Basic Hydrogeology
Course Outline

Course Description
This 1 day course is designed to increase the participants' knowledge in basic hydrogeology principles which include aquifer types and properties, groundwater flow direction, groundwater as a potable water source, sources and migration of contaminants, water chemistry, groundwater remediation, and groundwater under the direct influence of surface water (GUDI).

Course Pre-requisites
There are no specific pre-requisites for this course. However, Grade 12 (or equivalent) math skills are an asset. Math upgrades are available –contact us.

Continuing Education Units (CEUs)
This course is recognized by EOCP for 0.6 CEUs (core for SWS, BWD and WD certifications, and related for WT, WWT, WWC and SWWS certifications).

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

Course Topics
Introduction

Basic Principles of Hydrogeology
- The Hydrologic Cycle
- Recharge and Discharge
- Aquifers and Aquitards
- Heterogeneous and Homogeneous
- Pore Space
- Saturated and Unsaturated Zone
- Monitoring Wells and Piezometers
- Hydraulic Head

Groundwater Flow
- Darcy's Law
- Groundwater Flow Velocity & Direction
- Hydraulic Conductivity
- Hydraulic Gradient
- Triangulation

Groundwater Flow Modeling
- Model Output Example
- Contaminant Transport Modeling
- Usefulness of Modeling

Groundwater Contamination
- Potential Sources of Contamination
- Migration of Contamination
    - Advection
    - Dispersion
    - Diffusion
    - Density Effects
- Groundwater Remediation

Wellhead Protection Plans
- Purpose of Wellhead Protection Plan

Groundwater Under the Direct Influence of Surface Water (GUDI)
- Understanding GUDI
- Dangers of Surface Water
- GUDI Assessment Guideline
- Potential Vulnerable Wells

Groundwater Chemistry
- Major Ions in Groundwater
- Total Metals for Drinking Water
- Drinking Water Quality
- Naturally Occurring Groundwater Contamination

Delivery Method/Format

Instructional Method	Percentage of Class Time
Hands-on/Q & A	25
Examples/Case Study	15
Presentation/Lecture	60

Material/Handouts (supplied)

- Student Binder: Yukon University. Basic Hydrogeology; an elective – Technical Development– course. Whitehorse, Yukon.
- EOCP Course Completion and Evaluation Form.
    - every student needs to complete and return this form for any CEU allocation
- Calculators are provided but students are welcome to use their own.
    - please return

Course Requirements

Attendance and participation in class are required. CEUs will be allocated based on attendance and course completion; Yukon University records will show a pass or fail result. If the participant doesn't attend the class, Yukon University records will show a "no show" result and no CEUs will be allocated.

Evaluation

There will be a quantifiable evaluation at the end of this course with a passing mark of 70%. If anyone fails this evaluation, arrangements can be made for a re-assessment. Please note that this evaluation is for self-assessment purpose only.

The final evaluation for this course is NOT an EOCP certification exam. To challenge a certification exam, register separately with EOCP at least 3 weeks in advance: 1-866-552-3627 or crm.eocp.ca.

Appropriate Language

In all areas of the University environment, students are responsible for showing respect for others. Swearing, or language that is discriminatory or derogatory in relation to race, sex, ethnic background, religious beliefs, age, and physical condition is not appropriate.

Electronic Devices

In order to be successful in classes and minimize distractions for others, cell phones, iPods, and other electronic devices must be turned off while students are in class. In an emergency situation, the instructor may give a student permission to use a cell phone or pager.

Academic and Student Conduct

Information on academic standing and student rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/Admissions & Registrations web page.

Plagiarism

Plagiarism is a serious academic offence. Plagiarism occurs when students present the words of someone else as their own. Plagiarism can be the deliberate use of a whole piece of another person's writing, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material. Whenever the words, research or ideas of others are directly quoted or paraphrased, they must be documented according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Resubmitting a paper which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the University.

Academic Accommodation

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon University Academic Regulations (available on the Yukon University website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, they should contact the Learning Assistance Centre (LAC) at LearningAssistanceCentre@yukonu.ca.

Class Outline

8:30 am to 9:00 am: Introduction
9:00 am to 10:00 am: Basic Principles of Hydrogeology
10:00 am to 10:15 am: *Health Break*
10:15 am to 10:50 am: Basic Principles of Hydrogeology (cont…...)
10:50 am to 12:00 am: Groundwater Flow Equations
12:00 pm to 1:00 pm: *Lunch*
1:00 pm to 1:30 pm: Groundwater Flow Equations (cont……)
1:30 pm to 1:45 pm: Groundwater Flow Modeling
1:45 pm to 2:00 pm: Groundwater Contamination
2:00 pm to 2:15 pm: Migration of Contaminants
2:15 pm to 2:30 pm: *Health Break*
2:15 pm to 2:30 pm: Migration of Contaminants (cont……)
2:30 pm to 3:00 pm: Groundwater Remediation
3:00 pm to 3:15 pm: Wellhead Protection Plans
3:15 pm to 3:30 pm Groundwater Under the Direct Influence of Surface Water (GUDI)
3:30 pm to 4:00 pm: Groundwater Chemistry