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**Executive Summary Report**

## Development of Geotechnical Data Schema in Transportation

FHWA Report Number:	FHWA/OH-2012/12
Report Publication Date:	December 2012
ODOT State Job Number:	134254
Pooled Fund Number:	TPF-5(111)
Project Duration:	78 Months
Start Date:	October 1, 2005
Completion Date:	June 30, 2012
Total Project Funding:	\$ 644,398
Research Agency:	University of Florida
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**For copies of this final report go to <http://www.dot.state.oh.us/research>.**

### Project Background

The following document is a final report on the development of an international data exchange standard for Geotechnical and Geoenvironmental data. The standard, Data Interchange for Geotechnical and Geoenvironmental Specialists (DIGGS), was developed through the Transportation Pooled Fund Study (TPF 5(111)) coordinated by the Ohio Department of Transportation (DOT). The effort is a collaborative effort between Construction Industry Research and Information Association (CIRIA), Federal Highway Administration (FHWA), UK Highways Agency (UK-HA), United States Environmental Protection Agency (US EPA), US Army Corps of Engineers (USACE), US Geological Survey (USGS), FHWA-Eastern Federal Lands Highway Division (EFLHD) and the following state DOT's: California, Connecticut, Florida, Georgia, Indiana, Kentucky, Minnesota, Missouri, North Carolina, Ohio, and Tennessee. The focus of the TPF project is to compile the standards development work of the Association of Geotechnical & Geoenvironmental Specialists (AGS) from the United Kingdom, the Consortium of Organizations for Strong-Motion Observation Systems (COSMOS), the University of Florida, and others to create a new international data exchange format. The resulting data interchange format has global application and allows software vendors and users in the geotechnical community to seamlessly exchange data. The project, "Development of Standards for Geotechnical Management Systems, Project TPF-5(111)," was approved and funded in the summer of 2005 at a funding level of \$644,398. This process ultimately combined the expertise of a specialized consultant for a focused development building upon the enormous hard work of the devoted team that volunteered it's time in creating the standard.

## **Study Objectives**

**To develop a standard data dictionary and XML schema for geotechnical data.** The standard includes a data dictionary (imbedded in the schema) and XML (extensible markup language) schema which are GML (geographic markup language) compliant. A data dictionary is the definitions, ranges of values and agreed upon processes for the scientific information. The XML schema is a representation of the data dictionary in a standardized computer format. GML allows the data to be compliant with GIS systems and provides geospatial location capability. The dictionary and schema include a structure for geotechnical data, major portions of geoenvironmental data and some geophysical data as well as a method for adding new features and guidelines for adding to the schema. This standard was transferred to the GeoInstitute of the American Society for Civil Engineers (ASCE). The ultimate purpose of the standard is to create the foundation for the development of data and asset management systems.

## **Description of Work**

The work was accomplished through a survey of stakeholders to identify their required specific geotechnical data needs (at a dictionary description level). The survey results were used to develop a consensus for an international standard geotechnical data dictionary and to define the international standard XML (GML compliant) data interchange format schema. The achievement of the consensus on the data dictionary and structure was accomplished in Phase I. Phase II & III (Data Dictionary, Schema and adding major aspects of Geoenvironmental data) comprised the majority of the effort in creating a standard. Existing standards and efforts (AGS, COSMOS, UF-FDOT and US EPA) were used as the basis for this effort.

## **Research Findings & Conclusions**

The release of DIGGS v2.0, presented in this report, covers borehole logging data, geotechnical lab data, in situ testing data, site data (e.g. location, area, etc), water quality and testing data, and geotechnical testing data and some geophysical survey data. This release was developed by combining the existing standards developed by Association of Geotechnical and Geoenvironmental Specialists in the United Kingdom (AGS), Florida Department of Transportation/University of Florida, Department of Civil Engineering (UF) and the Consortium of Organizations for Strong-Motion Observation Systems (COSMOS) as well as working with a GML consulting group to ensure the compliance of the final product with the GML standard. The United Kingdom (UK) Highways Agency was also a collaborator.

The critical elements (covered in detail in Appendix A) are the data dictionary and XML schema files. The dictionary is imbedded in the XML schema and can be viewed using the MS Excel Tool. These are the fundamental basis for the transfer standard. It is this data dictionary and the Extensible Markup Language (XML) schema that defines the transfer format structure that comprise the complete standard. XML is a markup language that allows text transfer of information in a format which can be validated. The proposed schema will be Geographic Markup Language (GML) compliant which allows GIS systems to display the locations of the features.

In addition to the MS Excel tool, another tool was developed to convert DIGGS files to Google Maps KML format. The resulting schema files and associated tools are available at the <http://diggsml.org> website.

## **Implementation Recommendations**

DIGGS is intended to be a dynamic standard. The resulting body will continue to evolve the standard, adding new features, correcting errors and possibly developing new tools. As a result, the American Society of Civil Engineers – Geo-Institute has agreed to adopt the standard into its existing codes and standards committee structure. The final workshop run by this project will transfer the standard to ASCE Geo-Institute and develop a proposal to ODOT for establishing the required committee, procedures and website to continue efforts on the standard.