Issue 10 2012

Remediation Australasia

Deconstructing paper mills: CLEANING UP THE MERCURY

INSURANCE FOR ENVIRONMENT
How much is it worth?

USING SITE HISTORY INFORMATION
How to make the most of it

REDUCING METHANE EMISSIONS
Transforming animal waste

CRCCARE

Cooperative Research Centre for Contamination
Assessment and Remediation of the Environment

A safer, cleaner environmental future

CRC CARE is Australia's leading science-based partnership in assessing, preventing and remediating contamination of soil, water and air. With a unique mix of industry, university and government agency partners, CRC CARE's research program focuses on a range of environmental challenges, including contamination in water and soil through the use of fire-fighting foams.

Aqueous fire-fighting foams (AFFF), widely used in fire suppression systems, contain perfluorochemicals (PFCs) including PFOS and PFOA. CRC CARE technologies effectively clean up PFC contamination.

MatCARE™, our DIISR STAR Award-winning remediation product, has successfully demonstrated complete removal of PFOS and PFOA from wastewater and soil in field trials.

The process of remediating contamination starts with assessment. CRC CARE can help airports and other organisations dealing with AFFF or PFC contamination to assess ground pollution.

Once assessment is complete, remediation decisions need to include the right clean-up approach. Recommending an appropriate remediation method is a big part of our work at CRC CARE.

How can we help you?

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editor's note

Welcome, reader, to Issue 10 of *Remediation Australasia*.

It's a special time for the ARIC team, as we reflect on the great fun and hard work we've had, and put into, collating the last 10 editions of this magazine.

Since embarking on this journey, we've found that the readership we originally hoped for has been surpassed not only in numbers, but also by the attention and curiosity our readers have shown toward our activities and goals. *Remediation Australasia* has itself contributed to one of those goals: that of sharing environmental remediation information with the Australasian and global remediation industry.

This industry gets bigger each year. Although some of the increased demand for remediation services is driven by environmental misadventure, it is also driven by increased awareness among end-users and local communities, and growing professionalism among those who provide services and expertise. Most encouraging of all, the industry is populated by people working toward a more positive future. Ultimately, I suspect that most of us would like do ourselves out of our jobs by contributing to a world in which environmental pollution no longer exists.

The upside of our presence in the environmental industry is that we are always exploring new and better ways to achieve things, and looking to inform all facets of society about new practices and technologies to correct previous mistakes, accidents or unforeseen circumstances.

Sharing the insights, case studies, reports, explorations and innovations from our wide range of magazine contributors and industry members is something that we feel is invaluable, and your support has helped us achieve this. In this light, we are seeking to expand and disseminate our knowledge even further. In future editions of *Remediation Australasia* we anticipate a merge with two key Australian remediation industry groups – the Australian Land and Groundwater Association (ALGA) and the Australian Contaminated Land Consultants Association (ACLCA). This step bodes well for the publication, and we anticipate a new surge in the growth and scope of the magazine. Please keep an eye on coming editions for more information as it becomes available.

This edition of *Remediation Australasia* contains articles on novel digester technology that is transforming millions of tonnes of animal waste into reusable resources in China; the best methods to make the most of your site history information (as part of an ongoing series); a discussion on the importance and issues surrounding environmental insurance; and a unique case study on the successful remediation of a former paper mill site featuring chlor-alkali cell plant conditions. The release of Issue 10 is also accompanied by a re-release of our back issues (editions 1 – 6), so please do head to the website to have a browse.

As always, please contact us via **aric@crccare.com** if you have something for us. We would love to hear from you.

Prof Ravi Naidu
Managing Director, CRC CARE
Editor, *Remediation Australasia*

Remediation Australasia is a quarterly industry magazine produced by the Australian Remediation Industry Cluster (ARIC) for the Australian remediation industry.

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Your guide to environmental contamination & remediation issues in the media

ReMEDIAtion

'Moo poo' credits for carbon?

The Federal Government's carbon farming initiative is encouraging dairy farmers to destroy cow manure, particularly methane and other greenhouse gases, to earn carbon credits. Destroying the waste requires the covering of manure ponds, and the burning and destroying of the captured gas, or using it to fuel internal combustion engines (thereby producing electricity). This carbon credit scheme will also be available to pig farmers.

More information: www.bit.ly/moopoo ■

Fee hikes and illegal dumping

Newcastle residents and industry representatives have expressed their concern that increasing rubbish tip fees will lead to illegal dumping across the city. On May 28 the *Newcastle Herald* reported the discovery of about 70 dumped mattresses near Tea Gardens, some of which were set alight afterward. It is suspected that a mattress collection contractor chose to dump the mattresses rather than pay the recycling fee. More information: www.bit.ly/NewcastleTip ■

Permission to pollute: to grant, or not to grant?

Mining magnate Clive Palmer has applied for approval to pump wastewater from a north Queensland nickel refinery into the Great Barrier Reef. Specifically, the request seeks to release contaminated water held in tailing tanks at his nickel refinery plant near Townsville into Halifax Bay. The wastewater would 'only be released if levels in tailing tanks reached crisis levels'.

Federal Environment Minister Tony Burke says Mr Palmer is effectively applying for 'permission to pollute' the Great Barrier Reef.

The Marine Park Authority, which will review the application, does have scope to allow the nutrient-rich water into the reef under strict guidelines, if it can be proved the wastewater being held is at crisis levels.

More information: www.bit.ly/PalmerGBR ■

Landcare fights radioactive dump

Iluka's dumping of radioactive waste at a decommissioned mine near Horsham has caused a stir with a local Landcare group, Kanagulk Landcare, whose group members are worried about risks to the environment.

The group met with Iluka on May 23 for a discussion, after which the group said that some of their questions remained unanswered. It was claimed Iluka had informed the group that the site would be used indefinitely as a disposal dump until their Victorian operations concluded, which conflicted with earlier information about planned end dates.

In February, Douglas mine manager Hamish Little claimed that the by-products disposal had been approved, and that the company complied with all relevant state standards and regulations.

More information: www.bit.ly/MailTimesIluka ■

Royalty-free coal seam gas 'holiday' in NSW to end

The NSW Government has announced that mining companies involved in coal seam gas (CSG) production will have to pay royalties from the start of their operation. Until now, these companies have been given a 5-year period of royalty exemption, starting from the first year of production.

This initiative has encouraged investment, and received positive feedback from the industry group representing CSG miners. New legislation will force CSG extractors to pay a royalty from day one of production. Discussions have been held about the creation of a new role for a land and water commissioner to oversee the industry.

Coal seam gas activists appear cynical, saying the change is useless unless it is applied retrospectively. Research has shown that CSG production in NSW is currently valued at $35 million a year, with potential to grow beyond $1 billion by 2025.

More information: www.bit.ly/CSGinNSW ■

Free e-waste recyling scheme to roll out nation-wide

Canberra has become the first Australian jurisdiction to provide a free electronic waste recycling scheme. The scheme, to be rolled out nationally, means that residents will no longer incur a fee for recycling computer accessories including printers, keyboards and hard drives. These waste products contain hazardous materials such as lead and mercury, which are recovered by e-waste recycling sites instead of being left to enter and contaminate the environment (which frequently occurs when these products go to landfill).

Current e-waste recycling rates are only 17% nationwide; it is hoped the rollout of this scheme will increase that rate to 90% by 2022. The ACT Government hopes that illegal dumping across the city will be reduced as a result.

While mobile phones and microwaves are excluded from the scheme, it appears that a significant portion of e-waste comprises television sets. It is suspected that the inundation of waste received by the recycling site at Mugga Lane station has largely been influenced by the cheapness of newer and more technologically advanced TV sets, as well as the national switch to digital television (rendering old sets, for the most part, useless).

More information: www.bit.ly/ABCewaste ■

Concerns over impact of mining on groundwater

Gavin Mudd, senior lecturer at Monash University, has raised his concerns about the long-term impacts of coal seam gas mining on groundwater.

Mudd's consideration of an apparent gas leak in the Condamine River examines the Condamine Alluvium, a groundwater source that lies above the Walloon Coal Measures (containing gas seams). He attributes CSG activities as being the likely cause of changing groundwater pressures, leading to the situation of methane gas now bubbling in the Condamine River.

More information: www.bit.ly/MuddCondamine ■

Remediation brief

Transforming animal waste into resources

Australian science is helping to solve one of China's biggest and smelliest problems – what to do with the waste produced by its 700 million pigs.

Novel digester technology is innovatively recycling the Chinese pork industry's estimated annual production of more than 8 million tonnes of animal waste.

China has 700 million pigs in 1.8 million farms, which supply two-thirds of the country's rapidly-growing meat consumption – as well as about 1.4 million tonnes of manure and 7 million tonnes of urine. Of the enormous volumes of waste produced by these piggeries, only a tenth is currently being treated.

Compared with domestic sewage, piggery waste contains high levels of nitrogen and phosphorus, which are discharged, along with other contaminants, into the environment where they damage ecosystems and pose a threat to human health. The nutrients lost in the waste of a single pig are worth about $50 per year, but to date there are no technologies in place to recover and use this vital resource.

The digester technology – developed by CRC CARE in collaboration with technology firm HLM Asia Ltd and Huazhong University of Science and Technology (HUST)– produces clean energy (biogas), fertiliser and other valuable products from nutrient-rich waste using a two-step underground anaerobic bioreactor for treating piggery waste. The researchers have identified a particular combination of anaerobic treatments that can recover the nutrients and produce biogas. So far, the technology has been able to overcome problems such as the current small size of biogas reactors, their slow rate of digestion, the limiting influence of temperature, and the presence of heavy-metal contaminants that restrict the use of residues as fertiliser.

The technology is expected to have widespread application not only in China but throughout Asia, wherever animals are farmed intensively. Besides handling livestock wastes, similar bioreactor technology can be used to manage and cleanse the runoff from urban landfills and organic waste streams from other industries. The scientific and technical knowledge gained in the course of this research is also likely to benefit Australia's intensive livestock and food industries. ■

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Australian Government
Department of Industry Innovation, Science, Research and Tertiary Education

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BENEFITS OF CAPABILITY TEAM MEMBERSHIP

- Participate in joint promotions, marketing visits and trade fairs
- Contribute to joint communications, advertising and promotional literature
- Engage with domestic and international customers
- Collaborate to bid for projects and packages
- Receive improved chances of securing projects from target client groups
- Establish networks and connections with other cleantech solution providers
- Participate in forums to discuss new opportunities

Cleantech Industry Capability Teams are targeting five different customer groups:

- *Manufacturing*
- *Mining/resource and minerals processing*
- *Developing countries*
- *Built environment and infrastructure*
- *Food and beverage production and processing*

To register your interest to participate in the Cleantech Capability Teams, download and complete the registration form on our website: www.auscleantech.com.au/ACT_Cleantech-Capability-Teams.html

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Contaminated Land Conference

A conference to assist landowners and practitioners in preparing for the much changed Contaminated Site NEPM and other liabilities and legislation

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The Assessment of Contaminated Sites National Environment Protection Measure (NEPM) is the set of national rules in which contaminated land is assessed and managed. It is likely to be adopted this year and brings with it major changes to the way in which contaminated land is investigated and remediated.

This conference will consider the impacts the NEPM changes will have on various stakeholders including consultants, landowners and local government.

Learning about the NEPM's changes, its new flexibilities and increased coverage will assist you in dealing with contaminated land and its liabilities.

CONTAMINATED LAND LEGISLATION AND POLICY BRISBANE

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HYD Rooms, 324 Queen Street, BRISBANE

8.55am-4.30pm

Registration from 8.40am

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8.55am-4.30pm

Registration from 8.40am

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visit www.asbg.net.au for more information

Developing a comprehensive conceptual site model:

Using your site history information effectively

Ruth Keogh and James Corbett, Parsons Brinckerhoff

Investigating site histories and gathering site characterisation data are integral parts of the environmental site assessment process – but how should we interpret and use the information?

For a start, the information should be integrated and presented as a conceptual site model (CSM). According to ASTM International E1689-95 (2008) *Standard Guide for Developing Conceptual Site Models for Contaminated Sites*, a CSM is 'a written or pictorial representation of an environmental system and the biological, physical and chemical processes that determine the transport of contaminants from sources through environmental media to environmental receptors in the system'.

The development of a CSM comprises an iterative process of characterising site contamination on the basis of available information or data. It should be undertaken for every contaminated site, developed as early as possible within the site assessment program, and progressively updated as additional information or data become available.

A preliminary CSM can and should be developed prior to the commencement of any intrusive site investigations. This can be undertaken as soon as an understanding of the physical layout (both current and former) of a site, as well as its historical land-use information, has been obtained, and should ideally form part of the initial site history review (also see *Developing a comprehensive conceptual site model: What should you be looking for, and where?* on pages 8–11 of *Remediation Australasia*, Issue 8). Although its complexity will be at least partly dependent on the scale and complexity of the site, each CSM should address several fundamental areas, as outlined in this article.

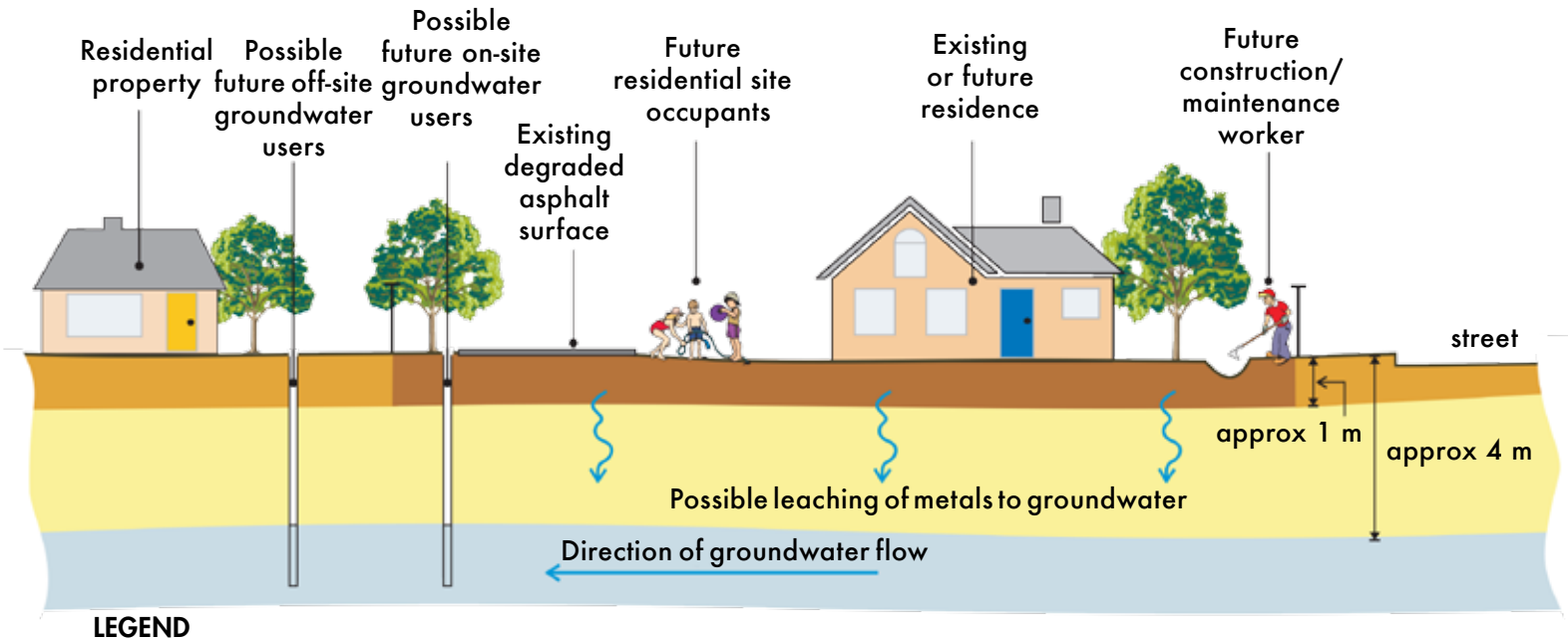
Site definition and background information

The first step is to gain an understanding of current site conditions and establish:

- the boundaries of the study area, including consideration of impacts from off-site sources
- local physical characteristics, including topography, geology, hydrogeology, surface drainage patterns and possible preferential underground contaminant migration pathways
- current land-use activities for the site and immediate surrounds, and
- the location, extent and nature of existing infrastructure.

The history of the site and immediately surrounding area should be summarised, along with the ways in which site use and infrastructure have altered over time.

Since the definition of site contamination is linked to land use (e.g. residential, industrial or recreational), it is essential to consider future site development.



ABOVE An example of a very simple preliminary conceptual site model for a residential property with fill material contaminated with heavy metals.

RIGHT An example of a more complex conceptual site model for a site containing a landfill and underground fuel storage.

WHAT THE ASTM GUIDE SAYS ABOUT CSMs

- They should be undertaken for every contaminated site
- They should be developed as early as possible within the site assessment program
- They should be progressively updated as additional information/data becomes available

This includes proposed site earthworks and features such as cellars, basement car parks and swimming pools that could be affected by, or could have an influence on the management of, subsurface contamination.

Sources of contamination and contaminants of potential concern

Based on an understanding of current and historical site conditions, potentially contaminating activities (PCA) can be identified and likely source areas and contaminants of potential concern (COPC) determined. A CSM should define source areas as accurately as possible, consider implications for both on- and off-site impacts, and determine the environmental media (e.g. soil, groundwater, surface water, sediments) that may have been affected. The identification of COPC, and their possible implications for the contamination of a site or its immediate surrounds, should take account of factors such as:

- the timing and duration of the identified PCA
- the period of use of any possible associated chemicals (i.e. when they were first developed and/or when their use ceased relative to the timing of the PCA), and
- the likely behaviour (e.g. mobility and persistence) of each chemical within environmental media.

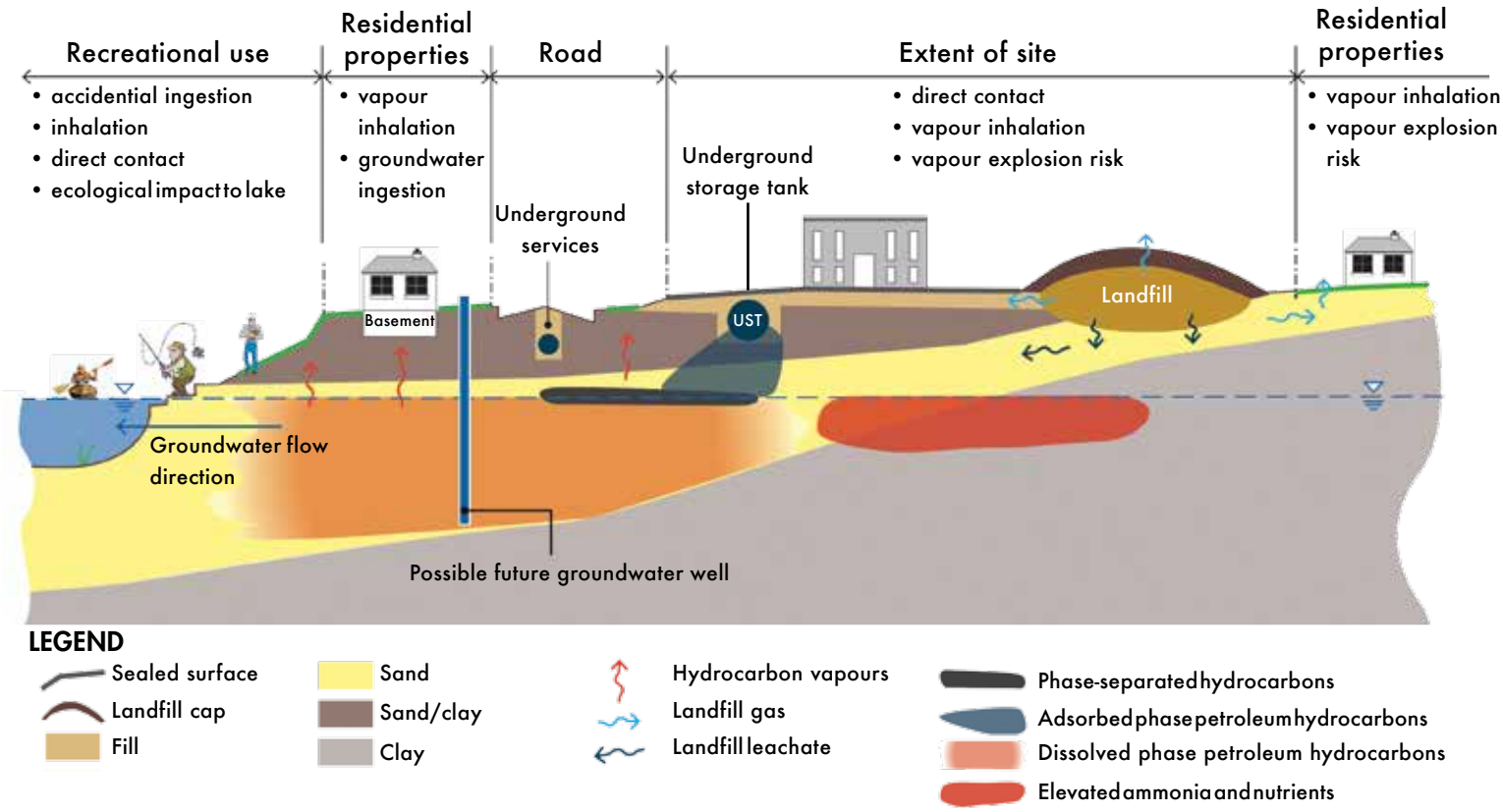
Sensitive receptors

The identification of possible sensitive receptors associated with the site and the surrounding area should include both current and future receptors, the latter comprising proposed land-use activities as well as the actual site development process. Possible human receptors may include:

- current or future site users such as residents, visitors and workers (depending on land use)
- on- and off-site construction or maintenance workers
- current or future users of surrounding residences, reserves, and commercial or industrial premises, and
- hydraulically down-gradient groundwater users who extract groundwater for purposes that could have implications for human health (e.g. potable/domestic, primary contact recreation, irrigation of home-grown produce).

Possible environmental receptors may include:

- surface water bodies located on or near the site
- groundwater environments beneath or in the vicinity of the site
- hydraulically down-gradient groundwater bores used to extract



groundwater for purposes that could affect the environment (e.g. parkland irrigation, stock watering), and

- flora and fauna that may inhabit or migrate through the site.

Migration pathways and exposure routes

For a source to be of concern, a mechanism for contaminant release into environmental media must be present (e.g. leakage from an underground fuel storage tank into surrounding soils). Likewise, for a risk to human health or the environment to exist, we need a source, a contaminant release mechanism and a receptor. We also need as well as a migration pathway that allows the COPC to move from the source to the receptor and a point of contact between the COPC and the receptor (i.e. an exposure route). Together these factors make up an exposure pathway, which must be complete for risk to occur. Possible migration pathways may include:

- leaching of contaminants through the soil profile to groundwater
- downward migration from one groundwater aquifer to another
- transport of contaminants via groundwater to surface water
- transport of contaminants via surface water
- volatilisation from soil and/or groundwater to air (indoor and outdoor)
- transport of contaminants by mechanical disturbance (e.g. earthworks), and
- biomagnification along food chains.

Possible exposure routes may include:

- direct contact (e.g. skin exposure) with contaminated environmental media
- ingestion of contaminated environmental media or
- ingestion of food stuffs grown or reared in contaminated media, and
- inhalation of contaminated media (e.g. vapour, dust).

In some cases a good CSM can eliminate the need for additional investigations if it shows that exposure pathways are incomplete.

Attempting to explain a CSM in words may be difficult and can also be open to misinterpretation by the reader. A figure illustrating the site setting and key contaminant migration mechanisms is a critical element of any conceptual model and represents a powerful tool for interpreting and conveying site information. If you cannot draw a conceptual model for your site, it is likely that you do not understand it.

In summary, a CSM is a highly beneficial tool that provides a foundation for the evaluation of human health and environmental risks. Furthermore, by identifying data gaps, CSMs can help users determine any additional investigation requirements. They can also assist with the development or evaluation of remediation or management strategies. Equally as important, CSMs facilitate communication of site contamination issues with a wide range of stakeholders, including the public.

As stated in ASTM International E1689-95, 'a CSM should be used to enable experts from all disciplines to communicate effectively with one another, resolve issues concerning the site and facilitate the decision-making process'. ■

Smart marketing for clean technologies:

Targeted energy, water, waste and environmental solutions

A new initiative is aiming to ensure that clean technology (cleantech) companies aren't missing their target when promoting their work, products and achievements to the Australian public.

Cleantech companies provide millions of Australians with innovative solutions, products and services focused on renewable energy, water, waste, recycling, energy efficiency, energy storage, building products, transport technologies and environmental services. However, the knowledge and information they try to share with the public can often be lost by trying to reach the same audiences through disconnected marketing campaigns. Often, this problem could be solved by establishing networks and connections with suppliers and targeting an audience through a team effort.

The 'CleanTech Industry Capability Teams,' an initiative led by the Supplier Advocate, enable effective collaboration between companies belonging to firms in the clean technology and water sectors.

Membership to the teams is free, and open to any Australia-based cleantech related company or organisation. The industry-driven teams are chaired by industry members, and pursue opportunities and market members' capabilities as a group. Their focus is to unite companies with common customer targets.

Dr Marc Newson, the Clean Technologies Supplier Advocate appointed by the Federal Minister for Industry, heads up the Supplier Advocate Program forming part of the $50 million Buy Australian initiative. Among Dr Newson's tasks will be the development and implementation of business plans through the Australian Clean Technologies Ideas Competition, which supports the cleantech initiative. This competition was first run in 2011 to identify the best ways of addressing the challenges of climate change and sustainability. The 2012 competition (launched in May and closed in June) will provide another opportunity for Australian cleantech companies to develop their businesses.

Over 150 firms are members of the teams and momentum and activity is building. Marketing material is being developed, and a capability statement for each team is close to being finalised. Download and complete the form at www.auscleantech.com.au and www.wateraustralia.org/ to register your interest to participate in the Cleantech Industry Capability Teams and the Water Industry Capability Teams.

CAPABILITY TEAM MEMBERSHIP – WHAT'S INVOLVED

- Participation in joint promotions, marketing visits and trade fairs – benefiting from the critical mass created through the Capability Teams in promoting capabilities
- Contribution to joint communications, advertising and promotional literature
- Engagement with domestic and international customers
- Collaboration to bid for projects and packages – providing improved chances of securing projects from their target client groups
- Establishing networks and connections with other cleantech solution providers
- Participating in forums to discuss new opportunities

The Cleantech Industry Capability Teams are an initiative of the Gillard Government's Supplier Advocate Program and its Clean Technology Focus for Supply Chains.
Visit **www.innovation.gov.au/supplieradvocates** for more information.

Subscribe today to *Remediation Australasia*

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The publication is currently distributed to ARIC members and contributors throughout Australasia, free of charge.

Each edition of *Remediation Australasia* includes a range of full technical articles, regulator updates, case studies, training events, publications, and news relating to new technologies and research developments, keeping the reader ahead of the public debates and scientific advances within the industry.

It informs people working in the Australasian remediation industry about new research and outcomes that may impact on their business, and helps them to better respond to the challenges of dealing with contamination.

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CASE STUDY:

Remediating the Wesley Vale Pulp & Paper Mill chlor-alkali cell plant

Lee Fergusson, Virotec Global Solutions

Following the closure of a paper mill in Tasmania, Virotec Global Solutions was contracted to demolish a chlor-alkali cell plant and all affected site buildings, and to treat all forms of liquid and solid waste on-site prior to closure.

Demolition of the cell plant using the 44-tonne, long-reach excavator.

After almost 40 years of continuous production and a 10-month review of its operations, paper manufacturer Paperlinx announced in December 2009 that its paper-manufacturing division, Tas Paper – based at the large-scale Wesley Vale Pulp and Paper Mill in northwest Tasmania – would cease operations.

The subsequent shutdown and decommissioning of the mill would be a complex task, with demolition of the mill's chlor-alkali cell plant and site decontamination in particular presenting significant risk.

of contaminated buildings and structures, and a significant volume of mercury-contaminated soil and concrete.

As the mill could not be sold or re-commissioned until all remediation work at the plant had been carried out to the satisfaction of both local and state regulators, these issues collectively required demolition and excavation prior to remediation.

The plant and surrounding areas were subject to four main contaminants:

The Wesley Vale Pulp and Paper Mill, showing the location of the chlor-alkali cell plant

"The top priority was to conduct the work in a way that …would demonstrate that every facet of segregated waste could be treated to the very highest standards, resulting in a permanent solution to mercury-contaminated demolition waste."

At the time of the announcement, Paperlinx's then-managing director Mr Tom Park said that, although complex, the mill's closure would be concluded quickly.

The Wesley Vale chlor-alkali cell plant commenced operations in 1970 but ceased operations in 1990, following the establishment of a more environmentally friendly peroxide bleach plant (and following a highly publicised campaign against use of the cell plant by now-Greens Party leader, Senator Christine Milne).

The original cell plant used brine and mercury to produce sodium hydroxide (caustic soda), calcium hypochlorite (bleach), and chlorine for bleaching pulp.

Twenty years of bleaching pulp left the plant with a number

- mercury, due to processes within the plant
- barium, due to brine treatment
- asbestos in roofing materials, and
- hydrocarbons from leaking underground tanks.

The primary driver for the project was for all remediation work conducted at the site to be carried out in a safe and environmentally sensitive way, resulting in a fully decontaminated and contoured site.

The top priority was to conduct the work in a way that represented not only best industry practice from both a safety and environmental point of view, but would also demonstrate that every facet of segregated waste could be treated to the very highest standards, resulting in a permanent solution to mercury-contaminated demolition waste.

The scope of work to be performed by Virotec included the mobilisation of plant, equipment and personnel to the site, and establishment of site facilities, including site office, first aid room, lunch room, toilets and decontamination facility, before work commenced.

Before commencing any work, Virotec staff identified areas of contamination at the cell plant that required demolition, excavation and removal. Following this process, the firts priority was to remove asbestos roof sheeting and other asbestos products. Non-contaminated asbestos was transferred to a licensed disposal site in Tasmania, while mercury-contaminated asbestos was immediately transferred to specially lined shipping containers for safe transport to Virotec's treatment and disposal facility in Queensland.

Paperwork and planning for this project were completed in accordance with relevant laws and procedures.

Example of free mercury in the soil beneath the cell plant.

THE PULP BLEACHING PROCESS

At Wesley Vale, a brine solution passed through anode and cathode cells consisting of graphite carbon (anode) and mercury (cathode) cells.

Mercury solution is used in the cells for the production of caustic soda, and this liquid is constantly recycled through the paper production process.

Notwithstanding this general operational process, cells are also regularly refilled to address routine mercury depletion due to process losses (e.g. in the caustic solution and as wastewater), vaporisation to the atmosphere and spillage.

Prior to the commencement of demolition and treatment, Virotec and Tas Paper submitted to the Tasmanian Environmental Protection Agency (EPA) an environmental effects report explaining the demolition of the redundant cell plant and remediation of contaminated solid and liquid wastes. Other preparatory documents included a detailed project risk assessment, method statement, and a safety environment management program.

Virotec applied to Workplace Standards for approval to remove asbestos in accordance with relevant acts and laws, and to local council for approval to demolish the buildings and other ancillary structures.

Once all contaminated and non-contaminated asbestos had been removed from the site, the next stage of the project involved demolition of the building's superstructure using a 45-tonne, long-reach excavator. Parts of this and other phases of the project were carried out by Virotec's sub-contractors on the project, McMahon Services of Adelaide. The removal of high-level contaminated steel involved cutting the steel to required sizes and, like the contaminated asbestos, loading it into shipping containers for transport to Virotec's waste-treatment facility for treatment and reprocessing. Mist sprays were used throughout the project to minimise any dust release from the demolition, and all stormwater runoff was collected technology, as required by the Tasmanian EPA. A wash-down facility was also provided to ensure that no contamination of any kind from the demolished building left the site.

Once demolition of the building's superstructure had been completed, existing concrete slabs and footings were removed and trammed to a designated crushing lay-down area. On completion of slabs and footings removal, workers excavated contaminated soil (particularly

Further site demolition.

that from immediately under the original plant building) from drains and surrounding areas, and loaded it directly into lined shipping containers for transfer to Virotec's waste treatment facility (the depth of excavation had been identified by various in situ measuring techniques prior to the commencement of demolition work). Excavation and processing of underground storage tanks and brine sludge tanks were also carried out at this stage of the project.

In some instances, free mercury was clearly visible in rivulets under the slab and in the soil, necessitating the very highest standards of safety and environmental practice. Because mercury was present not only as a trace element, but also in free-flowing liquid pools, it was crucial to isolate, segregate and treat the generated solid waste. The production and discharge of free and elemental mercury as a result of industrial activities such as those practiced at Wesley Vale can cause mercury contamination of natural aquatic systems.

Although elemental mercury has a relatively low solubility in the presence of water, even low concentrations of the metal in liquids and solids may lead to unacceptable levels of mercury contamination in the environment, depending on a variety of factors including the potential of elemental mercury to oxidize and form ionic species, which generally have much higher solubility than the base metal itself. For this reason, Virotec has developed sustainable on-site methods and protocols for mercury-contaminated building demolition waste treatment. As well as sequestering mercury into non-bioavailable species, which are less likely to leach from solids, Virotec's ViroFlow technology encourages chemical bonds that allow sequestration to strengthen over time. Compared with other binding techniques for mercury and other heavy metals, which weaken with the passage of time, the long-term binding capability of this technology represents one of the most sustainable approaches to metal sequestration.

The rubble resulting from excavated concrete tanks and the demolished superstructure was then crushed using a primary jaw crusher; creating a solid waste product. Steel reinforcement from the superstructure and ancillary structures was separated from the rubble at this stage, and crushed material was segregated and sorted prior to loading according to a pre-determined plan based on levels of contamination. All materials with higher levels of mercury contamination were progressively loaded into lined shipping containers for transport to Virotec's waste treatment facility, where they were processed and disposed of separately.

Treatment of contaminated surface water was required at various stages during the project. For example, mercury-contaminated stormwater was collected in pits and treated using ViroFlow technology in a mobile treatment plant brought to Wesley Vale from Queensland. After treatment and validation, this wastewater was discharged to existing

FAST FIGURES

over 200,000

tonnes of fine printing paper each year produced by the Tasmanian mill during the peak of its operation

approximately 30,000

litres of contaminated water were treated and successfully released during the project

approximately 2,000

tonnes of contaminated demolition waste, including concrete, steel, asbestos, timber and soil, were treated during the project

0

the number of safety and environmental incidents during the completion of the project

stormwater drains. On completion of the primary phases of demolition, excavation and segregation, Virotec fully decontaminated the cell plant and subsequently removed from the site all plant, equipment, shedding and fencing. The site was then graded to contour upon completion and left in a neat and presentable condition.

Throughout the project, Virotec routinely liaised with the key on-site personnel of Tas Paper and other stakeholders (including the EPA and Workplace Standards), and held regular meetings with contract managers and other relevant personnel. Since completion of the project, the site has received regulatory sign-off from the EPA, thereby completing the main objectives set by Tas Paper. One of the features of the project was Virotec's provision of a 'total solution' for demolition, treatment and disposal of this contaminated site.

The project was completed on time, and to the complete satisfaction of Tas Paper, all third-party regulators and the local community. Just as importantly, every facet of mercury-contaminated material was treated to relevant landfill acceptance criteria, and all contaminated stormwater was treated to Australian and New Zealand Environment Conservation Council 2000 water quality criteria.

Demolishing and remediating the chlor-alkali cell plant at the Wesley Vale Pulp and Paper Mill was crucial to overall site closure. Following the Wesley Vale work, Virotec successfully completed two other projects related to the closure of Tas Paper's Burnie paper mill. ■

Final contouring of the site after demolition and soil removal had been completed.

Regulator RoundUp

NSW

Jessica Dorricott, Arminda Ryan & Niall Johnston, EPA NSW

NSW Site Auditor Scheme Update

The NSW EPA has an established site auditor scheme under the Contaminated Land Management Act 1997 (NSW). The aim of the scheme is to ensure the protection of the environment and human health through proper management of contaminated land, particularly during changes in land use. The scheme improves stakeholders' access to competent technical advice by providing for site auditor review of the investigation and remediation of contaminated land.

Site auditors review reports by environmental consultants to ensure that the methodology used by consultants and their interpretation of data are consistent with current EPA regulations and guidelines. They issue site audit statements and site audit reports which certify the suitability of land uses or provide comments on the appropriateness of various assessment and remediation plans. These documents allow increased certainty for stakeholders. More broadly site auditors provide an important connection with the contaminated land industry and feedback on contaminated land guidelines prepared by the EPA.

The EPA recently brought two prosecutions in the NSW Land and Environment Court against a consultant for holding himself out to be an accredited site auditor and for carrying out a statutory site audit when he was not accredited. The defendant pleaded guilty and was convicted of both offences. He was fined a total of $7,500 and was also ordered to pay the EPA's legal costs. This is considered a fair outcome by the EPA as the defendant's actions had the potential to undermine the integrity of the scheme. ■

The 2013 ICOBTE Conference Organizing Committee cordially invites you to participate in the

12th International Conference on the Biogeochemistry of Trace Elements

June 16 - 20, 2013
Athens, Georgia, USA

The biennial ICOBTE Conference brings together scientists, professionals and policy makers.

It provides a multi-disciplinary arena for discussing the latest scientific developments.

Areas of interest include the biogeochemistry of trace elements and metalloids, analytical methods for trace element detection, speciation and bioavailability, recent advances in remediation technologies and regulatory measures for trace element contaminated sites.

IMPORTANT DATES FOR 2012

November 01 *Deadline for online abstract submission*

November 30 *Early online registration*

VENUE

University of Georgia
Conference Center & Hotel
www.georgiacenter.uga.edu/uga-hotel

for further information visit the conference website:
www.icobte2013.org/

‘Recycling’ Germany’s abandoned industrial sites

Increasing the value of former industrial sites in Germany requires a collaborative effort between site developers and environmental remediators, as outlined in this report from *Mull and Partner mbH.*

Axel Fahrenwaldt, Mull and Partner Ingenieurgesellschaft mbH

With a population of around 82 million and a land surface of approximately 357,000 km², almost 13% of Germany – around 46,000 km2 – can be identified as ‘settled’ (featuring cities, settlements, buildings and surrounding undeveloped areas, streets, etc.). National economic development has increased ‘land consumption’ over a four-year average to approximately 104 hectares per day. Over the last 60 years, settled areas in Germany have more than doubled. Between now and 2020, Germany’s Federal Government is aiming to significantly reduce the land used for settlements and traffic by introducing new policies encouraging efficient land use.

Responsibility for overseeing this shift will fall under the Federal Environment Agency’s Commission for Soil Protection.

Urban locations that are close to metropolitan centres are more desirable among new residential and commercial site developers, who compete for dwindling quantities of land that increase rapidly in value. The idea of ‘recycling’ or ‘reactivating’ former industrial sites in urban areas is expected to prove popular with investors interested in residential and commercial building development. Such sites typically feature contaminated soil, air and groundwater from historical activities. As such, and according to the German Federal Soil Protection Act (BBodSchG), without remediation measures these sites can be unsuitable for residential or commercial development. Further, because they are included in the urban register of contaminated sites, their value on the real estate market tends to be significantly lower than that of ‘undeveloped’ building sites. To fetch a higher valuation, land remediation services – often complex and multidimensional must be carried out at each specific location.

To remediate land, a range of permissions from the appropriate authorities must be granted prior to commencing remediation work. Only after the necessary approvals have been granted, should the site be released for the intended re-use. Subsequently, such remediated sites receive a higher market value.

During the process of converting a contaminated site to a fully remediated site, investors can be exposed to a range of risks including:

- contamination can appear ‘worse’ than initially expected
- unknown contamination can become apparent during remediation
- environmental clean-up costs can exceed initial cost assumptions
- time delays
- wildlife conservation, soil protection and field monuments protection measures can constrict development
- locating explosive ordnance residues can constrict development
- less-than-expected increase in value after implementation
- quality of redevelopment may be worse than expected, and
- conformation of remediation by appropriate authorities may not be as easy as expected prior to remediation.

German-based company Mull und Partner Ingenieurgesellschaft mbH (c) has worked for more than 30 years in evaluation, assessment and use-oriented remediation of such sites, focusing on site reactivation and rehabilitation for both residential and industrial purposes.

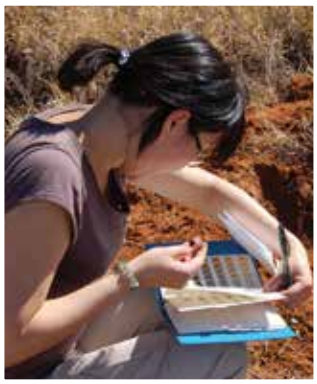
Sites reactivated by Mull und Partner are usually located in inner-city and urban locations of major German cities, and have high potential for re-use. Preparatory planning services take place prior to obtaining the required remediation authorisations from relevant authorities, and

From top to bottom:
Demonstrating the contaminated land site remediation process at one of Germany's metropolitan industrial sites.

depending on the complexity of the site can take up to 12 months. Site sizes range from less than 5,000 m^2 to 60,000 m^2; consequently, implementation periods range between 4 months and 2 years. Remediation costs are individually priced for each specific location.

Mull und Partner works with investors from site purchase through to the completion of remediation, and the final release of the property for re-use. Very few German companies implement such total site remediation, from taking over an abandoned industrial site at the beginning all the way through to the return of a rehabilitated site (including authority approval for the building contractor, and responsibility for adhering to agreed costs, time schedules and quality).

The land recycling described here is likely to succeed if it is supported by efficient preparation and planning, and experienced processing in close cooperation with appropriate authorities and a high level of cost-, time- and quality assurance. Furthermore, investors who are willing to remediate unused locations gain access to appealing geographical locations that are no longer available where undeveloped building sites exist.



Enhance your career with a research degree in environmental remediation.

CRC CARE is offering three PhD scholarships, valued up to $28,500 p.a. (tax free) for three years, for potential candidates to undertake projects focussed on light non-aqueous phase liquids (LNAPLs).

Australian petroleum industry and regulatory agencies wish to support improved understanding of the sustainable remediation of LNAPLs, such as petroleum fuels in groundwater environments. Such improved understanding will be developed through better field-scale quantification of the effectiveness of remediation strategies in removing LNAPLs from aquifers, thereby reducing exposures and risks. There are currently 3 research projects available:

- Field evaluation of the inter-comparison of petroleum (LNAPL) remediation technology efficiencies in complex fractured and/or porous media
- Multiphase modelling of petroleum (LNAPL) remediation options in aquifers with complex geologies
- Quantifying the transient risk due to petroleum (LNAPL) removal from impacted sites

The PhD students will work closely with project investigators, consultants and other specialist staff on this well funded, industry linked project. The projects will be conducted at CSIRO Land and Water, Floreat Western Australia in partnership with the University of Technology Sydney (UTS), and jointly with industry partners where field investigations are undertaken and applications tested.

For further project related information, please contact:

Colin Johnston
CSIRO Project Leader
+61-(0)8-9333 6328
Colin.Johnston@csiro.au

Robert McLaughlan
UTS Supervisor
+61-(0)2-9514 2614
Robert.McLaughlan@uts.edu.au

Visit **www.crccare.com** for more information on these and other scholarship opportunities.

CSIRO

UNIVERSITY OF TECHNOLOGY SYDNEY

CRCCARE

Insurance brokers

Do insurance brokers have an important community role to play in insuring a sustainable environment? And, following from this, can we protect our environment by purchasing environmental insurance?

Anthony Saunders, Envirosure

All insurance brokers have an important community contribution to offer by providing insurance to create a sustainable environment. This assertion raises a question: should environmental engineers highlight in their reports the potential of limited liability based on the cover they may hold?

When discussed, the topic of environmental insurance often invites responses that emphasise the high expense – even in the absence of costing. But why do we say this? Commonly we associate pollution clean-up costs with the cost of insurance. It is important to recognise that the cost to include environmental insurance is not the stumbling block; instead, it is the cost of environmental security, and the risk management procedures that need to be deployed to satisfy the insurer that risk has been minimised.

Consider the 2010 Gulf of Mexico oil spill, one of the worst environmental accidents in human history. Many an argument has posed that the spill could have been avoided had a sufficiently robust 'blow-out preventer' been deployed. This would have been a material condition if an environmental insurance policy had been in place. Without insurance, however, environmental risk prevention systems are commercially selected by the immediate stakeholders.

the main points

Foreseen vs Fortuitous (the two 'f's distinguish between certainty and uncertainty).

Self insurance invites reckless behaviour.
Imagine if we drove around in cars without any insurance in place to cover injury to the public.

With insurance, essential risk management criteria lead to best-practice operation and reduced community concern.

In this light, we must remember the distinction between the cost of the unexpected and the cost of insurance. If environmental liability insurance was compulsory, it would increase community risk awareness and improve material protection strategies. For example car manufacturers continue to improve safety features as a condition of compulsory insurance to protect drivers, occupants and the greater community.

withstand earthquakes of up to 7.9 on the Richter magnitude scale), and those that we imagine could never happen (such as the 2011 Japanese earthquake that resulted in a massive tsunami and flooding critical generators used to cool nuclear reactors, releasing radioactive material into the atmosphere and contaminated water into the groundwater and ocean). Had adequate insurance been a prerequisite for erecting the reactors, the location may have been deemed unsafe for the chosen reactor design.

"Any adequate response to today's environmental challenges must be built upon the intrinsic values of insurance."

Is our environment worth the risk of being uninsured?

It is on this subject of risk, however, that corporate social responsibility is challenged.

Corporations face difficulty in perceiving the difference between those risks that we are certain can occur (such as the Japanese nuclear reactors being built to

'Certainty vs. uncertainty' translates in insurance terminology to 'Foreseen vs Fortuitous'.

Fortuitous events – events that occur by chance – are insurable, and the robust methods that insurers apply to calculate a risk premium, are logical. Moreover, simply identifying the two 'effs' can encourage more transparency in commercial contracts, and demarcate between the commercial disputes and those that are fortuitous (leading to less contractual obligation ambiguity).

Is our environment (built or otherwise) worth the risk of being uninsured?

Communities would be well advised to appreciate the contribution that insurance can make to determining what society collectively values – but how is this connection made? Climate change appears to be increasing the frequency and severity of a range of environmental phenomena including floods, tsunamis, tornados, hurricanes and earthquakes. Such events place higher demand upon our (already) rapidly growing need for resources and result in a significant loss of




Developing environmental experts.

CRC CARE supports the growth of highly qualified and suitably trained researchers and decision makers in environmental risk assessment and remediation through:

- PhD and Honours research opportunities
- workshop training for environment industry professionals
- linkages with other industry peak bodies
- focusing on end user needs
- a suite of publications and guidance documents
- hosting the biennial 'CleanUp' industry conference

Contact CRC CARE for further information.

CRCCARE™
Cooperative Research Centre for Contamination Assessment and Remediation of the Environment

www.crccare.com

Risk assessment may not identify environmental risk (the kind of risk associated with total environmental degradation, beyond which advisers have not foreseen, nor can they afford to self insure).

Environmental insurance is commonly available. *Fortuitous* events are insurable, subject to an environmental security review and risk recommendation.

environment. Would the story change if environmental insurance was widely accepted?

When insured, individuals are more likely to act responsibly, as they can be accountable and transparent without fear of financial loss. For example, without legal protection (professional indemnity insurance) in place, a service station owner may prefer to avoid having to report a leaking underground storage tank.

The ability to address environmental risk is an intrinsic role that insurance brokers need to develop, or they may find themselves exposed to risk if a client remains uninsured. Environmental protection is a two-way street, one for the remediators and the other for those who need to learn how to stop contaminating. Insurance can be used to mitigate the costs.

In the case of environmental contamination, the best way to reduce liability is to admit to it. Sharing such knowledge with an insurance broker (or an experienced adviser in environmental risk) can be an important part of an effective remediation and financial strategy.

Many professionals perceive themselves to be environmental experts, but not all are licensed to advise and insure pollution risks. For example, environmental risk managers identify foreseen risks, and (unless advised otherwise) can assume the fortuitous is covered by insurance. The same may also apply to an environmental accountant, who accounts for the contributing factors that result in an existing or potential impact to the environment but could be exposed to fortuitous risk. Knowing that fortuitous environmental risk is covered creates certainty.

By expecting policies to be issued that respond to the laws governing the protection and sustainability of our environment, correct insurance may help educate communities and environmental advisers about the importance of respecting those laws.

Thus, it is critical that insurance brokers understand the inherent environmental risks when arranging cover.

If risk managers learn to distinguish between the 'effs', they can inform their clients about the fortuitous risks associated with environmental liability that must be insured. For environmental insurance to be coordinated, a key factor is to recognise that insurers must also understand the risks. Never assume that you are covered until you obtain a letter of confidence from your licenced insurance broker attesting to the adequacy of the cover arranged, and never agree to accept a disclaimer from an insurance broker.

Is our environmental security worth the risk?

To play its part in a better environmental future, the insurance sector needs environmental insurance advisers who are able to interpret – and cover – the fortuitous components of potential environmental liability. ■

Anthony Saunders is an environmental risk broker at EnviroSure. This article has been adapted from an opinion column at Insurance Business Online, published 28 May 2012.

CONTAMINATED SITES
LAW&POLICY
DIRECTORY

Need info on jurisdictional policies?
Visit **www.cslawpolicy.com**. It's free.

NMI makes a move

The National Measurement Institute's (NMI) Sydney chemistry laboratories will be moving from their current location in Pymble to new purpose-built premises in North Ryde at the end of June 2012. The Australian Astronomical Observatory will be co-located in the same building. NMI's other chemistry laboratories in Perth and Melbourne, and the physics and biology laboratories in Sydney are not affected and will remain at their present addresses.

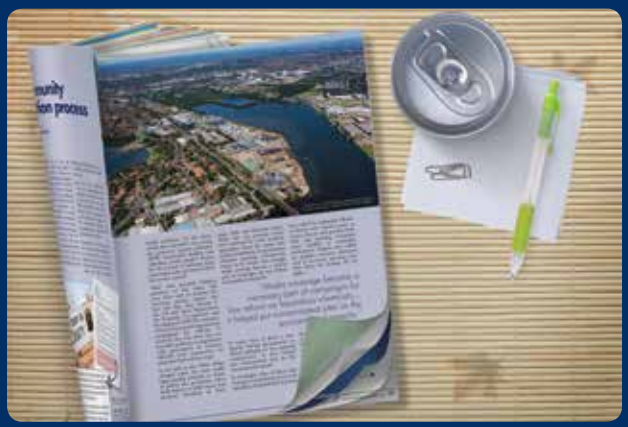
NMI chemical laboratories deliver world-class measurement services including activities of national significance in environmental testing, illicit drug analysis and sports drug testing. Research activities and service delivery will be enhanced by the increased space, new technology and infrastructure available to our teams in this new state-of-the-art facility.

The new building is located in Riverside Corporate Park, 105 Delhi Road, North Ryde, NSW 2113. Industry members are invited to visit once the move is completed; contact Cheryl Lim (cheryl.lim@measurement.gov.au, 02 8467 3845) or Gavin Stevenson (gavin.stevenson@measurement.gov.au, 02 9449 0140).

Give us your feedback!

Let us know what you think of Remediation Australasia.

What would you like to see? What would you change? Contact us at aric@crccare.com with your thoughts.



National Contaminated Land Conference

The Assessment of Contaminated Sites National Environment Protection Measure (NEPM) is the national system of rules through which contaminated land is assessed and managed. It is likely to be adopted nationally in 2012, and brings with it major changes to the way in which contaminated land is investigated and remediated.

This conference will consider the impacts the NEPM changes will have on various stakeholders including consultants, landowners and local government. Learning about the NEPM's changes, its new flexibilities and increased coverage will assist you in dealing with contaminated land and its liabilities. This conference will cover topics including:

- Changes to the Assessment of Site Contamination NEPM's reference papers and documents including health risk assessment and ecological investigation limits
- estimated impact of the ASC NEPM on:
  - Auditing, monitoring and clean up costs
  - Local government and planning and assessing contaminated land
  - Land owners; this will include information about what the obligations are, and the changes that are coming
- overview of the legal risks of managing contaminated land and transfer liabilities
- a landowner's experiences with contaminated land clean up and prevention, and
- contaminated soil management options – reuse, landfill, containment and dealing with hazardous soils.

Presenters from organisations including Vic EPA, Maddocks Lawyers, CRC CARE, Qld DoSITIA, SKM, Coffey Environment, ASBG and enRiskS will be present at the event.

Registration for subscribers or members to a range of organisations (ASBG, ACLCA NSW, ALGA, SBA members and HDY's Clients) will receive discounted attendance ($395); non-member registration costs $480.

Visit **www.asbg.net.au** to register.

The 1st International Conference on Contaminated Land, Ecological Assessment and Remediation (CLEAR 2012)

4-8 November 2012

Zhejiang A & F University
Lin'an, China

Abstract submissions for CLEAR 2012 are now closed and notifications of acceptance have been issued.

Please visit
www.bit.ly/CLEAR2012registration
to register.

Early Registration
Standard 300USD / Student 150USD
(Workshop only) 80USD

Late Registration
Standard 350USD / Student 200USD
(Workshop only) 100USD

www.bit.ly/CLEAR2012registration
Email: lisong66@yahoo.cn

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www.crccare.com

Institute of Soil Science, Chinese Academy of Sciences (China)

Croucher Institute for Environmental Sciences, Hong Kong Baptist University

Taken any snaps of the environment lately?

ENTER THEM in the *REMEDIATION AUSTRALASIA* PHOTO COMPETITION!

We're looking for great photos of all things environmental, whether they're focused on remediation of the environment, a project or site you've been working on, an issue in the field that you think deserves a writeup in our publication, or just something you've seen that really sums up the role of environmental research in our world.

The entrant with the best photo will win an Apple iPad.

All you need to do is email us a copy of the photo, a suggested caption for it, and details on when and where it was taken.

email your photo to aric@crccare.com to win.

Entries close September 15, 2012, and will be announced in Issue 11 of *Remediation Australasia* (to be released in October 2012).

Visit **www.crccare.com** for full terms and conditions of entry.

CRC CARE reserves the right to use entries in publications and on its website.

Training and events calendar

August

1 – 3 **Groundwater modelling for beginners**
SRIT / Sydney
www.srit.com.au/course_details.php?id=33

8 **Introduction to environmental site assessment (CPD training, module 6)**
Presenters: Sim Ooi (Parsons Brinckerhoff) and Karen Teague (Coffey)
ACLCA / Melbourne
www.aclca.org.au/cms-events/index.phps

10 **Contaminated Land Conference**
ASBG & SBA / Melbourne
www.asbg.net.au

15 **Requirements for optimising remediation designs - Is your tender documentation adequate?**
ALGA / Adelaide
www.landandgroundwater.com/Industry%20Calendar.html

21 – 23 **Introduction to Australian groundwater**
SRIT / Brisbane
www.srit.com.au/course_details.php?id=39

Highlight your event on our calendar page to our 2,000+ subscribers – **Free with any ad in *Remediation Australasia*.**

September

5 **Introduction to environmental site assessment (CPD training, module 7)**
Presenters: Darryl Strudwick (AECOM) and Michael Rehfisch (Senversa)
ACLCA / Melbourne
www.aclca.org.au/cms-events/index.phps

5 **Outcomes of the Jeffman case**
ALGA / Sydney
www.landandgroundwater.com/Industry%20Calendar.html

11 **Review of the revised NEPM**
ALGA / Perth
www.landandgroundwater.com/Industry%20Calendar.html

11 – 13 **Introduction to Australian groundwater**
Sustainable Resources Industry Training (SRIT) / Melbourne
www.aclca-wa.org.au/events

13 **Contaminated site environmental risk assessment**
ALGA / Auckland
www.landandgroundwater.com/Industry%20Calendar.html

19 **Outcome of EPA review and ministerial committee** *ALGA* / Melbourne
www.landandgroundwater.com/Industry%20Calendar.html

20 **Water and LNG/CSG projects - challenges, solutions, impasses**
ALGA / Brisbane
www.landandgroundwater.com/Industry%20Calendar.html

October

3 **Environmental management plans - Who reads them?**
ALGA / Sydney
www.landandgroundwater.com/Industry%20Calendar.html

10 **Introduction to environmental site assessment (CPD training, module 8)**
Presenters: Kevin Simpson (URS) and Lyle Carpenter (Coffey)
ACLCA / Melbourne
www.aclca.org.au/cms-events/index.phps

17 **SuRF and sustainable remediation - The great debate** *ALGA* / Melbourne
www.landandgroundwater.com/Industry%20Calendar.html

17 **Olympic Dam expansion (Groundwater issues/innovations/etc)**
ALGA / Adelaide
www.landandgroundwater.com/Industry%20Calendar.html

23 – 26 **Australian groundwater modelling school using GMS**
SRIT / Perth
www.srit.com.au/course_details.php?id=32

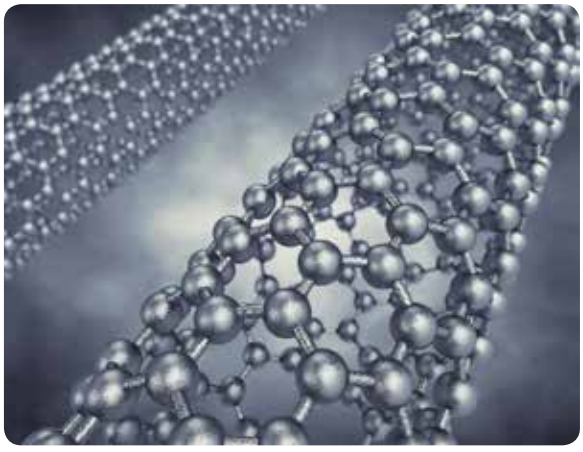
Oct 29 – Nov 1 **Groundwater modelling using ArcHydro GW**
SRIT / Perth
www.srit.com.au/course_details.php?id=41

Research RoundUp

Research Roundup aims to keep you up to date with current research on environmental contamination assessment and remediation in Australia. By keeping content succinct and focusing on particular projects, *Remediation Australasia* makes it easier for you to find the time to read about areas which are relevant to you. In this issue, the focus is on CRC CARE-funded projects.

CRC CARE's second term of operation commenced in July 2011, and the research programs have an increased focus on helping to develop uniform national standards for assessing and remediating contamination. The outputs from the research programs will fill knowledge gaps and allow adoption of remediation that balances health and environmental protection with economic and social considerations. Read on for descriptions of four new projects funded by CRC CARE.

Natural clay mineral-graphene composites for sustainable remediation



Recently, industries and households have been discharging a large amount of wastewater which is continuously deteriorating the quality of water and soil. A vast variety of contaminants may be introduced into the nature and eco-systems, and some of the pollutants were identified as emerging persistent organic pollutants (POPs), which can cause severe impact on the environment, safety and public health. A global concern is attracted by those chemicals, which are persistent, bioaccumulative and toxic. In Australia, POP pollution in water and soil becomes a serious issue and hinders the sustainable development. Complete removal of such pollutants therefore is an urgent demand. Traditional technology, such as extraction or filtration, can only transfer the pollution from one phase to another, fails to completely destruct the organic compounds to non-toxic substances, such as water, carbon dioxide and some inorganic ions. Though advanced oxidation processes can degrade the POPs, toxic transition metals (oxides) are necessary as catalytically active sites. The leaching of transition metals may lead to secondary contamination. This project proposes a novel technology and aims to provide a sustainable remediation to tackle emerging POPs. Natural clays and nanostructured carbon will be used as catalysts; therefore no secondary contaminations will occur. ■

Development of Australian petroleum vapour intrusion guidance

The project objective is to develop a petroleum vapour intrusion (PVI) guidance document as a companion to the existing CRC Care Health Screening Levels (HSLs) technical guidance documents. While the existing document focuses on the modelling of petroleum vapour intrusion, this document will focus on the site-specific investigation required when a site needs full assessment.

This document will provide a technical framework that outlines the use of the HSLs and the site logistics, layout and geology which outline under what site conditions PVI assessments are to be undertaken. The document will also specify methods/ procedures to be followed by practitioners if a PVI assessment is required. ■

Remediation of heavy metals in drinking water using innovative adsorbents

Heavy metals and metalloids (contamination from both natural and human activities) are some of the representative pollutants in surface and ground water used for drinking-water supply. As traditional remediation technologies are often unable to remove these pollutants, state-of-the-art technologies such as ion exchange and dense membranes have been used. Such advanced technologies, however, are not appropriate for the situation of India, especially in rural and remote areas, from a socio-economic point of view.

New adsorbents such as iron oxide-coated sand, chestnut shell, iron-oxide coated sponge have been found as cost-effective materials in removing heavy metals and metalloids. However, further studies are necessary to identify more efficient and economical adsorbents and treatment systems, which can produce drinking-quality water sustainably. Currently, low-cost adsorbents are extensively developed from a number of materials, such as minerals and agricultural or industrial by-products and wastes. Project researchers have developed two adsorbents for the removal of arsenic in small water-supply schemes. This work introduces low-cost and locally available materials with or without modification to remove heavy metals and metalloids. The project will also focus on safe disposal of used or exhausted adsorbents. ■

The future of landfills in Australia

The objective of this research is to undertake a detailed analysis of the 'state of', 'pressures on' and 'responses to' landfills in Australia, in consultation with key stakeholders, to develop a suite of potential policy options. Specifically, the research seeks to address the following questions:

• What is the condition, status, and trend of landfill as a waste-disposal mechanism in Australia?

• How are environmental impacts of landfill, including contamination and greenhouse gas emissions, being addressed through technological and policy innovations?

• What are the alternative views within industry (both landfill management, alternative waste treatment or resource recovery industry and regulators) about the future roles of disposal to landfills, relative to other options including alternative waste treatment technologies and waste minimisation?

• What are some of the pushes, pulls, barriers and opportunities for reducing waste to landfill – including social, technological, environmental, economic and political, including relative cost-effectiveness of options such as waste minimisation?

• What are appropriate policy responses, at the Commonwealth, state and local government levels, to minimise waste to landfill?

This research seeks to provide support for improved decision making at the many levels of government, which each have jurisdictions over waste. The project will also deliver potential policy options related to the decision-making processes themselves. ■

Publications Update

This section contains publications that have been published in the last 3 months (since the last edition of *Remediation Australasia*). The publications may originate from research institutions, regulators or industry groups. Let us know if you have any appropriate publications (no promotional material) to be included by emailing **aric@crccare.com**.

CRC CARE Technical Report 16:
Safe on-site retention of contaminants Part 2: A risk-based approach

Considers how a risk-based framework may be forumlated to assess the risk associated with the retention of contaminants in soil and groundwater at a site, and other related issues.
Download a copy at **www.crccare.com.**

CRC CARE Technical Report 21:
Sampling strategies for biological assessment of groundwater ecosystems

To meet Australian water needs, our groundwater must be managed effectively. TR21 provides guidance on how to biologically assess groundwater ecosystems, specifically in the context of localised environmental threats or impacts.
Download your copy at **www.crccare.com.**

Remediation Australasia re-released!

Remediation Australasia, until September 2011, was an online publication. The new print layout has sparked so much interest that the ARIC team has converted all back issues to the new format. To browse, visit **www.remediationaustralasia.com** ■

ARIC Update

Last edition we celebrated reaching a milestone 250 members, and as this goes to print we're about to hit the 300 mark. Welcome to all our new ARIC forum members!

Although only a few members have used the discussion board to post upcoming events (which you are all more than welcome to do!), it's great to see so many industry participants letting us know they'd like information and updates from us by joining.

Already an ARIC member?

Head to http://linkd.in/nsO2TN and send us a request to join the online ARIC forum.

We've noted in particular, as is often seen on social networking sites, that a lot of interest in our forum appears to have been generated through shared connections. Much of the literature we see from science communication organisations recognises the importance of using social media to share accurate scientific information, so we're pleased to see a lot of our members are embracing social media and tapping into the recommendations supplied by LinkedIn.

We must alert you, however, to the importance of supplying us with your postal address if you'd like to receive a hard copy of this publication.

Joined our LinkedIn forum, but not receiving any magazines?

We probably don't have your postal address! Flick an email with your postal details to aric@crccare.com

If you're on our LinkedIn forum but you've had to pinch this publication from a colleague because you don't have one, send us an email! We'd love to send you a copy, but we need to know where you are to get it to you.

If you haven't received your hard copy of this, but are still receiving emails, let us know what your new postal contact details are – we might not have them on our system. Please forward all emails to **aric@crccare.com** so we can ensure you stay up to date with all ARIC opportunities and news. ■

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