Course Description

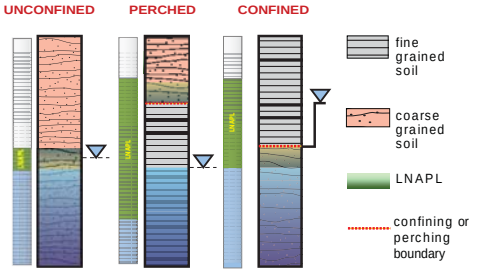
Managing Light Non-Aqueous Phase Liquid (LNAPL) in different subsurface settings such as heterogeneous media is a key element to site characterisation and remediation system design.

This newly-designed course presents the latest advances about how our understanding of LNAPL behavior has improved over the last few years. LNAPL distribution in the soil will be addressed accounting for the effects of various soil properties including pore size distribution, porosity, saturation, capillary pressure and permeability. Fluid properties such as viscosity, density, and interfacial and surface tensions and how these fluid properties affect LNAPL distribution and recovery will also be addressed. We will also introduce methods of predicting and evaluating recovery of LNAPL. We will discuss some assessment techniques and look at core photos taken from within lNAPL plumes.

Register now for this powerful two-day training course on LNAPL site management and quantitative techniques. This course will provide you with the knowledge to manage LNAPL conditions at your site.

Demystify Conventional Wisdom

Discover why LNAPL is simply not an accumulating layer in the soil floating and resting on the top of the water table, as shown in the figure below:



Learn why it is distributed with water and air in pore spaces as as functional control of capillary (hydraulic and soil) pressure. Using well-developed theories and methods, this distribution can be estimated. From this, the volume of LNAPL present in the soil and its conductivity can be estimated.

Discover how LNAPL recovery is constrained by capillary forces, fluctuating water tables, and relative permeability effects. Then learn the common assumptions and past convenational wisdoms in the theory of recoverability such as homogeneous soils and fluids in vertical equilibrium which can raise uncertainty. Armed now with our new understanding in addition to good data, we can arrive at a satisfactory understanding of LNAPL behavior in the soil.

Instructors

Randy Charbeneau, PhD., PE, Professor - Jewell McAlister Smith Professor in Engineering at the University of Texas. His areas of research include: Groundwater hydrology, subsurface fate and transport of hazardous and radioactive wastes, groundwater pollution, dose and risk assessment, multiphase flow, and mathematical modeling. Recently funded research includes fate and transport of hazardous organic chemicals in the vadose zone and more. Dr. Charbeneau received his Ph.D., from Stanford University in Civil Engineering, his M.Sc. from Oregon State University in Civil Engineering and his B.Sc. from University of Michigan in Civil Engineering.

Tom Sale, PhD, PG, is an Associate Professor and the Director of the Center for Contaminant Hydrology in Civil and Environmental Engineering. His Research and consulting focus on innovative solutions for groundwater contaminants in source zones and plumes, specializing in LNAPL plume mobilization. The innovative nature of the Center for Contaminant Hydrology's research is reflected in acquisition of five final and two provisional patents over the last seven years. Dr. Sale received his Ph.D. from Colorado State University, M.S. Degree from the University of Arizona, and B.A. degrees from Miami of Ohio.

Mark Adamski, PG, Hydrogeologist, Senior Technical Specialist with BP America in Houston. Mark supports projects both in the US and globally. He has worked for BP America since 1993. In his position, he directs both BP and American Petroleum Institute (API) research in the occurrence and behaviour of LNAPL in the subsurface. He has conducted site assessments, analyzed, and modeled LNAPL distribution and recovery at BP sites worldwide. As a result of this experience, he has presented at conferences, seminars, and workshops internationally since 2000, including Midwest GeoSciences Group since 2007. He has been involved with the development of landmark regulatory LNAPL guidance documents developed by the State of Texas, ITRC, and the US EPA. His primary areas of current LNAPL study are site characterization techniques, residual saturation, plume migration, and recovery techniques. Mark has worked in modeling fluid migration in porous media throughout his career with BP. Mark has been an ITRC LNAPL team member since 2007. He earned a bachelor's degree in Geological Engineering from the University of Arizona in Tucson, Arizona in 1987 and a master's degree in Hydrogeology from Texas A&M University College Station, Texas. Mark is a registered professional geologist in Texas.

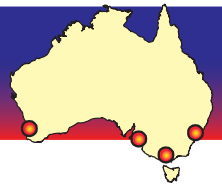
Advanced LNAPL Site Management and Quantitative Analysis

A professional education course

offered by
ACLCA and
Midwest GeoSciences Group

with support from the
LNAPL Forum (a CRC CARE initiative)

featuring instructors:
Randall Charbeneau, PhD, PE,
Tom Sale, PhD
Mark Adamski, PG



Perth	Mar 12-13
Adelaide	Mar 15-16
Melbourne	Mar 19-20
Sydney	Mar 22-23

Advanced LNAPL Site Management

and Quantitative Analysis

DAY ONE

8:00-8:15	**Course Introduction**
8:15-8:45	**Introduction – How We Got Here** - Historical Development of Petroleum - Current Practices - Implication of managing a legacy of past practice - Evolution of corrective measures
8:45-9:30	**LNAPL Fundamentals** - Terminology and Principles Governing Flow - Current Understanding of LNAPL Distribution - LNAPL Behavior
9:30-9:45	Break and Discussion
9:45-10:30	**LNAPL Plume Behavior** - LNAPL Behavior, thickness, mobility and plume stability - Processes Governing Natural Losses of LNAPL - A Mass Balance Approach to LNAPL Stability
10:30-11:15	**Recent Advances in Site Characterisation** - Site Assessment - LNAPL Behavior
11:15-11:30	**Project Objectives, Metrics and Solutions** - Understanding Project Drivers - Moving Away From Thickness as a Metric - Introduction toTrending Technologies
11:30-12N	**Technologies** - LNAPL Depletion, Barriers and Natural Attenuation - Discussion: Treating Residual LNAPL - Treatment Technologies and Combined Remedies - Endpoints
12N-1:00	Lunch
1:00-1:45	**Building the Hydrogeologic Framework** - Preparing Accurate and Complete Boring Logs - Depositional Environments - Effects of Secondary Weathering
1:45-2:00	Break and Discussion
2:00-2:45	**Principals and Concepts in Multi-phase Flow** - Additional Issues of Multi-Phase Flow
2:45-4:00	**LNAPL behavior at sites** - LNAPL thickness in wells; behavior with fluctuation WT - Observed LNAPL Saturations and Residual saturation - Confined and perched LNAPL – look out for it
4:00-4:15	Break and Discussion
4:15-5:00	**LNAPL Plume Behavior** - LNAPL Mobility, Plume stability; Partitioning; Transport - LNAPL Attenuation Studies - How to Estimate / Measure Loss Rates - LNAPL Seeps to Surface Water
5:00	Day One Adjourns

DAY TWO

8:00-8:10	Day Two Introduction
8:10-9:00	**LNAPL Site Assessment** - How to determine LNAPL distribution – field data -Detailed borings -Skilled Field Staff -TPH –cheap and easy substitute for Sn -LIF – Not all HC's fluoresce; pros and cons - Hydrographs - Critical Applications; Data; Interpretation - DGP's: How They Help ID Confined and Perched Conditions
9:00-9:45	**How to Determine LNAPL Transmissivity** - Baildown tests - Recovery system data -Data needed to determine Tn -How to calculate Tn
9:45-10:00	Break and Discussion
10:00-11:30	**Hands on exercises with API baildown sheet** - API spreadsheet - Three example problems -Classic Published Example -Confined Formation -Over Bailed (Vac Truck) Baildown Test
11:30-12:30	Lunch
12:30-1:15	**Remedial Technologies** - Setting Objectives Based on Composition vs Saturation - Recovery -LNAPL – Hydraulic Recovery for high saturation -Vapor – SVE - Containment – Eliminate Migration Risk - In Situ Treatment - Composition-Based Objectives - Endpoints and combined remedies
1:15-1:30	**Intro and to Tools and Resources** - ITRC Guidance Document, ANSR, API FAQs - API Baildown sheet, API LDRM, ASTM for Tn
1:30-1:45	Break and Discussion
1:45-3:15	**Hands on Example for LDRM** - Examples Matching Common Conditions - Tn from TPH Constrained LDRM
3:15-4:00	**Site-Specific Questions / Participants Presentations** - Open Discussions Following Presentation
4:00-4:30	**Concluding Remarks / Summary**
4:30	Course Adjourns

Education Level

Advanced. This course begins with a brief overview of LNAPL principles and continues at an advanced level throughout the course to match the range of real project conditions. A free 90-minute pre-course webinar is available to registered participants as a optional prerequisite for those who want to ensure understanding of fundamentals and terminology.

Fees (inclusive of GST)

Members: $1,200 AUD
(this includes ACLCA, ALGA, LNAPL Forum and CRC CARE members)

Non-members: $1,400 AUD

The course fee includes 16 contact hours of instruction, course notebook, *Field Guide for Soil and Stratigraphic Analysis*, certificate, full catering during the course (morning and afternoon teas and lunch).

Course Locations

12 & 13 March 2012 - Perth - Citigate Perth
15 & 16 March 2012 - Adelaide - International Visualisation Centre (IVC)
19 & 20 March 2012 - Melbourne - Karstens at CQ
22 & 23 March 2012 - Sydney - Karstens at CQ

Accommodations

Specific To Each City
Check Out: www.aclca.org.au
or www.midwestgeo.com

Contact Info

For more information contact Louisa Nicholls of ACLCA Vic on 03-9509 5949,
or email: aclcavic@ozemail.com.au

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