



## SHORT-COURSE ON LANDFILL ENGINEERING AND ENVIRONMENTAL MANAGEMENT

Course duration: 3 days ■ Course dates: 2 – 4 March 2011



### INTRODUCTION

Environmental impacts of landfills are becoming a major concern in Australia as a result of urban sprawl and also due to recent high profile cases and incidents (i.e. Tullamarine and Cranbourne Landfills) and related changes and increased tightening up of landfill regulations and guidelines. Furthermore changes to the EPA Vic licensing regime for operating landfills will mean increased requirements for appropriate environmental management systems, plans and audits both for operating and closed landfill sites (through post-closure PANs). ACLCA recognises that a skills gap exists in geo-environmental professionals with respect to assessing the risks and managing environmental impacts of landfills. The proposed course will address this by providing a series of training workshops covering the regulatory, scientific and engineering aspects of landfill environmental assessments and management.

## PRESENTERS

### Dr Steve Thornton

Senior Lecturer in Environmental Engineering Science, Groundwater Protection and Restoration Group, Dept of Civil and Structural Engineering, University of Sheffield, Course Coordinator for the MSc courses in Hydrogeology, Environmental Management and Water Engineering.

### David Hall

Principal of Golder Associates, Nottingham, UK specialising in landfill engineering, risk assessment, modelling (e.g. with LandSim) and remediation

### Roger Parker

Principal of Golder Associates, Melbourne. Geo-environmental Engineer and Environmental Auditor



## COURSE OUTCOMES:

1. To get an overview of the current Australian / state landfill regulations and guidelines and what it means for the operation and management of landfills.
2. To provide insight into the latest understanding of key physical, chemical and microbiological processes that determine the long term composition of landfill leachate and gas at sites.
3. To get an in-depth understanding of the key pollutants in leachate and gas and their potential environmental impact.
4. To get an updated view on the engineering design and performance of control systems used to manage and treat pollutant and waste emissions from sites.
5. To provide an understanding of the relative importance of physical, chemical and microbiological processes controlling natural attenuation of leachate pollutants in the subsurface.
6. To apply a risk based assessment process of landfill environmental impacts including the use of models for risk prediction and for analysis of natural attenuation of leachate pollutants for aquifer environmental management at sites.
7. To provide and insight into long term management and alternative design of landfills.

## COMPUTERS

The course will include practical training sessions using a landfill environmental risk assessment software (i.e. LandSim). A time limited copy of the software will be provided to attendees for the course. **Course attendees need to bring their own laptop computers (Windows operating system) to the course!**

## EDUCATION LEVEL

Intermediate to advanced level professionals specialising in landfill engineering and environmental management. Some prior knowledge of landfill engineering and contaminant fate and transport is beneficial.

## FEES (INCLUSIVE OF GST)

- Earlybird\* ACLCA members — **AUS\$1,500**
- ACLCA members — **AUS\$1,700**
- Earlybird\* non-ACLCA-members — **AUS\$1,700**
- Non-ACLCA-members — **AUS\$1,900**

*\*Earlybird registration must be received by 15 January 2011*

The course includes 23 contact hours of instructions, course notebook, certificate of attendance, full catering during the course (morning and afternoon teas and lunch).

Register online at [www.aclca.org.au](http://www.aclca.org.au)

## COURSE LOCATION

CQ Functions  
113 Queen Street  
Melbourne VIC 3000  
[www.cqmelbourne.com.au](http://www.cqmelbourne.com.au)

## CONTACT INFO

For more information contact Louisa Nicholls of ACLCA Vic on 03 9509 5949 or email: [aclcavic@ozemail.com.au](mailto:aclcavic@ozemail.com.au)



## LECTURE PROGRAMME FOR ACLCA LANDFILL ENGINEERING COURSE

### DAY 1 ■ 2 MARCH 2011

- |                          |   |
|--------------------------|---|
| <b>8.00am – 8:30am</b>   | <ul style="list-style-type: none"> <li>■ Personal introductions of speakers and course delegates</li> </ul>   |
| <b>8.30am – 9.30am</b>   | <ul style="list-style-type: none"> <li>■ Introduction to Australian / Victorian Landfill regulations and guidelines               <ul style="list-style-type: none"> <li>– Historical waste and landfill regulations</li> <li>– AUS / Vic waste management policies, regulations and guidelines including new EPA Vic licensing regime for landfills</li> <li>– Implications and implementation of current regulatory framework for management of landfills</li> <li>– Audits of landfill environmental performance and management</li> </ul> </li> </ul> |
| <b>9.30am – 10:30am</b>  | <ul style="list-style-type: none"> <li>■ Environmental impacts of landfill and introduction to waste               <ul style="list-style-type: none"> <li>– Environmental benefits and impacts of waste management options</li> <li>– Life cycle analysis and environmental impacts</li> <li>– Landfill environmental impacts</li> <li>– Environmental impact assessment for landfills</li> <li>– What is waste, what you need to know about waste etc.</li> </ul> </li> </ul>  |
| <b>10.30am – 10.45am</b> | <ul style="list-style-type: none"> <li>■ Tea break</li> </ul>   |
| <b>10.45am – 11.45am</b> | <ul style="list-style-type: none"> <li>■ Microbiological processes in landfills               <ul style="list-style-type: none"> <li>– Biological decomposition in landfills</li> <li>– Anaerobic decomposition processes</li> <li>– Factors affecting methanogenesis</li> <li>– Inhibitors / regulators of methane production</li> <li>– Effects of landfill operations (inc. overpumping &amp; effect on LFG production)</li> </ul> </li> </ul>   |
| <b>11.45am – 12.30pm</b> | <ul style="list-style-type: none"> <li>■ Lunch break</li> </ul>   |
| <b>12.30pm – 1.30pm</b>  | <ul style="list-style-type: none"> <li>■ Leachate and gas production and composition               <ul style="list-style-type: none"> <li>– Leachate production</li> <li>– Sources of compounds in leachate</li> <li>– Effects of biodegradation processes on leachate composition</li> <li>– Temporal trends in leachate composition</li> <li>– Representative leachate compositions</li> <li>– Landfill gas composition</li> </ul> </li> </ul>  |
| <b>1.30pm – 3.00pm</b>   | <ul style="list-style-type: none"> <li>■ Landfill emissions and long term behaviour               <ul style="list-style-type: none"> <li>– Knowledge base &amp; needs on emissions</li> <li>– Emissions &amp; LF design</li> <li>– Leachate production &amp; water balances</li> <li>– Dissolved contaminant emissions</li> </ul> </li> </ul>   |
| <b>3.00pm – 3.15pm</b>   | <ul style="list-style-type: none"> <li>■ Tea break</li> </ul>   |
| <b>3.15pm – 4.15pm</b>   | <ul style="list-style-type: none"> <li>■ Landfill emissions and long term behaviour (cont.)               <ul style="list-style-type: none"> <li>– Gas emissions</li> <li>– Methods to assess &amp; predict emissions</li> <li>– Use of leachate / solids ratios and the concept of kappa values</li> <li>– Exercise on estimating water balances</li> <li>– Exercise on predicting gas composition / contaminant emissions</li> </ul> </li> </ul>  |
| <b>4.15pm – 5.45pm</b>   | <ul style="list-style-type: none"> <li>■ Groundwater pollution from landfills and management using natural attenuation               <ul style="list-style-type: none"> <li>– Groundwater contamination by landfills</li> <li>– Natural attenuation processes for contaminants in landfills</li> <li>– Contaminant attenuation</li> <li>– Liners</li> <li>– Unsaturated zone</li> <li>– Aquifers</li> <li>– Natural Attenuation, transport processes, sorption isotherms, volatilisation of gas components from waste</li> </ul> </li> </ul>              |

## DAY 2 ■ 3 MARCH 2011

- 8.00am – 10.00am** ■ Environmental control systems for landfills
- Environmental control using site design
  - Landfill barrier system components
  - Mineral liners and synthetic liners
  - Liner system design
  - Mineral liner and synthetic liner quality control
  - Landfill cover systems
  - QA / QC
- 10.00am – 10.15am** ■ Tea break
- 10.15am – 11.45am** ■ Landfill leachate and gas management & treatment
- Leachate collection & removal systems
  - Landfill gas collection & removal systems
  - Leachate treatment methods (biological and physico-chemical)
  - Leachate re-circulation & bioreactor landfills (brief overview)
  - Gas condensate issues & knockouts (gas routes for contaminant release)
- 11.45am – 12.30pm** ■ Lunch break
- 12.30pm – 1.30pm** ■ Performance and failure of environmental control systems for landfills
- Classification of types, origin & timing of failure mechanisms
  - Mechanical failure and physico-chemical failure
  - Estimating leakage rates through liners
  - Syneresis (reaction) effects on liners
  - Diffusion
  - Controls on advection through liners
- 1.30pm – 3.00pm** ■ Risk assessment for landfills
- Framework for risk assessment at landfill sites
  - Guidance and protocols
  - Risk assessment for landfill planning and design
  - Monte Carlo analysis and application
  - Risk assessment for landfill operation, post-closure management and remediation
  - Case study examples
- 3.00pm – 3.15pm** ■ Tea break
- 3.15pm – 4.15pm** ■ Monitoring systems for LFG and leachate releases
- Objectives of monitoring programmes
  - Conceptual model on geology / hydrogeology
  - Design of monitoring points and networks for gas and leachate
  - Monitoring within landfill, considering settlement, redrilling methods
  - Sampling for gas and leachate, inc. target species
  - Data QA / QC issues

## DAY 3 ■ 4 MARCH 2011

- 8.00am – 10.00am** ■ LandSim landfill leachate emission model and exercise
- Background and theory
  - Uses of model for design, permitting and management
- 10.00am – 10.15am** ■ Tea break
- 10.15am – 12.00pm** ■ LandSim landfill leachate emission model and exercise (cont.)
- Case study
- 12.00pm – 12.45pm** ■ Lunch break
- 12.45pm – 2.15pm** ■ LandSim landfill leachate emission model and exercise (cont.)
- Practical Exercise on use of model (on laptops brought by attendees)
- 2.15pm – 3.15pm** ■ Bioflushing landfill design concept and applications
- Background and theory
  - Hydraulic management and process control issues, performance data etc.
  - Case study examples
- 3.15pm – 3.30pm** ■ Tea break
- 3.30pm – 4.30pm** ■ Plenary session – roll up and wrap-up
- Open session for questions and group discussion on any aspects of course

