

Geotechnical Zoning of Mexico Valley Subsoil

Zonificación geotécnica del subsuelo del Valle de México

Juárez-Camarena Moisés
Instituto de Ingeniería, UNAM
E-mail: mjuarezc@iingen.unam.mx

Auvinet-Guichard Gabriel
Instituto de Ingeniería, UNAM
E-mail: gauvinetg@iingen.unam.mx

Méndez-Sánchez Edgar
Instituto de Ingeniería, UNAM
E-mail: emendezs@iingen.unam.mx

Información del artículo: recibido: mayo de 2014, aceptado: enero de 2016

Abstract

A new geotechnical zoning map for the subsoil of Mexico Valley is presented. This proposal is based on a Geographic Information System for Geotechnical Borings (GIS-GB), which contains over 10000 soil profiles. In addition to the geotechnical information, available topographic and geological data on the studied area were taken into account. Geostatistical techniques were used to assess the spatial distribution of the thickness of the lacustrine clay deposits within the area down to the so-called deep deposits. As a result, a contour map was obtained that was used to update the current geotechnical zoning map for Mexico Valley. It has been proposed to include this new map into the Building Code for the Federal District (Mexico City).

Keywords:

- subsoil
- borings
- Geographic Information System
- Mexico Valley
- Geostatistics
- correlogram
- estimation
- variance of estimation
- Kriging
- mapping
- geotechnical zoning

Resumen

Se presenta una nueva zonificación geotécnica para el subsuelo del valle de México. Esta propuesta se basa en un Sistema de Información Geográfica para sondeos geotécnicos (SIG-GB), que almacena más de 10000 perfiles de suelo. Además de la información geotécnica, se tomaron en cuenta los datos topográficos y geológicos disponibles relativos a la zona estudiada. Se aplicaron técnicas geoestadísticas para evaluar la distribución espacial del espesor de los depósitos arcillosos del área hasta los llamados depósitos profundos. Como resultado se obtuvo un mapa de contornos que se utilizó para actualizar la zonificación geotécnica para el Valle de México. Se ha propuesto que este nuevo mapa de zonificación geotécnica se incorpore en el nuevo Reglamento de Construcciones para el Distrito Federal.

Descriptor:

- subsuelo
- sondeos
- Sistema de Información Geográfica
- Valle de México
- Geoestadística
- correlograma
- estimación
- varianza de estimación
- Kriging
- mapeo
- zonificación geotécnica

Introduction

The numerous geotechnical borings performed in the urban area of Mexico City can be used to obtain a better knowledge of the subsoil and for improving the accuracy of the existing geotechnical zoning map for regulatory purposes of construction (GDFa, 2004; GDFb, 2004).

To take advantage of the available information, computational and informatics tools, such as Geographical Information Systems as well as powerful mathematical tools based on Geostatistics have been used. Geographic Information Systems are useful to organize geotechnical information for fast and easy reviewing. On the other hand, Geostatistics, defined as the application of random functions theory to the description of the spatial distribution of properties of geological materials, provides valuable tools for estimating data such as thickness of a specific stratum, or local value of a given soil property, taking into account the correlation structure of the medium. Additionally, uncertainty associated to these estimations can be quantified.

In recent years, several studies dealing with the subsoil characterization for different areas within the Valley of Mexico have been published. In that studies, Geostatistical methods have been widely used to assess the spatial distribution of geotechnical properties (Jiménez, 2007; Valencia, 2007; Hernández, 2013; Eyssautier, 2014; Juárez, 2014). The results of these works have been taken into account in the geotechnical zoning proposed in this paper.

Location of study area

The study presented in this paper is focused on the area shown in Figure 1. It includes parts of political delegations Álvaro Obregón, Azcapotzalco, Benito Juárez, Cuauhtémoc, Gustavo A. Madero, Iztacalco, Miguel Hidalgo and Venustiano Carranza in the Distrito Federal and municipalities of Naucalpan, Ecatepec, Nezahualcoyotl, Tlalnepantla in the Estado de Mexico (Figure 1).

Basic information

To characterize the geological formations and soil deposits typical of Mexico Valley subsoil, it was considered necessary to collect data of very different nature and to integrate and present this information in synthesized form.

Topography

Figure 2 shows a *Shaded Relief Model* (SRM) illustrating the topographic configuration of the area. The model was built from the electronic data edited by Instituto Nacional de Estadística Geografía e Informática (INEGI, 2010).

Mexico Valley is a former lacustrine area limited by large topographic elevations: *Sierra de Las Cruces*, *Monte Alto* and *Monte Bajo* to the west reaching an altitude of up to 3600 m, *Sierra de Guadalupe* to the north reaching an elevation of 2960 m, the eastern *Sierra Nevada*

Download English Version:

<https://daneshyari.com/en/article/274801>

Download Persian Version:

<https://daneshyari.com/article/274801>

[Daneshyari.com](https://daneshyari.com)