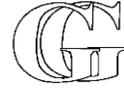


HYDROGEOLOGICAL INVESTIGATION OF AQUIFERS

STRUCTURE OF APPLICATION

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INTRODUCTION

A brief argumentation of the importance of the Aquifer Conceptual Model for the efficient management of investigation by direct methods complemented by geophysical methods.

1. HYDROGEOLOGICAL METHODS OF AQUIFER INVESTIGATION

Write a brief description of the main methods of direct and geophysical investigation of hydrostructures on the following structure (at most 2 pages):

- **direct investigation**
 - Mapping: outcrops, geomorphology of area, elevation of piezometric level in wells/boreholes
 - Boreholes: lithology, grain, porosity(n), permeability (Kp), thickness (M/h) etc.
 - Hydrogeological parameters determined by hydrodynamic tests in hydrogeological boreholes groups:
 - Parameters of the aquifer: piezometric level (NP), hydraulic conductivity (K), hydraulic difuzivity / coeficient of piezoconductivity (a) etc.
 - The hydraulic parameters of pumping wells: dynamic level (DL), rate flow(Q), drawdown (s), radius of influence (R), local piezometric drawdown (Δs)/ hydraulic resistance (ζ)
- **geophysical investigation** and hydrogeological parameters evaluated (synthesis of bibliographical documents:
http://www.ahgr.ro/media/112594/applied_geophysics_hydrogeology.pdf)
 - Seismic methods: geological structure, petrophysical characteristics
 - Gravimetric methods
 - Magnetic methods
 - Geoelectric methods
 - Vertical Electrical Sounding (VES)
 - Borehole geophysical logging
 - Ground-penetrating radar (GPR)

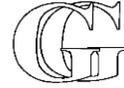
2. HYDROGEOLOGICAL PARAMETERS DATABASE FOR APPLICATION

Description of the databases used (from the file: **DATABASE for exam application.xlsx**):

- analysis of the data application (from the excel file assigned to each student))
- structure of database in software package ROCKWORKS (BOREHOLEMANAGER)
- ways to transfer data between:
 - excel and borehole manager
 - boreholemanager and utilities (location)

Graphical representation of data application

- 3D model of topographical map
- Multi-Log 3D with LITHOLOGY
- Multi-Log 3D with HUMIDITY



3. CONCEPTUAL MODEL OF THE HYDROSTRUCTURE

The objective of aquifer investigation is to create a Conceptual Model of Hydrostructure (CMH). The CMH is a simplified representation of the characteristics of aquifers with three components:

- spatial model of hydrostructure
- parametrical model of hydrostructure
- hydrodynamic model of hydrostructure

3.1. *Spatial model of hydrostructure*

The spatial model of the hydrostructure is built based on the ***lithological*** succession of permeable and impermeable formations and the position of the piezometric level which together allow the separation of the three zones: ***the vadose zone, the aquifer*** and the ***aquifer bed*** (in the case of the phreatic hydrostructure which is the subject of the application).

Mandatory content for the 3D spatial model:

- 3D lithological model of hydrostructure with:
 - one fence with minimum 2 direction
 - two plan maps at different elevations
- the separation model of the three hydrostructural units:
 - sketch for a borehole with:
 - lithological boundaries
 - the three zones (***the vadose zone, the aquifer*** and the ***aquifer bed***)
 - table with the depths at the boundaries of the three zones for a borehole
- 3D hydrostructure model with:
 - one fence with minimum 2 direction
 - two plan maps at different elevations

NOTE. Don't forget to attach the topographic surface map to the two 3D models

3.2. *Parametrical model of the hydrostructure*

For the investigated hydrostructure we only have the humidity values, expressed in percentages and determined at an equidistance of one meter in each borehole.

Mandatory content for the 3D parametrical model:

- 3D humidity model with:
 - one fence with minimum 2 direction
 - two plan maps at different elevations

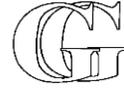
3.3. *Hydrodynamic model of hydrostructure*

The hydrodynamic model of the hydrostructure will be created in 2D (using the SURFER program), based on the coordinates of the boreholes and the elevations of the piezometric level of the phreatic aquifer.

Mandatory content for the 2D hydrodynamic model:

- spatial distribution of the boreholes (Post Map)
- contour map with elevation of piezometric level
- vector of groundwater flow

NOTE. Don't forget to attach the topographic surface map to the 2D model of flow.



CONCLUSIONS

A brief summary of the application with **suggestions** for the efficient organization of the investigation (**direct** and **geophysical**) necessary for the realization of **the Conceptual Model of the Hydrostructure**.

REFERENCES

- Daniel Scărădeanu, Alexandru Gheorghe, 2007, Hidrogeologie generală , Editura Universității București
- Castany, G., 1967, Traité pratique des eaux souterraines, Deuxieme Edition Dunod, Paris.
- Fetter, C.W., 1980, Applied Hydrogeology, Merrill, Columbus, Ohio.
- Gheorghe Alexandru, 1978, Processing and synthesis of hydrogeological data, Abacus Press,, Bucharest. Groundwater Geophysics-a tool for Hydrogeology,2006, Editor Reinhard Kirsch, Springer Berlin Heidelberg New York

FINAL NOTE

- The application will be presented in **pdf** format with the applications text, realised according with proposed structure.
- All figures will have associated the topographic map TOPO.jpg, with the coordinates of the corners: $X_{min}=0$, $X_{max}=100$, $Y_{min}=0$, $Y_{max}=100$
- To achieve the application use:
 - the packages: ROCKWORKS, SURFER10
 - the excel file (HW_i, i= 1,2, ...)
 - TOPO exam application .jpg
- Don't forget to attach the **excel file** with calculations and the transfer format in Borehole Manager