North Carolina Department of Environment and Natural Resources
Division of Water Resources

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Director

Dee Freeman
Secretary

April 2, 2009

Mr. Horace S. Willson
Martin Marietta Materials
Environmental Services
PO Box 30013
Raleigh, NC 27622-0013

Subject: Comments regarding latest model results for the proposed Vanceboro Quarry near Wilmar, North Carolina

Dear Mr. Willson:

In regard to our latest meeting and presentation of modeling results by Groundwater Management Associates, we have reviewed the materials submitted and considered the information provided verbally to us. We have the following comments and concerns:

1. We are concerned that the recharge rate of one inch per year to the surficial aquifer in the model is too low. This would have an impact on the withdrawal rate necessary to dewater the quarry excavation and potentially on the size and shape of the cone of depression. In the original GMA report of August, 2008, a reference was made to Giese and others, 1997 (the date is actually 1991) of a recharge rate of one inch per year to the surficial aquifer in the modeled region. However, page 44 of this report states clearly that recharge to the surficial aquifer was estimated to range between 12 and 20 inches per year over the North Carolina Coastal Plain and to average nearly 14 inches. The Giese report states that maximum recharge rates occur in the Sand Hills area and minimum rates occur further east in the coastal plain where surficial soils have higher clay content. Heath, 1994, assigned even lower recharge rates to areas with silty, clayey soils. The area of the proposed Vanceboro Quarry is situated in an area that receives approximately 200,000 gallons of recharge per day per square mile, or 4 inches per year according to the Heath report. A lithologic log provided by GMA from the proposed quarry site indicates a mixed lithology of silty fine sand and fill limestone, gravel, silt, silty peat with minor fine sand from 0 to 10 feet, and silty fine sand from 10 to 35 feet.

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We believe that the recharge rate should be higher based on this lithology. If the recharge rate to the surficial aquifer is indeed much higher, a much larger volume of water than the model predicts would seep into the mine excavation from the surficial aquifer.

2. A vertical hydraulic conductivity (K') of .0001 ft/day was assigned to the Upper Castle Hayne confining unit based on analysis of pump test data. A head difference of 15 feet was measured at the proposed quarry site between wells completed in the surficial and Upper Castle Hayne Aquifers. The nearby DWR monitoring stations at Wilmar and Cox Crossroads indicate much smaller head differences, and semi-confined conditions, which would suggest that K' is higher in the vicinity. Did GMA account for the possibility that the Castle Hayne confining unit has a higher K' value in the vicinity of Wilmar and Cox Crossroads in the model? This would affect the model recharge rate and have an impact on the withdrawal rate necessary to dewater the quarry excavation. It would also affect the size and shape of the cone of depression.

3. In reference to the plot of calculated vs. observed head under steady state conditions, there is a large difference between computed and observed heads in the Castle Hayne Aquifer at Cox Crossroads and Wilmar monitoring stations. This indicates a significant calibration problem that would affect the model output results, and may be a result of using too low of a recharge rate in the area of Wilmar and Cox Crossroads. There may be other reasons as well. DWR would like to see closer agreement between observed and computed heads in the model.

4. Modeling results submitted in April, 2008 with the report entitled "Vanceboro Quarry Site Hydrogeologic Characterization and Predictive Modeling Analysis," showed a smaller cone of depression over the same time period than the latest model results. Apparently this is due to the use of a larger vertical hydraulic conductivity value for the Castle Hayne confining unit (K'= .0035 ft/day) than in the latest model. The current value of .0001 ft/day decreases the recharge rate to the Castle Hayne Aquifer, and apparently increases the size of the cone of depression. Thus, the required search area for potentially affected water supply wells is larger than before.

Please feel free to call me or Jeff Lautier at 919-715-5445 and 919-715-5395 if you have any questions.

Sincerely,

Nat Wilson, Chief
Ground Water Management Section

Jeff Lautier, Senior Hydrogeologist
Ground Water Management Section

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