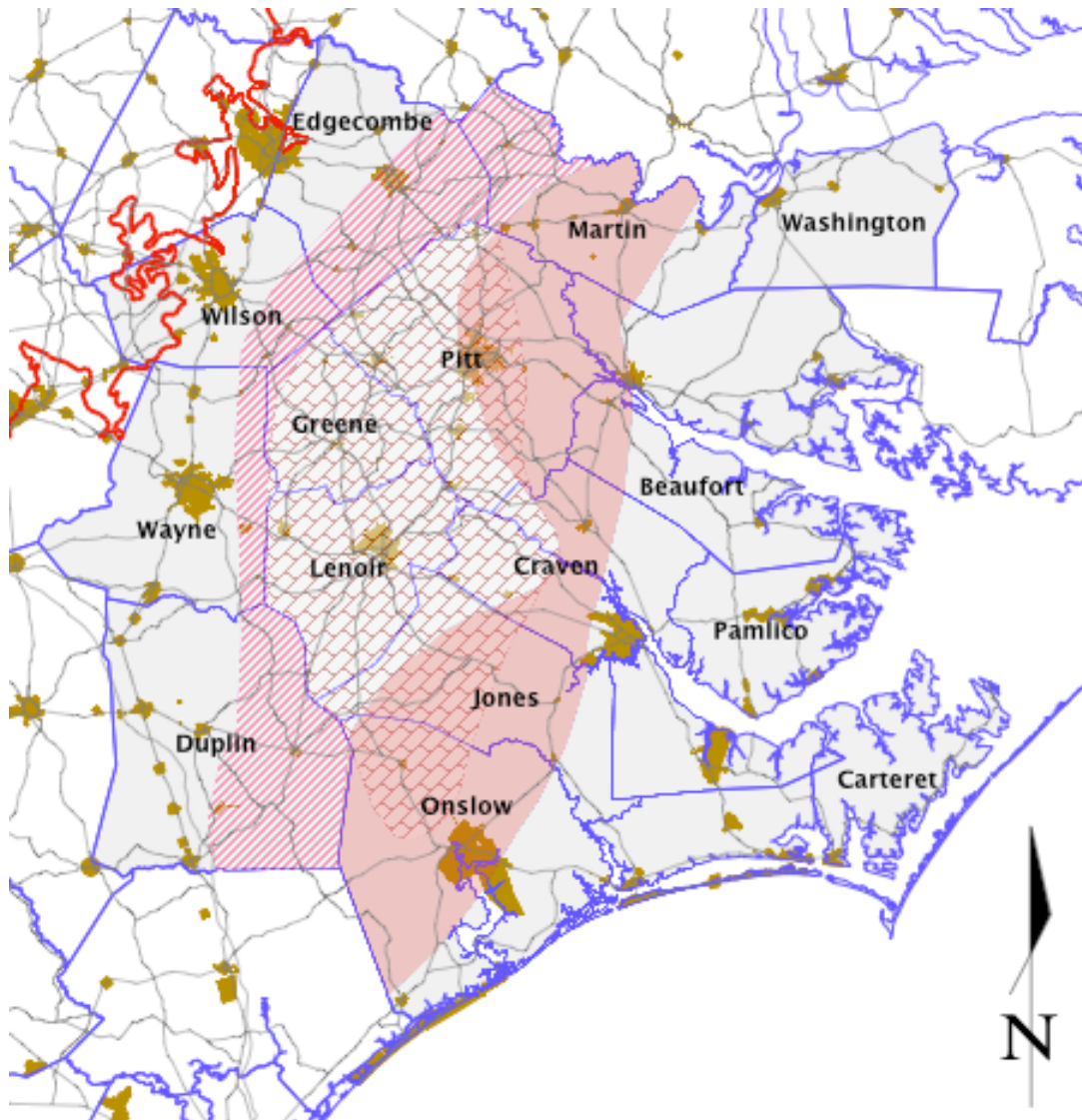


Central Coastal Plain Capacity Use Area Assessment Report



September 2008
Ground Water Management Section
Division of Water Resources
North Carolina Department of Environment and Natural Resources

Introduction

15A NCAC 2E .0503(7) of the Central Coastal Plain Capacity Use Area (CCPCUA) rules requires that the Division of Water Resources (DWR) produce an analysis of central coastal plain aquifer conditions as set forth below:

"(7) The CCPCUA Cretaceous Aquifer Zones map shall be updated, if necessary, in the sixth, eleventh, and sixteenth years following the effective date of this Rule to account for aquifer water level responses to phased withdrawal reductions. The map update shall be based on the following conditions:

- (a) Rate of decline in water levels in the aquifers;
- (b) Rate of increase in water levels in the aquifers;
- (c) Stabilization of water levels in the aquifers;
- (d) Chloride concentrations in the aquifers.

This aquifer information shall be analyzed on a regional scale and used to develop updated assessments of aquifer conditions in the CCPCUA. The Environmental Management Commission (EMC) may adjust the aquifer zones and the water use reduction percentages for each zone based on the assessment of conditions. The EMC shall adopt the updated map and reduction percentage changes after public hearing."

Although the CCPCUA rules require assessments to be produced in 2008, 2013, and 2018, the Division of Water Resources staff feels obligated to constantly track aquifer conditions so as to best serve the permit holders in the region and be aware of potential ground water supply issues.

We conclude after a thorough review of those aquifer conditions that no action need be taken by the Environmental Management Commission to alter either the reduction zone boundaries or rule language in 15A NCAC 2E .0503.

Our analysis, as described in the remainder of this report, consists of exploring the CCPCUA in the following ways: 1. Comparing the current aquifer water level conditions to reduction zone boundaries to estimate how the area is responding; 2. Comparing chloride concentrations gathered from the DWR network wells and a subset of permit holders with our maps of the individual aquifers and reduction zone boundaries; 3. Analysis of two case studies that illustrate how the aquifers are responding to changing withdrawals; and 4. Careful study of permit holder suggested changes to reduction zone boundaries.

Ground Water Level & Chloride Concentration Analysis

DWR has invested well over one million dollars and many person hours since 1998 to improve the monitoring well network throughout the state, and especially in the central coastal plain area. That investment has occurred to enhance our understanding of the regional aquifer system that underlies our coastal plain. It also has taken place to provide valuable information about how the aquifers are responding to the changing patterns of water withdrawals. Monitoring stations are drilled to allow us to see both the extent of the over-drafting situation and the recovery of water levels as investments in alternative water supplies come to fruition.

To those ends, 130 wells have been constructed at 38 monitoring stations since 1998. In combination with existing wells they are positioned so as to provide a more detailed picture of the cone of depression beneath the CCP in each of the major aquifers. Automatic recording equipment is used on over 57% of the network now to give DWR the best access to water level conditions and how they change over time. Chloride concentrations are now measured on a subset of network wells every three years to assess that adjusting set of conditions.

DWR provides access to water level and chloride data it collects through the website (www.ncwater.org) at the link entitled "Ground Water Data."

Reporting is required as part of every CCPCUA permit. Daily withdrawals from every source well or sump are reported to DWR and that information is digitized and made available to the public. Both monthly static and pumping water levels for each well are also reported and digitized. Recently, DWR has begun requiring chloride concentrations be submitted annually by select permit holders. Public access to all this data is available from the main DWR website following the link entitled "Central Coastal Plain Capacity Use Area."

DWR is firmly committed to providing easy access to all the data we collect either through our monitoring well network or permitting system. We believe that the best decisions are made when the best data is available.

Figures 2 & 3 illustrate the distribution of water levels in the two primary Cretaceous aquifers, the Black Creek and Upper Cape Fear. Each map shows ground water levels as color-filled contours referenced to mean sea level. Each map also has county boundaries, the fall line (the line that delineates the coastal plain from the piedmont), the transitional zone between fresh and salt water in the aquifer, points where water level and chloride data was collected (red-filled to indicate chloride concentrations equal to or exceeding 250 mg/l or ppm), and the three Cretaceous aquifer zones as described in 15A NCAC 2E .0503 and portrayed in the CCPCUA Cretaceous Aquifer Zones map (see figure 1).

Figures 4 & 5 include the previously described information and static water level and chloride concentration data from permit holders.

Admittedly, the maps are complex. However, they show the relationship between the state of our knowledge at the time of rule-making for the CCPCUA (represented by the Cretaceous aquifer zone boundaries) and current conditions. For the most part, conditions have worsened in the CCPCUA. In part this is because DWR has more monitoring stations to measure the situation, but it is mostly because permit holders have not switched to their alternative water sources yet and the Cretaceous aquifers are still meeting their demands. In the next year (August 1, 2008 through July 31, 2009) new sources are projected to begin to meet part of those needs as Cretaceous withdrawals are required to meet the first reduction phase.

CCPCUA Case Studies in Martin and Lenoir Counties

Several large industries have closed their doors in the past few years due to economic downturn in Martin and Lenoir counties. One affect of losing these industries is a decline in water withdrawals from the Cretaceous aquifers which has given DWR an opportunity to monitor the impact on the ground water resources. In two limited areas of the CCPCUA this decrease in use ahead of the scheduled reductions has caused rebounding of ground water levels. This knowledge strengthens the belief that the phases of reduction outlined in the CCPCUA rule will produce the desired result; ground water withdrawals in the CCPCUA can reach a sustainable level and the resource can be used indefinitely.

The Town of Robersonville in Martin County has reduced water usage approximately 72% since 2002 with the loss of one of their largest water users. One result of that loss is evidence of ground water level rebound at two of DWR's monitoring stations, Gold Point (approximately 2 miles away from the Town's wells) and North Pitt High School (about 8 miles away). Gold Point is one of our newest monitoring stations, with water levels starting in July 2002. The Upper Cape Fear aquifer well (J22P1), has recorded a 25 foot increase in water levels. The Upper Cape Fear aquifer well at North Pitt High School (L24B4) has recorded a 10 foot increase in water levels since 2003. This data can be viewed on the previously mentioned web pages.

The second region where DWR is seeing a rebounding of ground water levels response to a decline in water usage is around Kinston in Lenoir County. An estimated 37% decrease in total reported water usage from the Black Creek aquifer in the county has occurred since 1997. At the Kinston Yard (Q27R5,6) and Savannah School (P26U7) monitoring stations, ground water levels have rebounded about 20 feet.

In both cases, the water level rebounds represent fractions of the overall decline record in the aquifers, but these two situations give us a glimpse of what the CCPCUA phased reductions in water use will have on the Cretaceous aquifers. Data from both regions show that aquifer water levels will rebound with smaller withdrawals. DWR is now certain that at least the first two reductions in 2008 and 2013 will be necessary before we start to see portions of these aquifers being used at a sustainable rate.

Permit Holder Suggested Changes to Reduction Zone Boundaries

| Item Number | Proposed Boundary Change | Analysis |
|-------------|---|---|
| 1 | Expansion of the Declining Water Level Zone to the east in northern Pitt County | High chloride concentrations in the Upper Cape Fear aquifer favor leaving the boundaries as they are; increased withdrawals would allow for upconing of saltier water. |
| 2 | Expansion of the Declining Water Level Zone to the east in Martin County | High chloride concentrations in the Upper Cape Fear aquifer favor leaving the boundaries as they are; increased withdrawals would allow for upconing of saltier water |
| 3 | Contraction of the Declining Water Level Zone in Duplin County | Provisions in the rules allowed for lessening the reduction requirements for a particular permit holder in the Declining Water Level zone with submission of water level evidence |

1. On December 13, 2001, McGill and Associates, and Groundwater Management Associates (GMA) submitted a report to the Ground Water Management Section entitled “Water Resource Management Plan, Pitt County, North Carolina.” In this report, a recommendation was made to Pitt County that they may elect to question the delineation of reduction zones as defined in the current version of the CCPCUA rule, especially for parts of northern Pitt County (near the Town of Bethel) where GMA demonstrated that over-draft of the Black Creek and Upper Cape Fear Aquifers may not be a serious concern. A map was submitted with this recommendation that illustrated the proposed changes to the reduction zones. Pitt County has not submitted a formal request to the Ground Water Management Section to consider the proposed recommendation. A review of the report and proposed changes by the Ground Water Management Section led to the following observations and conclusions:
 - At the DWR North Pitt High School ground water monitoring station, located approximately 3.5 miles to the south of the Town of Bethel, water level declines

have occurred at a rate of 1.25 feet per year in the Upper Cape Fear Aquifer from April 1980 to January 2003. A slight recovery has been occurring since January 2003 (as described earlier in this report).

- The Town of Bethel well field is situated in the toe of the salt water interface of the Upper Cape Fear Aquifer. The lower portion of the aquifer contains salt water. Water levels in the Upper Cape Fear Aquifer have rebounded about 16 feet since January 2003.
 - Due to the location of the Bethel well field in relation to the Upper Cape Fear salt water wedge it would not be prudent to change the area of northern Pitt County from the dewatering zone to the declining water level zone. A lessening of the reduction requirements in northern Pitt County may increase the likelihood of salt water intrusion if additional pumping demands occur.
2. In March 2005, Groundwater Management Associates (GMA) submitted a report to the Ground Water Management Section entitled “Martin County Water Resources Master Plan.” In this report a recommendation was made to Martin County that they may elect to question the location of reduction zones as defined in the current version of the CCPCUA rules, especially for parts of Western Martin County (near Robersonville), where GMA claims to have demonstrated that over-drafting of the Black Creek and Upper Cape Fear Aquifers, declining water levels, and salt water migration may not be as serious of a concern as elsewhere in the CCPCUA. Groundwater Management Associates also requested that we also consider the interpretation of the positions of salt water interfaces in the Black Creek and Upper Cape Fear Aquifers submitted in the report, which are different from positions delineated in the DWR hydrogeologic framework of the CCP. The Ground Water Management Section reviewed the subject report and came to the following observations and conclusions:
- The position of the salt water interface in the Upper Cape Fear Aquifer in Western Martin County is such that the lower part of the aquifer is salty underneath the Town of Robersonville well field and in a few of the Martin County Water and Sewer District wells. Any westward migration of the interface could potentially affect water supplies in this area. Furthermore, there are some indications that upconing of salt water may be occurring near Robersonville as indicated by chloride measurements in the DWR Gold Point monitoring station. Chloride concentrations in well J22P5 screen 432-442, Upper Cape Fear Aquifer, increased from a non-detectable level, to 162 parts per million between September 2004 to September 2007. For these reasons, the Ground Water Management Section does not recommend that any changes be made to the established reduction zones in Martin County.

- The Ground Water Management Section reviewed the interpretations made by GMA of the salt water interface positions in the Black Creek and Upper Cape Fear Aquifers. Completion of the DWR Gold Point monitoring station in western Martin County (near the town of Robersonville) had occurred during the preparation of the GMA report. Hydrogeologic framework interpretations based on information gained from the new DWR monitoring site do not support the interpretations made by GMA. The Ground Water Management Section elected not to accept the alternate interpretation.
3. On January 17, 2008 (and later discussions) the Ground Water Management Section met with Guilford Mills Corporation concerning the CUA permit for their Guilford East Plant in Kenansville, Duplin County. The purpose of the meeting was to consider their request that the site of their well field be placed outside the Declining Water Level reduction zone. They provided 3 years of water level information to demonstrate that the Black Creek aquifer was not responding with a downward trend. The CCPCUA rule provisions allow for situations like this in the Declining Water Level zone, so based on this water level evidence Guilford Mills is not required to reduce their annual withdrawals below their Approved Base Rate.

Conclusions

Based on analysis of water level and chloride concentration conditions in the CCPCUA gathered through August 2008, there is no reason for the EMC to consider adjusting either the CCPCUA reduction zone boundaries or reduction percentages. The overall trend is one of worsening. We expect to see water level and chloride concentration improvements as alternative water sources become available beginning this year. We intend to capture those improvements with continued monitoring.

Although the CCPCUA rules require assessments to be produced in 2008, 2013, and 2018, the Division of Water Resources staff feels compelled to constantly track aquifer conditions so as to best serve the permit holders in the region and be aware of potential ground water supply issues. Another formal assessment will be conducted in 2013.

DWR plans to compile our second CCPCUA Status report for the EMC in September 2009.

Figure 1.

CCPCUA Cretaceous Aquifer Zones

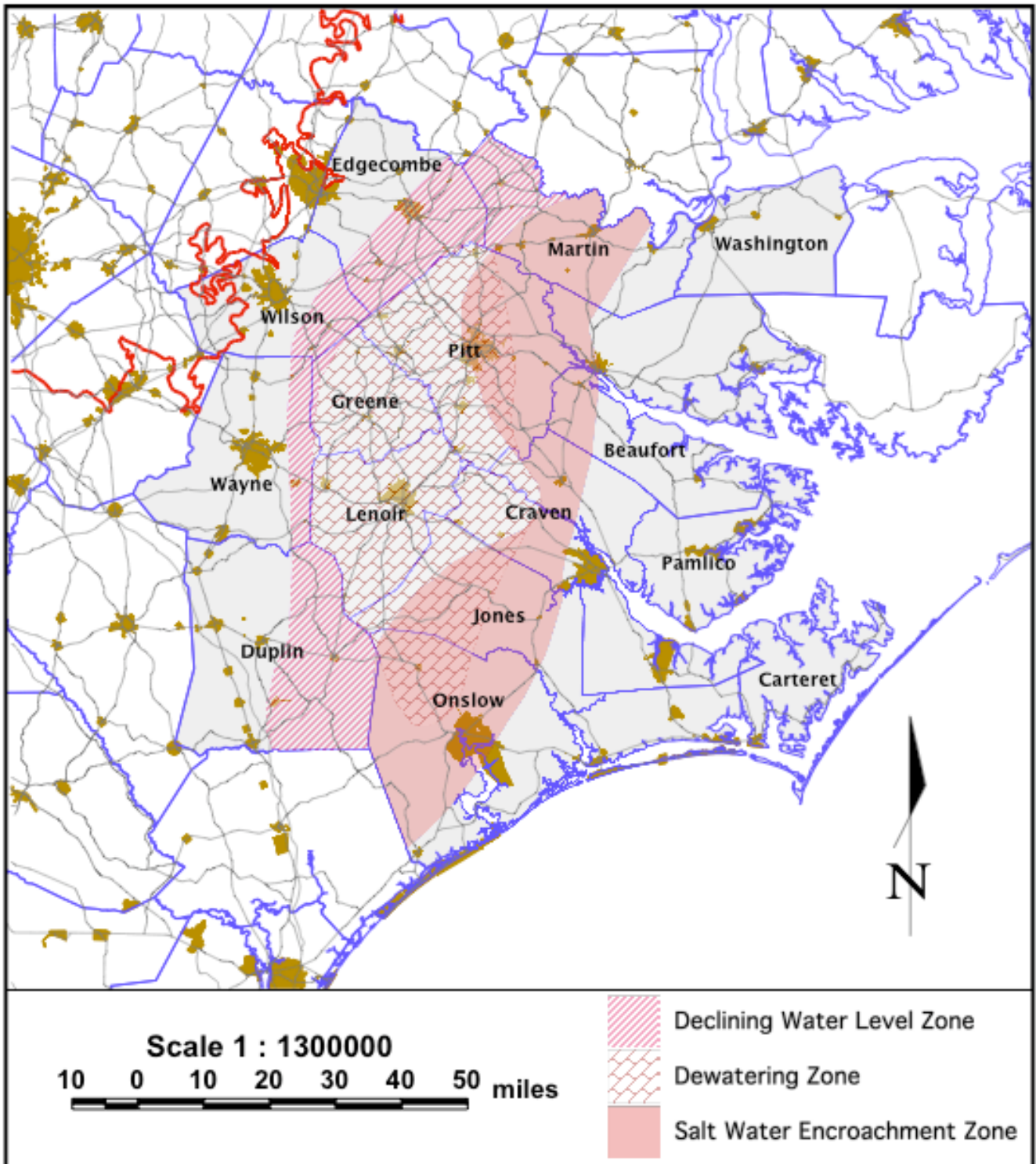


Figure 2.

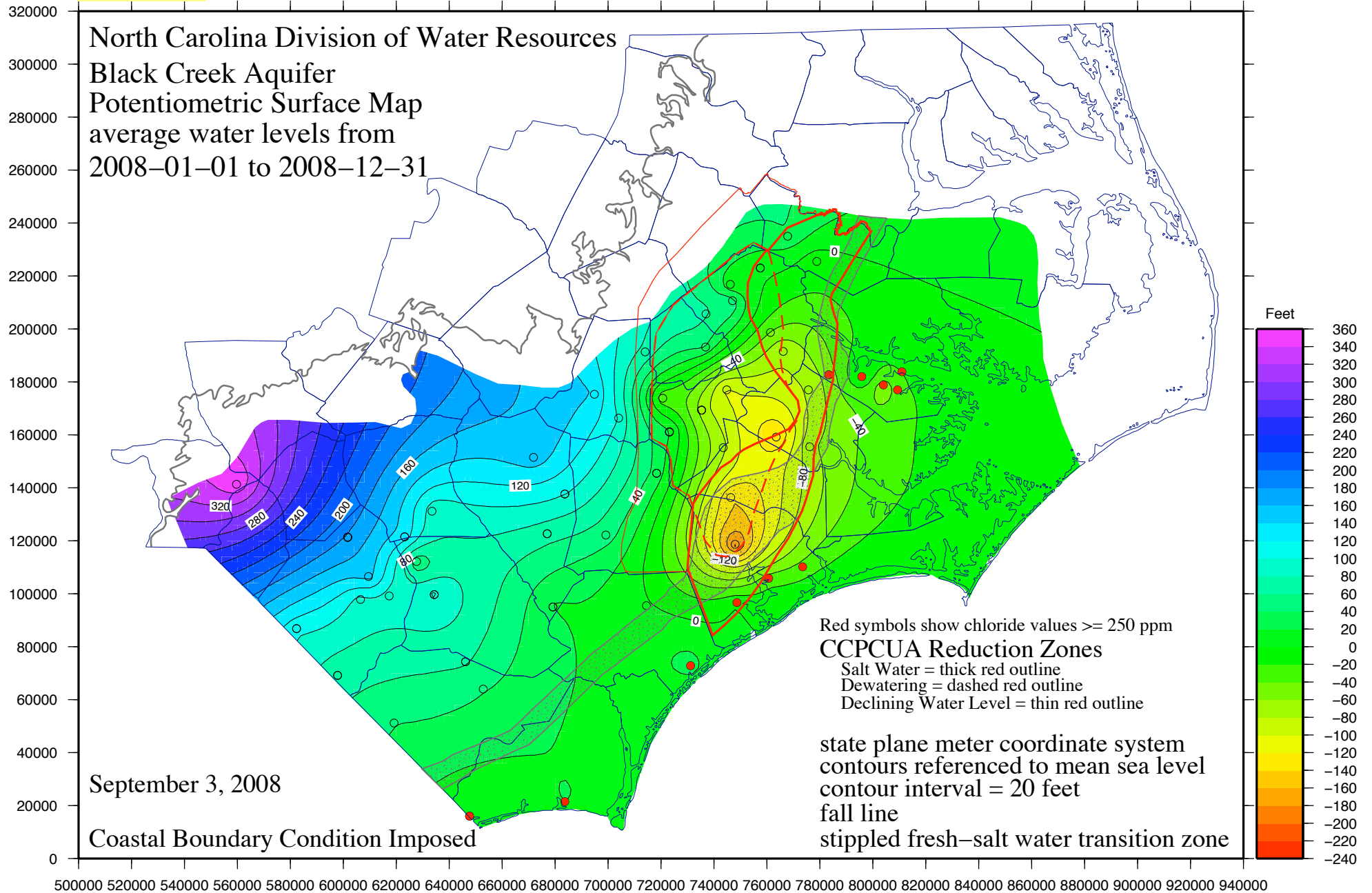


Figure 3.

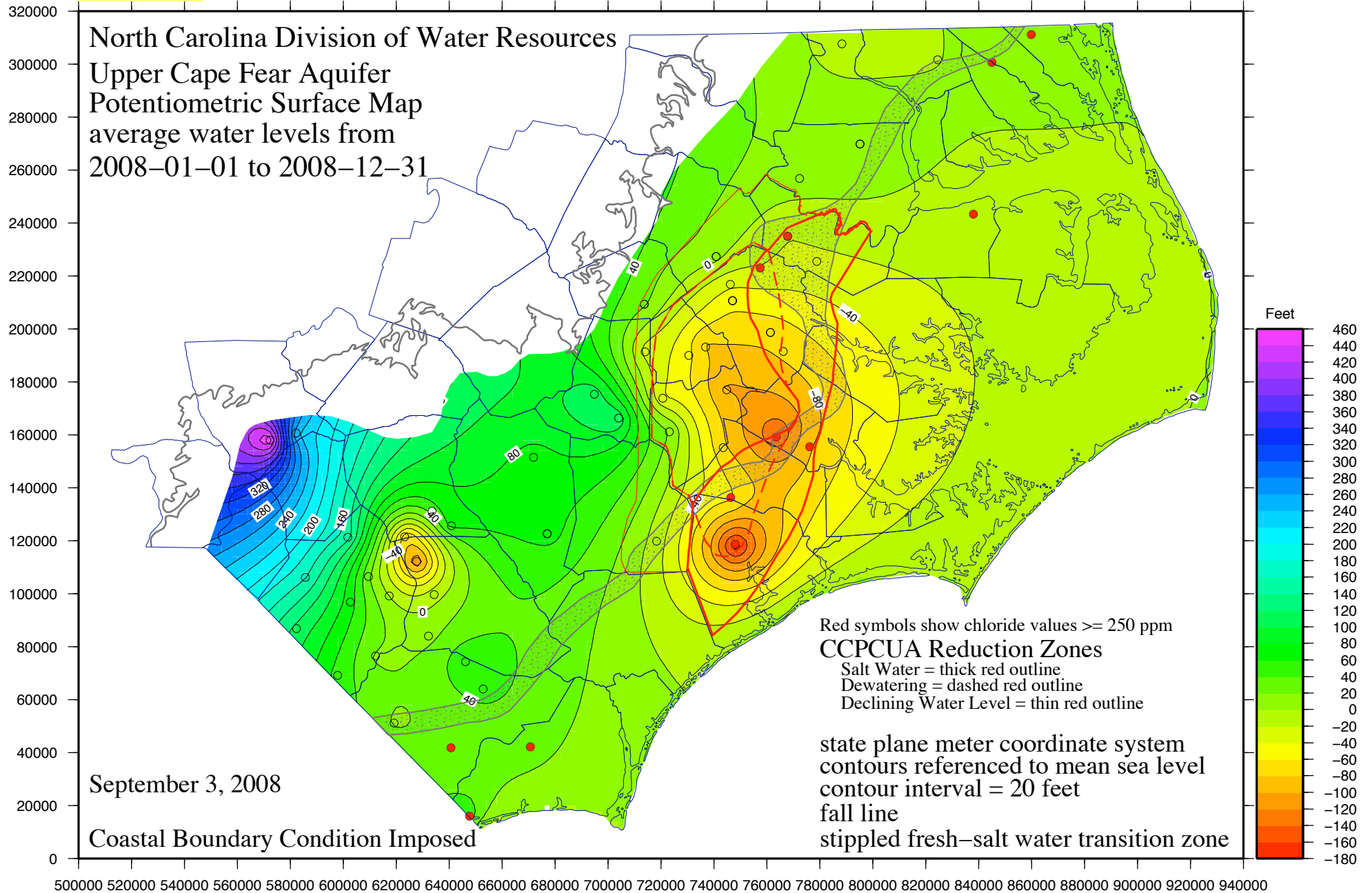


Figure 4.

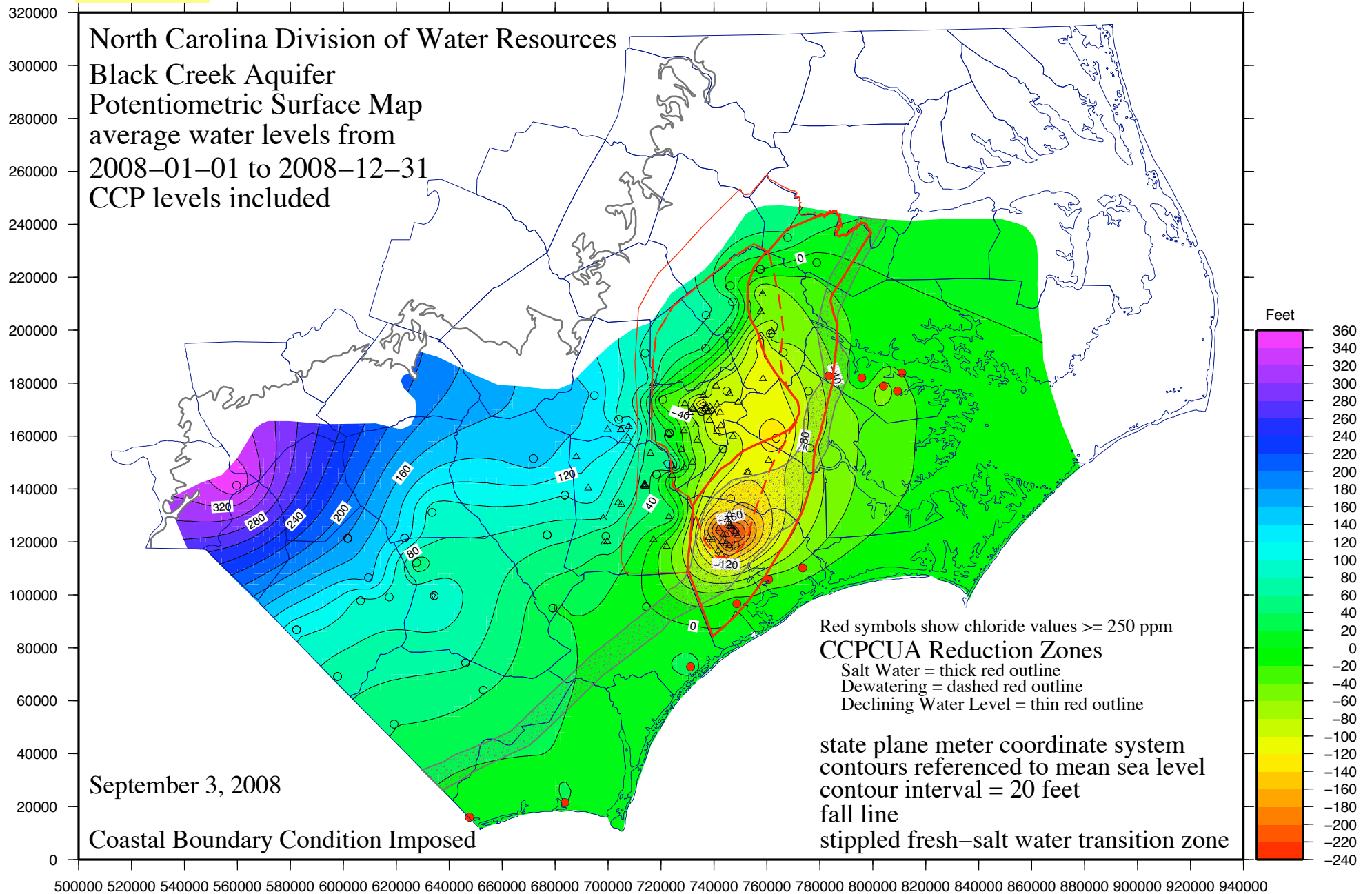


Figure 5.

