



CLIENTS | PEOPLE | PERFORMANCE



Australia

New Developments in Contaminated Land and Groundwater Management and Remediation

Peter Nadebaum

**Australian Land and Groundwater Association
Cooperative Research Centre (CRC CARE)**

GHD Pty Ltd

Peter.nadebaum@ghd.com

ICCL, Helsinki 2009



CLIENTS | PEOPLE | PERFORMANCE



Overview of the Australian System

- Risk-based approach – protect only what is necessary
- Protect relevant “beneficial uses” of land and groundwater
 - Health, ecological, aesthetic, food production
- Protect specific land uses
 - Residential (low/high density), recreation (parks), commercial, industrial
- Protect specific groundwater uses
 - Drinking, irrigation, stock, etc – depends on salinity
- Generally aligned with World Health Organisation (toxicology)

Information on Australian national guidance: <http://www.ephc.gov.au/taxonomy/term/44>



Australian regulatory system

- Driven by the State environmental agencies
 - Weak link with other agencies (town planning, health, agriculture, OH&S)
- Federal and state
 - Federal – guidance on assessment but not management/remediation (the “NEPM”)
 - State
 - States regulate
 - Each has State legislation, regulations and guidelines
 - Private sector
 - Manage, remediate, certify (auditing system)



Current situation in Australia

- Legislation and guidelines
 - Evolved over 20 years, reasonably well established
 - System is working
 - ~ thousand sites are cleaned up and certified each year
 - flexible – allows for variety of solutions
 - little litigation
 - regulatory agencies: the regulators/administrators
 - private sector: implements, remediates, certifies (independent)



Independent audit system

- State EPA accredits “Environmental Auditors” (not companies) from private sector
- The auditors assess the work of consultants and certify that land is suitable for a proposed use

Successful system:

- Has been in operation for nearly 20 years, thousands of sites certified
- Rigorous system because auditors can be personally liable
- Accepted by all parties
- Almost no litigation
- Shifts cost, liability and staffing requirements to private sector
- Provides for “independent review” when problems arise – easier for regulatory agency
- Can provide for rapid certification

Guidelines on the Victorian audit system (for example):

<http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/759.1?OpenDocument>

Community concern

- Regulatory system accepted by community, industry, banks
- Generally little concern by community
- Only large sites or serious contamination issues are subject to formal community consultation program
- Influence of interest groups
 - Very strong where involved
 - Very difficult to develop a new landfill (→ zero waste/levy)
 - Can lead to anomalous outcomes
 - Recent move by government to litigate for costs where activism is based on spurious claims
 - prompted by >100 million € additional costs for recent project



Current situation, cont'd

- National guidelines for assessment (“NEPM”)
 - Comprehensive review under way (complete next year)
 - More complete set of “Investigation Levels”
 - Health (HILs) and ecological (EILs)
 - Include volatiles
 - Major thrust
 - Broaden
 - Address issues, reflect current knowledge
 - Avoid unnecessary conservatism
 - Sustainability – new – coming



Issue - conservatism

- Community has a fear of hazardous wastes/chemicals
- Our community typically spends
 - 30,000 € per life saved for breast cancer screening, traffic lights
 - 30 million € per life saved for land contamination
 - Community views these risks 1000 fold higher
- Global financial crisis, global warming/energy use/resource use
- Major push to avoid unnecessary conservatism
 - Ensure new NEPM guidelines are not overly conservative
eg benzene in soil under buildings: > 3 mg/kg not 0.3 mg/kg
 - Principles of sustainability being considered



Introducing principles of sustainability

- “Ecological Sustainable Development” – in place for many years
≈ Environment protection (not social/economic/environment)
- “Sustainable Development”
Yes - town planning, No - contamination management
- “Sustainable management and remediation” – recent (2 years)
- SuRF Australia
 - Launch September 2009
 - Draft framework (drawn from UK)
 - Achieve a balance
Implies not a fixed endpoint!



Sustainability cont'd

- Important issue:
Is the remediation endpoint fixed?
- What is the remediation endpoint?
Is containment and long term administrative control acceptable?
(can offer lowest energy/resource consumption)
- In some States – encouraged; some - discouraged
Depends on strength and reliability of administrative controls
- Proposal – assessment of future risk to determine acceptability
 $\text{likelihood} \times \text{consequence} = \text{risk}$



NEPM issue – human health/ecological risk assessment

- Private sector assesses and signs off results
- Regulatory agencies cautious – lack of consistency and lack of agreement on basis/assumptions
- Review will provide more certainty

- Major program to develop health based investigation levels for petroleum hydrocarbons
- Some issues:
 - Risk level (cancer: 1 in 100,000 default (not 1 in 1 million))
 - Draw on international knowledge and approaches
eg criteria for soil/soil gas



NEPM issue - Health-based levels for volatile hydrocarbons

- Guidelines developed for hydrocarbons (draft)
 - Health-based guidelines \approx clean up criteria
Australia – no provision for accepting higher concentrations
- Soil, groundwater, vapour - direct exposure, volatiles
- Various soil types, depths

Issues:

- Importance of soil properties (moisture)
- Inability to predict soil vapour from soil concentrations
 - generally over-predicts by 10 – 1000 fold



NEPM issue – soil criteria for volatiles cont'd

Proposed approach (eg for benzene):

- Hierarchy/preference:

Soil vapour > groundwater prediction > soil prediction
(most reliable) → (least reliable)

- Prefer direct measurement of soil vapour where possible
But: remediation/future development – soil gas not representative
- Soil prediction: adjustment factor of 10 to account for conservatism
- Biodegradation: yes
 - Where air ingress: 10 – 100 fold reduction in vapour



Risk-based audits

- Extension to Victorian statutory audit system (Section 53V of EPA Act)
- Audit to assess risks of contamination to beneficial uses
 - Likelihood x consequence = risk
- Not certifying suitability of land for a use

Advantages:

- Informs EPA of the risks and allows EPA to make a decision whether to require further action
- Avoids the need for strict compliance
- Can focus on particular issues (eg groundwater impact on a river)
- Can take uncertainty into account – does not require full understanding
 - Allows judgment – can be used to direct priority for further investigation to important issues
- Can be used to assess sustainability options



Applications of risk-based audits - examples

Example	Decision being informed
Contaminants in fill on industrial precinct leaching into a river (arsenic, copper, ammonia, phosphate)	Does it pose an unacceptable risk to fish and fishing?
Landfill leachate impacts on groundwater (all landfills in the State)	Are there landfills with unacceptable risks?
Landfill gas (all landfills in the State)	Are there landfills with unacceptable risks?
Soil and groundwater contamination at an oil refinery	Is the contamination being adequately managed?
Soil and groundwater contamination at a gasworks	Can the gasworks continue to be used as a heritage park?

Example of audit report for industrial precinct audit http://www.epa.vic.gov.au/water/rivers/maribyrrnong_audit.asp



Containment of contamination on sites

- CRC CARE is currently developing a set of guidelines as to how to assess the acceptability of contamination containment
- Builds on the risk-based audit approach
- Framework and approach has been developed and applied to several case examples
- Expect draft report later this month
- Should have relevance to assessing sustainability options.

