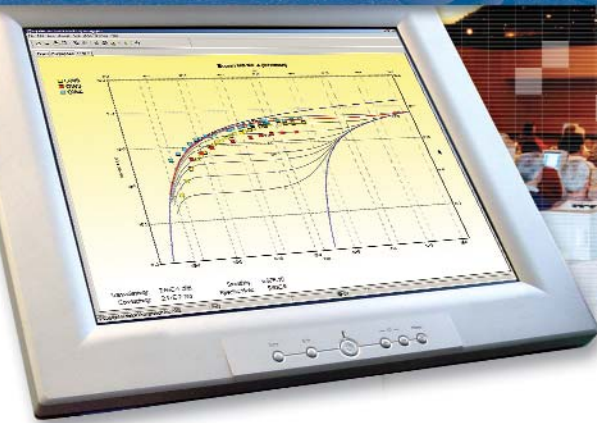


Aquifer Test Analysis

Principles of Pumping Test Design and Techniques for Data Analysis

"Impressed with the quality of process used to present information. Good mixture of principals that apply to examples."
- Red Deer, Jock Foster



Course Topics

- ▶ Introduction to aquifer test analysis
- ▶ Learn how to plan a pumping test
- ▶ Basics of groundwater flow equations
- ▶ Equations for flow to a pumping well
- ▶ Using "Type Curves" for pumping test analysis
- ▶ Overview of AquiferTest Pro*
- ▶ Learning basics of pumping tests for:
 - ▶ Confined Aquifers with Leaky Aquitards
 - ▶ Unconfined Aquifers with Delayed Yield
 - ▶ Partially Penetrating Wells
 - ▶ Variable Pumping Rates
 - ▶ Aquifer Boundaries
 - ▶ Fractured Media
- ▶ Introduction to Slug Tests
- ▶ Introduction to Well Performance Tests

Course Objectives

From hands-in experience, you will learn...

- ▶ Theory behind aquifer test analysis
- ▶ How to use AquiferTest Pro to analyze pumping test and slug test data
- ▶ Hydrogeologic properties of aquifers and aquitards and their significance in pumping test and slug test analysis
- ▶ Skills for optimizing and planning your pumping test and slug test analysis
- ▶ When to apply appropriate Analytical Techniques (Type Curves) for your pump test
- ▶ How to effectively apply AquiferTest Pro to your projects

Course Description

Increased concern for groundwater resources has arisen over the past few years as a result of numerous incidents of groundwater contamination, among them the contamination of the water distribution system in Walkerton, Ontario, Canada. The resulting strict environmental regulations issued by the Ontario Ministry of Environment (MOE), and growing competition for limited clean freshwater resources, has led to a rapid increase in groundwater resource investigations. These investigations, or hydrogeologic analysis, are

completed to analyze the subsurface geologic, hydrologic and geochemical conditions at a field site. This includes the completion of field work to determine aquifer properties (e.g. hydraulic conductivity, leakage and storage parameters), which includes drilling test wells and observation wells, and completing aquifer test analysis (pumping tests and slug tests).

The hydrogeologic environment is a complex system of aquifers and aquitards. Hydrogeologists strive to determine the most reliable values for the hydraulic characteristics of the geological formations. An important component of hydrogeologic analysis is mathematical modeling because mathematical models provide the most accurate predictions of system behavior. However, analyzing and evaluating pumping test data is as much an art as a science. It is a science because it is based on theoretical models that a hydrogeologist must understand, and thorough investigations that must be conducted into the geological formations in the area of the test. It is also an art, because different types of aquifers can exhibit similar drawdown behaviors, and accurate analysis demands good interpretation skills on the part of the geologist or engineer.

This course was designed to present the theory behind groundwater flow to a pumping well, and to illustrate the practical development of aquifer test solutions. This course introduces the equations of groundwater flow, the analytical techniques that have been developed to solve these equations, and their practical implementation in AquiferTest Pro. It alternates between lectures and exercises to illustrate ease of using the software. New exercises have been developed to show the aquifer tests for unconfined, leaky-confined and confined aquifer conditions. Attendees will gain a more complete understanding of the analysis of pumping tests and slug tests, and the determination of aquifer hydraulic properties.

The exercises presented in this course will help the student to develop the skills needed to evaluate and interpret the most common types of pumping tests and slug tests.

Course software: AquiferTest Pro

Course Schedule

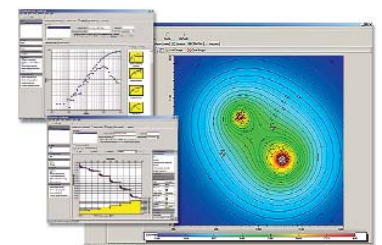
Day 1

- Course Introduction
- Lecture: Principles of Aquifer Test Analysis
- Lecture: Overview of AquiferTest Pro
- Exercise: Introduction to AquiferTest Analysis
- Lecture: Groundwater Flow Equations and Type Curve Analysis
- Exercise: Pumping Test Analysis - Confined Aquifers
- Lecture: Leaky-Confined Aquifers
- Exercise: Pumping Test Analysis - Leaky-Confined Aquifers

Day 2

- Lecture: Unconfined Aquifers with Delayed Yield
- Exercise: Pumping Test Analysis - Unconfined Aquifers
- Lecture: Introduction to Slug Tests
- Exercise: Slug Test Analysis
- Lecture: Analysis using The Theory of Superposition
- Exercise: Pumping Test Analysis - Multiple Well in a Confined Aquifer
- Lecture: Fracture Flow Analysis
- Exercise: Pumping Test Analysis - Fractured Media
- Exercise: Pumping Test Analysis - Village of Erin

Note: Breaks and lunches are not listed.



AquiferTest Pro Output