SYNTHESIS STUDY of STATE DOTs and the UNITED KINGDOM GEOTECHNICAL DATA SYSTEMS

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Geohazards in Transportation
in the Appalachian Region

Columbus, Ohio
4 August 2004

GeoSyntec Consultants

DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

Synthesis Study of State DOTs and the United Kingdom… Geotechnical Data Systems

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Synthesis Study of State DOTs and the United Kingdom… Geotechnical Data Systems

- **Presentation Objectives**
  - Present results of study undertaken by Ohio DOT and FHWA to synthesize geotechnical management practices of state DOTs
  - Assess potential for development of a distributed database system for geotechnical and geologic information and adoption of system by state DOTs

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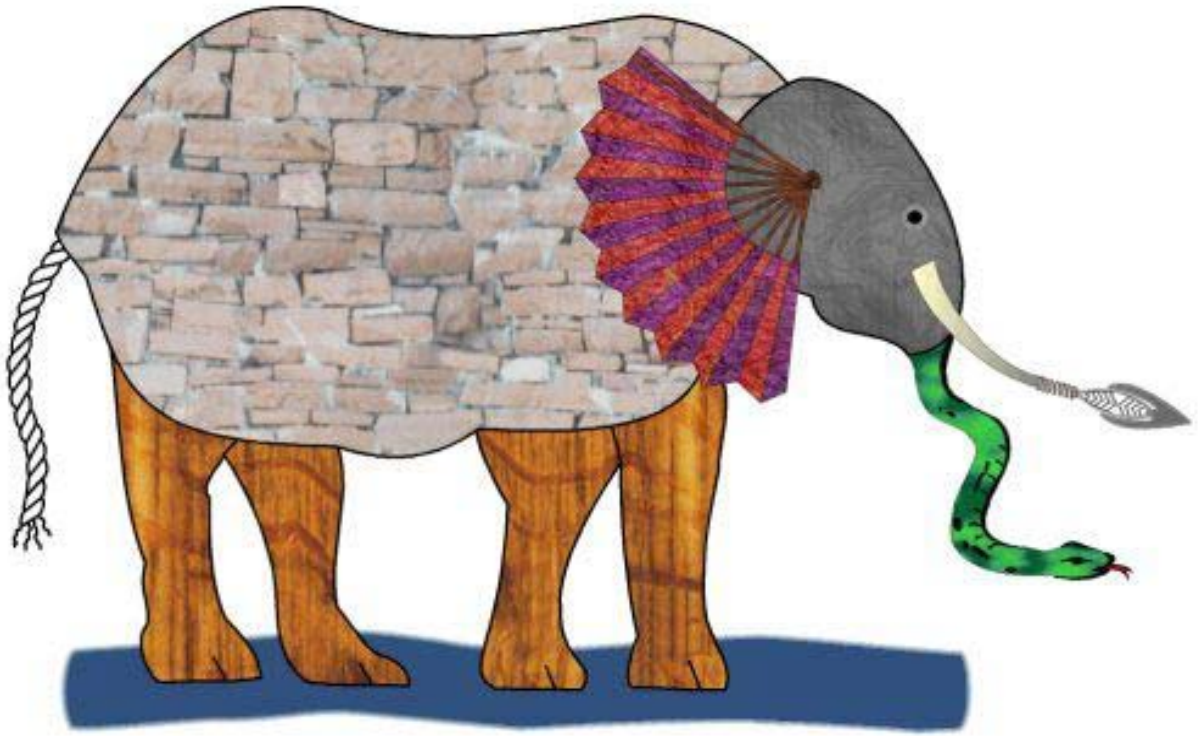
Geotechnical Management System Information Synthesis

- Project undertaken by Ohio DOT in collaboration with FHWA
- Objective of study was to synthesize relevant information regarding the Geotechnical Management System (GMS) that is used by each state DOT and by professionals in the United Kingdom (UK)
- Interviews with personnel from each state DOT involved with the development and/or implementation of the state's GMS

What is a Geotechnical Management System?



It is different things to different states!!

What is a Geotechnical Management System?

- Geotechnical borings, geologic hazards, project construction and performance information
- Bookcase, file cabinet, or box of geotechnical reports cataloged by project number, county, or highway designation
- Spreadsheet record of relevant project reports and data
- Scanned images of boring logs that accompany bridge inventory information
- Electronic records of borings logs and lab/field test results
- Web-based data dissemination of project and geotechnical information, including boring logs and lab/field testing results

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What is a Geotechnical Management System…and Why is This Important for State DOTs

- It is not one system that has been adopted across the agency
- Most states have developed “A” system that works for that state…for better or for worse
- Most states recognize the benefit of a true “data based” GMS, they recognize the existence of an enormous amount of geotechnical data, and they recognize financial and personnel obstacles to improve
- Most are interested in participating in a regional or national workshops to learn how others have found success when faced with similar constraints
- States recognize the valuable role that FHWA plays in helping with the development and implementation of a standard GMS'

Geotechnical Management System Information Synthesis

- **Impetus for the GMS Synthesis Project**
  - Ohio DOT Initiative – Ohio DOT wants to develop a comprehensive geotechnical management system for the state, but does not want to "reinvent the wheel"
  - FHWA Encouragement – FHWA sees benefits in developing and/or adopting a standardized system that has potential for use across the country
- **Prior FHWA and DOT Database Experience**
  - Automated Geotechnical Information and Design-Aid System (AGIDS)
  - National Geotechnical Experimentation Sites Database (NGES)
  - Statewide Bridge Maintenance Database (BIMS)
  - Anecdotal Reports Regarding DOT Experience

Geotechnical Management System Information Synthesis

- **Goals for the Synthesis Project**
  - Provide a comprehensive synthesis and summary of current DOT experience across the US and the UK
  - Identify states and/or other organizations who have developed similar data management systems
  - Identify capabilities of developed systems
  - Identify problems with development of current systems to aid new developers
  - Provide guidelines and recommendations regarding the development of a “standard” GMS format

Geotechnical Management System Information Synthesis

- **Develop and Conduct Contact Survey**
  - Obtain key contacts from Ohio DOT and FHWA
  - Develop interview form as Access database input form and interview at least one primary contact in each state to complete database
  - Include descriptions and examples of systems used by each state DOT
  - Identify other organizations/individuals within state for participation in synthesis study

Geotechnical Management System Information Synthesis

- **Relevant Information from Survey**
  - Who are primary contacts within state and how to contact them?
  - What are current geotechnical data management procedures within the state?
    - Types of information collected
    - Data management methodologies
    - Development costs and results
  - Goals for future developments within the state

Geotechnical Management System Information Synthesis

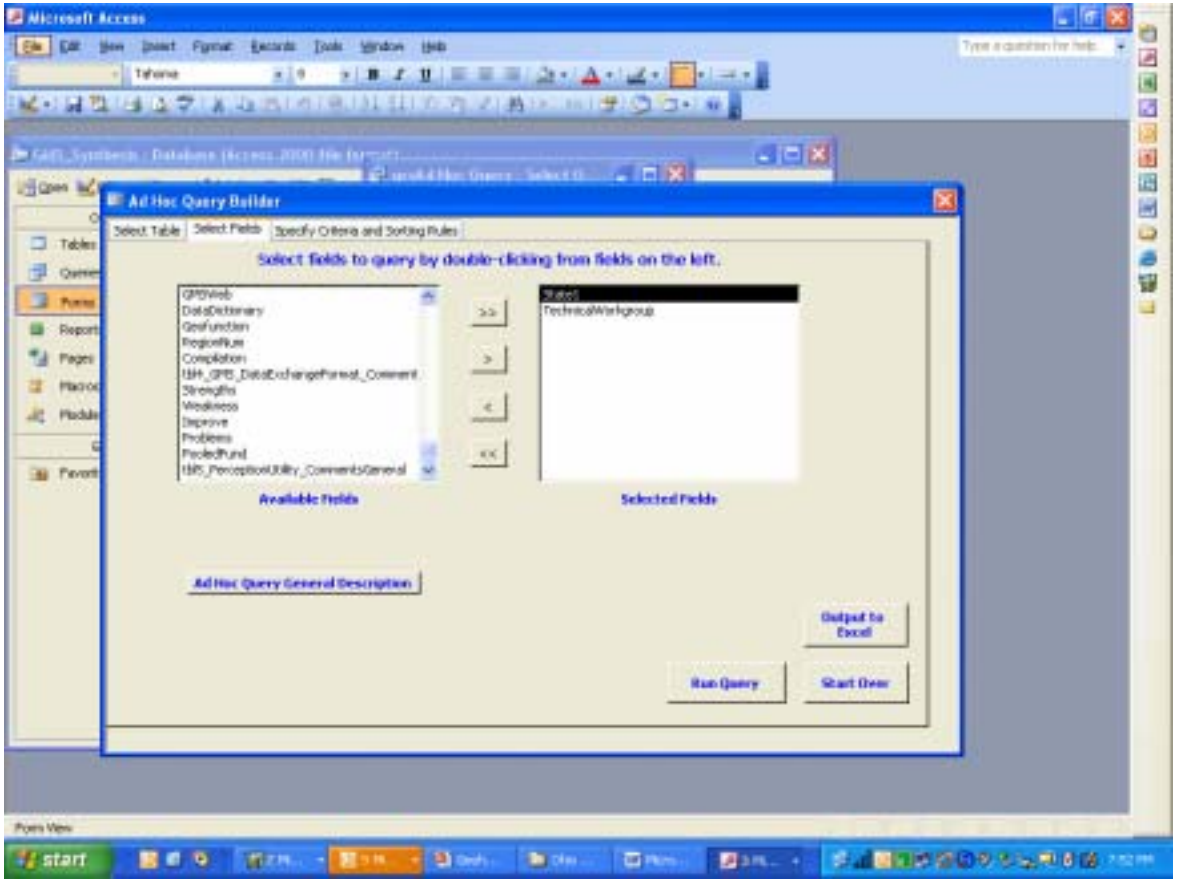
- **Who are the Primary Contacts and What Have They Done to Make the Activity a Success??**
  - Geotechnical or geologic professionals
  - Collaboration with IT/GIS personnel
  - Little interaction outside of state DOT
  - If a “champion” can be found, the state will likely have a “modern” system

Geotechnical Management System Information Synthesis

Types of Information Included in GMS

- Boring Logs
- Materials
- Lab Tests
- Instrumentation
- Pile Records/Tests
- Retaining Walls
- Geo Hazards
- Construction Records
- Geologic Maps
- R&D Projects
- Geophysics
- Filed Tests
- Borehole data
- Archived Data
- Geologic Rating
- Bridge Records
- Maintenance Records
- Photographs

Ad Hoc Query Builder



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Technical Workshop Participation

qryAd Hoc Query : Select Q...

State1	TechnicalWorkgroup
KY	Yes
MD	Yes
MA	Yes
NE	Yes
OR	Yes
SC	Yes
TX	Yes
WC	Yes
WV	Yes
WY	Yes
GA	Yes
DE	Yes
MI	Yes
MN	Yes
MO	Yes
NJ	Yes
PA	Yes
AK	Yes
AR	Yes
CT	Yes

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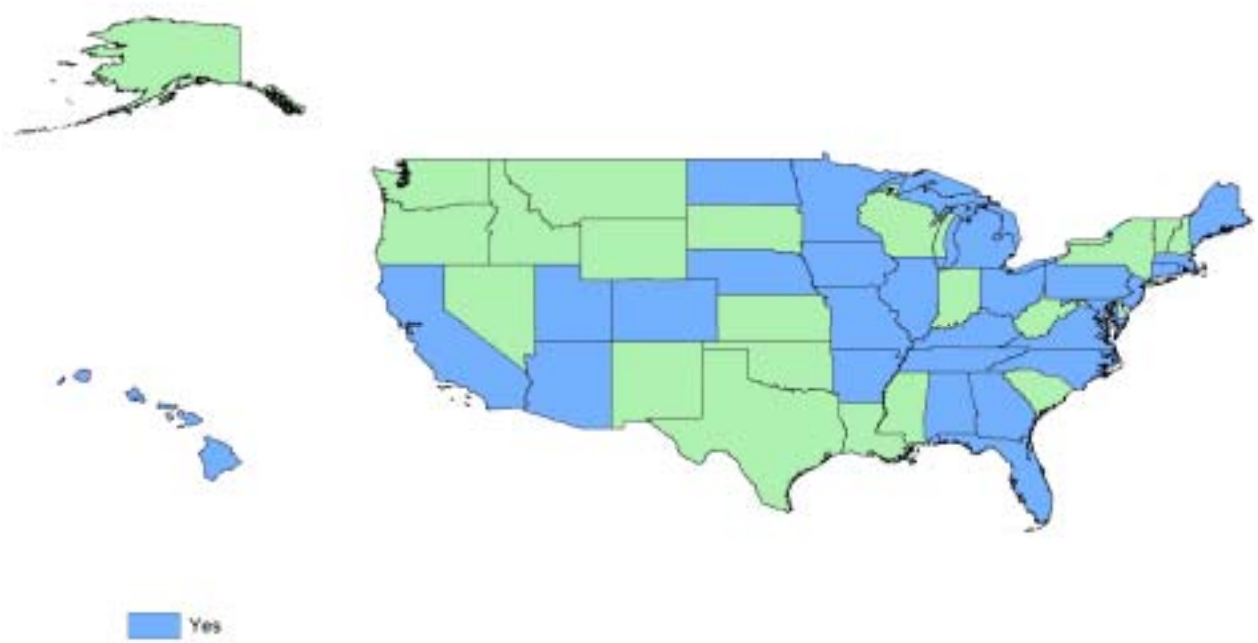
States with a GMS



Geotechnical Management System Information Synthesis

- **General Trend in Synthesis Results**
  - Only 50% have a GMS
  - Common:
    - focus on geotechnical reports
    - reports typically indexed
  - Limited:
    - laboratory testing records
    - borings logs (most scanned)
    - geologic hazards, rockfalls
  - Few:
    - electronic data, including logs
  - Fewer Yet:
    - web-based distribution

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Geotechnical Management System Information Synthesis

- **Data Management Methodologies**
  - Reports: predominantly paper copies
  - Boring Logs: hand, gINT, LogDraft, scan (24)
  - Lab: spreadsheets, text, some database
  - GIS: approximately (12) - station/offset
  - Database: Access (18), Oracle (12), SQL (1)
  - Integrated: Few (5)
  - Web-Based: Few (5)
  - Link to Applications beyond Logs: One (1)

Geotechnical Management System Information Synthesis

- **Development Costs**
  - Majority: cannot estimate - internal
  - Remainder: range from two summer interns to multi-year university study
  - Good news: Working systems have been consciously developed for <$50k

Geotechnical Management System Information Synthesis

- **Goals for future**
  - Collect geospatial information for GIS (30)
  - Manage information electronically (35)
  - Electronic boring logs (20)
  - Archived Data (5)
  - Integrate (4)

Geotechnical Management System Information Synthesis

- **Perceived Obstacles and Inconsistencies**
  - Limited recognition of the value of geotechnical “data”
  - Many agencies do not require consultants to deliver in standard format
  - Goal to use GIS but do not anticipate obtaining geospatial information beyond station and offset
  - Historical data integration seems insurmountable
  - States organizations vary from 100% to 10% internal….average approximately 50%
  - States that are decentralized do not have internal consistency
  - Some utilize university R&D funding vehicles that do not always seem to be focused on states needs

Geotechnical Management System Information Synthesis

- **Benefits**
  - Improvement: Almost near unanimous recognition that a better system, based on electronic information, is needed
  - Leverage: Many states have developed strong relationships with in-house IT and GIS personnel
  - Resources: Most are resourceful and can do more with less
  - Existing Systems: Several states have systems that are recognized by their peers as being laudable
  - Communication: In general, fairly good communication among states...particularly at a regional level
  - FHWA: Recognition that FHWA has historically addressed issues that are applicable to all states

Geotechnical Management System Information Synthesis

- **Obstacles/Challenges**
  - Improvement: A little electronic information is good… will more be perceived as simply ”too much”
  - Leverage: With strong internal IT and GIS relationships, we now have to encourage the support of others, specifically non-geotechnical specialists
  - Resources: Resourceful people take a “standard” and make it work for them, thus making it non-standard
  - Existing Systems: Several states have existing systems that are functional…why change
  - Communication: In general, fairly good communication at the regional level…work into an asset and not allow a mob-mentality
  - FHWA: Recognition that FHWA may unconsciously take on yet another national initiative

Geotechnical Management System Information Synthesis

- **Experience in UK**
  - Well developed and adopted system is available...and has been for more than 10 years
  - Association of Geotechnical and Geoenvironmental Specialists (AGS) has a working committee dedicated to the development and implementation
  - Well-developed system, rules, and guidelines are a reality and are the de facto standard in the UK
  - System could be “adopted” essentially in its current form...but it has not been!

Geotechnical Management System Information Synthesis

- **Experience with other US Groups**
  - Other agencies...USACE, USGS, etc.... have developed or are currently considering data management systems...we will here more about this later this morning
  - Consortium of Strong Motion Observation Systems (COSMOS) has developed a “standard” system and developed techniques for wide-scale distribution via the Geotechnical Virtual Data Center (GVDC)
  - Interest is high, but each system is somewhat independent in terms of development and implementation

Potential for Standardized Geotechnical Database System

- **Biggest Benefits**
  - It Works: Experience on project- and agency-specific levels indicates that these type systems can work efficiently and effectively if they are adopted
  - Demonstration: An active demonstration of a working system should be sufficient to convince our peers of the applicability
  - Standardization: Standardization is needed and will encourage development of “standard” software
  - Field of Dreams: Once adopted, it is easy to see that the concept will become a self-fulfilling prophecy...if you build it, they will come

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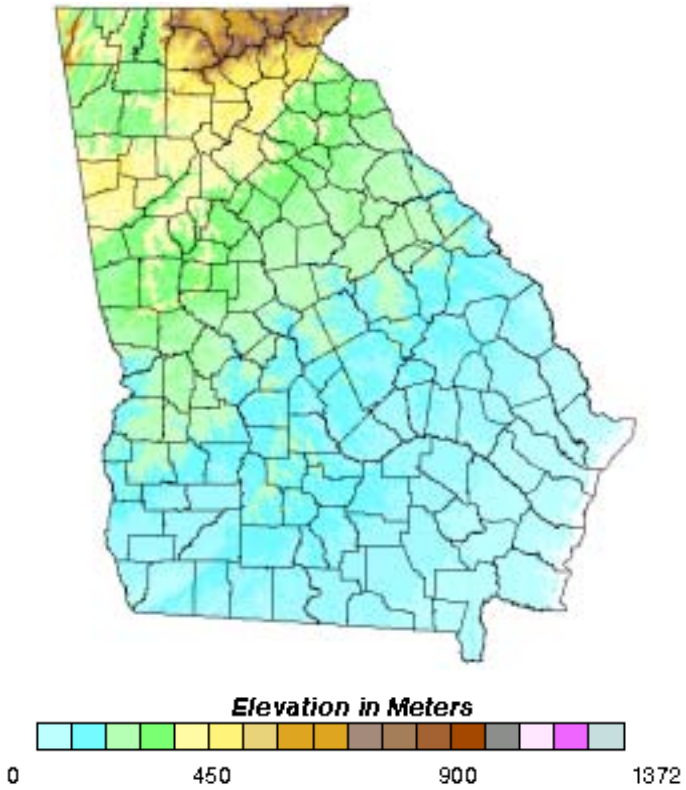
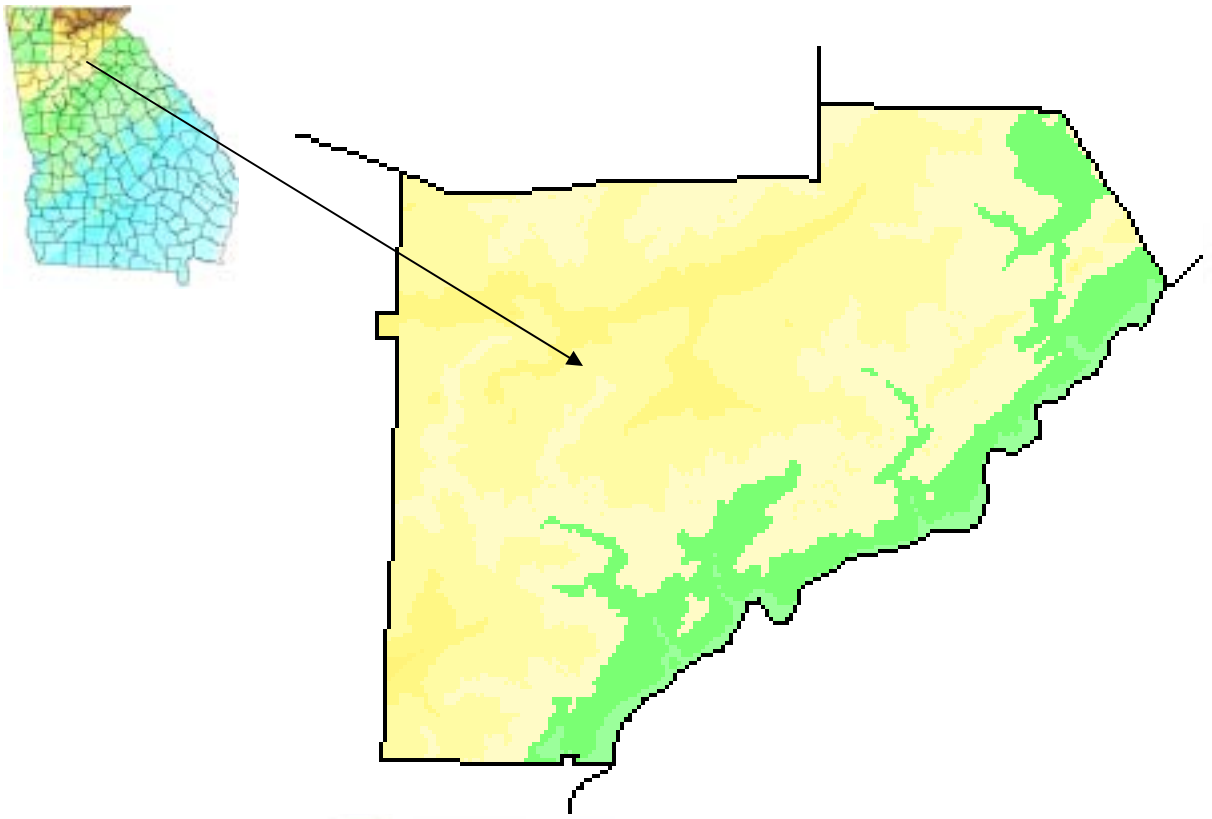
Statewide Geotechnical Database

START BY USE OF THE STATE MAP



Follow Up With Focus On Target Area



Identification of Current and Historic Projects

Potential Reference Themes:

Project Sites

Current Data Locations

Historic Data Locations

Historic Problem Areas

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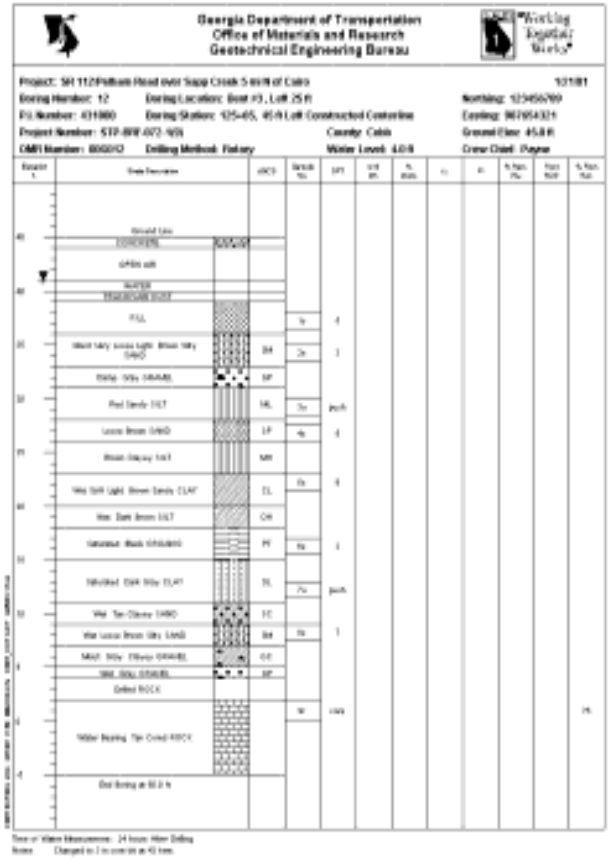
Demonstration of a Working GMS

Attributes

County:	Douglas
Date:	1970
Location:	Intersection of I-20 and Hwy. 82
Number of Borings:	4
Type of Borings:	Geotechnical
Approximate Depth:	100 feet
Comments:	High water table encountered

Boring Log



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Potential for Standardized Geotechnical Database System

- **Biggest Obstacles**
  - Standards: Need to be able to truly sell the benefits of a standard system. We should provide limited cafeteria options
  - Existing Systems: Each state has developed a system for managing data. Can we integrate these efforts
  - Data: Few states manage and use information as data. Concepts of data management will be foreign to many and training is needed
  - Resources: We have to find a way to make the system work with existing resources and recognizing costs

Potential for Standardized Geotechnical Database System

- **Suggestions**
  - Document Management: Develop a system that provides, at a minimum, a document filing and retrieval system...this is most common technique used by agencies
  - Incremental "Buy-In": Can the standardized system be implemented "incrementally" to control costs and resources...this also maximizes potential for developing "grass roots" support
  - Training: Training seems an essential component...this may be a key role for FHWA
  - Information Dissemination: Utilize network of regional DOT conferences (like the conference today) to promote, encourage, and implement. This is a critical role for the state DOTs and for FHWA. The synthesis database is hopefully a "living" document.

Potential for Standardized Geotechnical Database System

- **Suggestions**
  - Listen: Need to listen to states and understand challenges...you will have a tendency to develop a system you...not the client...prefer
  - Start Small: Look for opportunity on large mega-projects
  - Start Focused: Identify the local champion and encourage integration/collaboration within the agency
  - Integration: Each state has developed some type of system for data management. We need to think about approaches that are flexible enough to capture their existing data
  - Consultants: Consultants can prove to be our own worst enemy and they must similarly be shown the benefits of the standard system

Potential for Standardized Geotechnical Database System

Where do we go from here?

Do you have suggestions or input?

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