Final Report 2002-2003: Subsurface Database for the Shelby County Hazard Mapping Project

The Creation, Expansion, Maintenance, and Application of a Subsurface Database for Shelby County, Tennessee – A Cooperative Agreement Between the Center for Earthquake Research and Information and the Ground Water Institute at The University of Memphis

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Introduction

The Memphis, Shelby County Seismic Hazard Mapping Project has provided a unique opportunity for collaborative research between Center for Earthquake Research and Information (CERI), the United States Geological Survey (USGS), and the Ground Water Institute (GWI) at The University of Memphis. This research effort is leading to better understand of the geologic, hydrologic, and geotechnical features in Shelby County. This understanding has been a crucial component in development of the proposed subsurface database. The development of the database and access to it by geological and geotechnical professionals should enhance a better understanding of those features which make the geology in the area unique. Interest from various parties has transformed this project into a multi-use application of the database within the fields of earthquake research, geology, and engineering. The ever-growing database is the most extensive source of subsurface information within this area.

Project Status

The current version of Oracle being used to serve GIS data was incompatible with the newest version of ESRI's ArcSDE. The upgrade plan with Oracle purchased from previous awards allowed for a free upgrade in Oracle from v.8.1.5 to v.8.1.7. Oracle was upgraded and the latest version of ArcSDE was installed. All of the GIS data from the previous Oracle database was migrated to the new database. Under the previous USGS contract (01HQGR0205), ArcIMS was found to be sensitive as a whole to Oracle. ArcIMS would not work properly if Oracle was down, files were changed or they were updated. Therefore as a solution all of the spatial files used in ArcIMS were copied onto a local hard drive (flatfile) and served from the hard drive. This virtually eliminated all problems. Per this contract period, an attempt was made to again have ArcIMS read GIS data directly from Oracle. The ArcIMS website did not have many problems, and thus Oracle became the parent storage and dissemination tool for GIS data.

A second task of the contract was to create two-dimensional surfaces of the stratigraphy using the interpretations made on the available geophysical and geotechnical logs by the USGS and University of Memphis, respectively. Included would be an error analyses on the probable variation of point elevation values and lack of data. To accomplish this task, the PI of this contract worked with Joan Gomberg of the USGS and many other collaborators to publish the resulting generated surfaces[1].

Aside from using ArcSDE and ArcIMS, there was the idea of allowing users to download data using FTP. Upon further inquiry to users of the data, ArcSDE was found to serve everyone's purposes thus eliminating the need for FTP. However, the flatfiles created in the previous contract (01HQGR0205) are being maintained in case FTP is needed.

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[1] Gomberg, J., Waldron, B., Schweig, E., Hwang, H., Webbers, A., Van Arsdale, R., Tucker, K., Williams, R., Street, R., Mayne, P., Stephenson, W., Odum, J., Cramer, C., Updike, R., Hutson, S., Bradley, M., 2003. Lithology and Shear Velocity in Memphis, Tennessee, Bulletin of the Seismology Society of America, 93(3), pp. 986-997.

Lastly, the issue of uncertainty in the USGS NED elevation datasets could not be addressed. It was expected that 2 ft. contour elevations would be provided for Shelby County by an outside contractor not affiliated with this effort which could then be used to estimate ground surface elevation errors at borehole locations. This data was not collected during the project period, and thus this task could not be completed as hoped.

Acknowledgements

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