Development of a National Geotechnical Data Management System for Transportation Applications

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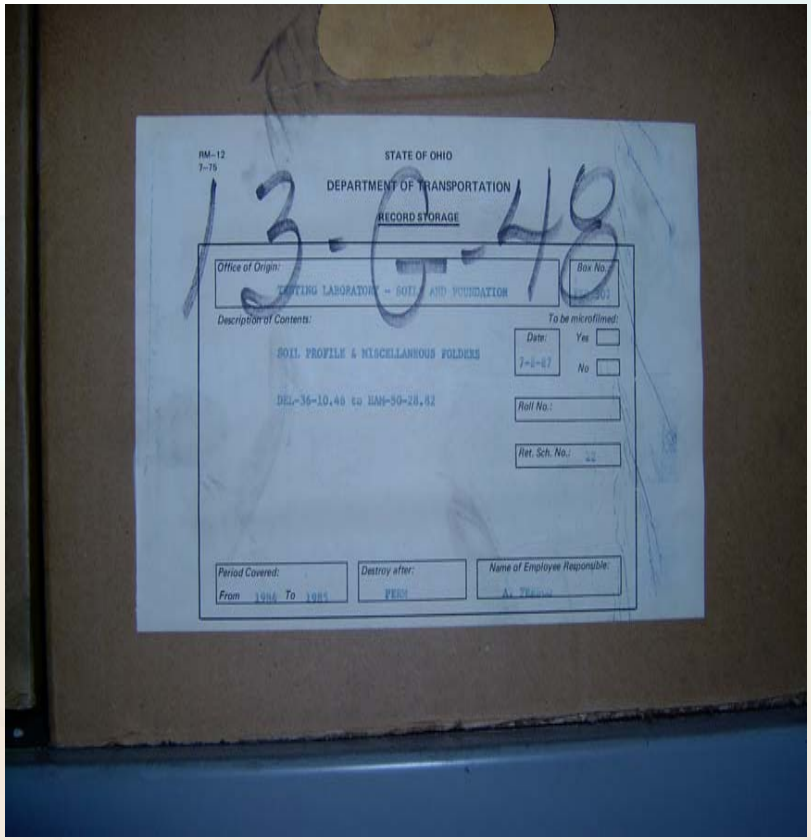
Past and Future

- **Past:**
  - **Paper management of data - fragmented, time consuming and expensive**
  - **Manual information manipulation and analysis**
- **Future:**
  - **Seamless electronic data transfer and management system - efficient, fast and economical**
  - **Unlimited electronic data manipulation and analysis**

$1/2 billion in assets

Accessing $1/2 billion in assets



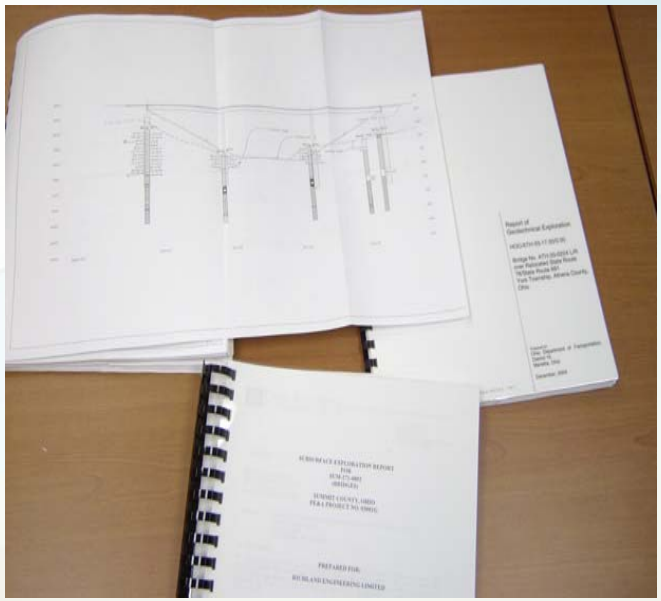
20-30 person hours per week to retrieve information

Protecting $1/2 billion in assets

Benefits

- 10-20% less drilling
- $12-24 million savings

90% of new projects



$52 million per year

Benefits of Electronic Data Management Using Standards

- Efficient storage and retrieval of data.
- Cost & time savings
- Quality designs
- Ability to be proactive
- Informed decision making
- Information sharing
- Etc.

Management System Basic Elements

- Data
  - **Investigation**
  - **Testing**
  - **Monitoring**
  - **Construction**
- Assets
  - **Inventory**
  - **Evaluation & Condition**
- GeoHazards
  - **Inventory**
  - **Risk Assessment**

Pooled Fund Project TPF-5(111)

Objectives

- Combine existing geotechnical data transfer standards
- Expand to include other data (i.e. geohazards, geotechnical assets)

Project Deliverables

- Data Dictionary
- Electronic data structure for data
- Electronic data structure for the metadata
- Allow local extensions and customizations

Collaboration Meeting

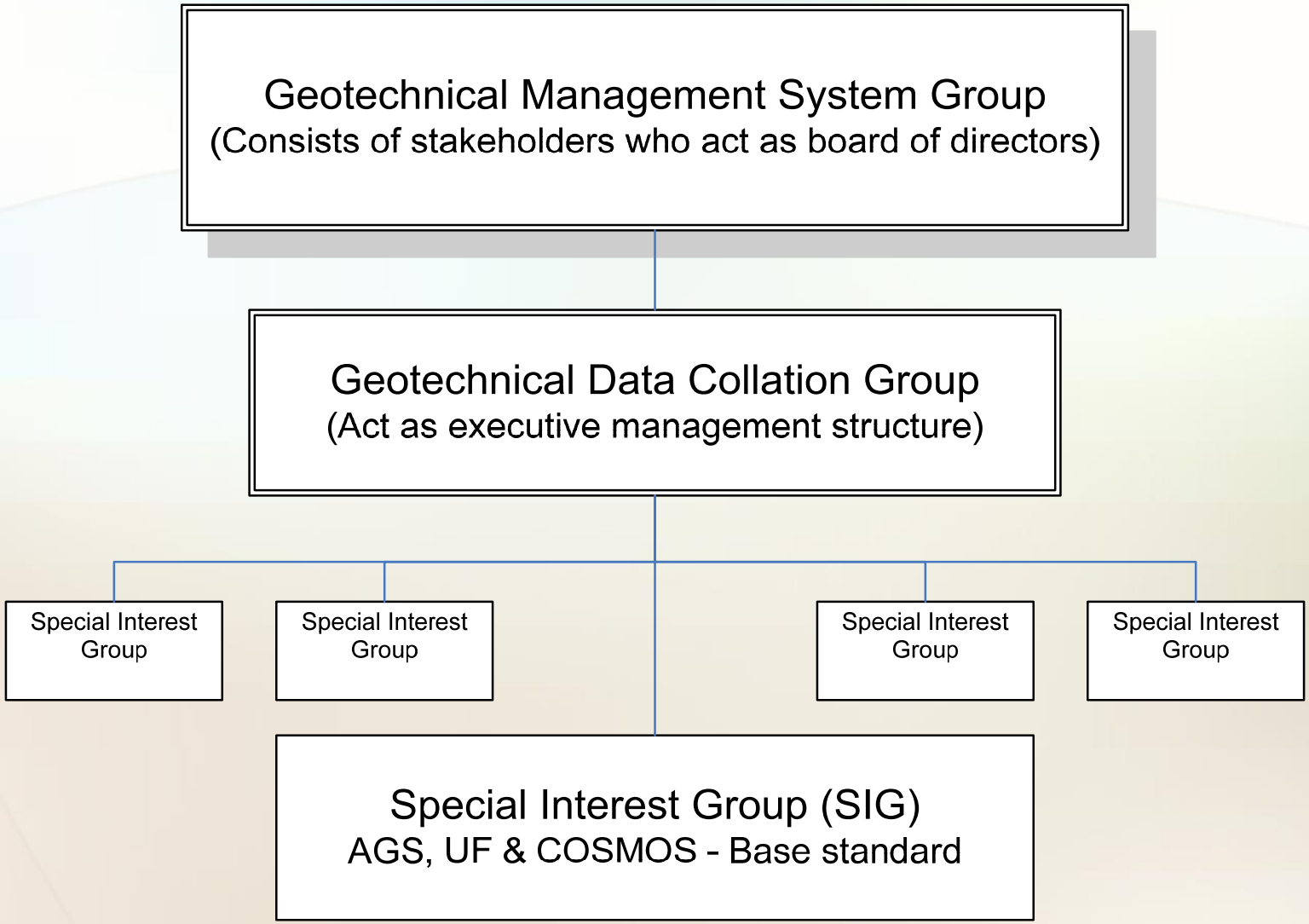
Agreed to combine existing standards


DiGGS
DATA INTERCHANGE FOR GEOTECHNICAL
AND GEOENVIRONMENTAL SPECIALISTS

Benefits of DIGGS

- **GML Compatible**
  - **International GIS standard compatible with mapping software**
- **Extensible**
  - **Has built in methods for local additions**
  - **Allows profiles (local definitions of acceptable portions of standards – but sharable)**

Organization



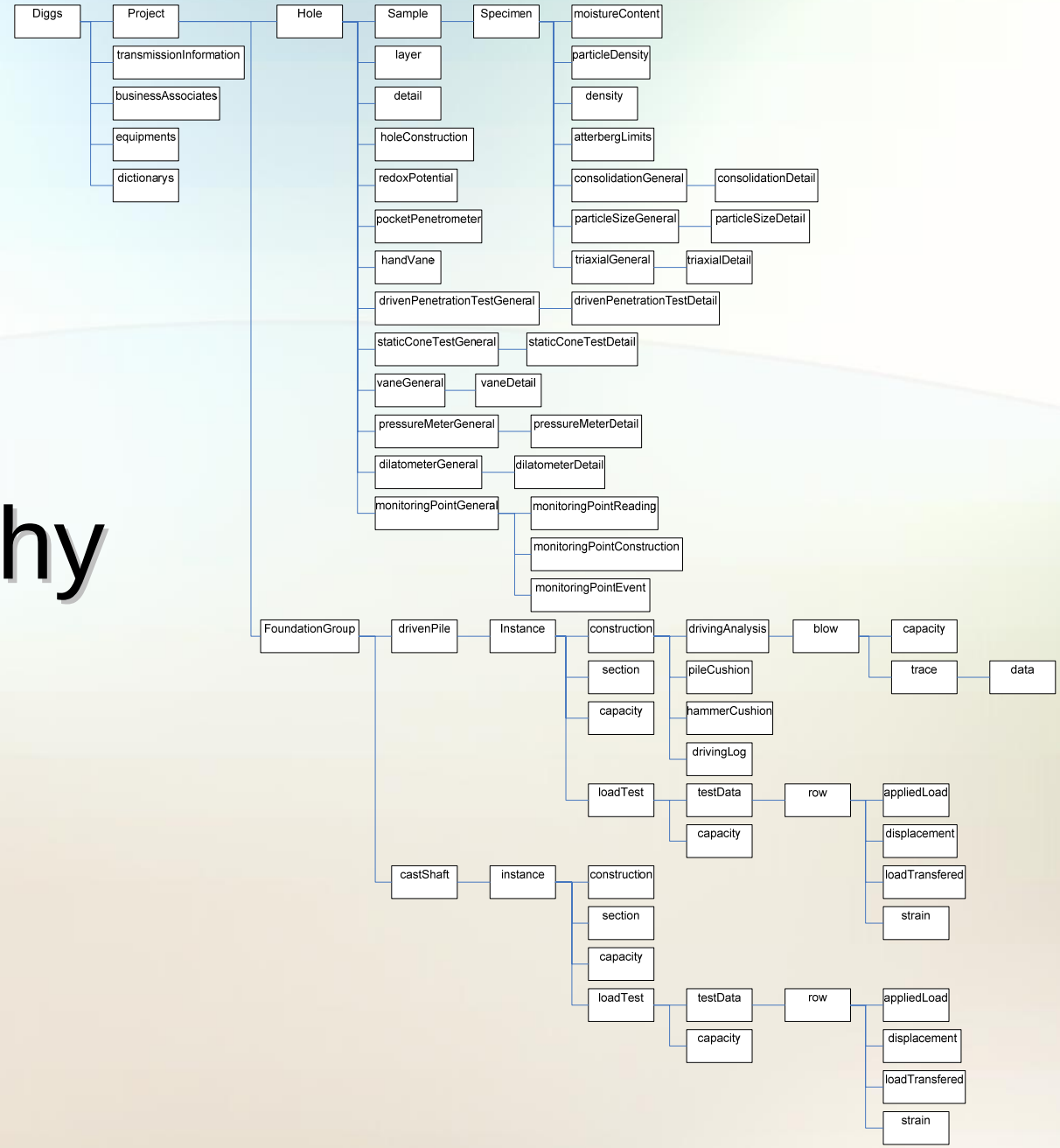
GMS Group Members

- California DOT
- Connecticut DOT
- Florida DOT
- Georgia DOT
- Indiana DOT
- Kansas DOT
- Kentucky DOT
- Minnesota DOT
- Missouri DOT
- North Carolina
- Ohio DOT
- Tennessee DOT
- FHWA
- FHWA Federal Lands
- United Kingdom Highway Agency
- US Army Corps of Engineers
- USEPA
- USGS

Geotechnical Data Coalition Members

- University of Florida
- Consortium of Organizations for Strong Motion Observation Systems (COSMOS)
- Association of Geotechnical and Geoenvironmental Specialists (AGS)
- Construction Industry Research and Information Association (CIRIA)
- FHWA
- Ohio DOT
- Special Interest Group Managers

DIGGS Hierarchy



Macro Data Structure

Hole

Sample

Specimen

Atterberg

Limit

MoistureContent

ParticleDensity

Static Cone

Monitoring Point

Monitoring Data

Layer

Detail

FractureSpacing

Hole – Geometry

- **Multiple ways to define a hole**
  - **Point, line, inclined, multi-point line**

```
Hole> <-- Vertical hole example
        <geometry>
                <gml:LineString srsName="urn:espg:crs:4326">
                        <gml:pos>125000 130000 255</gml:pos>
                        <gml:pos>125000 130000 200</gml:pos>
                </gml:LineString>
        </geometry>
</Hole>
<Hole> <--Inclined Hole Example
        <geometry>
                <gml:LineString srsName="urn:espg:crs:4326">
                        <gml:pos>125000 130000 255</gml:pos>
                        <gml:pos>125000 132000 200</gml:pos>
                </gml:LineString>
        </geometry>
</Hole>
```

Samples, Cores and Specimens

```
<sample gml:id="bf6615a0-6a74-11da-8cd6-0800200c9a66">
        <gml:name codeSpace="keylab1">12345678452</gml:name>
        <depthTop uom="m">1.00</depthTop>
        <type>B</type>
        <reference>1</reference>
        <specimen> ← tests are preformed on a specimen
                <gml:name codeSpace="keylab1">12345678452</gml:name>
                <depthTop>1.00</depthTop>
                <depthBase>1.00</depthBase>
                <description>Soft brown Clay</description>
                <reference>23</reference>
                <remarks/>
                <subsamplingMethod></subsamplingMethod>
                <roles/>
                <description>-</description>
        </specimen>
</sample>
```

Complete Layer Definition

```
<layer>
        <depthTop>0.00</depthTop>
        <depthBase>3.45</depthBase>
        <description system="Engineering geology">
                <classification system="USCS">SC</</classification>
                <description>soft to firm brown clay</description>
                <legend system="AGS">201</legend>
        </description>
        <basisOfLayer>Geologist logged samples</basisOfLayer>
        <geologyStratum>A</geologyStratum>
</layer>
<layer>
        <depthTop>1.00</depthTop>
        <depthBase>3.45</depthBase>
        <description system="Weathering grade">
                <classification system="HKGEO">VI</classification>
        </description>
        <basisOfLayer>Geologist logged continuous core</basisOfLayer>
</layer>
```

Project Schedule

- April 2006 – Draft
- September 2006 – Version 1
- Next Phases
  - Geoenvironmental
  - 2D