



NuStart Grand Gulf Nuclear Project

NRC Onsite Review
Site Geotechnical Investigation Activities
June 19-20, 2006



Project Introduction & Agenda

- **Project introduction** – George Zinke (NuStart)
 - Introductions
 - Project Background and Status
- **Project Organization and QA** – M. Bennett (Enercon)
- **Site Investigations Overview** – Jim Hengesh (WLA)
- **Site orientation** – Jim Hengesh (WLA)
 - Site safety briefing
 - Logistics
 - Site tour



Project Background

- **October, 2003** - Grand Gulf ESP submitted October, 2003
- **April, 2004** - NRC issues Draft ESP SER
- **September, 2005** - NuStart selects Grand Gulf & Bellefonte for COLAs
- **October, 2005** - NRC issues Final ESP SER
- **December, 2005** - ACRS recommendation letter to Commission
- **January, 2007** - Commission decision on ESP (tentative)

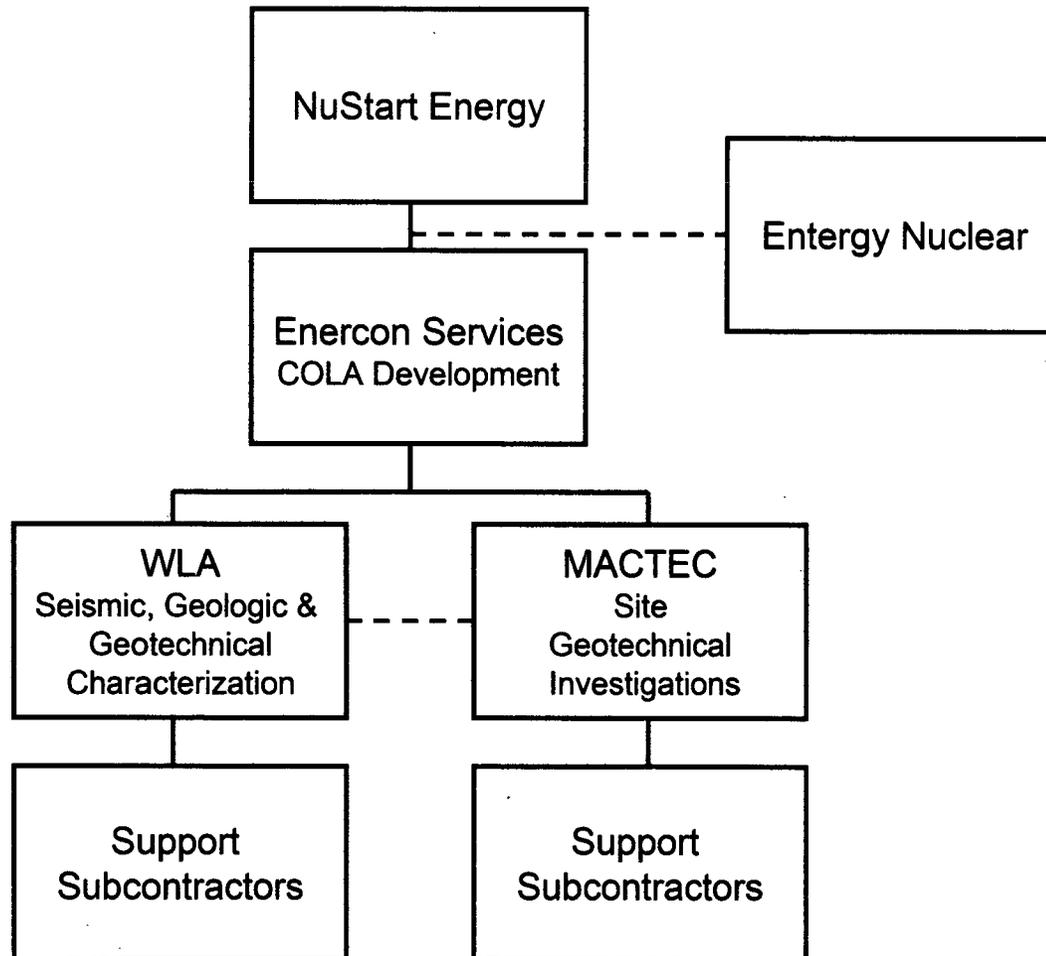
Overview of Current Status

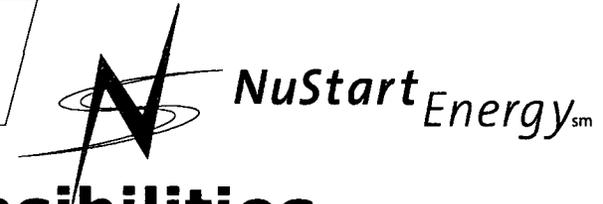
- **ESP stage site characterization complete**
- **COLA development in process**
- **Additional & confirmatory site characterization activities ongoing**
 - Proceeding with geotechnical investigations for ESBWR
 - Contingent planning for AP1000 geotechnical investigations



Project Organization

Site Geotechnical Investigations





Project Organization Responsibilities

Site Geotechnical Investigations

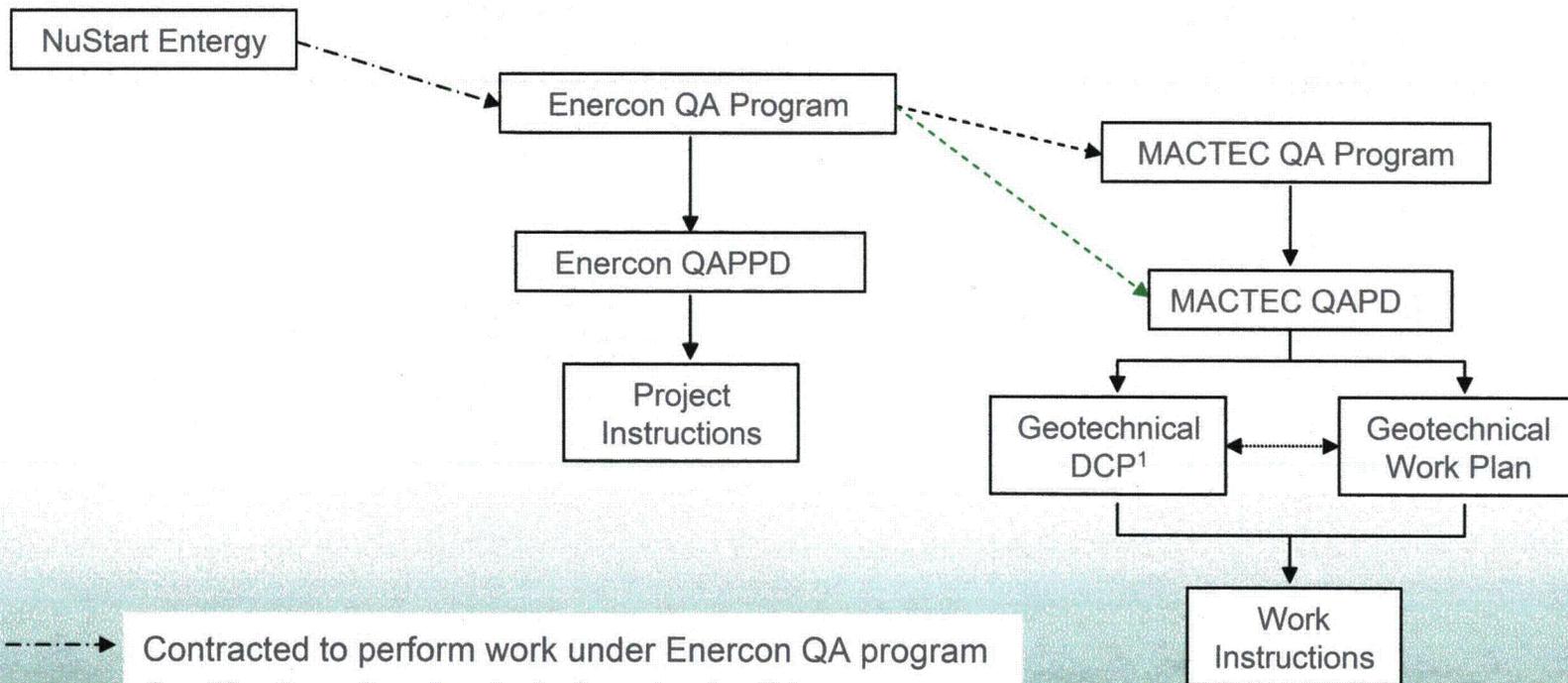
- **NuStart Energy**
 - Overall direction and management of COLA preparation
- **Entergy Nuclear**
 - Site owner; interface as necessary with NuStart Energy
- **Enercon Services, Inc.**
 - COL Application contractor for NuStart Energy
 - Providing QA oversight for geotechnical investigation activities as well as managing interface with site owner
- **Enercon Subcontractors**
 - William Lettis & Associates, Inc. (WLA) – Provides Overall Technical Direction for Geological, Geotechnical and Seismological Consultants
 - MACTEC Engineering and Consulting – Implementation and Coordination of Site Characterization Activities; I.e., Drilling, Well Installation, Laboratory Testing, Engineering Services



Project Organization Responsibilities Site Geotechnical Investigations (cont'd)

- **MACTEC and WLA share field project management responsibilities for geotechnical and geologic data collection tasks**
- **MACTEC Site Coordinator provides supervision of the day-to-day field activities**
- **Rig Geologist (or a rig geotechnical engineer) is assigned full-time with a drill rig; responsibilities include:**
 - **Ensure drilling or testing operations are conducted in conformance with specified procedures**
 - **Documenting sample or test depths and test results**
 - **Maintaining field logs of borings, including classification of materials recovered and description of geotechnical soil properties**
 - **Chain-of-custody document preparation and logging samples**

Site Investigation/Data Collection Quality Assurance



- > Contracted to perform work under Enercon QA program
- > Qualification of contractor/subcontractor QA program
- .-.-.-> Review of Quality Assurance Plan
- > Flowdown of requirements
- > Interrelationship between documents

¹Includes well locations

Quality Assurance

- **NuStart contracted Enercon Services to perform COLA development under the Enercon Services' QA Program**
- **COLA work by Enercon Services is performed under the Enercon Services' Quality Assurance Project Plan Document**
- **Engineering analysis performed by William Lettis & Associates and MACTEC is performed under the Enercon Services' Quality Assurance Project Plan Document**
- **Enercon Services has qualified the MACTEC Quality Assurance Project Document**
- **Geotechnical field investigation and laboratory testing by MACTEC is performed under the MACTEC Quality Assurance Project Document**
- **Geotechnical field work by William Lettis & Associates is performed under the MACTEC Quality Assurance Project Document**



Site Geotechnical Investigations Data Collection Objectives

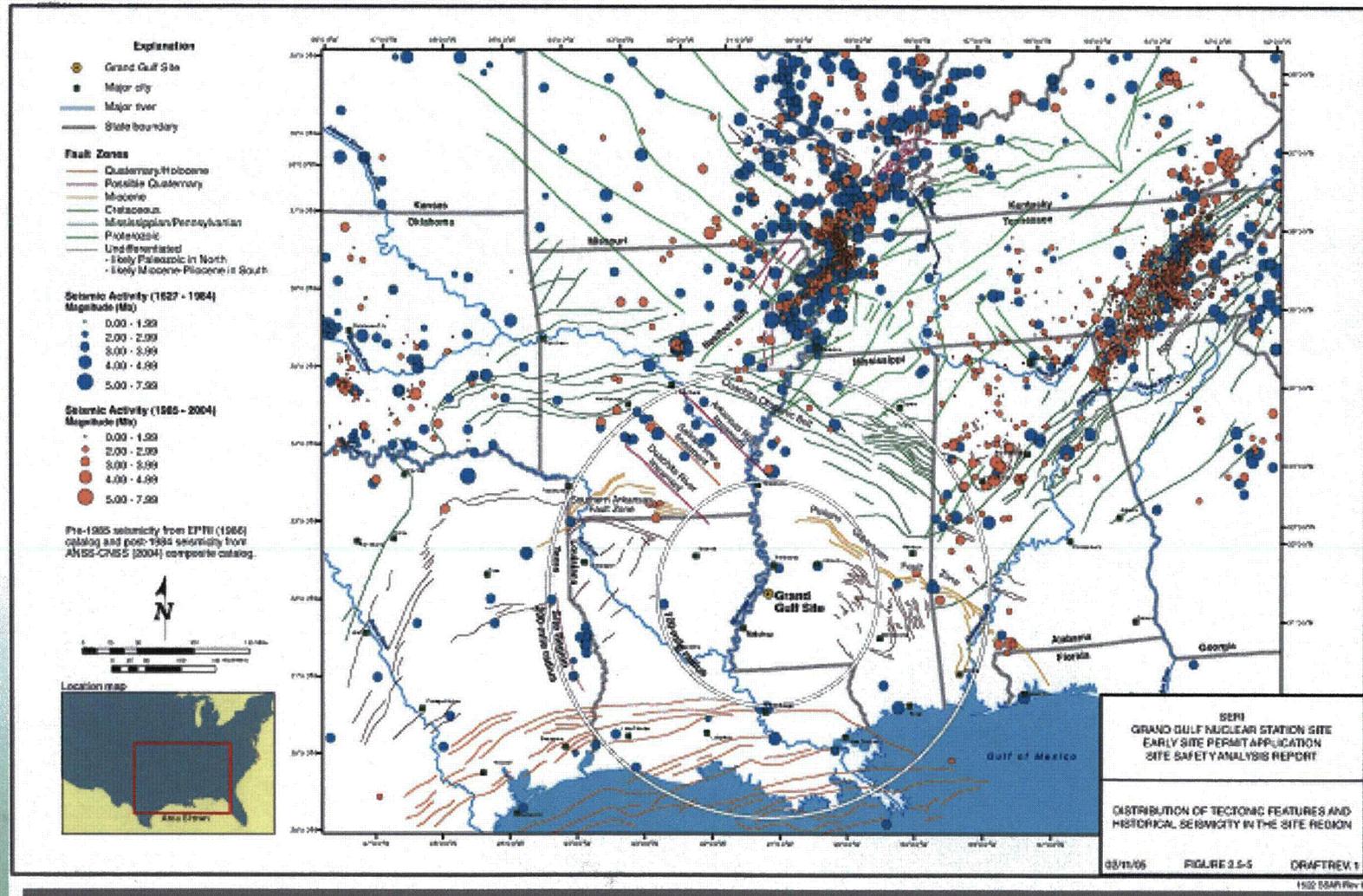
- **Confirm and demonstrate applicability of field data from previous limited exploration**
- **Obtain new data in safety related areas to meet**
 - Regulatory Guide 1.132
 - Vendor DCD requirement
 - ESP COL Action Items
- **Collect new data on certain non-safety related areas**



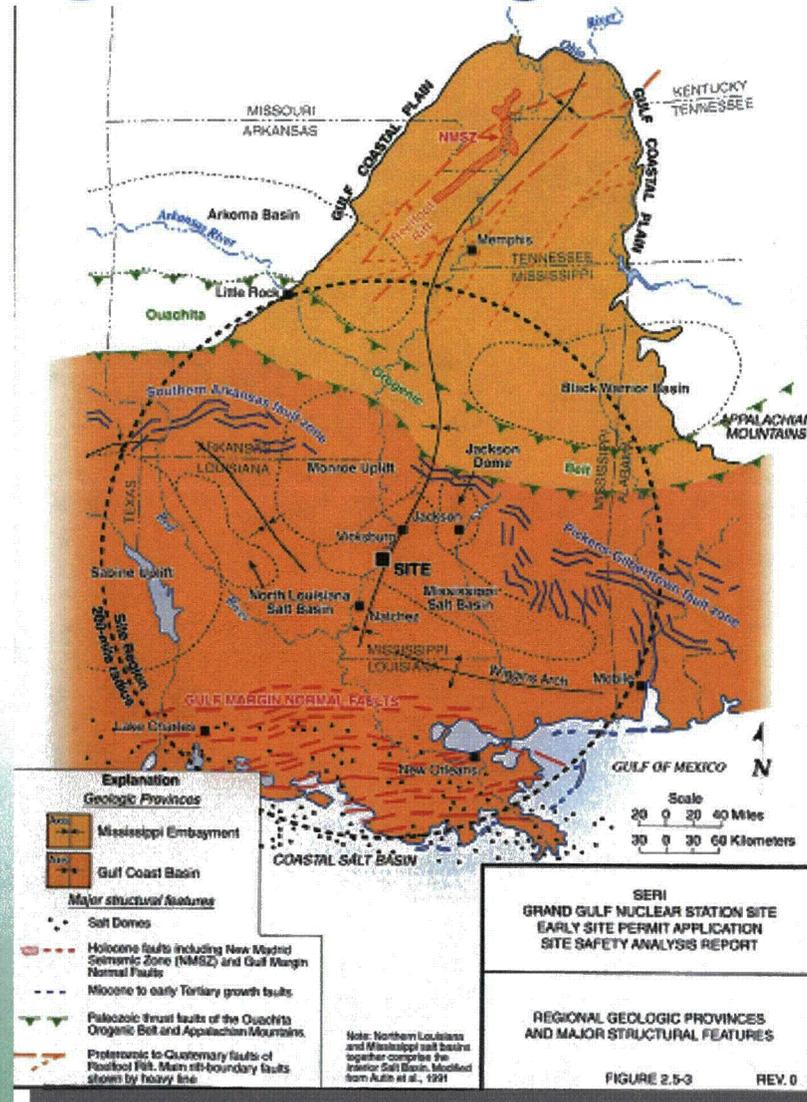
Geologic & Geotechnical Site Characterization Scope

- **Perform geological, geotechnical and geophysical exploration program to confirm and refine:**
 - site stratigraphy and groundwater conditions
 - static and dynamic soil properties
 - site geohazards and foundation conditions
- **Evaluate variability of site conditions and soil parameters**
- **Evaluate site suitability with respect to regulatory guidance and reactor vendor DCD**
- **Determine if site soil parameters within range of ESP site soil parameters**
- **Update, as required, site soil profile, site response, and SSE**
- **Characterize and mitigate possible seismic and/or geotechnical hazards**

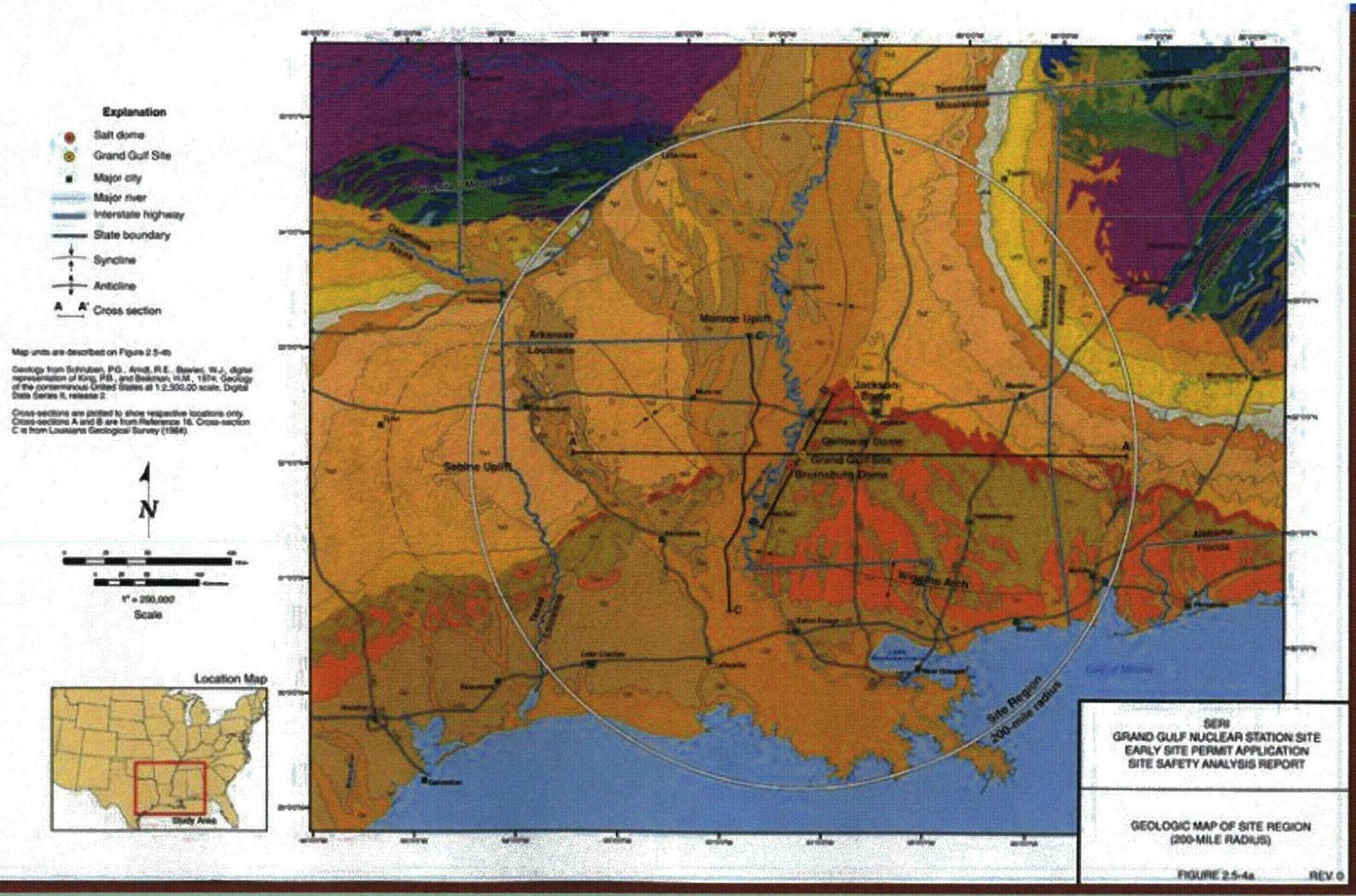
Tectonic Setting



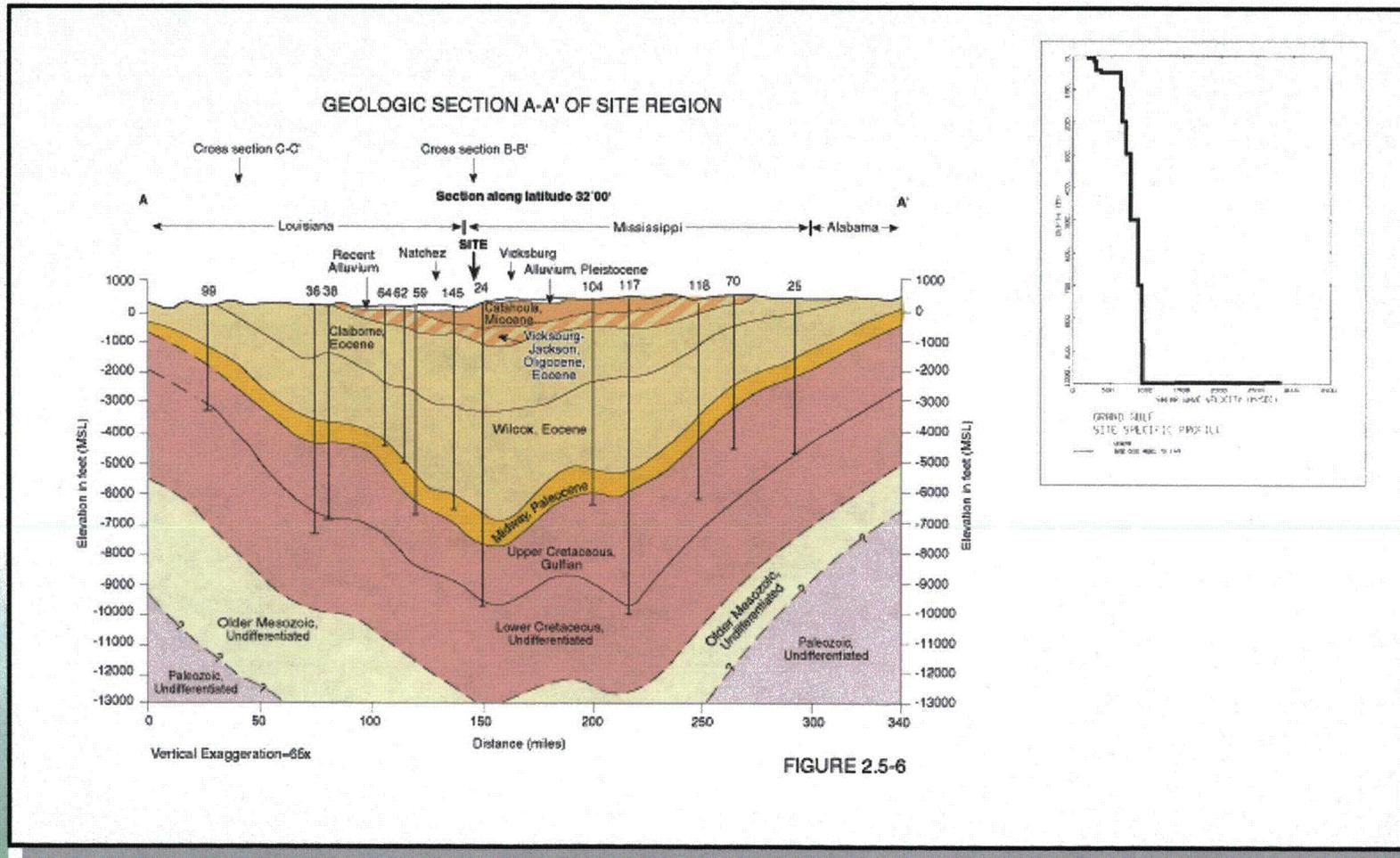
GGNS Regional Geological Setting



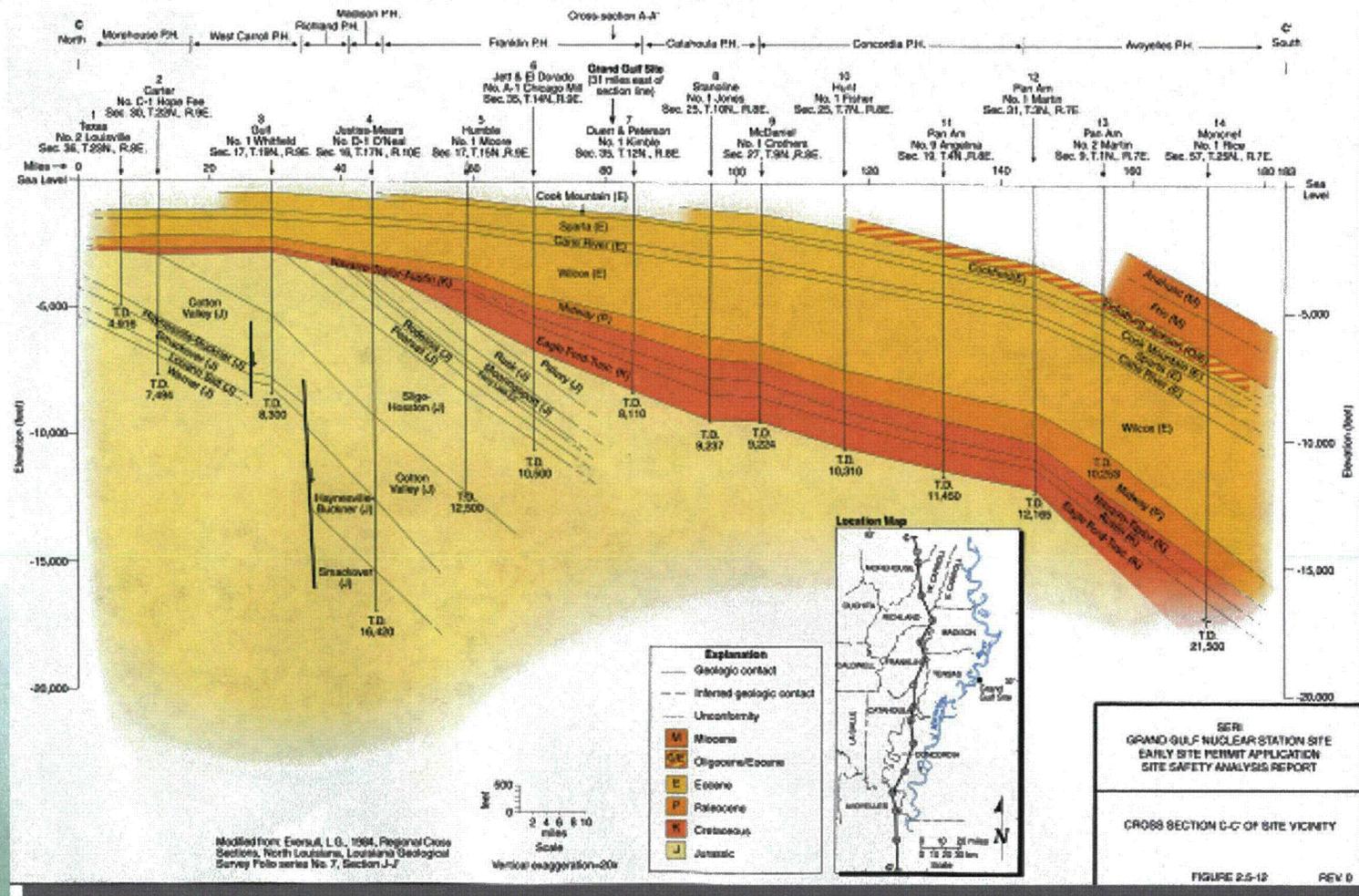
GGNS Regional Geological Setting



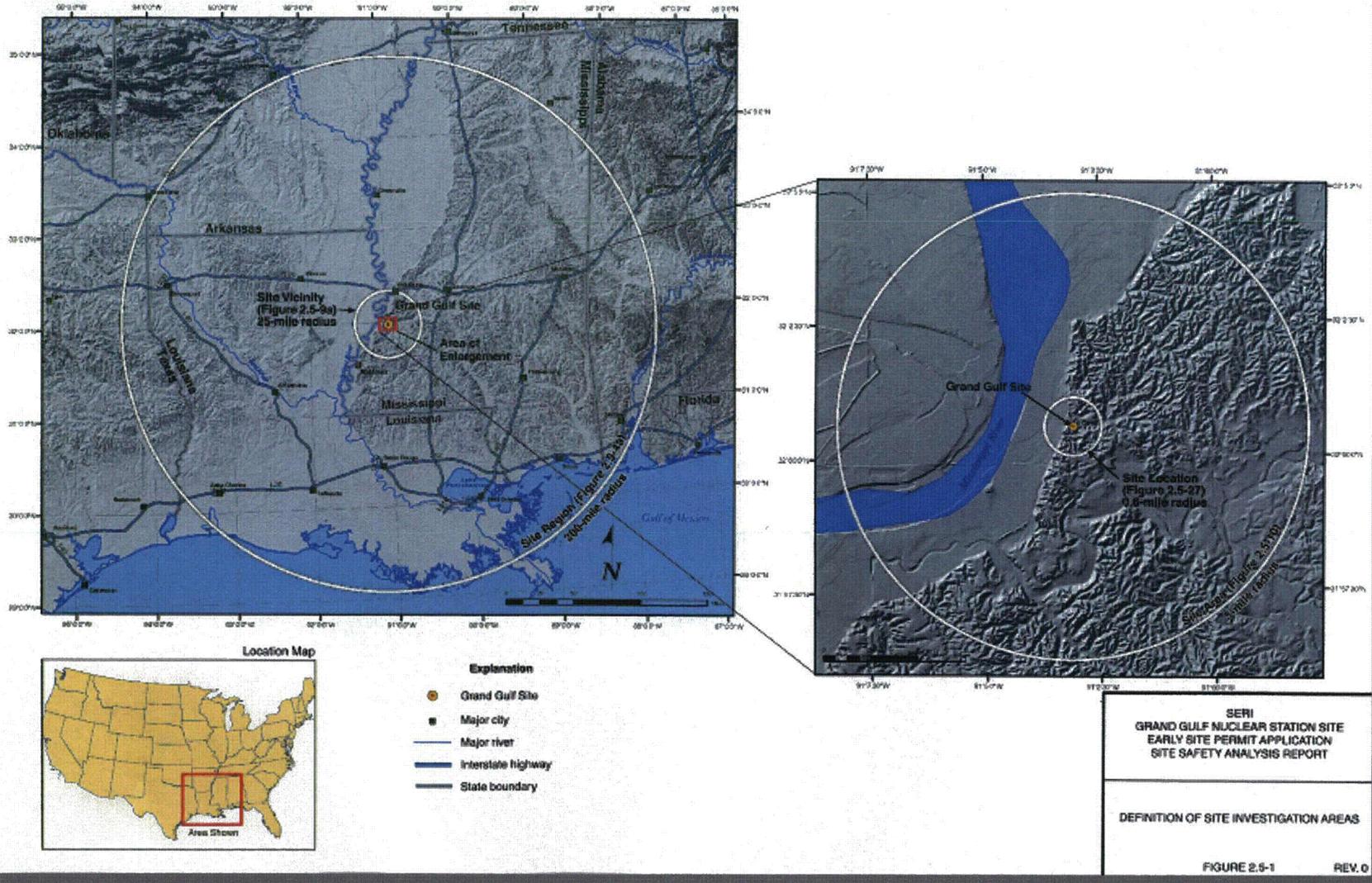
GGNS Regional Geological Section A-A'



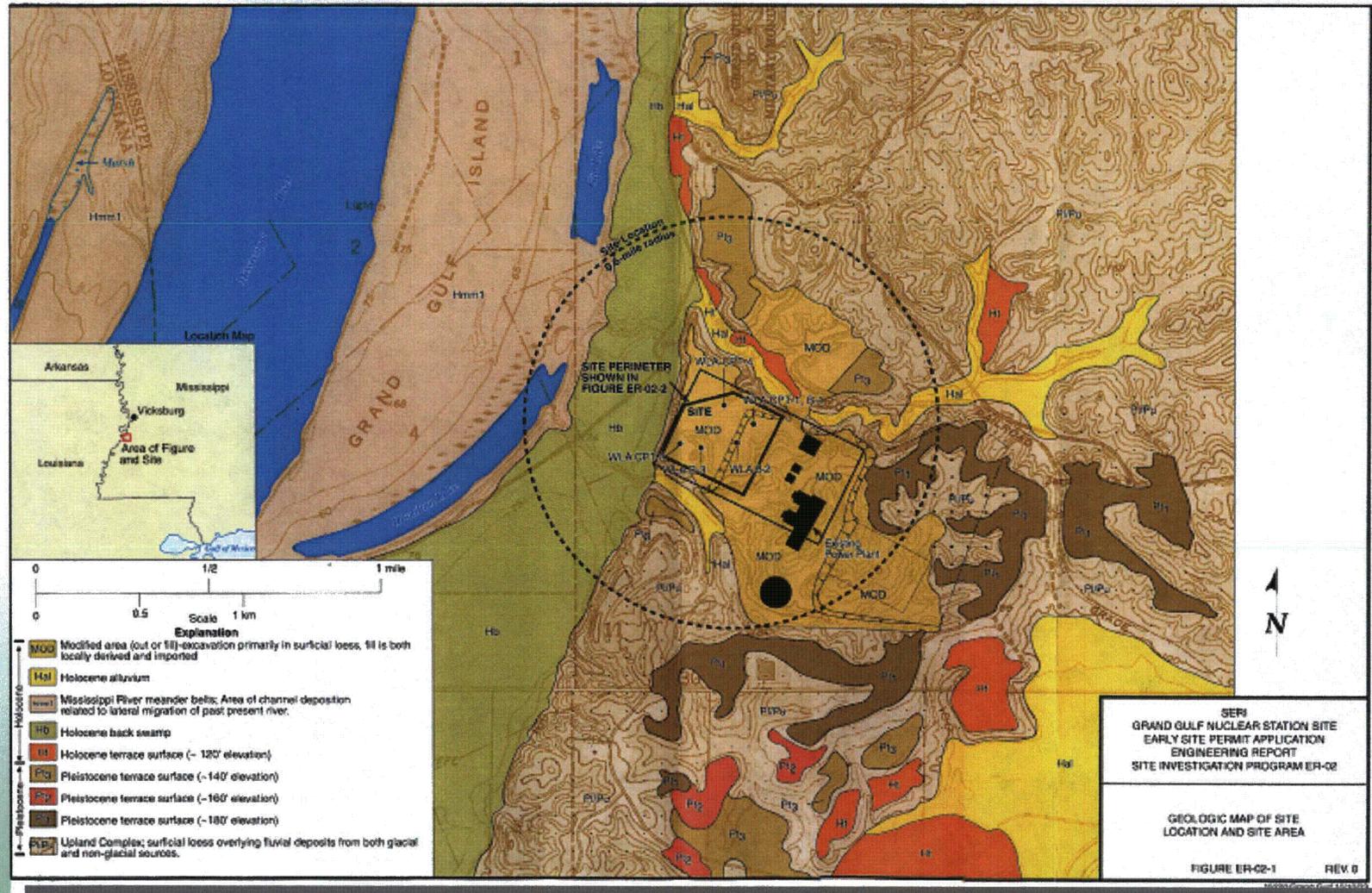
GGNS Regional Geological Section C-C'



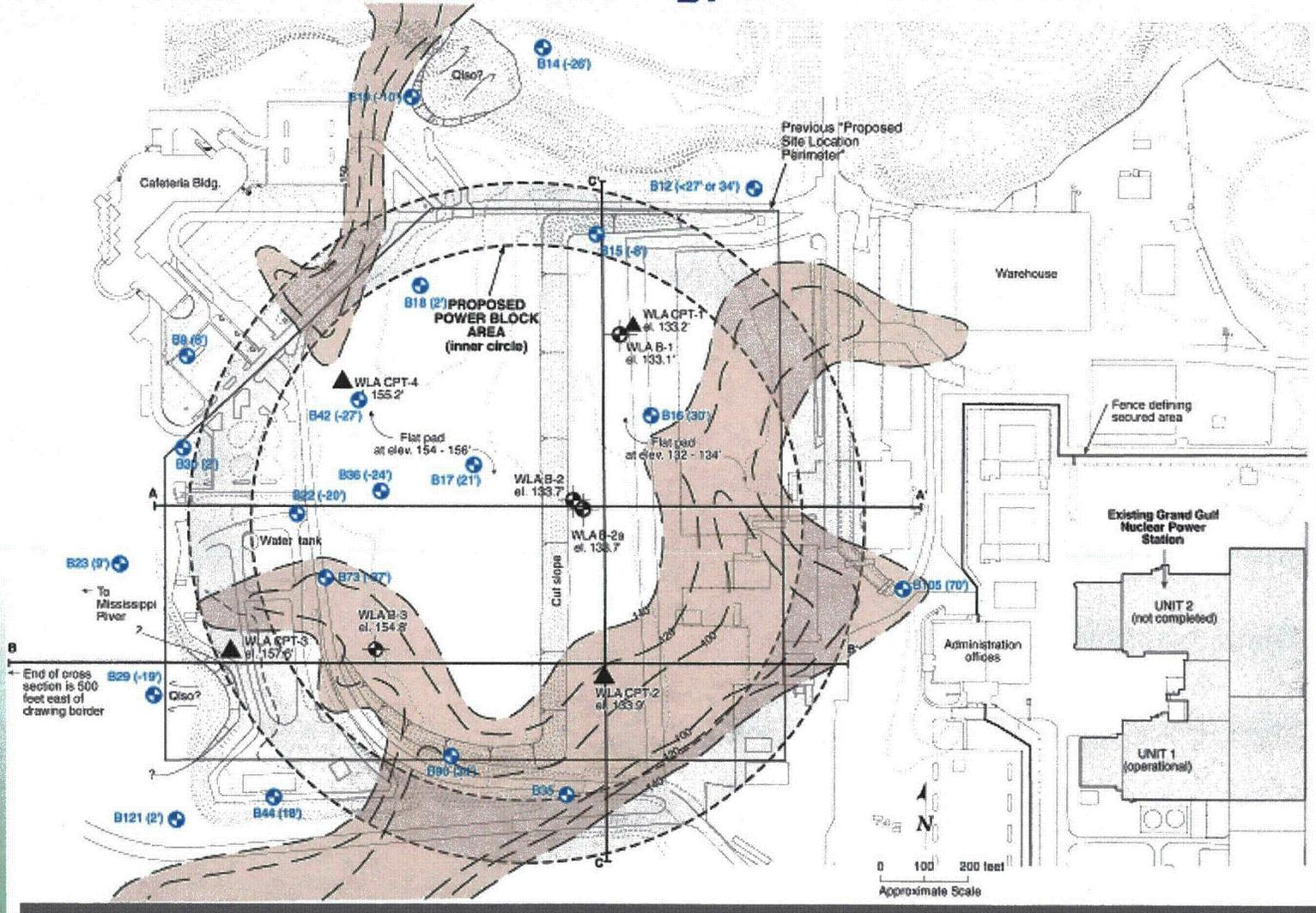
Grand Gulf Site Location



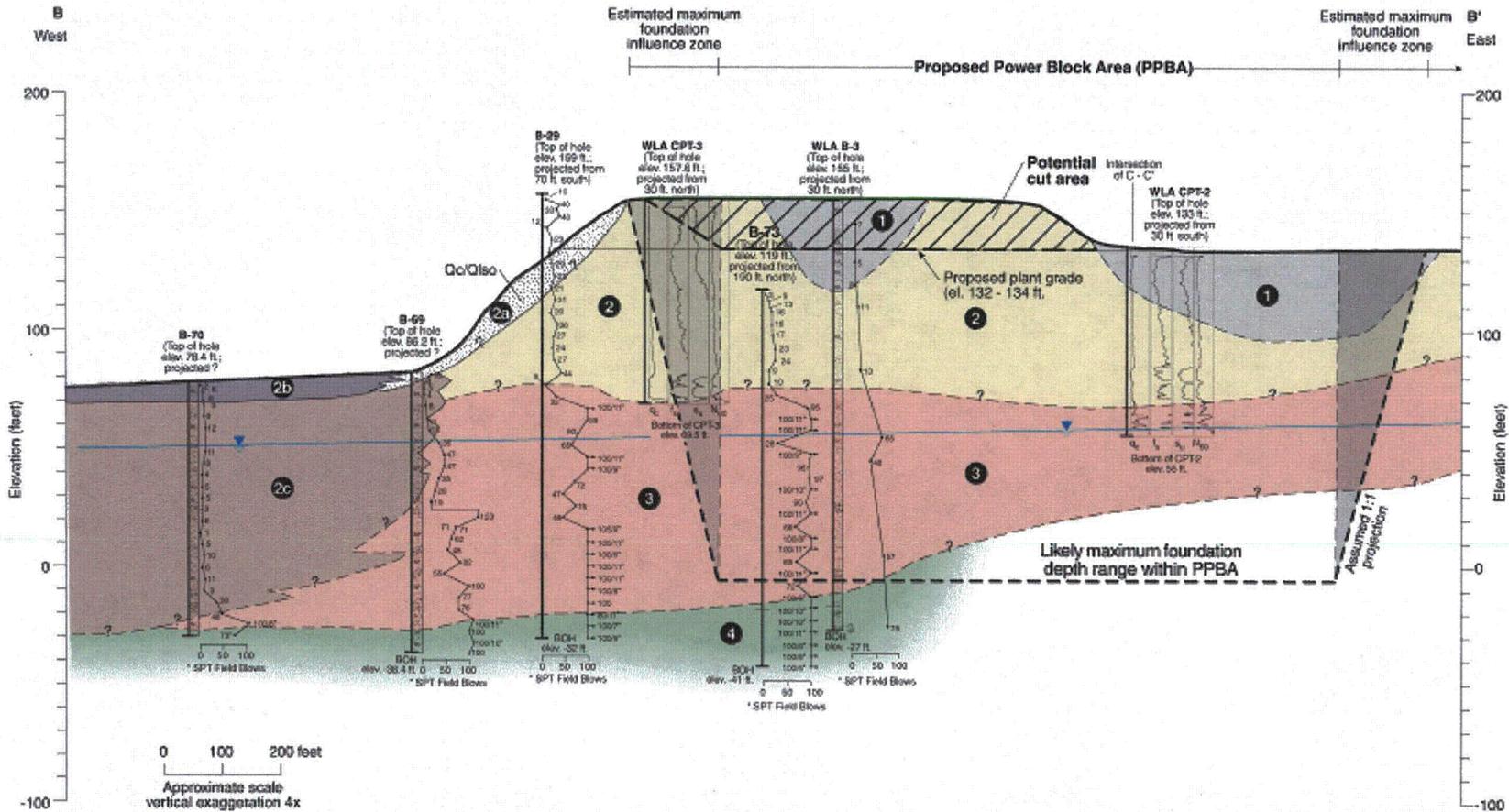
GGNS Geological Map of Site Area



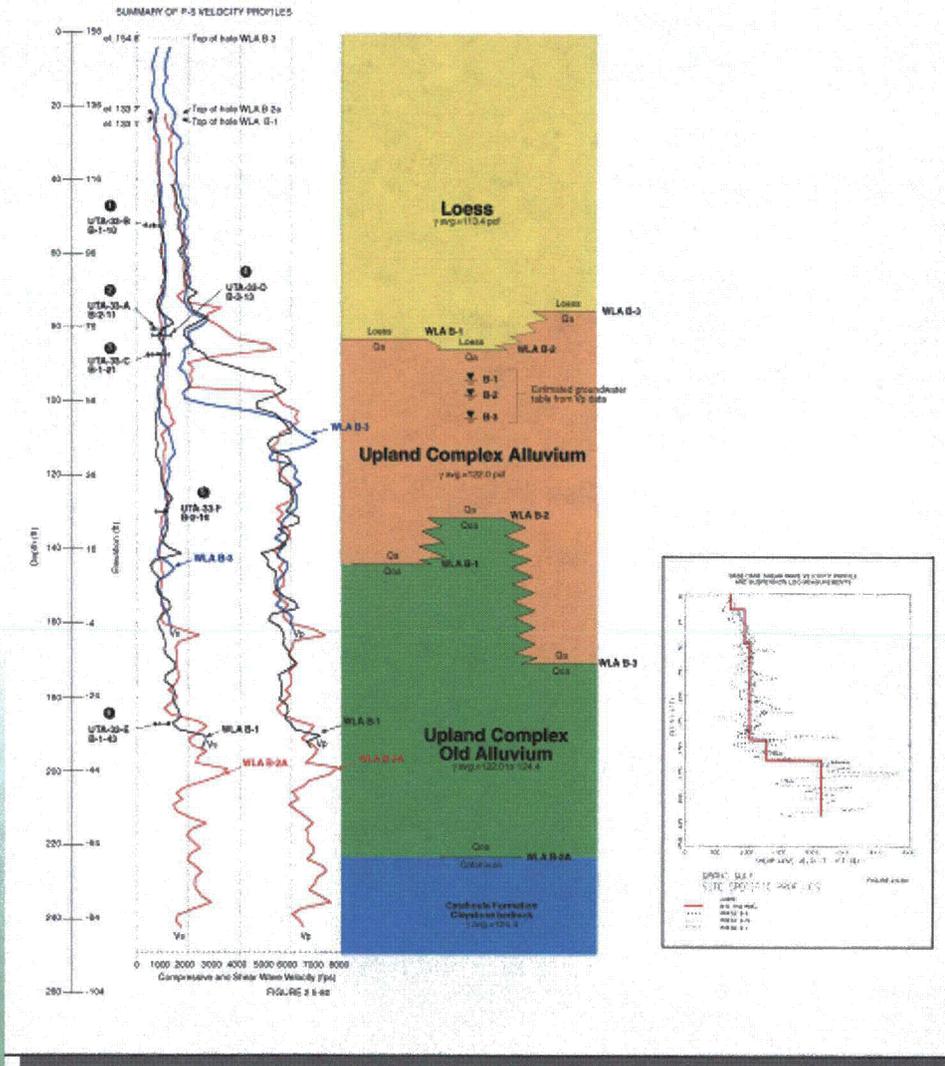
GGNS Unit 1 and ESP Boring/CPT Locations



Geologic Section B-B'



P-S Velocity Profile Summary

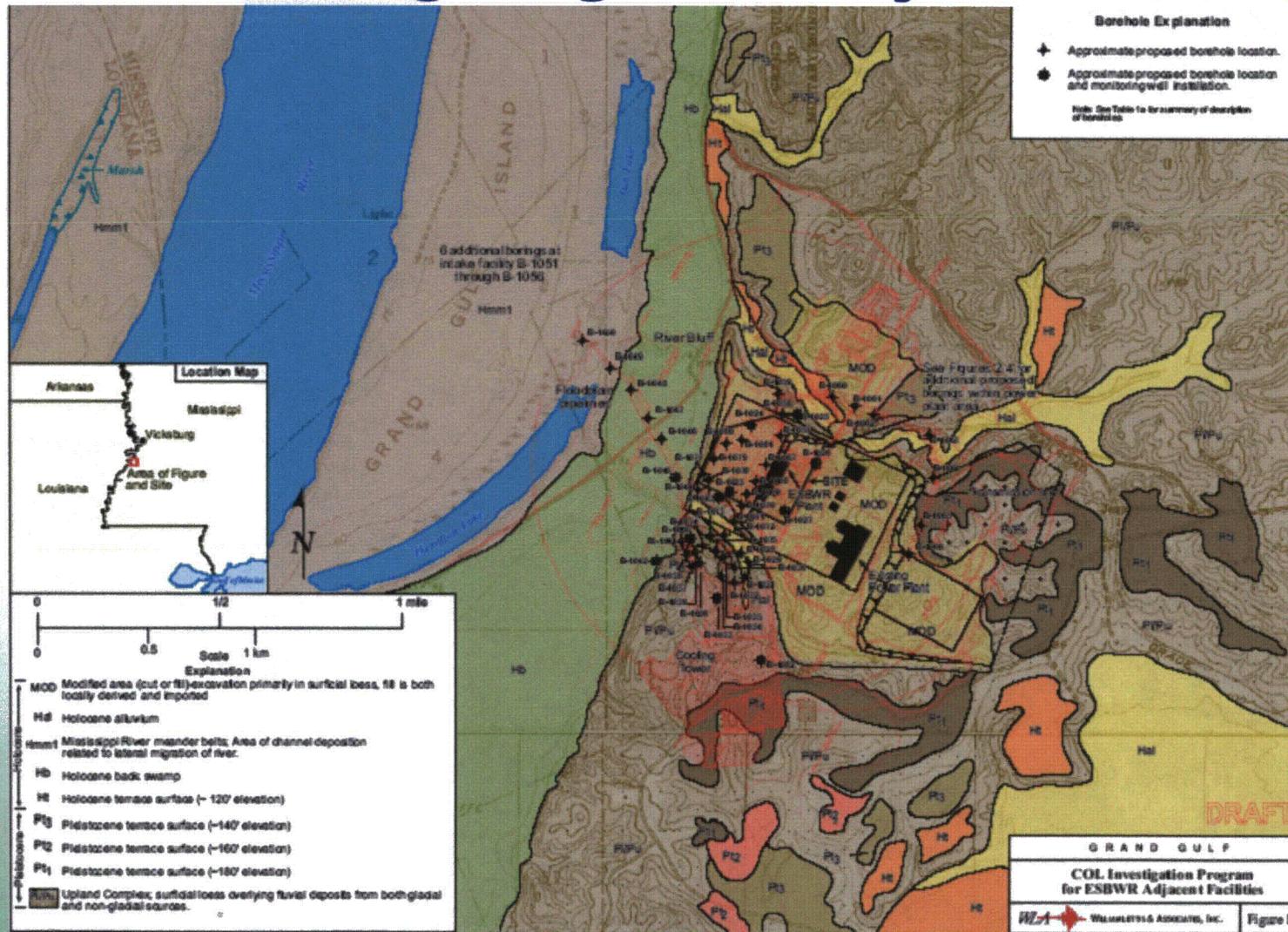




Geologic & Geotechnical Insights/Constraints

- **Positive evidence for no significant geologic hazards**
- **Extension of foundations below loess and upper alluvium will mitigate any possible hazards from seismically-induced ground failure, settlements, or slope failure**
- **Old alluvium and Catahoula Formation are resistant to settlement, and have provided good support for existing plant**
- **Groundwater dewatering/control procedures will be required**

ESBWR Boring Program – Adjacent Facilities



Field Exploration Methods

- **Standard Penetration Testing (SPT)**
- **Rock Coring (HQ sizes)**
- **Borehole Pressuremeter**
- **P-S velocity logging**
- **Borehole Accoustic Logging**
- **Spectral Analysis Of Surface Waves (SASW)**
- **Cone Penetration Test (CPT) Soundings**
- **Groundwater Monitoring Wells**
- **Geologic Mapping**
- **Test Pit Excavation and Mapping**

Lab Testing Program

GEOTECHNICAL INDEX

Moisture Content

Specific Gravity

X-Ray Diffraction/Mineralogy

Grain size Mechanical

Grain size

Atterberg Limits and Indices (soil)

Slaking Durability (core)

Organic Content

DYNAMIC

X-ray of UD Samples Prior to Shipping to Austin

Combined Resonant Column/Torsional Shear

Lab Testing Program (Cont'd)

GEOTECHNICAL STRENGTH

Petrographic Thin Section

Unconfined Compression (core)

Unconfined Compression with modulus (core)

Unit Weight (core)

Triaxial CU (3-point)

Triaxial SCUE (3-point) - Remolded

Direct Shear (3-point)

GEOTECHNICAL STRENGTH

Consolidation

Corrosion

Proctor

California Bearing Ratio (CBR) Test

Geotechnical Borehole Procedure

- **Work Instructions issued to drilling companies and Rig Geologists defining duties**
- **Boring Assignments for each borehole prepared by MACTEC Site Coordinator with Principal (WLA) review; Boring assignments specify:**
 - Boring location
 - Boring type
 - Boring depth
 - Required tests
 - Boring Completion
- **Rig Geologist directs Drill Crew to prepare and perform drilling per Boring Assignment**
- **Rig Geologist monitors drilling, describes samples, maintains field log**
- **Modifications to Boring Assignment instructions, if needed, reviewed and approved by Site Coordinator/Principal**
- **Samples transported to site storage facility at end of day**

Beginning of Day Activities

- **Daily group safety briefing at field office before leaving for assignment**
- **Rig Geologist (or Mapping Geologist) conducts morning crew safety meeting and inspection of equipment with operator**
- **Rig Geologist completes safety inspection checklist**
- **Review Boring Assignments for the day**

End of Day Activities

- **Return field records and all samples to the site storage facility**
- **Complete sample inventory forms and place samples into site storage facility**
- **Partially completed field records copied to assure data backup**
- **Completed originals remain in locked file cabinets until checked, duplicated for site file, and original record transported to secure file cabinet at MACTEC's Raleigh office**

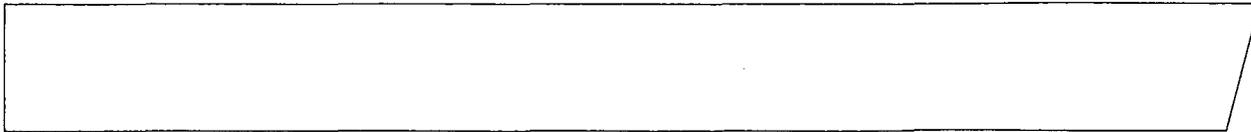
Data Transmittal

- **At appropriate intervals (generally at end of each 10-day shift), Site Coordinator prepares package of collected data and transmits or transports originals to secure file cabinet at MACTEC's Raleigh office**
- **Selected soil and rock specimens are transported under Chain of Custody to appropriate laboratory for testing**

Current Site Activities

- **Borings**
 - 27 of 120 borings completed or in progress*
- **Testing**
 - SASW Testing
 - Pressuremeter testing
 - P-S Velocity testing
 - Accoustic logging
- **Monitoring Wells**
 - 31 of 60 monitoring wells installed or in progress*

* Projected as of the date of this presentation



Q&A