



LANDFILL AND GROUND GAS INVESTIGATION, RISK ASSESSMENT AND REMEDIATION

14 – 17 September 2010 (4 days) In Melbourne, Victoria

A professional education course offered by
ACLCA Victoria

Presented by **Steve Wilson** and **Geoff Card**



COURSE DESCRIPTION

Landfill gas has become a major concern in Australia as a result of recent incidents where landfill gas has migrated from landfill sites and into buildings. This is particularly acute in residential developments. The Australian Contaminated Land Consultants Association (ACLCA) recognises a skills gap for geo environmental professionals with respect to assessing the risks posed by landfill gas. The proposed course will address this by providing a series of training workshops covering ground investigation, risk assessment and remediation related to landfill gas.

PRESENTERS

Steve Wilson is the Technical Director of EPG Ltd, Warrington, UK.

Geoff Card is a Chairman of Card Geotechnics Ltd, Aldershot, UK.

Both presenters have been intensely involved in all aspects of landfill and ground gas investigations, risk assessments and remediation for a number of decades and are the main authors of landfill and ground gas guidelines in the UK for many years and most recently authored the "Ground Gas Handbook" (Whittles Publishing, 2009). Steve and Geoff have provided training courses on landfill and ground gas issues to consultants, regulators, councils, universities and other stakeholders for many years in the UK. Steve and Geoff can be considered as two of the main experts on landfill and ground gas issues in the UK.



The course comprises of four modules, each one day long, so that each subject can be covered in detail.

MODULE 1 ■ DAY 1

Landfill gas generation and migration mechanisms

Knowledge of the way in which landfill (and other gases) are generated in the ground environment is vital to help plan site investigations and carry out risk assessments. The module will cover the chemistry and physics of gas generation (from landfill and other sources) and the different mechanisms that can drive gas migration from or through the ground. This will include how to use simple numerical models to assess ground gas migration and generation. It will look at specific issues relating to the geology in Victoria that can affect gas migration pathways.

MODULE 2 ■ DAY 2

Landfill gas investigation

Gas concentrations and flows in the ground are transient and vary with time. This needs to be understood when planning site investigations. There is a wide range of information that needs to be collected during a site investigation. This starts with the desk-top study which involves obtaining information on leachate quality, organic content of materials, percentage of material that can degrade, etc. Different methods of gas monitoring will be discussed together with items that need to be considered when installing standpipes for gas monitoring (response zones, etc).

Practicable and appropriate monitoring strategies will be discussed. This will include guidance on when to use FID and flux box surveys.

Other methods of measuring ground gas emissions would be discussed, together with differences in the approach to landfill gas between the UK and USA.

MODULE 3 ■ DAY 3

Landfill gas risk assessment

Risk assessment of ground gas following the latest UK guidance. This will extend the work on generation and migration modelling from Module 1 and use the learning from Module 1 to assess the risk of gas posing significant risk. It would cover migration pathways into buildings (based on typical Australian building types), ventilation rates, etc. A critical part of the process is the development of robust conceptual models and this would be covered in some detail.

The risk posed by landfill gas will be compared to the risk from other sources of gas, where applicable.

MODULE 4 ■ DAY 4

Remediation of landfill gas migration

Module 4 looks at the design and construction of various engineered systems that can be used to minimise the risk of ground gas migration. It will cover in ground vertical barriers, protection to new buildings near landfill sites and retro fitting protection to existing buildings.

It will show how to extend the risk assessments to help design cost effective remediation strategies.

COURSE SCHEDULE

DAY 1 ■ 14 SEPTEMBER

8.30am

- Arrival and coffee
- Introductions
- **Lecture 1:** Setting the scene — Australian and UK experience and specific UK and Australian guidance
- Discussion of issues arising from recent gas migration events in Australia

10.30am

- Coffee break
- **Lecture 2:** Sources of gas and current generation rates (natural and man made sources), chemistry of landfill gas generation and other gases (e.g. CO₂ from colliery spoil), gas trapped in ground, e.g. Coal Measures, generation models, use of leachate data
- Worked example of generation rates

12.30pm to 1.30pm

- Lunch
- **Lecture 3:** Migration pathways — general and discrete pathways
- Worked example of identifying potential migration pathways

3.00pm

- Tea break
- **Lecture 4:** Migration mechanisms and simple calculations (advection, diffusion, buoyancy, solution in groundwater)
- Worked examples of estimating gas migration rates
- Discussions

5.00pm

- Finish

DAY 2 ■ 15 SEPTEMBER

8.30am

- Arrival and coffee
- Introductions
- **Lecture 1:** Desk study (Phase I Study) — sources of information in Australia, how to present data, walkover inspections — what to look for, use of thermal imaging cameras during walkover
- **Lecture 2:** Intrusive site investigation for ground gas (trial pits, boreholes, soil descriptions, estimating proportion of degradable material)

10.30am

- Coffee break
- **Lecture 3:** Laboratory testing (biological methane potential, lignin, BOD/COD, etc), carbon isotope testing and what it means, trace gas analysis, leachate testing, bulk gas analysis in laboratory
- **Lecture 4:** Gas well installations (location of wells, response zones, how many wells)
- Worked example

12.30pm to 1.30pm

- Lunch
- Worked example — design a gas investigation
- **Lecture 5:** Gas monitoring methods (field meters, continuous Gas Clam, flux chamber), factors that affect gas monitors, internal monitoring with FID

3.00pm

- Tea break
- **Lecture 6:** Health and safety during ground gas investigations — drilling into Coal Measures — latest BDA advice on flush, health and safety procedures, when to use intrinsically safe monitors

5.00pm

- Finish

EDUCATION LEVEL

Intermediate to advanced level professionals specialising in landfill gas assessment and management. Some prior knowledge of landfill or ground gas issues is beneficial.

FEES (INCLUSIVE OF GST)

- Earlybird* ACLCA members — **AUS\$1,500**
- ACLCA members — **AUS\$1,700**
- Earlybird* non-ACLCA-members — **AUS\$1,800**
- Non-ACLCA-members — **AUS\$2,000**

**Earlybird registration must be received by 15 July 2010*

The course includes 28 contact hours of instructions, a course notebook, certificate of attendance and full catering during the course (morning and afternoon teas and lunch).

Register at www.aclca.org.au

COURSE LOCATION

Karstens at CQ
Conference and Training Centre
123 Queen Street
Melbourne, Victoria

www.karstensatcq.com.au

ACCOMMODATION

Citclub Hotel
113 Queen Street
Melbourne, Victoria

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



DAY 3 ■ 16 SEPTEMBER

8.30am

- Arrival and coffee
- Introductions
- **Lecture 1:** The conceptual model, including migration pathways and pathways into buildings
- Worked example — develop a conceptual model
- **Lecture 2:** Assessing gas generation and other data (e.g. leachate data, BOD/COD ratio), critical CH₄ to CO₂ ratios, trends of gas concentration over time. Use actual examples.
- Worked example

10.30am

- Coffee break
- **Lecture 3:** Qualitative risk assessment and risk screening from CIRIA, BS 8485, etc)
- **Lecture 4:** Quantitative risk assessment, risk of gas migration and venting, comparison of risks, fault tree, time series analysis
- Worked example

12.30pm to 1.30pm

- Lunch
- **Lecture 5:** Vapour assessment — J&E modified
- **Lecture 6:** Example — bringing it all together — use NIDO as example

3.00pm

- Tea break
- Worked example

5.00pm

- Finish

DAY 4 ■ 17 SEPTEMBER

8.30am

- Arrival and coffee
- Introductions
- **Lecture 1:** General overview — what are we trying to achieve and different types of protection — make it clear this is about protection to development near to old landfills — not landfill design for new landfills. Look at specifics of typical Australian construction with respect to landfill gas.
- **Lecture 2:** Building protection methods

10.30am

- Coffee break
- **Lecture 3:** Building protection design — BS 8445, CIRIA C665 and NHBC, ventilation design
- Worked example
- **Lecture 4:** Gas resistant membranes — design issues, verification of installation, post installation testing

12.30pm to 1.30pm

- Lunch
- **Lecture 5:** In ground barriers — methods
- **Lecture 6:** In ground barrier design and specification
- Worked example

3.00pm

- Tea break
- **Lecture 7:** Barrier case study
- Worked example
- Discussion

5.00pm

- Finish