What Have We Learned?

1. *Where are the known locations where salt water is entering the Upper Floridan Aquifer and why is salt water entering at these locations?*

   Salt water is entering the Upper Floridan Aquifer in three areas. The first area is near the northern end of Hilton Head Island, SC. The second is in an offshore area just east of Hilton Head Island and northeast of Tybee Island. In both of these areas, the upper boundary of the aquifer is thin and has been breached. Salty water has migrated DOWN through these breaches and into the Floridan aquifer. Modeling shows that continuation of current levels of pumping across the Floridan aquifer will contribute to a gradual expansion of the size of these saltwater plumes.

   The third area is on the Brunswick peninsula where salt water is moving upwards from the Fernandina Permeable zone into the aquifer along fractures or other flow paths in the rock.

   Are there any other areas where salt water is entering the aquifer that we do not know about?

   NO, however there is evidence that another mechanism of entry is the areal downward movement of salt water through the upper boundary of the Floridan aquifer. This downward movement across the aquifer's upper boundary appears to be occurring in a very uneven fashion across much of the approximately 2400 square miles that are under the influence of the cone of depression induced by past and current withdrawal patterns. We are not yet certain of the rates at which these salty waters move toward pumping centers once they've completely broken through the aquifer's upper boundary. We also do not know the extent to which the chloride concentration of these salty waters changes as lateral migration toward pumping centers occurs.

2. *How fast is salt water traveling?*

   The largest of the three salt water plumes in the vicinity of Hilton Head has grown by about six miles since the mid-1960s.

   How does pumping affect the rate and direction of salt water travel?

   Modeling shows that increases in withdrawals from the aquifer in pumping centers at and near Chatham County and Hilton Head Island will steepen the downward slope of the aquifer's water level toward those pumping centers. As this slope steepens, the rates and directions of expansion of the salt water

plumes are influenced. Also, increased pumping in some areas of the Brunswick peninsula could cause the existing plume to enlarge.

What is the life expectancy of the aquifer?

Modeling shows that - under 2000 pumping conditions - many decades will elapse before there's reason to be concerned about salt water intrusion affecting Floridan aquifer wells in Georgia. If the plumes at Hilton Head continue to expand at the 1965 – 2004 pace, we would not expect salty water from them to be a problem in Georgia for more than 100 years. We understand that there might be other influencing factors.

3. Other than Savannah and Brunswick, are there any other areas in coastal Georgia where salt water intrusion can be reasonably expected?

No. There is no evidence that other areas of the aquifer's upper confining layer at or near Georgia's mainland is under immediate threat of being breached due to natural causes OR current and foreseeable pumping conditions.

When will Georgia, South Carolina, Florida drinking water wells in the Upper Floridan Aquifer no longer meet water quality standards?

Some wells in South Carolina already have been affected by contamination; others may become contaminated as the plume expands in the next few decades.

There is no evidence of near-term threats to Chatham County area Floridan aquifer municipal wells under current and foreseeable pumping conditions. Some wells within the plume at Brunswick have previously been abandoned because of contamination, but with the current stable plume, we do not expect contamination to occur in wells beyond the current plume.

The study results shed no light on conditions of wells in the State of Florida.

4 *Can areas having minimal impact on salt water intrusion be identified and separated from areas having significant impact?*

Yes. Under 2000 pumping patterns, as well as several forecasted pumping scenarios, we can identify broad geographical areas where additional

pumping patterns will not have significant impacts on the aquifer's water levels in the vicinity of Hilton Head, Savannah, or Brunswick.

Can some counties or portions of counties be eliminated from the Final Strategy?

Yes. The 24-county area will likely not require a uniform set of water management strategies to address salt water.

5. *What are the other fresh water resources of coastal Georgia, and what amount of water can be obtained from them?*

A water reclamation/reuse program is means by which the current fresh water resources can be extended. A coordinated and goal-oriented regional water conservation strategy will also extend current fresh water resources.

A number of rivers and streams deliver surface water to Georgia's coastal counties, and could be tapped for additional water supplies for portions of the region. The Savannah and Altamaha rivers, for example, are capable of supplying some of the area's present and future potable water demands.

Also the Miocene Aquifer, as well as the lower Floridan, can both meet some of the region's future water needs.

What would be the approximate costs of these sources of water alternative to the Upper Floridan Aquifer?

Extending the life of current water supplies through water conservation programs has been widely shown to be the least expensive of water supply options. A specific water conservation program for the 24-county coastal area has not been developed, so no hard and fast cost figure is yet available. A study conducted under the Sound Science Initiative indicates that the estimated cost of a gallon of potable surface water will be approximately five times the cost of a gallon of potable ground water.

6. *What are the current data gaps and what additional data are needed? How should existing and future data be organized, integrated, and made available to the public?*

The Sound Science Initiative had a limited and well-defined scope of work. Namely it was to examine the major factors influencing salt-water intrusion into the Floridan aquifer. For the most part, the SSI has done an effective job of giving light to those factors. Nevertheless, we need to continue to

model and monitor those areas where salt-water is entering the aquifers. We need more modeling to define the offshore extent to which there is general areal downward migration of salty water through the aquifer's upper confining boundary. We also need more modeling to define how chloride concentrations change as the salt water migrates laterally toward pumping centers.

We need to further develop the solute transport model in the Brunswick area.

Some new areas of research are also warranted. One is the need to better understand the impacts that ground water pumping is having on surface waters, particularly where the Upper Floridan Aquifer is shallow and irrigation pumpage is expected to grow.

Can a long-term monitoring system be established so that changes in salt water intrusion can be measured?

Yes. The foundation for such a monitoring program has been implemented.

7. *What engineered solutions can be used to prevent salt water from reaching Savannah and uncontaminated parts of Hilton Head Island or expanding in Brunswick to uncontaminated areas? How can the salt water intrusion problem be stopped and approximately how much will this cost?*

The aquifer is not amenable to construction of any sort of physical barriers to halt the movement of salt water. The only way to stop the intrusion is to try and return to pumping conditions that existed very early in the 20th century.