

**Ain Shams University
Faculty of Engineering
Irrigation and Hydraulics Department**



COMBINATION OF DIFFERENT METHODS OF LOWERING GROUNDWATER TABLE IN URBAN AREAS

By

Eng. Emad Aziz Samaan Abd El-Shahid

B.Sc. Civil Engineering Ain Shams University 2006
Demonstrator Irrigation & Hydraulics Department
Faculty of Engineering Ain Shams University

**Thesis Submitted in Partial Fulfillment of the Requirement
for the Degree of Master of Science in Civil Engineering**

Supervisors

Prof. Dr. Ahmad Ali Ali Hassan

Professor of Environmental Hydrology
Irrigation and Hydraulics Department
Faculty of Engineering Ain-Shams University

Dr. Mohammed Taha Abdel-Rahman

Associate Professor
Structural Engineering Department
Faculty of Engineering Ain-Shams University

Cairo – Egypt

2013

Examiners Committee

Signature

1- Prof. Dr. Kamal Hefny Hussein Hefny

Former Head of Groundwater Research Institute

National Water Research Center

2- Prof. Dr. Khaled Shafik Hafiz El-Kholy

Professor of Environmental Hydraulics

Faculty of Engineering

Ain Shams University

3- Prof. Dr. Ahmad Ali Ali Hassan

Professor of Environmental Hydrology

Faculty of Engineering

Ain Shams University

4- Associate Prof. Dr. Mohammed Taha Abdel-Rahman

Associate Professor of Soil Mechanics

Structural Engineering Department

Ain Shams University

Date: 22 /4 / 2013

Statement

This thesis is submitted to Ain Shams University for the degree of M.Sc. in Civil Engineering.

The work included in this thesis was carried out by the author at the Department of Irrigation and Hydraulics, Faculty of Engineering, Ain Shams University, Cairo, Egypt.

No part of this thesis has been submitted for a degree or a qualification at any other University or Institution

Date: 22/ 4 / 2013

Name: Emad Aziz Samaan

Signature:

Acknowledgment

First of All Thanks to GOD

I wish to express my deepest gratitude and appreciation to Professor Dr. Ahmad Ali Ali Hassan, Professor of Environmental Hydrology, Irrigation and Hydraulics Department, Faculty of Engineering, Ain Shams University, for his patience, help, guidance, useful suggestions, dedication and encouragement throughout this work till its completion which is gratefully acknowledged and sincerely appreciated.

My grateful appreciation is also extended to Professor Dr. Mohammed Taha Abdel-Rahman, Associate professor of Soil Mechanics, Structural Engineering Department, Faculty of Engineering, Ain Shams University, for his kind supervision, stimulating discussion, fruitful comments and valuable advice.

Special thanks go to Dr. Ashraf Mohammed Elmoustafa, Associate professor, Dr. Peter Hany, Lecturer, and Eng. Bishoy Kamel, Irrigation and Hydraulics Department, Faculty of Engineering, Ain Shams University, for their valuable advices and encouragement.

I wish to express my thanks to all the staff members of the Irrigation and Hydraulics Department, Faculty of Engineering, Ain Shams University, for their support and encouragement.

Last but not least, I'd like to thank my family, Antonia and my best friends for their prayers, patience, encouragement and support throughout all the difficult and hard times.

Abstract

Controlling and lowering the groundwater table in urban areas is an important point of research as groundwater can be one of the main obstacles that might hinder the implementation of construction projects and the protection of monuments.

This study is concerned about how to combine and integrate different dewatering methods to achieve better efficiency and lower cost.

The research scope is focusing on deep well dewatering method, limitation of its usage, relation between depth of well and drawdown, and when to introduce another dewatering method in combination with deep wells. This study is aimed towards giving solutions for the inefficient usage of only deep wells system in dewatering, especially in stratified layered soil with low permeability soil overlying the aquifer pervious layers.

To achieve the previous goals; "Visual MODFLOW" was used to develop a groundwater numerical simulation model for a construction site under different conditions of soil stratification especially with upper clayey strata followed by sandy layer with different depths.

The effect of depth, number, and arrangements of deep wells with constant total discharge on the groundwater table and drawdowns is investigated under different stratifications.

The studied scenarios are compared in order to identify the most efficient one, the limitations of usage of the deep well system and when to combine another method with the deep well system.

In the cases where the deep wells system didn't achieve the targeted drawdown, shallow wells were used in combination with the existing deep wells; to study the effect of combining the two proposed systems on the groundwater table and the expected drawdown, with the change of deep well depths, number and arrangements with constant total discharge.

The Results of this research are presented in the form of trend curves and percentage limitations; aiding to know when to introduce another dewatering system in combination with the deep well system and the relation between different arrangements of deep wells, screen length and the expected drawdowns.

Keywords: Groundwater, Dewatering, numerical modeling, Visual MODFLOW, Deep wells, shallow wells, urban areas

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