

INFLUENCE OF COASTAL PLAIN CARBONATES ON RESERVOIR DEVELOPMENT: BIENVILLE NATIONAL FOREST, SMITH COUNTY, MISSISSIPPI

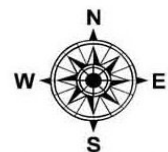
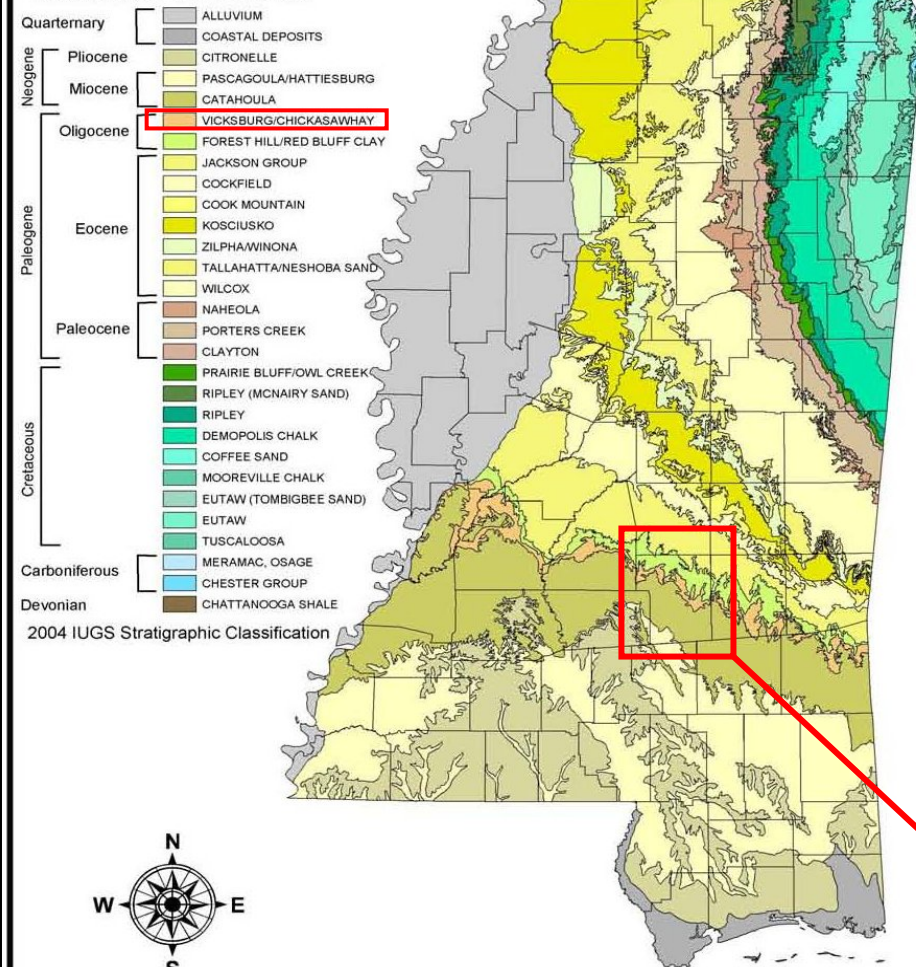


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The study site is in south-central Mississippi in Paleogene/Neogene coastal plain deposits

GEOLOGY OF MISSISSIPPI

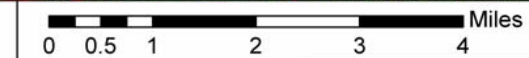
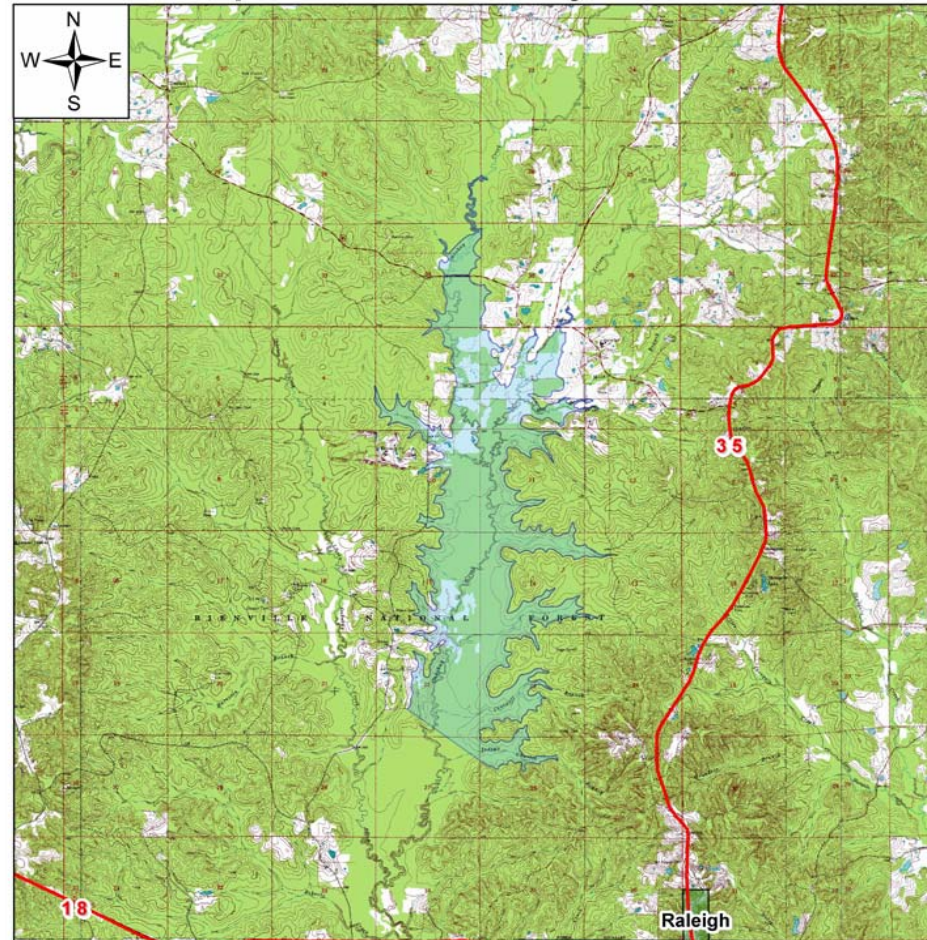
STRATIGRAPHIC COLUMN



23 April 2005
MSTM NAD 1983

Data Source: Maris, 2003

Proposed Smith County Reservoir



Legend

- Primary Roads
- City Limits
- Proposed Reservoir

Created November 29, 2006
Projection: MSTM - NAD 83
Source Data: MARIS

Geology

Surface Geology Map of Proposed Reservoir



CATAHOULA FORMATION
 VICKSBURG GROUP
 FOREST HILL FORMATION

RESERVOIR FOOTPRINT

0 0.25 0.5 1 Miles

Created April 18, 2011
 Projection: MSTM - NAD 83
 Source Data: MARIS

MIOCENE

Catahoula
Formation

OLIGOCENE

Bucatanuna Clay

Vicksburg
Group

Byram Marl

Glendon
Limestone

Mint Spring Marl

Forest Hill
Formation

Dip is SSW at 6.6m/km, with significant local variation.

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Surface Geology Map of Proposed Reservoir



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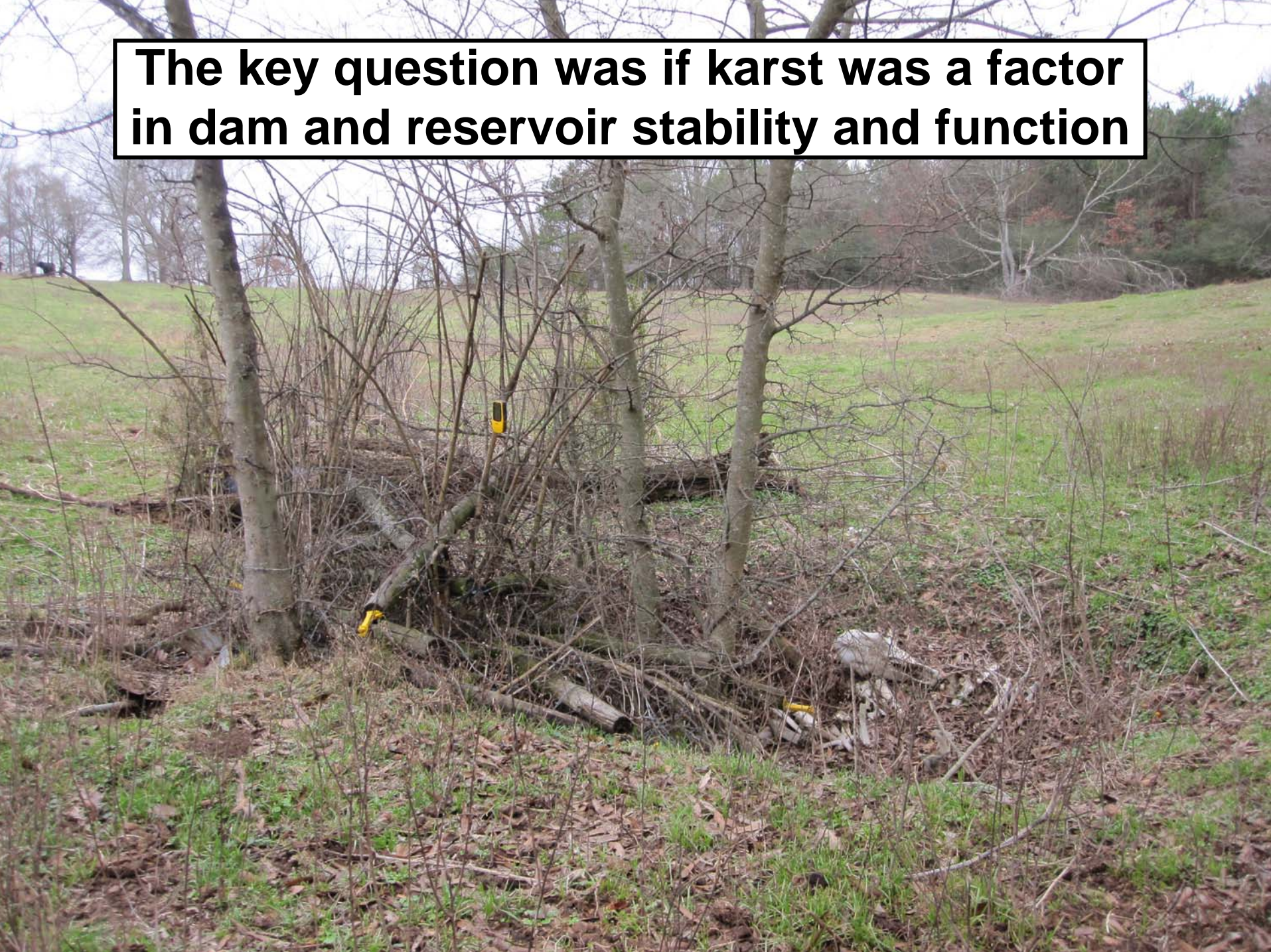
Glendon Limestone

Mint Spring Marl

Forest Hill Formation

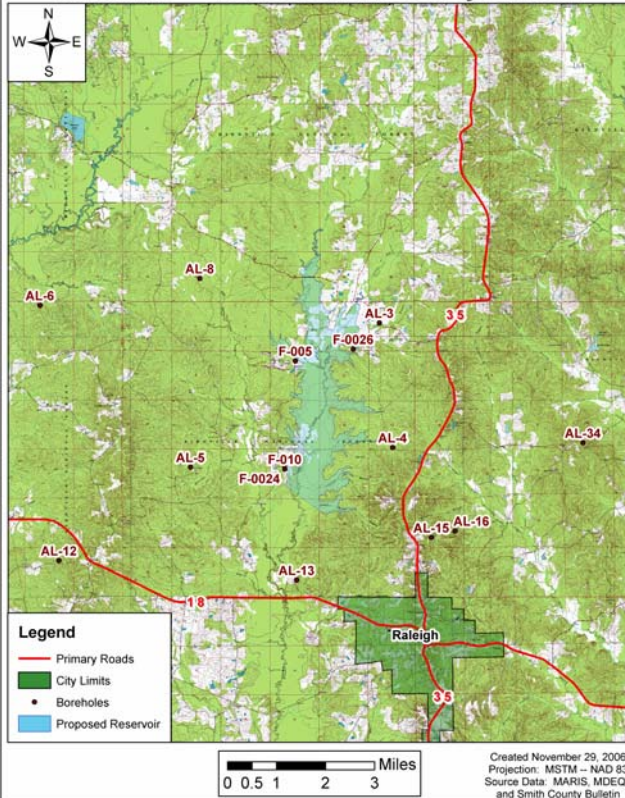
Dip is SSW at 6.6m/km, with significant local variation.

The key question was if karst was a factor in dam and reservoir stability and function

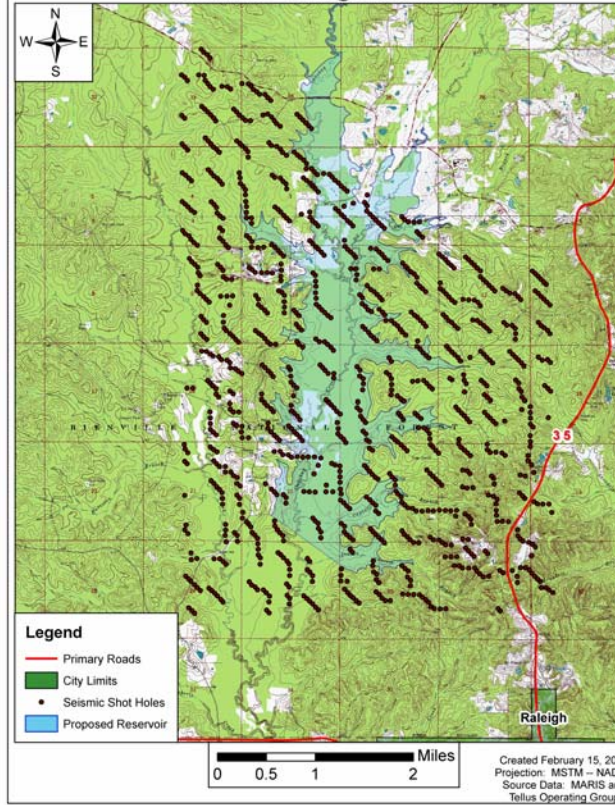


Well logs from a variety of sources reported lost circulation and bit drops up to 2 m

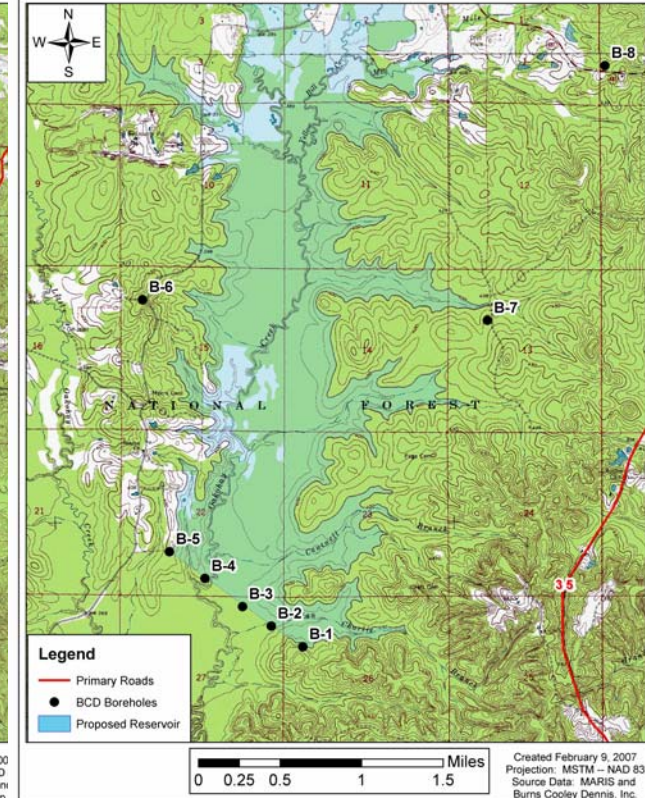
Boreholes --- MDEQ & Smith County Bulletin



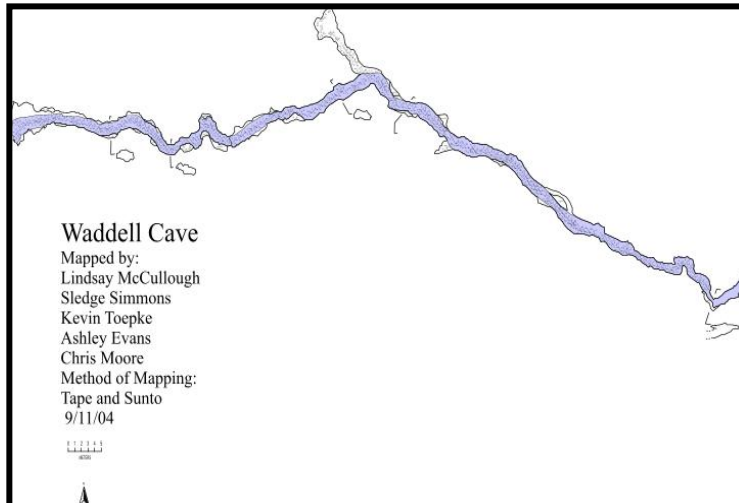
Seismic Boring Locations



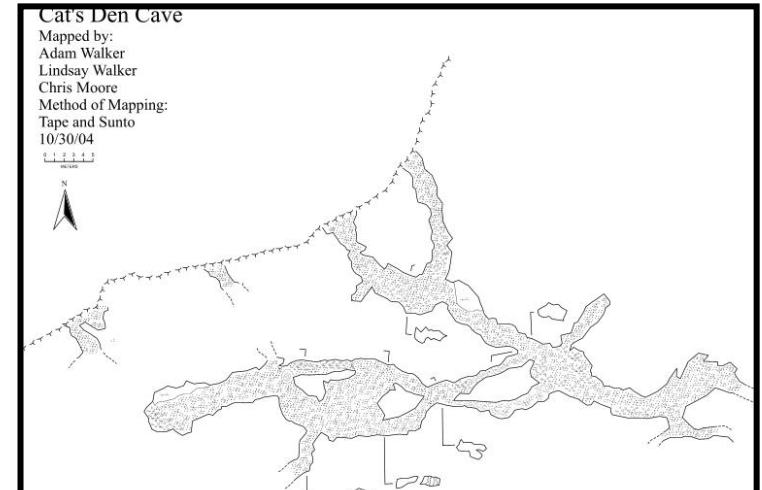
Boreholes --- BCD



Active and abandoned karst conduits are found in the Glendon Limestone a few miles east of the reservoir site



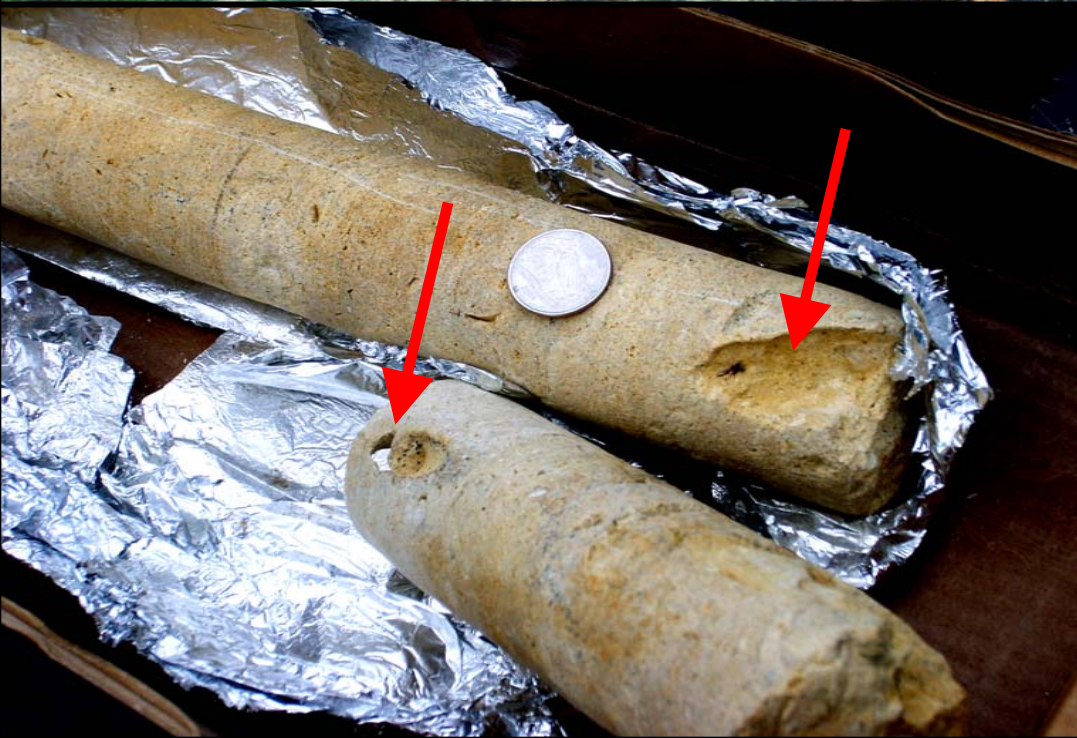
Modern active flow



Valley wall paleo-flow



**Karst dissolution
in the Glendon
Limestone was
visible in outcrop
and in core.**



Field Reconnaissance found few actual karst features. The most dramatic were four cover collapse sinkholes in one pasture.



Tributaries crossing the Glendon Limestone displayed surface karren but did not sink.



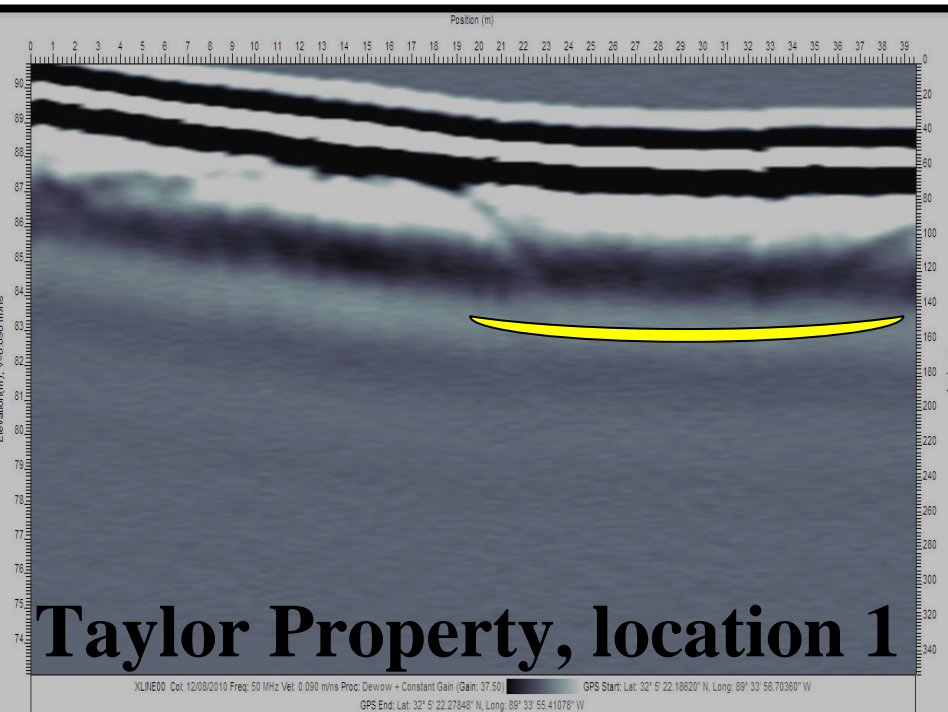


A sonic drilling rig was used to assess suspected karst features and anomalies

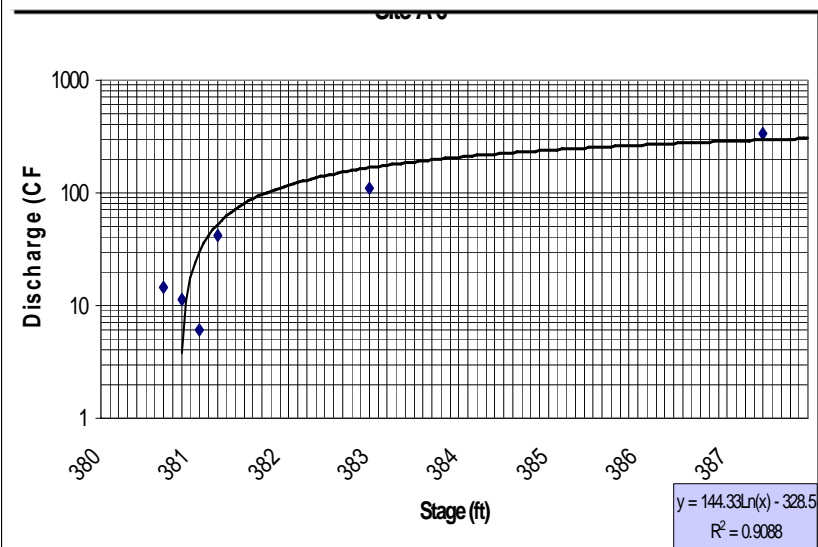
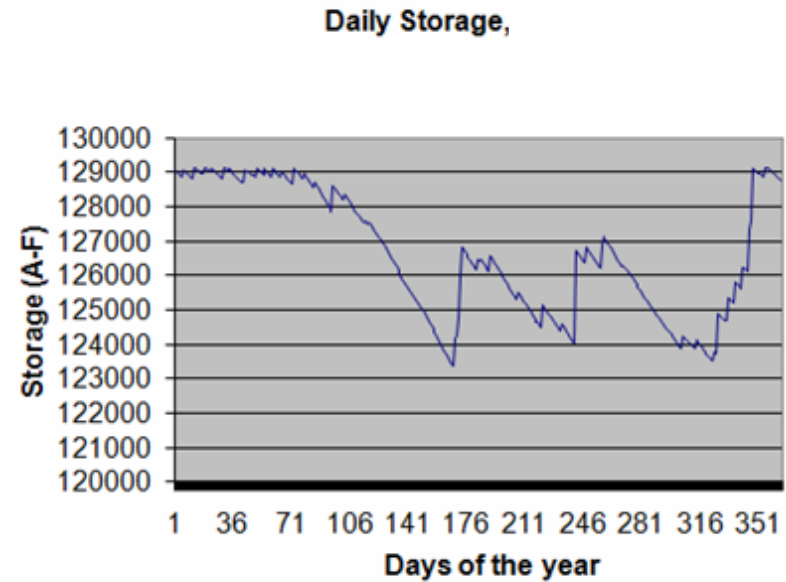




Ground penetrating radar located anomalies, but when drilled, they were not karstic.



Stream flow and water budget analysis did not identify losing or gaining reaches.



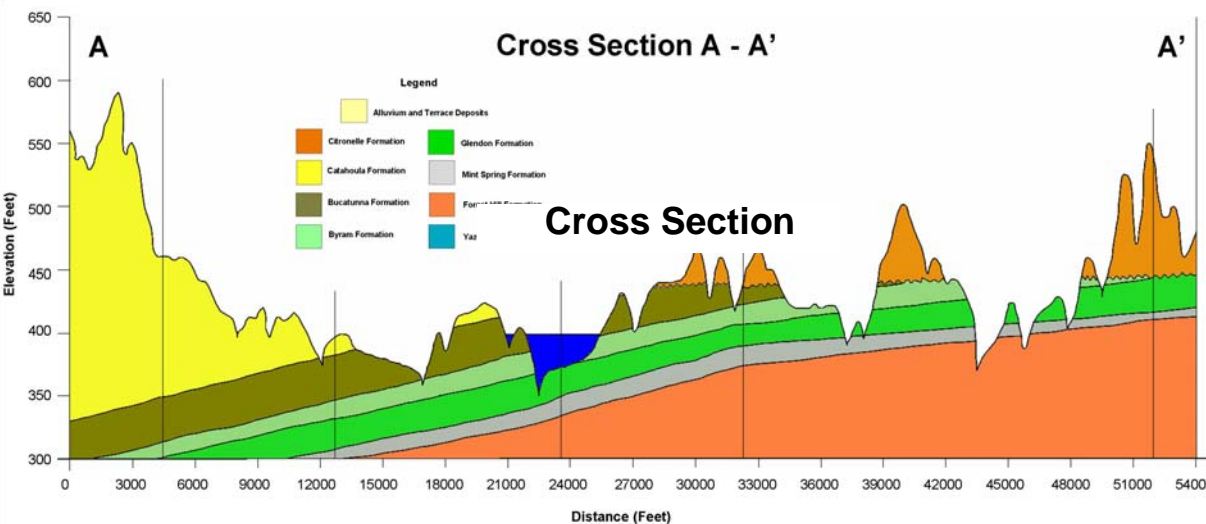
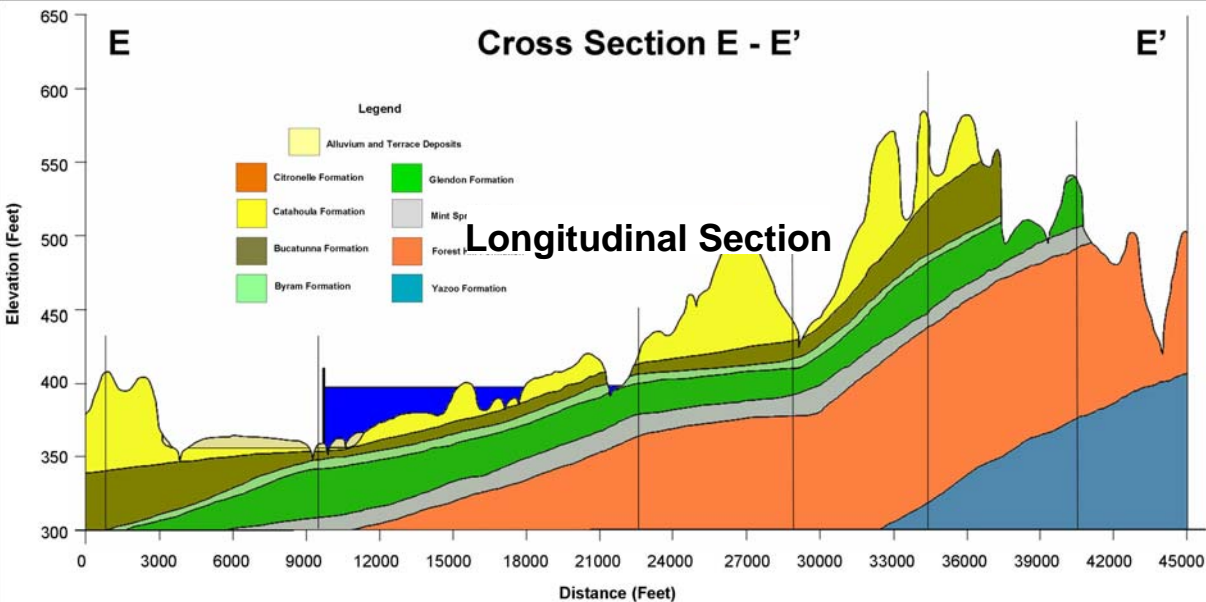


**HARD
GLENDON
LIMESTONE**



**SOFT MINT
SPRING MARL**

Drilling revealed that when the hard Glendon Limestone was penetrated, the soft Mint Spring Marl below absorbed drilling fluid and also allowed very rapid penetration, mimicking a bit drop.



10X vertical exaggeration

Variation in Glendon Limestone thickness, once thought to be possible paleokarst, is now believed to be deformation caused by salt flow at depth.



The evidence to date suggests that there is no active karst flow within the footprint of the proposed reservoir.

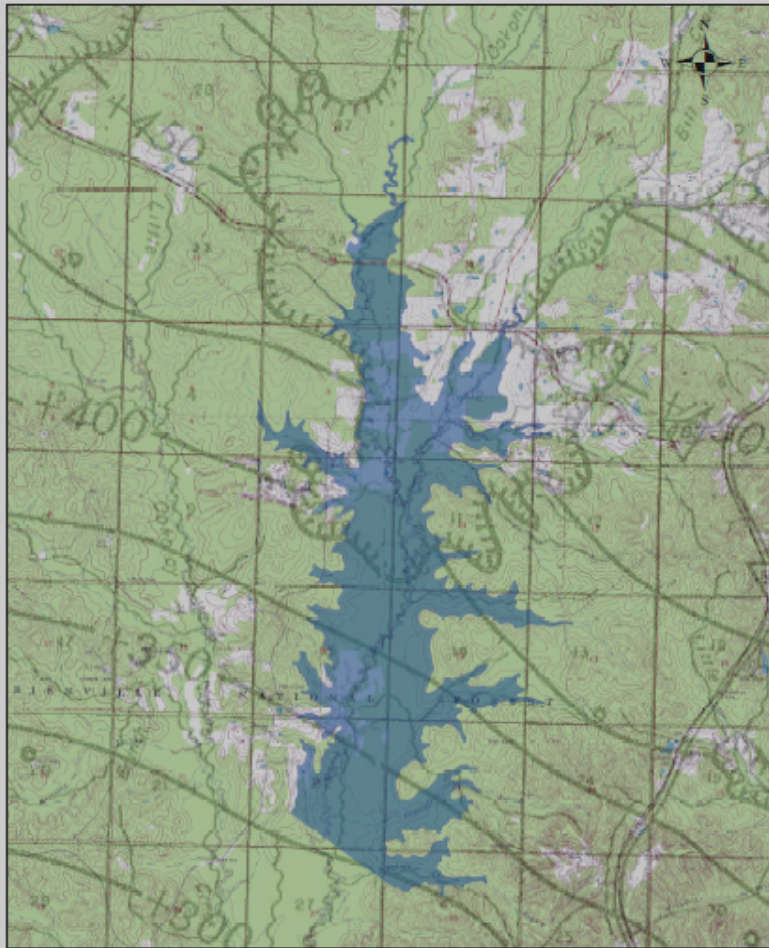


Some relict karst does exist, and there is a risk of re-activation of paleokarst pathways in the valley wall when the reservoir fills and creates high heads.

CONCLUSIONS:

1) Karst is not well expressed.

Glendon Structure Map



Legend
RESERVOIR FOOTPRINT

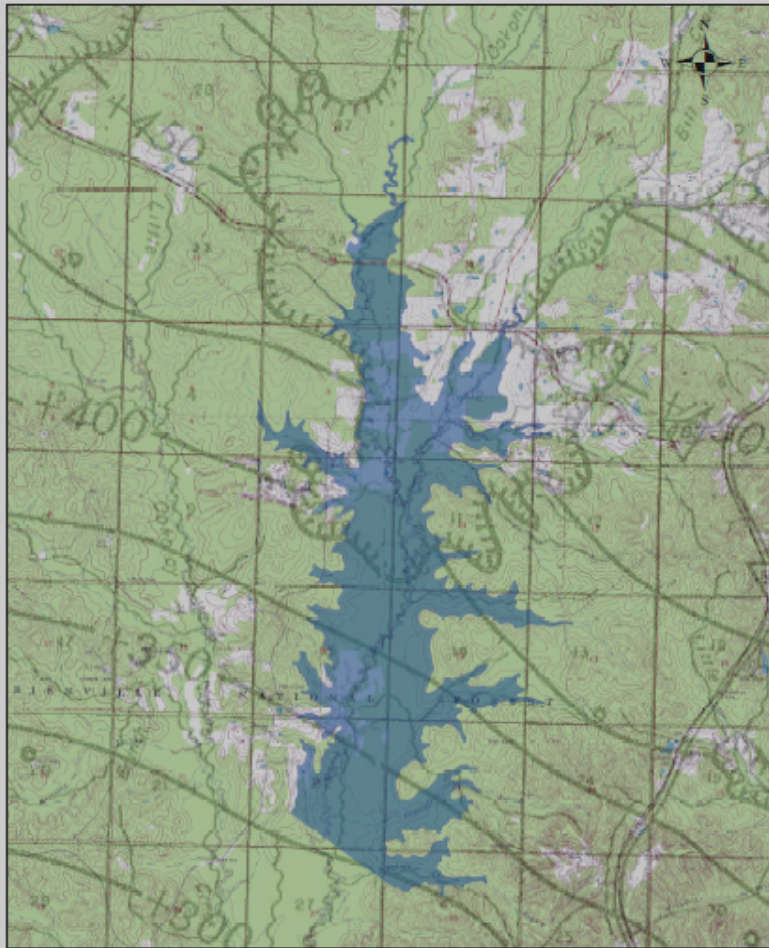
0 0.35 0.7 1.4 Miles

Created April 18, 2011
Projection: MSTM - NAD 83
Source Data: MARIS

CONCLUSIONS:

- 1) Karst is not well expressed.
- 2) Karst flow was not observed.

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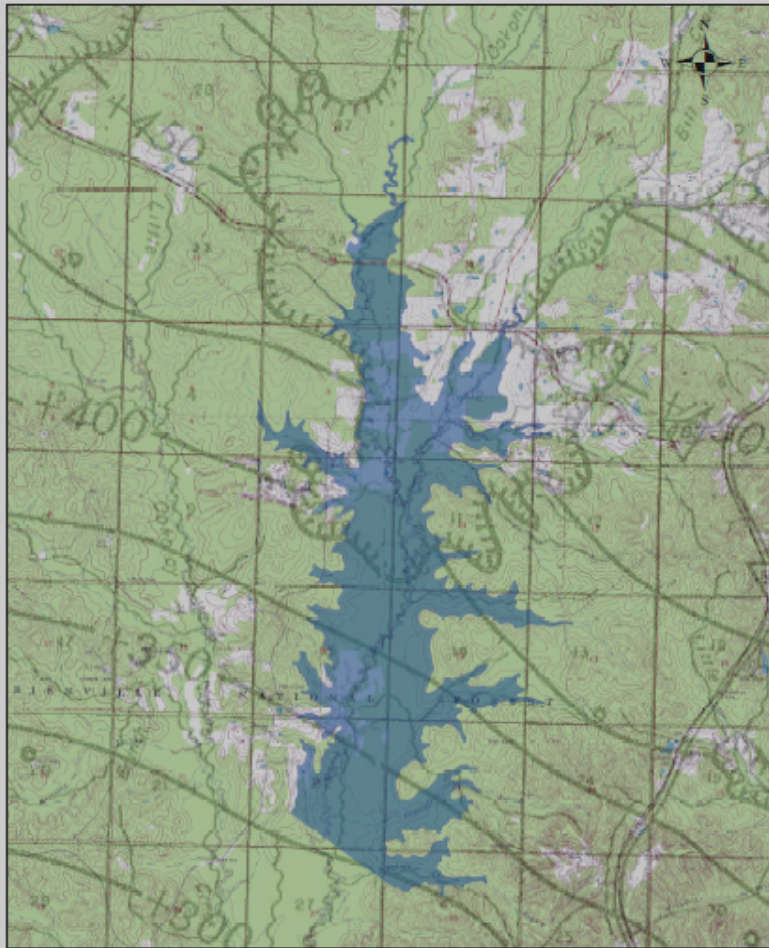
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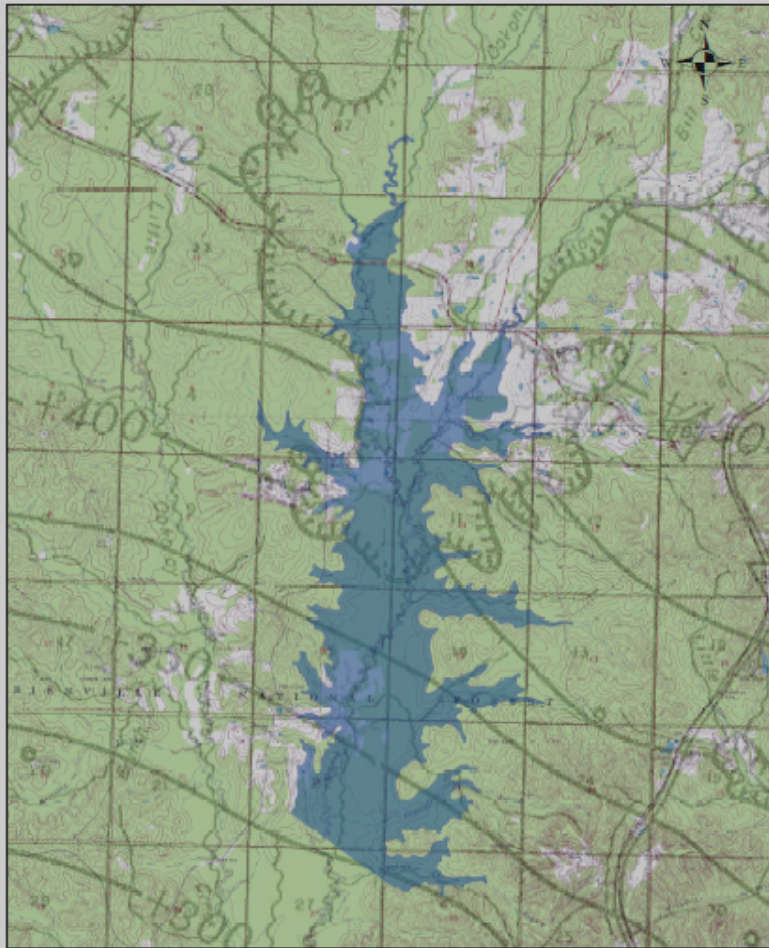
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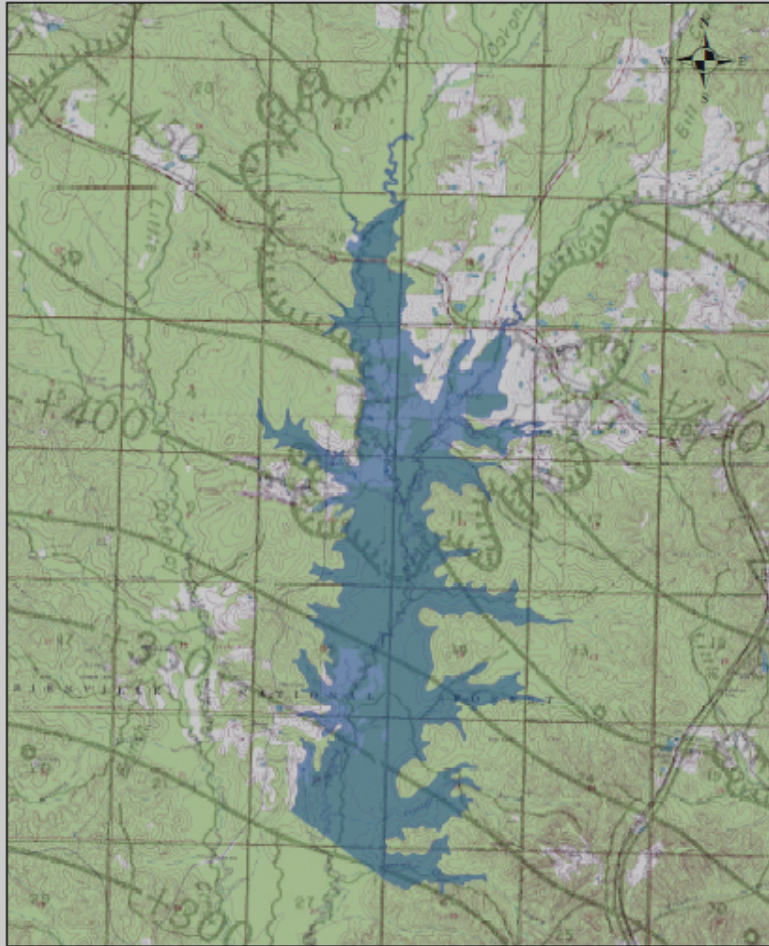
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- 3) Bit drops and loss of circulation are artifacts.
- 4) Paleokarst was not observed.

HOWEVER:

Reactivation of abandoned conduits in the valley wall is still possible.

Glendon Structure Map



Legend
RESERVOIR FOOTPRINT

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**THE END
(of the road)**

