



COURSE OUTLINE

WO 011

Groundwater Quality & Treatment

PREPARED BY: _____ DATE: _____
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APPROVED BY: _____ DATE: _____
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Course Outline prepared by Robert Rondeau, 2011

Yukon College
P.O. Box 2799
Whitehorse, YT
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Groundwater Quality & Treatment

WO 011

Course Description

This 1 day course is designed to provide operator information on groundwater sources, well construction and components, sources of contamination, water quality, and treatment.

Course Pre-requisites

There are no pre-requisites for this course.

CEU Credit

This course is registered with EOCP and offers 0.6 CEUs.

Course Duration

- 1 day
- 8:30 am to 4:00 pm each day
- 1 hour lunch break
- morning and afternoon break (15 minutes each)

Course Agenda and Objectives

Introduction

- Housekeeping
- Instructor Introduction
- Operator Introductions

Occurrence of Groundwater

- Groundwater Source
- The Hydrologic (Water) Cycle
- Unsaturated and Saturated Zones
- Confined and Unconfined Aquifers

Evaluation of Regional Groundwater Conditions

- Identifying Potential Water Sources
- Type and Source of Contamination

- Field Methods for Locating Suitable Groundwater Supplies

Types of Wells

- Types of Well Construction
- Well Components
- Well Disinfection

Quantitative Evaluation of Wells

- Aquifer Parameters
- Hydraulic Conductivity
- Storage Coefficient

Aquifer Investigation

- Water Level Measurements
- Methods of Aquifer Investigation

Pump Classification

- Centrifugal Pump
- Deep-Well Turbine Pump
- Submersible pump
- Propeller and Mixed-Flow Pumps
- Rotary Pump
- Positive Displacement Pump
- Reciprocating Pump or Plunger Type Pump
- Impulse Airlift Pump
- Impulse Jet Pump
- Selecting a Type of Pump

Chemicals in Groundwater

- Physical Characteristics
- Chemical Characteristics
- Groundwater Contamination

Biological Contaminants

- Pathogens

Chemical Contaminants – Inorganic Compounds

- Nitrogen Group
- Total Dissolved Solids
- Mineral Contaminants
- Radionuclides

Chemical Contaminants – Organic Compounds

- Volatile Organic Chemicals
- Pesticides
- Pharmaceutical Active Substances

- Sources of Chemical Contamination

Groundwater Treatment

- GUDI Assessment
- Aeration
- Oxidation
- Ozone
- Softening
- Oxidation and Filtration
- Sequestration

Filtration

- Granular Filtration
- Membrane Filtration
- Cake Filters
- Arsenic Removal
- Granular Activated Carbon
- Powder Activated Carbon
- Corrosion Control

Disinfection

- Disinfection
- Hypochlorous Acid
- Free, Total, and Combined Residuals
- Chlorine Demand
- Chlorine Dosages
- Breakpoint Chlorination
- Ct Concept
- Chlorine Dioxide
- Ozone
- Multi-Oxidant Solution
- UV Disinfection

One Day Outline

Introduction

Module 1: Occurrence of Groundwater

Module 2: Evaluation of Regional Groundwater Conditions

Module 3: Types of Wells

Module 4: Quantitative Evaluation of Wells

Module 5: Aquifer Investigation

Module 6: Pump Classification

Module 7: Chemicals in Groundwater

Module 8: Biological Contaminants

Module 9: Chemical Contaminants – Inorganic Compounds

Module 10: Chemical Contaminants – Organic Compounds

Module 11: Groundwater Treatment

Module 12: Filtration

Module 13: Disinfection (includes practical lab for testing turbidity, free, and total chlorine residuals)

Course Requirements:

Attendance and participation are required. CEUs will be allocated based on attendance and course completion.

Evaluation:

There will be a final exam in this course with a passing mark of 50%. Yukon College records will only show a pass or fail result. If anyone fails this exam, arrangements can be made for a re-write.

STUDENTS WITH DISABILITIES OR CHRONIC CONDITIONS:

Reasonable accommodations are available for students with a documented disability or chronic condition. It is the student's responsibility to seek these accommodations. If a student has a disability or chronic condition and may need accommodation to fully participate in this class, he/she should contact the Learning Assistance Centre (LAC) at (867) 668-8785 or lassist@yukoncollege.yk.ca.