Sustainable Groundwater Use for Power Generation in Georgia, Case Study

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Proposed Plant Washington

- 850-megawatt, coal-fired, base-load power plant
- Sponsored by Power4Georgians, a consortium of Georgia EMCs
- High-efficiency, supercritical thermodynamic design...more power and lower emissions per pound of coal burned
- Innovative conjunctive use of surface water from the Oconee River with backup groundwater use during seasonal low-flow periods
Proposed Groundwater Extraction is from Cretaceous Aquifer System

Plant Site

Valley and Ridge and Appalachian Plateaus

Blue Ridge

Piedmont

Coastal Plain
Hydrogeologic Cross-Section

Source: Georgia Geologic Survey Information Circular 74, 1985

Location of Hydrogeologic Section

Groundwater Flow Model Report
Plant Washington
Washington County, Georgia
Hydrogeologic Section of the Dublin-Midville Aquifer System
Model Layers

Cross-Section along Column 240

- Layer 1 (Jacksonian)
- Layer 2 (Twiggs Clay)
- Layer 3 (Huber)
- Layer 4 (Upper Cretaceous)
- Layer 5 (Aquitard)
- Layer 6 (Middle Cretaceous)
- Layer 7 (Aquitard)
- Layer 8 (Lower Cretaceous)
- Layers 1 & 2 Absent
- City of Sandersville

L. Keg Creek
City of Sandersville

NW
SE

Column 240
Row 169

106 m
-262 m
Model Domain and Topography
Extent of Twiggs Clay
Detail of Model Grid
Calibration to Historic Groundwater Levels and Pumping
Cross-correlation shows 10-month time lag between rainfall and groundwater level change.
Conservative Assumptions for Predictive Model

Average recharge:
- $3.76 \times 10^{-4}$ m/d or
- $1.48 \times 10^{-2}$ in./d

100-year Drought
5-Year Drought

No normally-occurring above-average rainfall/recharge is simulated in the model which is therefore conservative.
Simulation of 100-year Drought

<table>
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<th>Average Year</th>
<th>5-Year Drought</th>
<th>100-Year Drought</th>
<th>Influence of Drought</th>
<th>Influence of Drought</th>
<th>Average Year</th>
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Plant Washington Wells Pumping

Recharge (x10⁻² in./d)

Average

- 6.6
- 9.8
- 9.8
- 13.1

Average

Hydraulic Head at GHBS (feet)

- 6.6
Model Prediction

USGS Index Well 23X027 in Sandersville

- **USGS data logger**
- **Predicted, no Plant Washington wells pumping; average recharge; increasing pumping by other users**
- **Predicted, Plant Washington wells not pumping; drought conditions**
- **Predicted, Plant Washington wells pumping; 100-year drought**
Model Prediction

USGS Index Well 23X027 in Sandersville

- Land Surface
- USGS Datalogger Data
- Plant Washington Wells Pumping
- Plant Washington Wells Not Pumping
- Top of Cretaceous Aquifer
- Water Level Elevation (ft amsl)

Year

Model Prediction
Model Prediction

- Withdrawal only from deep portion of Cretaceous aquifer minimizes impacts on surface streams and Oconee River in the west.
- No measurable impact on surface water bodies east of Sandersville.
- Acceptable impact on existing wells near Plant Washington (<10 ft additional drawdown during extreme drought).
- Monitoring requirement is part of the permit.