

Presentation to

AQUIFER COMMITTEE STAKEHOLDER EVALUATION GROUP

Results of the March 13 & 14, 2001
Working Group Meeting

April 20, 2001



Purpose of the Initial Working Group Meeting

- a) Discuss the existing hydrogeologic conditions in the Savannah area
- b) Identify the technical concerns relating to potential impact to the Upper Floridan aquifer resulting from deepening of the Savannah Harbor Navigation Channel
- c) Reach a consensus regarding the technical concerns and recommend a list of technical concerns to the Aquifer Committee
- d) Discuss potentially suitable and appropriate methodologies and approaches to address the technical concerns identified

Outline of Presentation

- a) Overview of the existing hydrogeologic conditions in the Savannah area
- b) Technical concerns
- c) Potential methodologies and approaches
- d) Working Group action items
- e) Questions and answers

Summary of Existing Hydrogeologic Conditions at and near Savannah

- a) Extensive cone of depression centered at Savannah
- b) Lateral saltwater Intrusion first identified at Dolphin Head on Hilton Head Island, South Carolina
- c) Top of Upper Floridan aquifer occurs at shallow depths near Beaufort, South Carolina
- d) Downward net vertical hydraulic gradient from the surficial aquifer to the Upper Floridan aquifer

Summary of Existing Hydrogeologic Conditions at and near Savannah (continued)

- e) Preliminary work in Savannah by SCDHEC regarding salinity of pore water in the Miocene sediments at the U.S. Hwy 80 bridge over Bull River
- suggests a vertical salinity profile within the Miocene confining unit
 - chloride concentrations ranged from 8,000 mg/l near the top of the unit; 6,000 mg/l at 50 ft depth and 1,000 mg/l at 90 ft depth

Summary of Existing Hydrogeologic Conditions At Savannah (continued)

- f) Off-shore drilling program conducted by USGS, USACE and SCDHEC
- Core holes were drilled at distances of 7, 10 and 15 miles off-shore of Tybee Island
 - 15 mile well produced saline water
 - 10 mile well contained freshwater with increasing chloride concentrations with depth
 - 7 mile well contained saline water near top of Upper Floridan aquifer where the upper confining unit was thin

Technical Points of Agreement

- a) Net vertical hydraulic gradient from surficial aquifer to the Upper Floridan aquifer, within the Savannah cone of depression, is downward. The proposed Savannah Harbor Expansion is contained within this area.
- b) Leakage through Miocene confining unit will increase if additional low permeability material is removed.

Recommended Technical Concerns

- a) Increase in rate and quantity of leakage through the upper confining unit that will occur as a result of channel deepening is unknown (previous studies have suggested that increases in leakage resulting will be minimal)
- b) Potential temporal changes in chloride concentrations in the Upper Floridan aquifer resulting from channel deepening are unknown
- c) Hydraulic properties, salinity and hydraulic head in the Miocene units are poorly understood, as is the variability of these parameters

Technical Concerns (continued)

- d) Hydraulic properties and geometry of the previously identified paleochannels are poorly understood
- e) The geological framework is not as well refined as needed to fully understand hydrogeologic relationships and interactions

Potential Technical Approaches Identified

- a) A phased study may be undertaken to address technical concerns. The first phase could consist of the following elements. The need for additional studies could be determined by analysis and evaluation of the results of the initial tasks
- b) Complete additional seismic work to attempt tracking one or more of the paleochannel features on-shore

Technical Approaches Identified (continued)

- c) Jack-up rig could be used to drill areas within the existing navigation channel
- d) Geostatistical analyses could be used to plan optimum drilling locations
- e) Three of the identified paleochannels have been drilled, there appear to be paleochannels located over the Tybee High, the additional paleochannels should be investigated

Vertical Hydraulic Conductivity

- a) Wide range of reported values for Miocene sediments
- b) The scale of pumping tests would be preferable to that afforded by laboratory tests
- c) Feasibility of conducting a meaningful pumping test is questionable.

Vertical Hydraulic Conductivity (continued)

- d) A preliminary assessment of pumping test feasibility is being completed
- e) Laboratory derived data should be used to estimate values of vertical hydraulic conductivity if in-situ methods are not feasible or are unsuccessful
- f) Geostatistical methods may be used to determine confidence limits

Geologic Framework

- a) Cross-sections and transects should be completed to better understand hydrostratigraphic relationships
- b) Cross-sections should identify the Miocene A and B units
- c) All core samples should be carefully inspected for joints and fractures

Sampling and Analyses

- a) The existing monitoring wells could serve as locations for additional well clusters. GAEPD may be able to complete well clusters as a cooperative effort
- b) USGS can conduct sampling and analyses at monitoring well clusters at Tybee Island and Ft. Pulaski as a cooperative effort
- c) USGS/SCDHEC will conduct radio-isotope analyses of samples collected from Rotosonic borehole that was drilled April 9 - 11

Sampling and Analyses (continued)

- d) Additional monitoring well clusters should be considered at the Bull River Rotosonic core hole site and at two disposal sites along the Savannah River (across the river from Elba and Hutchinson Islands respectively). GAEPD may be able to construct additional monitoring well clusters as a cooperative effort

Geotechnical

Geotechnical parameters such as grain-size distribution, Atterberg Limits, vertical hydraulic conductivity and porosity will be analyzed by USACE for samples from core samples collected during the April 9-11 Rotosonic drilling program

Modeling

- a) To predict the leakage increase resulting from navigation channel deepening, some level of numerical modeling may be needed
- b) To complete a model, the history of pumpage, dredging and chloride concentrations or surrogate data will be needed
- c) A 2-D model should be used first to predict vertical migration of salt water
- d) If 2-D model predicts that leakage is significant, then it may be necessary to address lateral transport of saline water in the Upper Floridan

Summary of Potential Study Elements

- a) Nested monitoring wells within Miocene section
- b) Additional seismic survey
- c) Additional core holes
- d) Isotope analyses
- e) Simulate potential chloride transport through the upper confining unit into the Upper Floridan aquifer
- f) Long term monitoring of the Upper Floridan aquifer

Working Group Action Items

- a) Upon acceptance or revision of technical concerns by the Aquifer Committee, the Working Group will reconvene to discuss data needs and technical approaches designed to address the technical concerns of the Aquifer Committee
- b) Recommendations will be made to the Aquifer Committee for approval