

DIGGS

Digital Interchange for Geotechnical and
Geoenvironmental Specialists



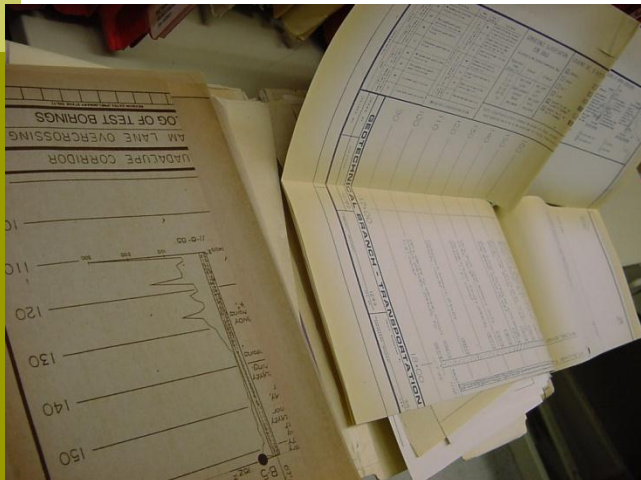
Presentation to TransXML Workshop

December 9, 2013

Marc Hoit, PI, NC State University
FHWA Pooled fund study TPF-5(111)
Robert **Schweinfurth**, PI, ASCE GeoInstitute
Ohio DOT Grant

Caltrans Experience

- 30,000 project files
- 2 million documents
- 300 projects/year
- 80 years of data
- Difficult to access information



Ohio DOT Experience

- 20-30 person hours per week to retrieve information

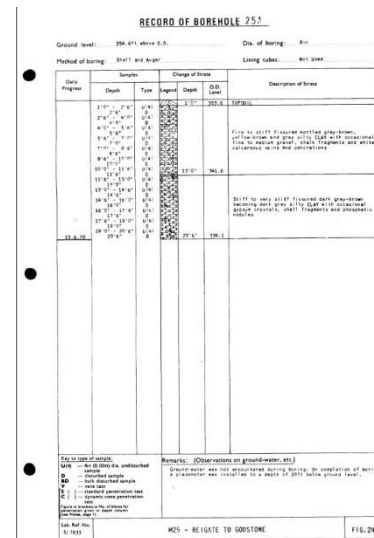
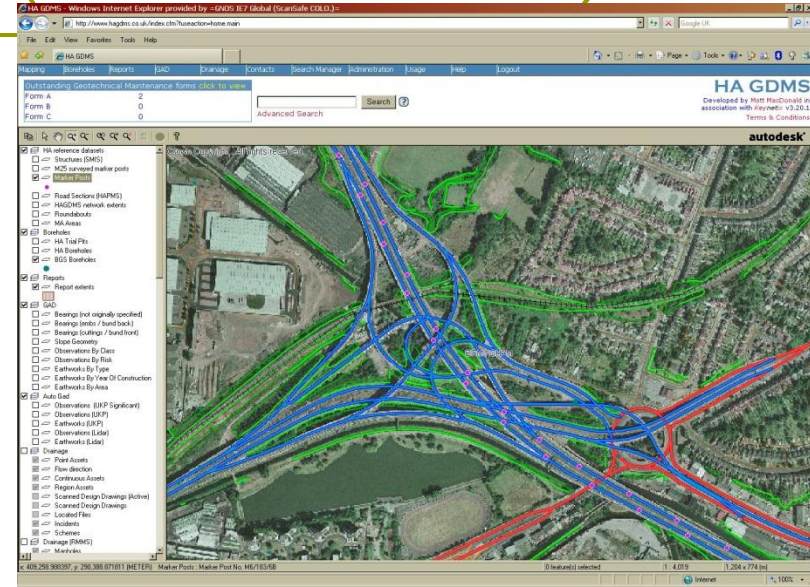


DIGGS Evolution

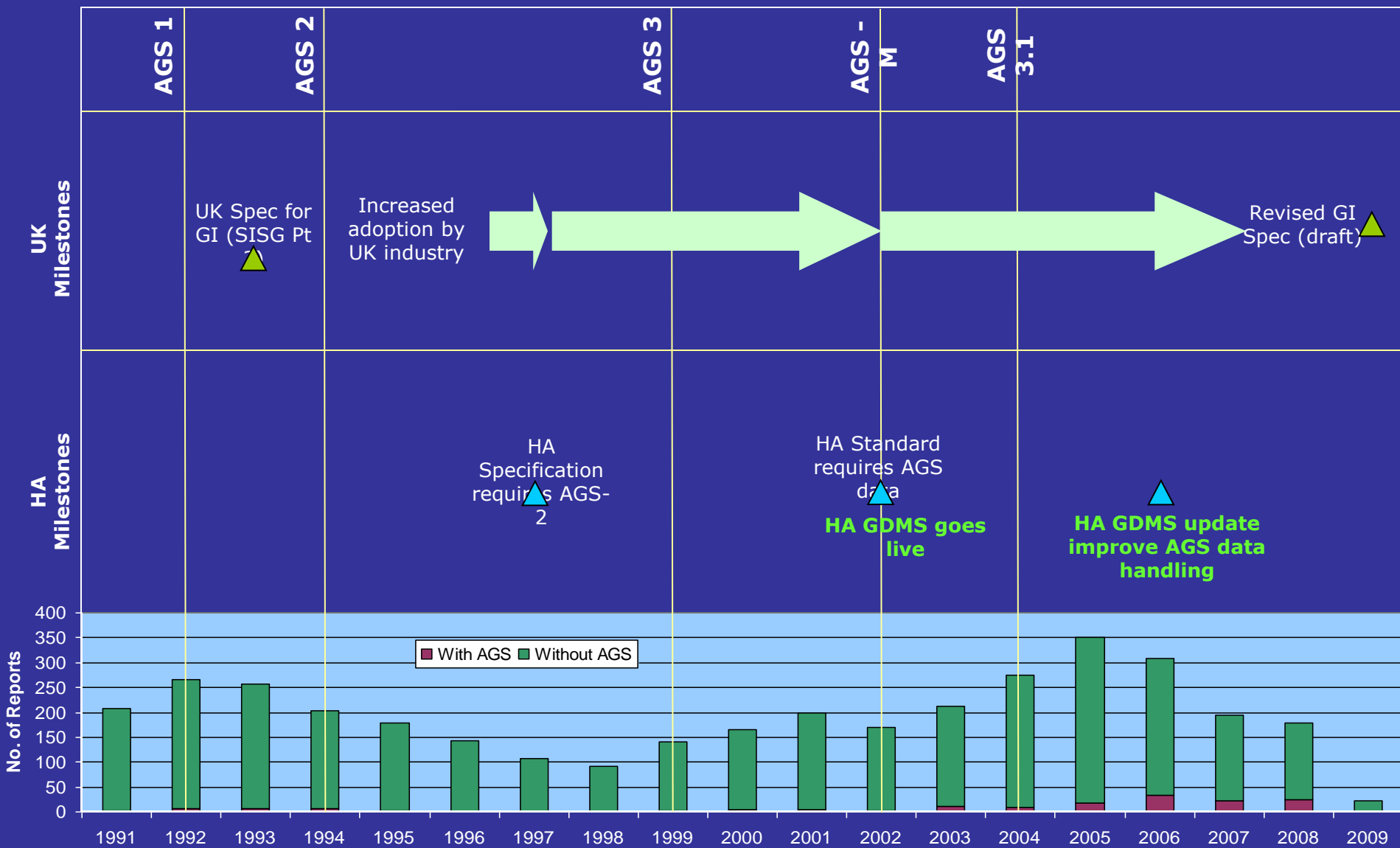
- ❑ Pooled Fund Study to create DIGGS
 - TPF-5(111), started 2005 (run by Ohio DOT)
 - Merger of existing XML standards:
 - ❑ COSMOS standard (CA, Earthquake group)
 - ❑ AGS standard (UK)
 - ❑ FDOT/UF Pile standard
 - GML Compliant (International Geo-Spatial XML standard)
 - Version 2 to be final result from study (June 2012)
 - Partners: USGA, EPA, COSMOS, AGS, UK-HA, UF, GINT, KeyNetix, State DOTs, FHWA, EarthSoft

The HA Geotechnical Data Management System (HA G

- Internet-based GIS
- Stores data on:
 - spatial context (mapping and aerial photos)
 - assets
 - reports
 - boreholes
- Supports UK AGS data transfer format
 - data storage/retrieval
 - summary logs
 - summary test sheets



AGS Implementation Timeline



Location Information				
Location Description				
Latitude	Min :		Max:	
Longitude	Min :		Max:	
Documents and Files				



GEODOG TOOLS

- Home
- Search projects
- Logout
- Add Data to GeoDOG
- Manage My Account

ADMINISTRATIVE TOOLS

- System Setup
- Manage Users

LINKS

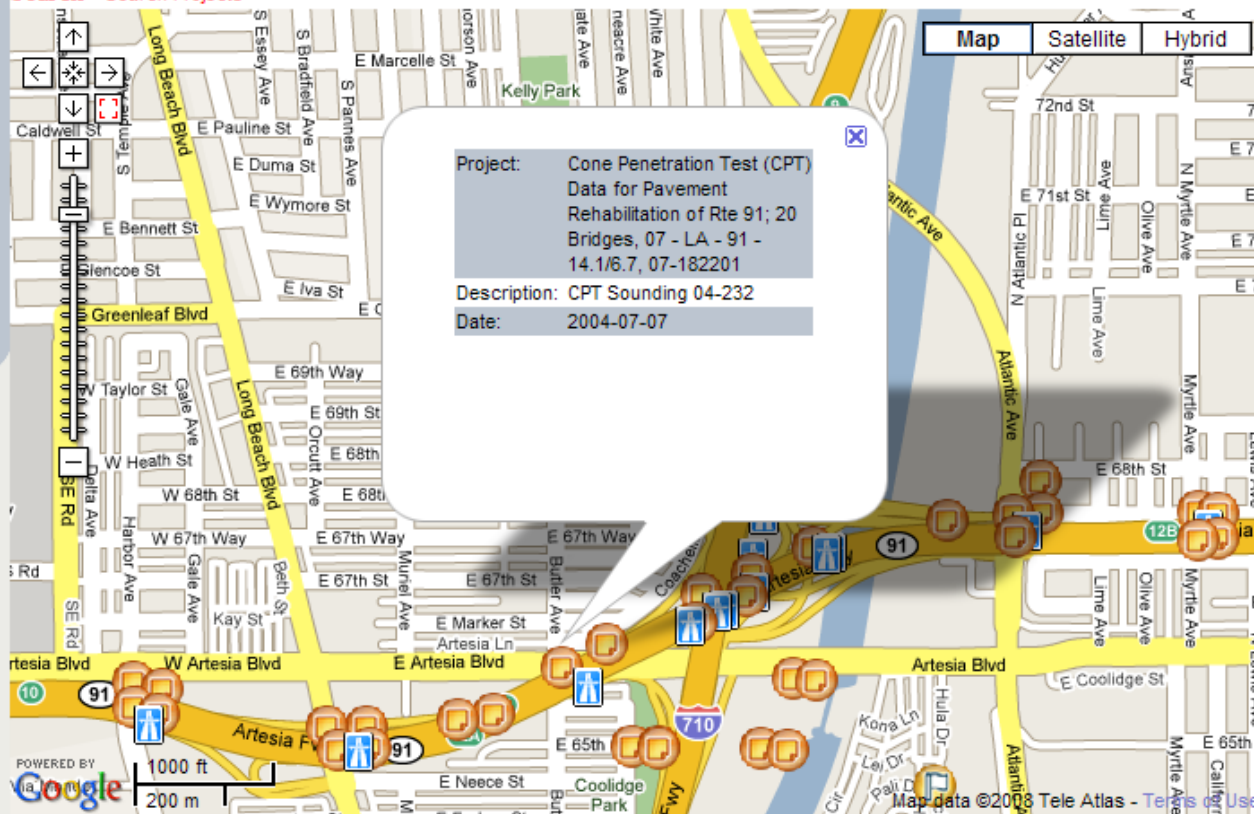
- Caltrans
- Division Of Research Innovation
- GeoResearch Group



Welcome: admin

Profile

Search > Search Projects



Latitude: 33.8740856316268 Longitude: -118.181390762325

Project Information

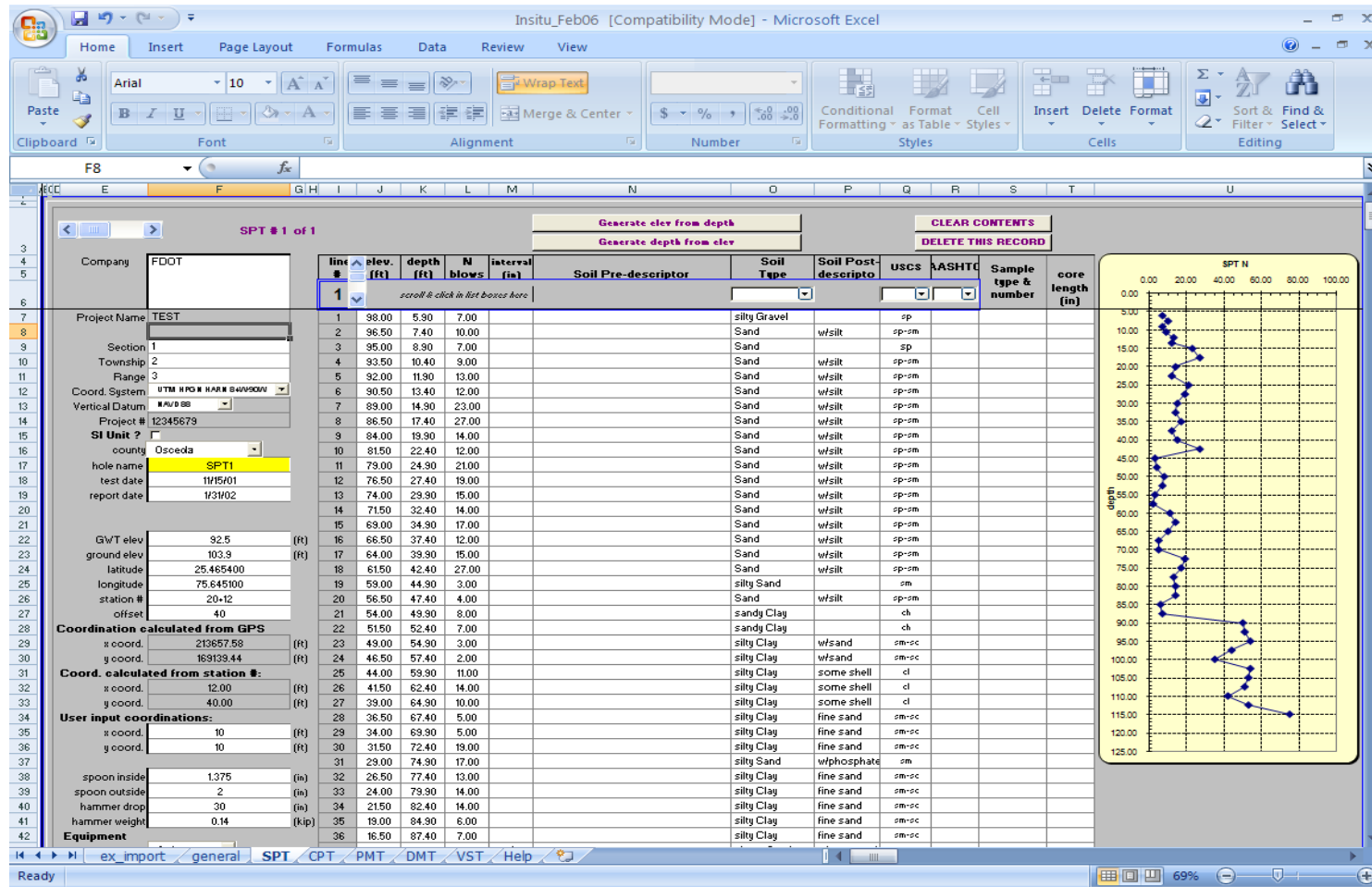
Project Name

Florida

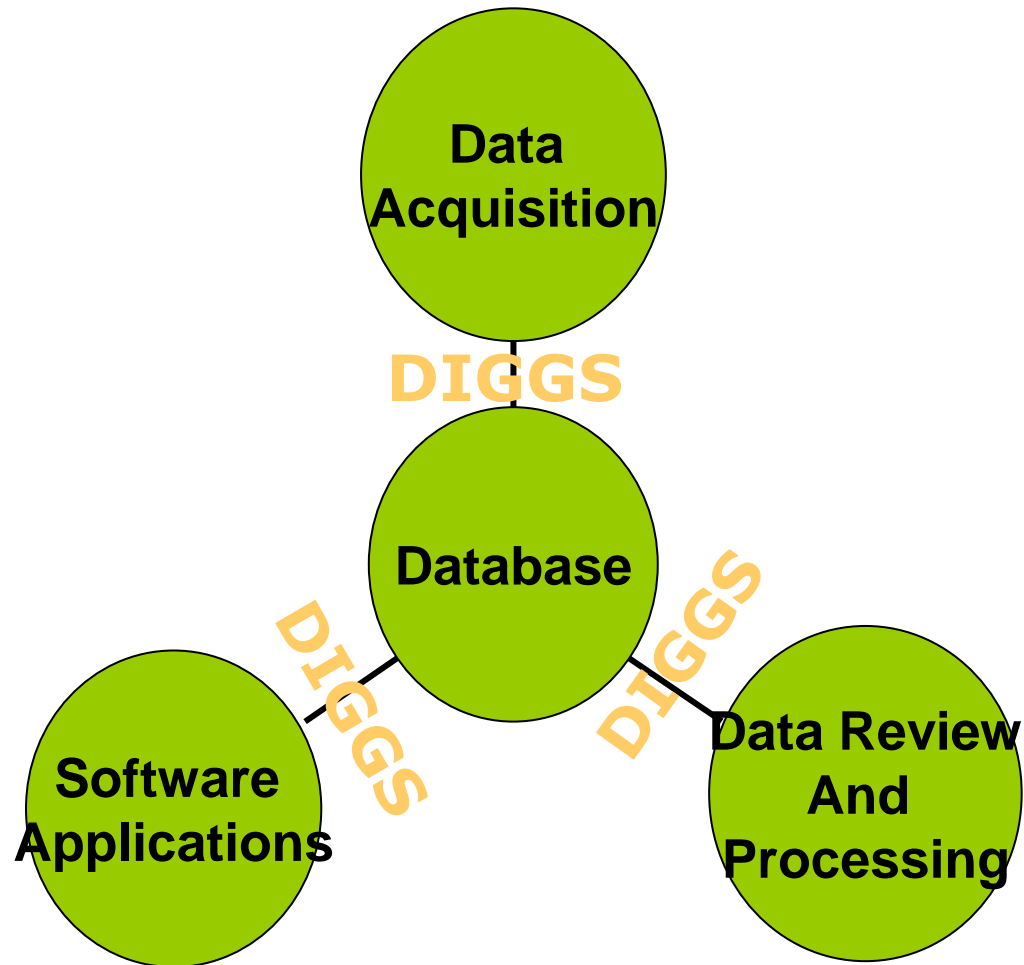
- ❑ FDOT Geotechnical Database
- ❑ Bridge Software Institute (BSI) has developed three unique pieces of software that can access the database
 - FB-Deep
 - Pile Technician
 - Database Spreadsheets



Example of In-situ spreadsheet



The DIGGS Advantage



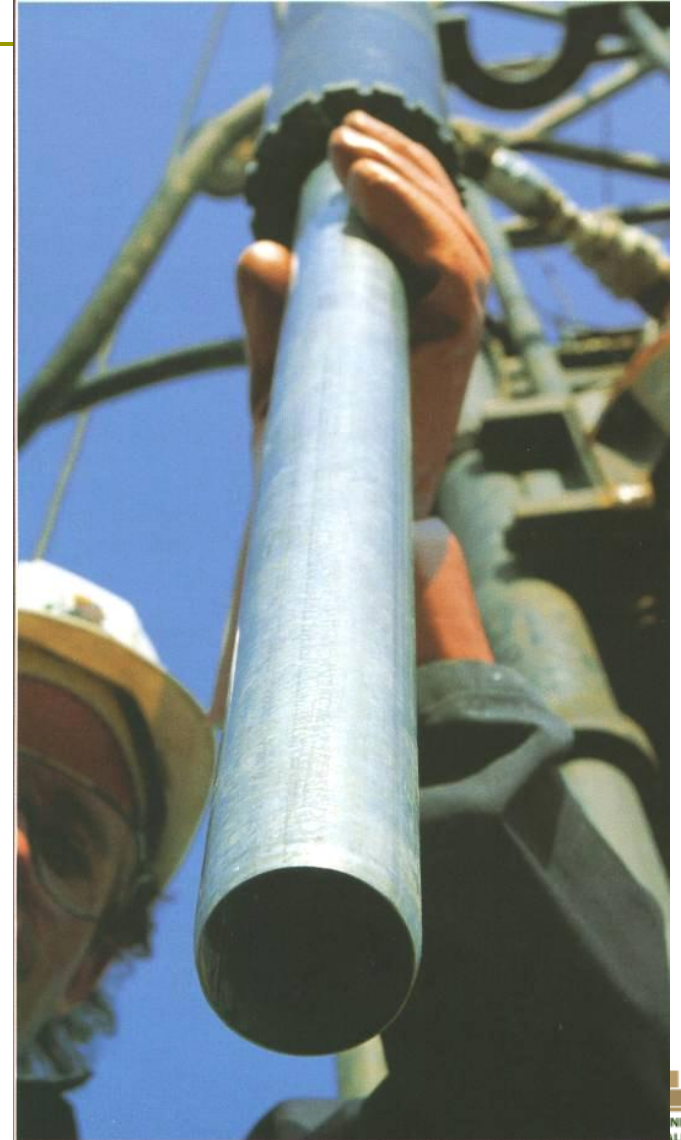
Key Activities

- Borehole Data
 - Point Location
 - Drilling Operations



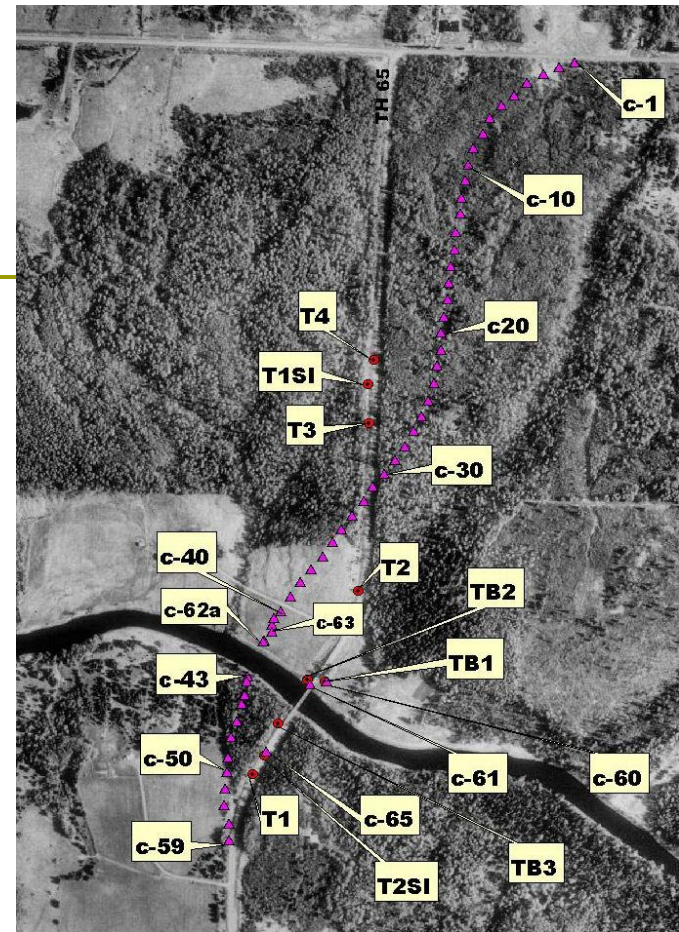
Key Activities

- ▣ Borehole Data
 - SAMPLES!



Data TRANSFER

- Site Information
- Depth Information
 - Field
 - Lab Testing
 - Soil and Rock



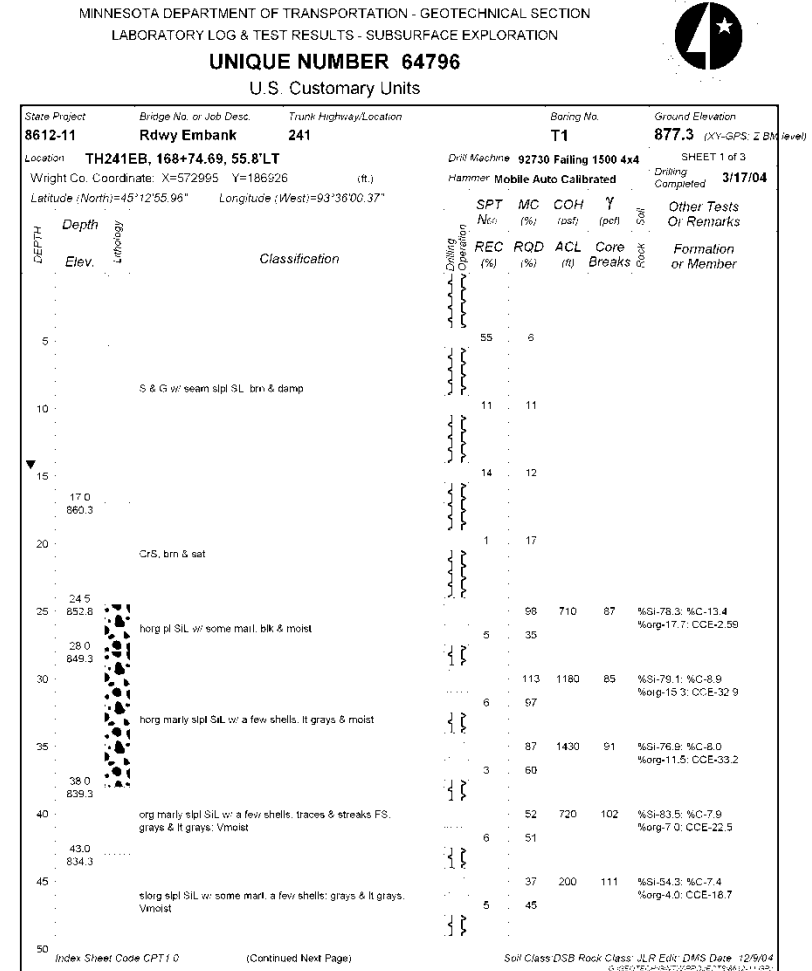
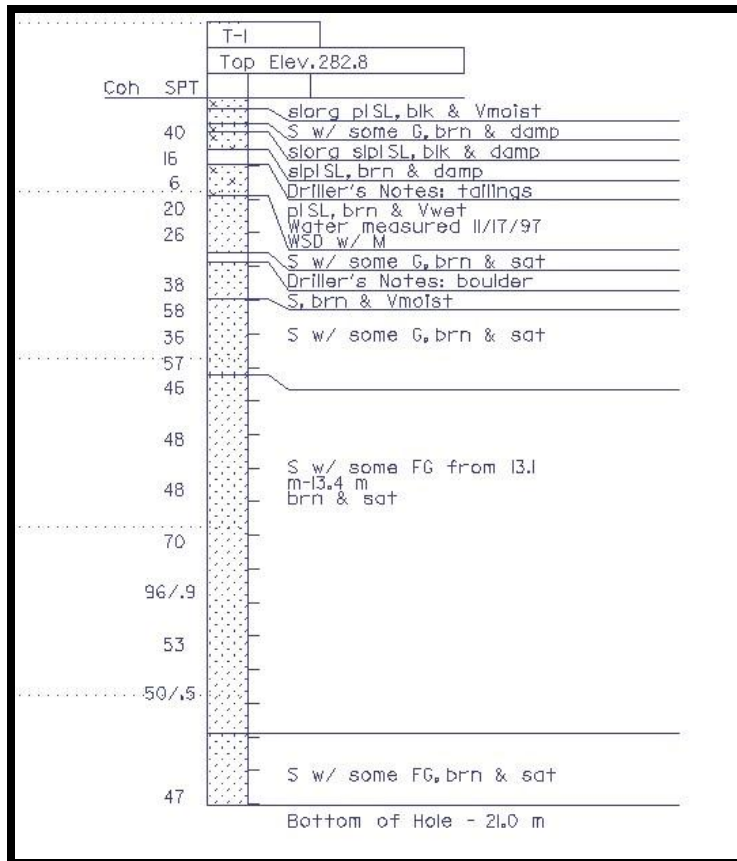
Data TRANSFER

▣ Lab Data (results and/or test data)



Logs and Log Data

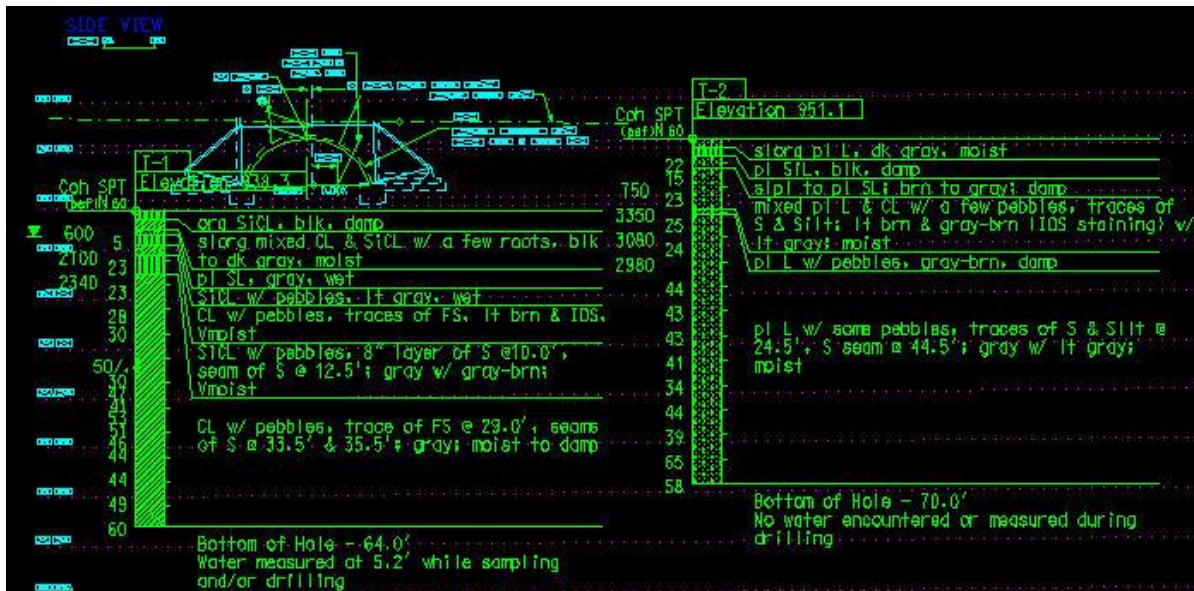
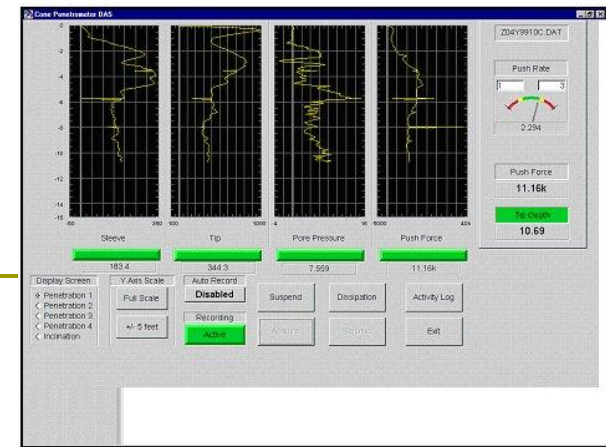
Electronic / Paper



Data TRANSFER

□ Borehole data

- From field to office
- Intraoffice (among software)
- Interoffice (among staff)
- From office to External



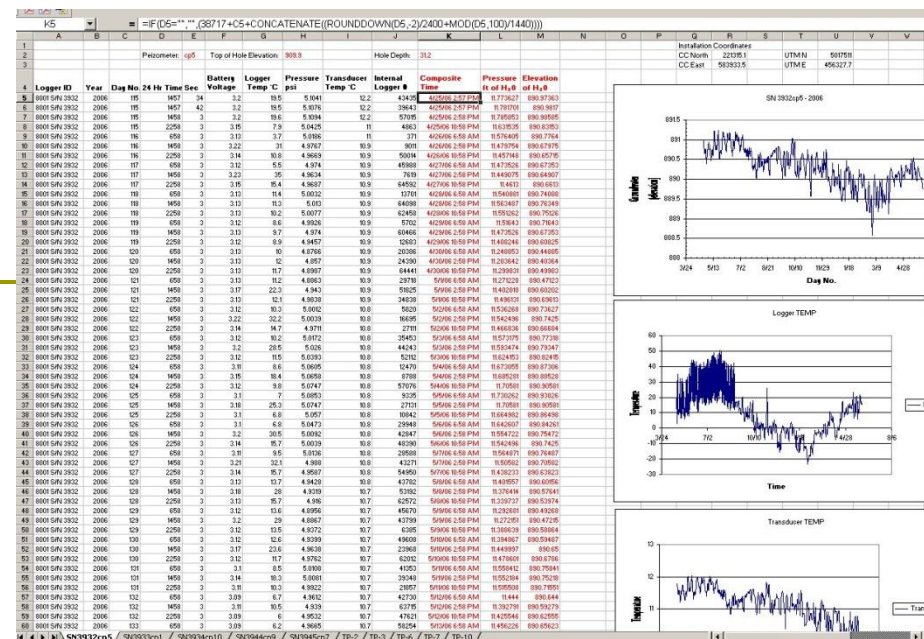
QC/QA Testing

- ▣ PDA/CAPWAP
- ▣ O-Cell/SLT



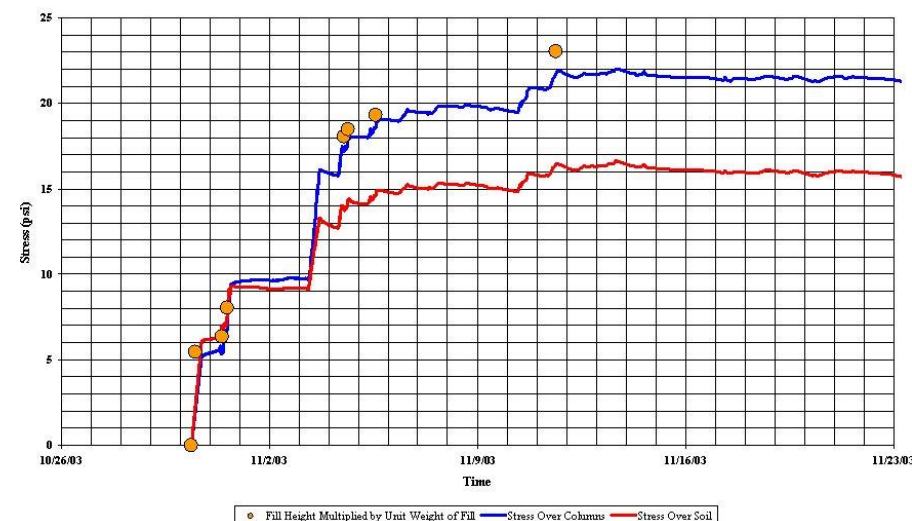
Sensor Data

- Manual
- Automated



A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Piezometer TP-10 Information													
2	Location: TH 159, (US Bank)													
3	Depth of H2O from top of Riser Pipe, A inches			To be measured										
4	Ht. of casing from GL, B inches			24										
5	Top of Riser Pipe to top of casing, C inches			4.75										
6	Size of plumb bob (inches)			5.875										
7	Ground Level Elevation			983.4										
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Pressure Cell Time-History



Cost Savings

- ❑ Ohio DOT:
 - 10-20% less drilling, savings \$12-24M per year
- ❑ Florida DOT:
 - Fewer borings saving \$250,000 - \$500,000 on one project
- ❑ Missouri DOT:
 - 10-15% fewer borings per bridge
- ❑ Missouri DOT:
 - \$81,000 savings per year in boring log preparation by using electronic data entry in the field
- ❑ California DOT:
 - 20% savings (\$200k/year) with laboratory data management system implementation

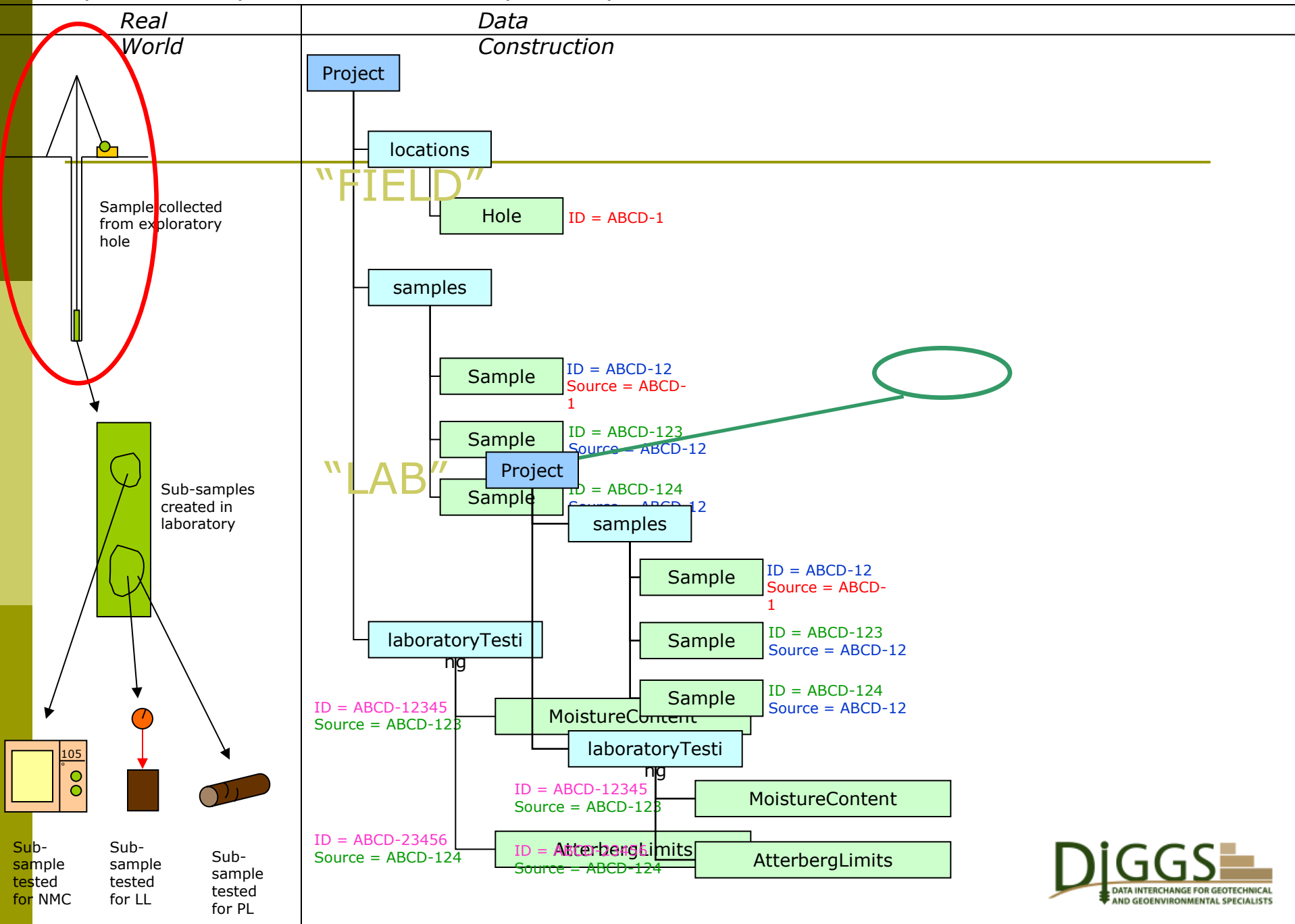
Samples, Cores and Specimens

```
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>
```

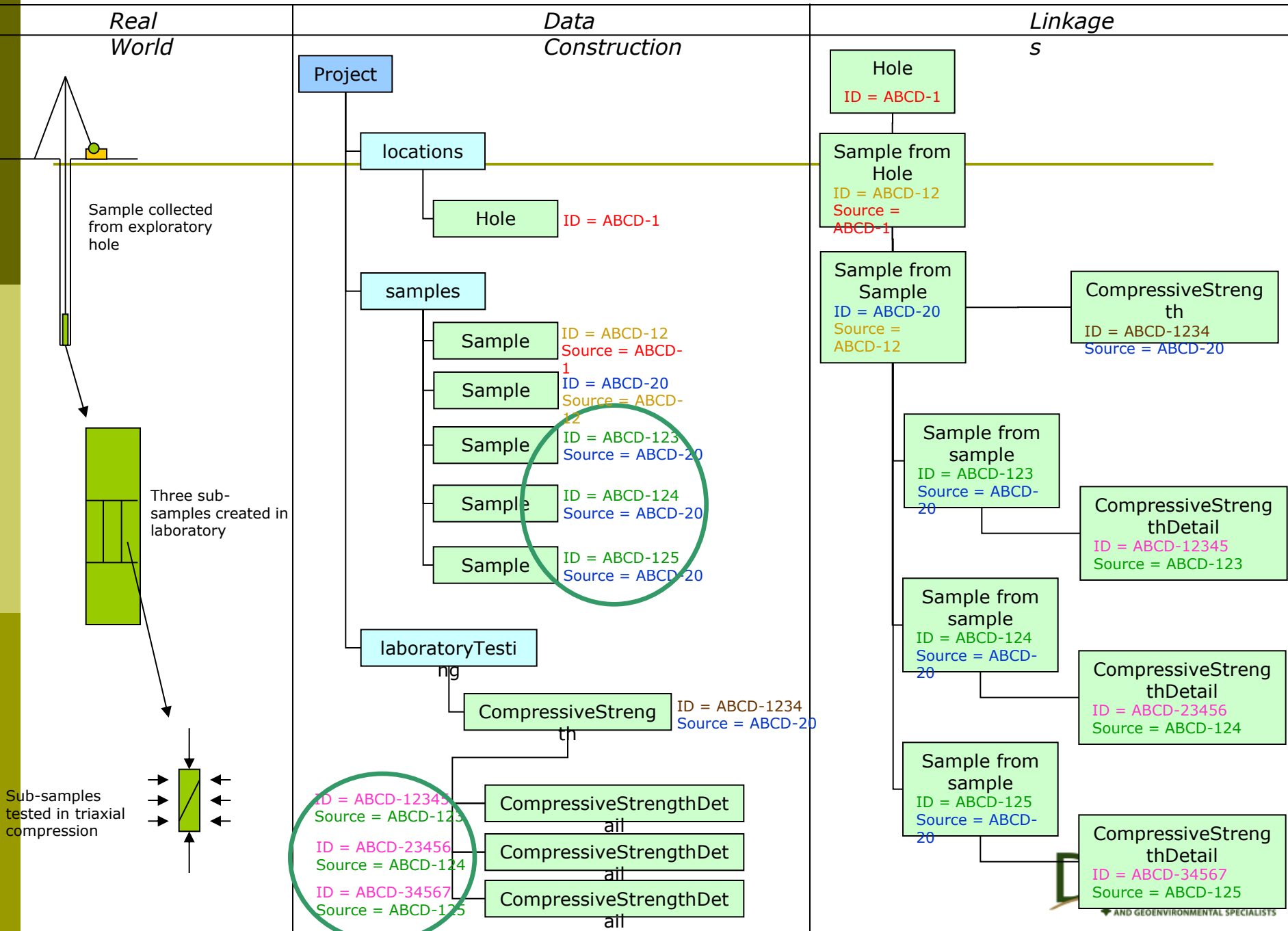
Laboratory Tests

```
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  <gml:name codeSpace="NWH">8452</gml:name>
  <depthTop>1.00</depthTop>
  <depthBase>1.00</depthBase>
  <description>Soft brown Clay</description>
  <reference>23</reference>
  <remarks/>
  <subsamplingMethod></subsamplingMethod>
  <roles/>
  <moistureContent> ← Tests then hang off specimen
    <moistureContent uom="%">23</moistureContent>
    <role></role> <--- who tested, checked and QA'd it etc
    <specification></specification> <--- BS xxxyyy clause 2
    <preparation></preparation>
    <remarks></remarks>
    <isNatural></isNatural>
  </moistureContent>
</Specimen>
```

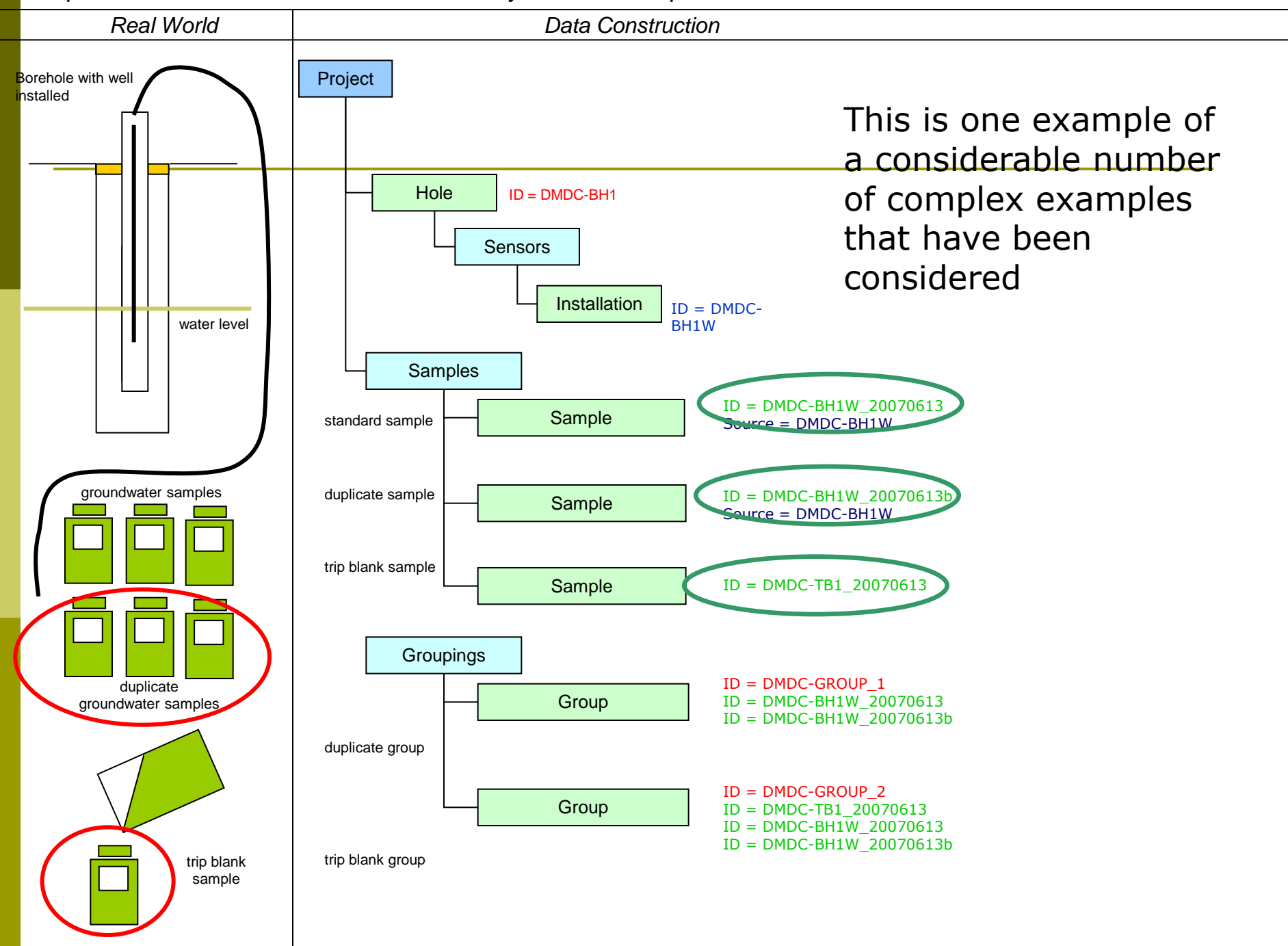
Example 2 – Sample Taken from an Exploratory Hole, tested for NMC, LL and PL



Example 5 – Sample Taken from an Exploratory Hole, tested by 3 stage, 3 sample triaxial test



Example 7 – Geoenvironmental: Field Quality Control Samples



<http://diggsml.com> – Website



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International geotechnical and geoenvironmental data interchange framework based on XML and GML.
Written by geotechnical professionals, for geotechnical professionals.

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Data Interchange for Geotechnical and GeoEnvironmental Specialists (DIGGS)

DIGGS is a coalition of government agencies, universities and industry partners whose focus is on the creation and maintenance of an international data transfer standard for transportation related data. The coalition came into existence through coordination from the US Federal Highway Administration sponsoring meetings and eventually forming the pooled fund study project. The initial base schema consists of geotechnical data including Borehole, soil testing, site information and more. The first SIG is extending the schema to include Geo-Environmental testing. More SIGs and expanded membership are in the works.

The draft DIGGS standard is available for review and comment. In order to act as a reviewer, you must [create an account](#). You will then have access to [download the schema and documentation](#) as well as participate in the [online discussion forum](#). The forums will be monitored and the DIGGS team will answer questions to help in the understanding and implementation of the schema and will be the main point of contact for review comments. The schema will be updated monthly with corrections and additions during the review. [Review Forum >](#)

Recent Blog Entries ([Full Blog Listing](#))

Status of Work on the DIGGS v1.2 Release

September 4, 2010 - 1:13am — [LTurner](#)

It's been several months since the release of DIGGS v1.1 this past April. At the roll-out meeting we had anticipated having a version 1.2 ready by July. However, the changes in version 1.2 have required far more analysis and work than originally anticipated. ([Read more....](#))

[LTurner's blog](#) [Read more](#) [3 attachments](#)

[Public](#) [Frontpage](#)

DIGGS v1.1 Release

May 19, 2010 - 10:30pm — [LTurner](#)

We are pleased to announce the release of DIGGS v1.1. This release includes a number of significant schema changes. The net result is a schema that is more robust and easier to use, far less complex in organization and file size, loads and validates much quicker, and is compliant with GML 3.2 standards.

[LTurner's blog](#) [Read more](#) [1 attachment](#)

[Public](#) [Frontpage](#)

Pooled Fund Project TPF 5(111)

The Pooled Fund Project is a US Federal Highways Administration project administered by the state of Ohio. Multiple states commit funds to create a larger project under which all organizations receive the benefit from the project. The DIGGS project was created to develop an international standard interchange format for geotechnical data. The project brought together the existing formats created by Association of Geotechnical and Geoenvironmental Specialists in the United Kingdom (AGS), Consortium of Organizations for Strong-Motion Observation Systems (COSMOS) and Florida Department of Transportation (FDOT) created by the University of Florida (UF). The project has a governance structure for developing the base schema as well as Special Interest Groups (SIG) to create extensions. The result of the project is the DIGGS schema. [Pooled Fund Project >](#)

DIGGS Current Status

- DIGGS Version 2.0a - July 2012
 - Update of Data Dictionary
 - Update of Schema
 - Creation of “DIGGS to Excel” Tool
 - DIGGS Website Update

DIGGS Implementation

- ❑ ODOT Contract with Geo-Institute-2 years
 - October 2013 – October 2015

- ❑ Goals of Contract
 - Finalization of DIGGS Schema standard from 2.0α to 2.0β and Public Release of DIGGS 2.0
 - Transition of ownership to Geo-Institute
 - Development of Long Term Business Plan and Management Structure

DIGGS Implementation

- ❑ Engagement of DIGGS Advisory Board
- ❑ Survey of DIGGS User Community
- ❑ DIGGS Training Materials
- ❑ Pilot Testing of DIGGS 2.0a
 - State DOTs & EPA, Software/Hardware Vendors, Federal Agency
- ❑ Update XML Schema and Data Dictionary

DIGGS Implementation - Tools

- ❑ Refining of existing “DIGGS to Excel”
- ❑ AGS 3.1 to DIGGS
- ❑ Excel/Web Form to DIGGS
- ❑ Validation