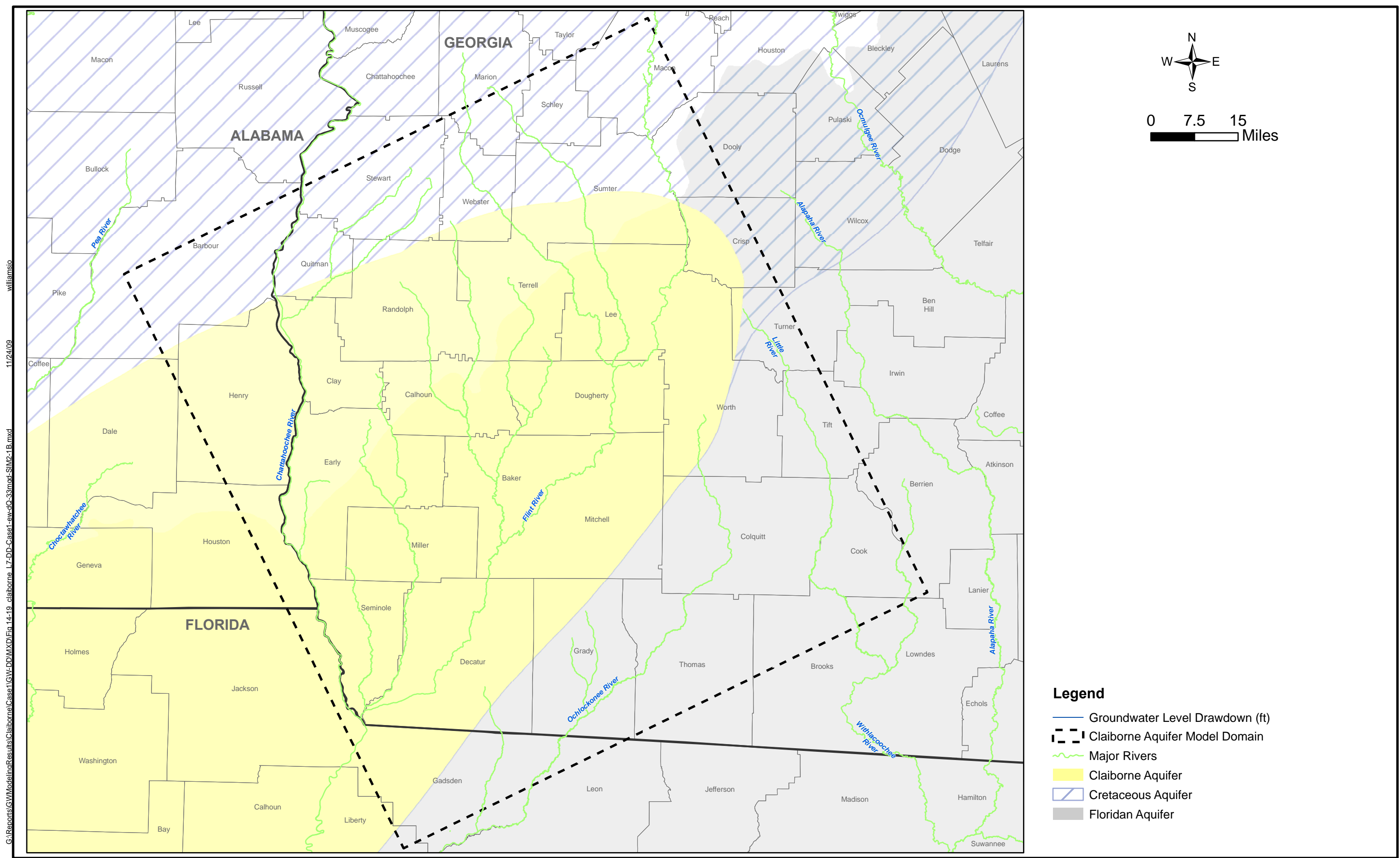
- Groundwater Level Drawdown (ft)
- Existing Pumping Wells
- Claiborne Aquifer Model Domain
- Major Rivers
- Claiborne Aquifer
- Cretaceous Aquifer
- Floridan Aquifer

Figure 14-29
Simulated Groundwater Level Drawdown in Providence Sand-Peedee-Dublin Aquifers (Layer 5)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model



CDM

Figure 14-30
Simulated Groundwater Level Drawdown in Eutaw-Midville Aquifer (Layer 6)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model



G:\Reports\GWM\ModelingResults\Claiborne\Case1\GWL\DDMXD\Fig 14-31 claiborne LZ-DP-Case1-ewd\Q-33mod-SIM2-1B.mxd 11/24/09 williamsio

CDM **Figure 14-31**
Simulated Groundwater Level Drawdown in Upper Atkinson-Upper Tuscaloosa Aquifers (Layer 7)
Due to Increasing Existing and Additional Well Pumping in Claiborne Aquifer ($\Delta Q = 183$ mgd) Using Sub-Regional Claiborne Aquifer Model