



FUNDAMENTAL CONTAMINANT CHEMISTRY

Course ID: Chem-403A

A review of chemistry principles associated with contaminant transport, fate, and remediation

Course I.D. CHEM-403A (Course 1 of 3 in a Series)

November 15, 2010, 8:00AM- 5:00PM

Holiday Inn - Conference Center Downtown

22 North Last Chance Gulch | Helena, MT 59601

Instructor: Erick McWayne, Northwest Environmental Training Center

Description: This course provides participants with an overview and refresher of key chemistry concepts associated with environmental contamination, contaminant transport, fate, and remediation. It also includes a review of chemical naming rules (e.g., understanding what 1,1,1-TCA is) and the ways in which they can be used to predict molecular geometry and environmental behavior. This material is intended for non chemists in the environmental field seeking a fundamental understanding of chemistry principles to use in their work. Moreover, this course is recommended for all environmental professionals working with contaminated soil and water who have had minimal formal training in the subject. It is also recommended for project managers seeking a review of contaminant chemistry.

Course Topics:

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| <ul style="list-style-type: none">• Overview of Physical and Chemical Properties of Contaminants (S, Koc, Kow, KH, TB, TM)• Periodic Chart Applications to Remediation• Isotopes, Ions, and Chemical Bonds• Predicting Molecular Geometry and Behavior• Solubility Rules, Precipitation, and Applications for Inorganic• Remediation Chemical Reactions, Kinetics, and Thermodynamics• Stoichiometry (balancing reactions)• Oxidation States and Redox Reactions | <ul style="list-style-type: none">• Chemical Equilibrium and Limiting Reactants• Empirical, Chemical, and Structural Formulas• Mass-Based and Molar-Based Concentrations• Visualizing Molecules with Lewis Dot Notation• Polyatomic Oxoanions (nitrate, phosphate, chromate, perchlorate, permanganate, etc.)• Organic Molecules and IUPAC Nomenclature• Functional Groups - Alcohols, Aldehydes, Amines, Aromatics, Ethers, Ketones, and Organometallics• BTEX - Benzene, Toluene, Ethylbenzene, and Xylene |
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This course is part one of a three-part series. It is immediately followed by [Contaminant Chemistry and Transport in Soil and Groundwater Workshop \(CHEM-403B\)](#) from November 16-17, 2010. A discount applies when registering both courses.

After completing this course, participants will be able to:

- Identify common physical and chemical properties that affect chemical fate and transport in soil and water;
- Use molecular shape to predict chemical behavior (solubility, vapor pressure, Henry's law constant, boiling point, melting point, and viscosity);
- Understand chemical solubility in polar versus nonpolar solvents;
- Predict whether anions or cations will be more mobile in groundwater;
- Express contaminant concentrations in terms of mass and moles, and predict limiting reactants;
- Understand the concepts of chemical equilibrium, kinetics, and thermodynamics and how they affect remediation;
- Describe the structure of common organic chemical contaminants using diagramming methods such as the condensed structural formula and Lewis Dot notation; and
- Identify and name simple organic chemicals (e.g., 2,4,5-trichlorophenol) using the International Union of Pure and Applied Chemistry nomenclature system.

Prerequisites: Some college level chemistry is required (even if it was a long time ago).

Education Level: Fundamental overview/refresher

Course Materials: Each participant will receive a copy of the course proceedings including notes and reference material on the first day of the course.

Continuing Education Units: 0.75 CEU's

Registration: *Early Bird rate \$300/\$245 if registered by August 13; \$350/\$295* thereafter*

*(*reduced tuition is available to employees of Native American tribes, government agencies, and nonprofits; students; and [NAEP](#) members). An additional discount applies when registering for [CHEM-403B](#). You may register via the link below or by calling the Northwest Environmental Training Center at 206-762-1976. [Register Online!](#)*

What to Bring: Scientific calculator, mechanical pencil, coffee mug and water bottle (to reduce waste). Please wear comfortable clothing appropriate for the prevailing weather.

About the Instructor: Mr. McWayne has fifteen years of experience leading soil, groundwater, and geophysical investigations for the characterization of contaminant transport and fate. In addition, he has extensive experience teaching contaminant chemistry, transport, natural attenuation, and hydrogeology. As an environmental consultant, Mr. McWayne served as a project manager for remedial investigation and feasibility studies at numerous Department of Defense and other contaminated sites. He currently serves as Executive Director of the Northwest Environmental Training Center and teaches workshops in transport and fate, environmental chemistry, and hydrogeology across the country.

Cancellation Policy: *Registration fees are fully refundable up to 30 days prior to the event and 50 percent refundable (or 100% credit) thereafter up to 3 business days prior to the event. No refunds are issued for cancellations occurring less than 3 business days before the start day. Course registration fees and cancellation policy are subject to change without notice.*

Disability Accommodations: *To request disability accommodations, please contact us at info@nwetc.org or (206) 762-1976 at least 30 days prior to the event.*



CONTAMINANT CHEMISTRY & Transport in Soil and Groundwater

Course I.D. CHEM-403B (Course 2 of 3 in a Series)
November 16-17, 2010, 8:00AM- 5:00PM
Holiday Inn - Conference Center Downtown
22 North Last Chance Gulch | Helena, MT 59601

Instructor: Erick McWayne, Northwest Environmental Training Center

Description: This course provides participants with an overview of key concepts essential for understanding soil and groundwater contamination and the selection of appropriate remediation approaches. This material is intended for environmental professionals seeking a solid understanding of contaminant behavior, monitoring parameters, and how both relate to site remediation. This course is recommended for all environmental professionals working with contaminated soil and groundwater seeking a thorough review of essential topics. The course material will greatly enhance on-the-job training and is also recommended for project managers seeking a more thorough understanding of contaminant behavior.

Course Topics:

Contaminant Chemistry Overview

- Functional Groups, Chemical Properties, and Hazards

Transport Mechanisms

- Advection
- Mechanical Dispersion
- Diffusion (Chemical Dispersion)

Contaminant Solubility Rules

- Molecular Geometry
- Effective Solubility

3- and 4-Phase Equilibrium Partitioning

- Adsorption and Absorption
- Applications of K_d , K_{oc} , f_{oc} , K_{ow} , and K_H
- NAPL and the One Percent Rule
- Molar Fraction Calculations- Contaminant Mass Fraction Calculation
- Residual Saturation Calculation

Groundwater Transport

- Hydrogeology Review
- Three Point Problem
- Groundwater Velocity Calculations
- Retardation and Solute Velocity Calculations

Nonaqueous Phase Liquid (NAPL) Transport

- Capillary Fringe Interactions and Smear Zones
- Estimating LNAPL Thickness from Well Free Product
- Estimating DNAPL Critical Height

Vapor Transport

- Vapor Pressure, Solubility, Molecular Weight, and Vapor Density
- Contact Surface and Henry's Law Partitioning
- Vapor Diffusion and Air-Filled Porosity

Natural Attenuation

- Overview of Natural Attenuation Processes
- Biodegradation Pathways for Common Contaminants

Focus on Hydrocarbon Contamination

- Gasoline and Diesel Chemistry
- BTEX, Oxygenates, Additives, and Other Potential Concerns
- Ethanol Cosolvation and Plume Elongation
- Geochemical Indicators of Natural Attenuation
- Plume Behavior and Zones

Focus on Chlorinated Hydrocarbon Contamination

- Chlorinated Solvent Chemistry
- Type I, II, and III Plume Behavior
- Reductive Dechlorination and Cometabolization
- Geochemical Indicators of Natural Attenuation

Focus on Metal Contaminants

- Mobility, pH, and Amphoterism
- Dissolved and Particulate Forms
- Cation/Anion Exchange and Variably Charged Soils
- Complexation, Chelation, and Ligands
- Hydrated Metals as Acids

This course is part two of a three-part series. It is preceded by [Fundamental Contaminant Chemistry \(CHEM-403a\)](#) on November 15, 2010. A discount applies when registering for both courses.

After completing this course, participants will be able to:

- Understand basic soil and groundwater chemistry;
- Calculate chemical partitioning;
- Understand the significance of temperature, redox potential, pH, DO, and other monitoring parameters;
- Apply soil chemistry principles to soil investigations;
- Apply water chemistry principles to groundwater investigations;
- Understand the chemical and biological aspects of natural attenuation;
- Estimate partitioning coefficients and calculate solute average linear velocities;
- Demonstrate an improved overall understanding of contaminant chemistry; and
- Use site-specific chemistry data for selecting appropriate remediation strategies.

Education Level: Introductory to intermediate/refresher.

Prerequisites: Completion of [CHEM-403A - Fundamental Contaminant Chemistry](#) workshop, equivalent course work, or on-the-job experience.

Course Materials: Each participant will receive a copy of the course proceedings including notes and reference material.

Continuing Education Units: 1.5 CEU's

Registration: *Early Bird rate \$545/\$445 if registered by August 13; \$595/\$495* thereafter*

(*reduced tuition is available to employees of Native American tribes, nonprofits, and government agencies; students; and [NAEP](#) members). *An additional discount applies when registering for [CHEM-403A](#).* You may register via the link below or by calling the Northwest Environmental Training Center at 206-762-1976. [Register Online!](#)

What to Bring: Scientific calculator, mechanical pencil, coffee mug and water bottle (to reduce waste). Please wear comfortable clothing appropriate for the prevailing weather.

About the Instructor: Mr. McWayne has fifteen years of experience leading soil, groundwater, and geophysical investigations for the characterization of contaminant transport and fate. In addition, he has extensive experience teaching contaminant chemistry, transport, natural attenuation, and hydrogeology. As an environmental consultant, Mr. McWayne served as a project manager for remedial investigation and feasibility studies at numerous Department of Defense and other contaminated sites. He currently serves as Executive Director of the Northwest Environmental Training Center and teaches workshops in transport and fate, environmental chemistry, and hydrogeology across the country.

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Disability Accommodations: *To request disability accommodations, please contact us at info@nwetc.org or (206) 762-1976 at least 30 days prior to the event.*



Directions to:

Holiday Inn - Conference Center Downtown
22 North Last Chance Gulch | Helena, MT 59601

[Accommodations](#) | [Course Catalog](#)

Greyhound: <http://www.greyhound.com>

Amtrak: <http://www.amtrak.com>

FROM Helena Regional Airport

Turn LEFT onto Skyway Dr.

Turn LEFT at the light onto N. Washington St.

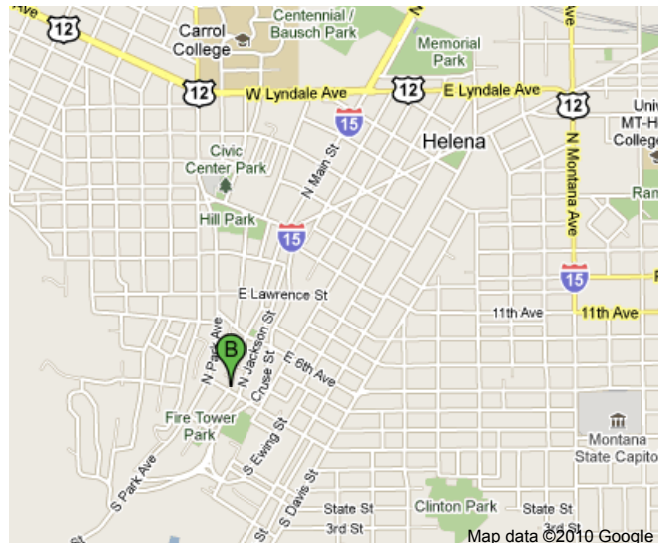
Turn RIGHT onto Cedar St./Airport Rd.

Turn LEFT onto N. Montana Ave.

Turn RIGHT at the second stop sign after 11th Ave, onto Broadway.

Hotel is to the RIGHT

Map your own route using [MapQuest](#) or [Google Maps](#).



[View Larger Map](#)

Northwest Environmental Training Center

A 501(c)(3) non-profit program of EOS Alliance
650 S. Orcas Street, Suite 220 | Seattle, Washington 98108
Phone: (206)762-1976 | Fax: (206)762-1979

www.nwetc.org



Helena, MT | ACCOMMODATIONS near the Holiday Inn - Conference Center Downtown

Holiday Inn - Conference Center Downtown
22 North Last Chance Gulch | Helena, MT 59601
Reservations: (888)-HOLIDAY

Red Lion Colonial Hotel

2301 Colonial Drive
Helena, MT

(800) Red-
Lion
(406) 443-
2100

[\(reservations\)](#)

Best Western Helena

835 Great Northern Boulevard
Helena, MT

(800) 528-
1234
(406) 457-
5500

[\(reservations\)](#)

Helena Days Inn

2001 Prospect Avenue
Helena, MT

(800) 329-
4766
(406) 442-
3280

[\(reservations\)](#)

Fairfield Inn Helena

2150 11th Avenue
Helena, MT

(800) 228-
2800
(406) 449-
9949

[\(reservations\)](#)

Holiday Inn Helena Downtown

22 North Last Chance Gulch
Helena, MT

(800) 465-4329 (406)
443-2200

[\(reservations\)](#)

Jorgenson Inn and Suites

1714 11th Avenue
Helena, MT

(800) 272-1700
(406) 442-1770

[\(reservations\)](#)

Shilo Inn Helena

2020 Prospect Avenue
Helena, MT

(800) 222-2244
(406) 442-0320

[\(reservations\)](#)

Super 8 Motel Helena

2200 11th Avenue
Helena, MT

(800) 800-8000 (406)
443-2450

[\(reservations\)](#)

Northwest Environmental Training Center

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650 S. Orcas Street, Suite 220, Seattle, Washington 98108
Phone: (206)762-1976, Fax: (206)762-1979
www.nwetc.org



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Phone: (206) 762-1976 | Fax: (206) 762-1979
www.nwetc.org | www.eosalliance.org

REGISTRATION FORM

Name: _____ Today's Date: _____

Agency/Organization: _____

Street Address: _____

Street Address (cont'd): _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____

Email: _____ Title: _____

Fundamental Contaminant Chemistry Workshop \$ _____

Course ID: Chem-403a

November 15, 2010, 8:00 A.M. to 5 P.M.

Holiday Inn, 22 North Last Gulch, Helena, MT 59601

Registration: \$350 (\$295*)

Contaminant Chemistry and Transport Workshop \$ _____

Course ID: Chem-403b

November 16-17, 2010, 8:00 A.M. to 5 P.M.

Holiday Inn, 22 North Last Gulch, Helena, MT 59601

Registration: \$595 (\$495*)

*Reduced rates for Native American Tribes; nonprofits; government; students; and NEBC, NAEP and NWAEP members.

Payment Method: Check Credit Card (Visa Mastercard) Total: \$ _____

Credit Card #: _____ Exp: _____

Notes: Please make checks payable to Northwest Environmental Training Center.

Cancellation Policy: Registration fees are fully refundable up to 30 days prior to the event and 50 percent refundable (or 100% credit) thereafter up to 3 business days prior to the event. No refunds are issued for cancellations occurring less than 3 business days before the start day.