



A case study of GIS-based geotechnical database in urban environment (Oviedo, NW Spain)

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This contribution describes the development and usefulness of a GIS-type geotechnical database designed for Oviedo, a mid-size urban core in northwestern Spain. This city is located on a Mesozoic-Palaeogene basin with a gentle synclinal structure, placed on a basement of strongly folded Devonian and Carboniferous formations. The Cretaceous consists of alternating carbonate and siliciclastic units, while the unconformable Palaeogene series, of fluvial-lacustrine origin, are chiefly composed of marls and clays with intercalated calcareous and gypsiferous layers.

The relational database generated contains a wide range of unpublished subsurface data, mostly provided over the past six decades by geotechnical reports and fieldwork. The information was specifically collected and 3D georeferenced (X, Y, Z coordinates) for this research in order to ensure its spatial consistency and conservation. Currently the database includes 2,200 site investigations, a thousand on-site tests, and the results from 4,000 laboratory tests carried out on 1,600 samples of rocks, soils and groundwater. Moreover the database is supplemented with approximately 250 cartographic files and aerial images, all georeferenced.

Through different spatial analysis methods, the geodata stored were processed to study the distribution and thickness of the surficial deposits (man-made fills, alluvial sediments and residual soils), and also to address the identification of unknown faults crossing below the urban area. Moreover, the main properties of all the rocks and soils in the study area were assessed using geotechnical parameters compiled from laboratory and field testing. The results obtained, examined by descriptive statistics, are useful as bibliographical reference for further research. This made possible to review the lithostratigraphic division of the Palaeogene; as a result six sections were defined instead of the three gathered in previous investigations. Regarding urban hydrogeology the permeability values for all the rocky units and unconsolidated deposits were estimated, as well as the chemical aggressiveness of groundwater for the structural concrete.

The pointed contributions allowed improving noticeably the knowledge about the city subsoil, illustrated by means of two new 1:15,000 scale maps: i) surface geological map; ii) geo-engineering map based on lithological, geotechnical and constructive criteria.