Down to *Earth* Solutions

Welcome to the Spring 2000 edition of our newsletter. We're keeping you up-to-date on what's happening in our firm, contamination issues, new processes and technologies and the latest legislation.

Remediation of lead contamination

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Environmental & Earth Sciences was recently requested by an industrial client to review available investigation data prior to the sale and subdivision of a site at Seven Hills, in Western Sydney. The objective was to demonstrate that the land was free of contamination and suitable for industrial uses.

Given that lead based paints were formerly manufactured on site and that some remediation of lead contaminated soil had occurred, additional, carefully focussed investigations were carried out. It was found that previous remediation had removed only isolated surface areas of soil and that parts of the site were still heavily contaminated by lead and to a lesser degree other heavy metals. Laboratory analysis found concentrations of lead as high as ten per cent.

Based upon these findings, a remediation action plan was designed and implemented. The short time available to carry out the work was a major consideration in the design of the plan. Analysis results were used to divide the soils in the backfilled area of the site into three classes:

— clean soil that could remain on site;
— contaminated soil classified as solid/ industrial waste to be removed; and
— contaminated soil classified as hazardous waste to be stabilised before removal.

By separating the three classes of soil it was possible to minimise both disposal and treatment costs. In addition, the stabilisation technique was one developed in-house and this also resulted in significant cost savings for the client. Initially the client had a quote to do stabilisation offsite at $500/ tonne. Environmental & Earth Sciences', EPA approved proprietary immobilisation technique, including transport and disposal, was less than $200/tonne. With a total of over 2500 tonnes of soil being classified, treated and disposed offsite, this meant a saving of $750,000 for the client.

Upon completion of the remedial works, the site was validated suitable for industrial uses. The total project cost was less than $300 000 and all works were undertaken while the site was still operational.

Melbourne office and staff changes

Our Melbourne office has undergone a number of major changes over the last four months. Former Victoria State Manager, Richard Campbell has moved on and we are pleased to introduce Stewart Black as our new Victoria State Manager.

Stewart (pictured) has over 25 years of experience related to the environment industry. This has given him a broad and comprehensive knowledge of environmental issues including environmental audits, due diligence and risk assessments, cleaner production principles, environmental reporting, waste minimisation and sustainability. He has been involved in a number of sectors of the industry including environmental research and development, planning, corporate environmental management and consulting for over 25 years.

Stewart has a practical knowledge of environmental legislation and regulation. He is a certified environmental auditor with the Quality Society of Australasia Register of Certifed Auditors (QSARCA) and successfully completed a number of due diligence projects during the privatisation of assets by the Victorian Government. **Continued on page 3 . . .**

An update on asbestos contaminated site investigations in New Zealand

Rural parts of Flat Bush in the Manukau area where asbestos was found in a number of existing house lots and new subdivisions.

Environmental & Earth Sciences has been involved in the investigation and remediation of a number of existing house lots and new subdivisions in the Manukau area, South Auckland.

An investigation of the rural areas of Flat Bush for new subdivisions, revealed asbestos deposits. This led to the requirement for a site investigation to be conducted prior to any building development, or resource consent being approved.

Fragments of asbestos sheeting that was used as fill..

It was reported that between 1930 and 1970, large volumes of asbestos in the forms of sheeting, pipes and bags of loose asbestos fibres had been used by farmers on farm tracks to improve drainage in low lying areas and to fill in gullies.

Subsequent development of some of these rural properties has resulted in the mixing of contaminated areas with uncontaminated soil, spreading relatively low asbestos contamination over large areas. Soil containing greater than one per cent asbestos was characterised as asbestos containing material. As a result of spreading by various land activities, some soil samples have been found to contain minor amounts of visible asbestos chips although the contamination level would probably constitute less than 0.001 per cent by mass of soil.

The Flat Bush region became the focus of intense investigation and, as a result, Manukau City Council developed a set of guidelines for consultants carrying out asbestos investigations in the Flat Bush area.

During the investigations, Environmental & Earth Sciences also carried out numerous investigations for asbestos on large subdivision blocks, some with over 300 lots.

The difficult issue of expressing the asbestos contamination as a meaningful percentage and the subsequent tagging of the LIM (land information memorandum) by the council across all properties within the investigated area, had huge implications for landowners and property values.

In 1999 the Manukau City Council set out to develop a qualitative risk-based characterisation process for safe threshold levels in soils of the Flat Bush area. The findings of the stuy undertaken by Alan Rogers OH&S Pty Ltd were presented to the Manukau City Council in October 1999.

In November 1999, the Flat Bush Investigation Steering Group, in consultation with Alan Rogers OH&S Pty Ltd, proposed a management control strategy based on class and land disturbance activity for the Flat Bush study area. The protocol for individual site investigations was amended accordingly to accommodate their proposed management plan.

The important difference in the newly adopted protocol for site investigations is that low-level, dispersed asbestos fibre and asbestos cement contamination in an area, poses no unacceptable risks, however, deposits of bulk asbestos containing minerals could pose unacceptable risks if disturbed. The identification of bulk materials containing asbestos and the risk posed to human health in context of the land use/ disturbance activity, is of greatest importance, while the sampling and analysis for low-level (microscopic detectable) fibre contamination in soils is a lower priority.

Although these regulations for site investigations were aimed at the Flat Bush area, they are welcomed by environmental consultants, landowners and developers as a reference and guide for future asbestos contamination investigations in other areas as well.

The NSW EPA is currently working with study groups to develop new guidelines for asbestos investigations and contamination classification in New South Wales. As soon as more information is available it will be published in this newsletter and on our internet site at www.groundscience.com.

Ionic composition important in analysis

Analysis of ionic composition proved to be important in a recent environmental assessment of a landfill in Central Victoria.

At the time of the assessment, seepage was observed to be emanating from the base of the wall of the leachate dam below the landfill. Initially it was presumed that this seepage was due to a failure in the dam wall. However, analysis of groundwater data indicated that the ionic ratios of the major ions, in particular Na/Ca, Mg/Ca, Ca/K, Cl/SO_4 and Cl/HCO_3 in the leachate were significantly different from those in the seepage water. Based on this data, and along with other variations in ionic composition, it was deduced that the seepage observed was not related to the leachate dam but was regional groundwater discharge from the underlying silt stone aquifer.

Environmental & Earth Sciences have extensive expertise in hydrogeochemistry, which is an important tool for the early determination of groundwater flow paths.

In order to understand the chemical processes occurring in the groundwater, a detailed analysis of analytical data is required. The identification of processes influencing groundwater, when limited to comparing total ionic concentrations of different sources, is difficult due to variations in ionic concentrations resulting from localised dilution, dispersion, attenuation and infiltration.

Using ionic ratios clarifies changes in water quality and can aid in identifying any dominant groundwater influences. The possible onset of a contaminated front and an original source of water are more easily identified by the changing ratios of principal ions.

Analysis of ionic composition proved to be important in a recent assessment of a landfill in Central Victoria.

Environmental audits of contaminated sites

Philip Mulvey, Principal of Environmental & Earth Sciences Pty Ltd, carries out an inspection following a burst gas line.

The management of contaminated sites is often seen as a two-part process. First, contaminated land consultants engaged by the site owner, developer or other relevant party, conduct the site assessment and undertake any necessary remediation and validation.

Secondly, accredited site auditors independently review the assessment, remedial and validation actions taken by the contaminated land consultant to ensure that they comply with current regulations and guidelines, and that the site has been assessed, remediated and validated to a standard appropriate to the proposed land use.

To improve access to competent technical advice and to increase certainty in the "sign-off" of contaminated site assessments and remediation, in 1989 the Environment Protection Authority of Victoria have introduced the "Victorian EPA Environmental Auditor (Contaminated Land) Scheme". This was followed by the NSW EPA in 1998 with the "Guidelines for the NSW Site Auditor Scheme". Since the creation of these two systems, Philip Mulvey, principal of Environmental & Earth Sciences Pty Ltd, has been one of the few auditors accredited by both the Victorian and NSW Environmental Protection Authorities to audit environmental works carried out by other environmental consultants.

An auditor may be used when independent expert technical advice is requested or when a site audit is a statutory requirement, particularly under the *Contaminated Land Management Act 1997* or under the *Environmental Planning and Assessment Act 1979*.

During this process the auditor must exercise professional judgement and be objective in reviewing reports on the contaminated site investigation and remediation. The auditor then prepares a site audit report, which is a written statement by the site auditor of the findings of the audit. On the basis of this report, a site audit statement (certificate in Victoria) is then issued.

The Environment Protection Authorities conduct annual checks of the work of site auditors to ensure that the standards required are being maintained.

As an accredited auditor, Philip Mulvey is required to maintain an excellent and up to date knowledge of technical issues as well as all existing regulations related to environment and site property. If needed, he is assisted and supported by specialists from the CSIRO and various universities.

For further information on site audits, contact Philip Mulvey or his assistant, Philippe Finance, on (02) 9922 1777.

Site inspections are carried out as part of standard audit procedure.

More changes in Melbourne office

With Stewart's experience and knowledge we look forward to producing high quality work to meet client needs and reaching new horizons with Stewart at the helm.

Environmental & Earth Sciences is also happy to introduce hydrogeologist, Joe Tranter to our Melbourne team. Joe will focus on contaminant hydrogeology and has experience in contaminated site investigations as well as planning and conducting hydrogeological investigations. He has also been involved in groundwater salinity studies.

Our goal is to improve the quality and delivery timing of our services to clients. To this end, one of our primary objectives for the next six months is to gain ISO 9001 accreditation for the quality assurance system being implemented in the Melbourne office.

Market Development Manager

Ian Brookman of our Melbourne office has recently been promoted to the position of Market Development Manager for Environmental & Earth Sciences. Ian has been with us now for the last two years and has been instrumental in establishing a broad client base for the Melbourne office.

In his role of Market Development Manager Ian will be developing an Australia-wide marketing plan for Environmental & Earth Sciences and assisting the regional managers in Victoria, New South Wales, Queensland and Western Australia with the implementation of strong marketing strategies in their respective states.

Melbourne office has been moved from Port Melbourne to 102 St Kilda Road, St Kilda. Contacts: Phone: (03) 9593 8770 Fax: (03) 9593 8771.

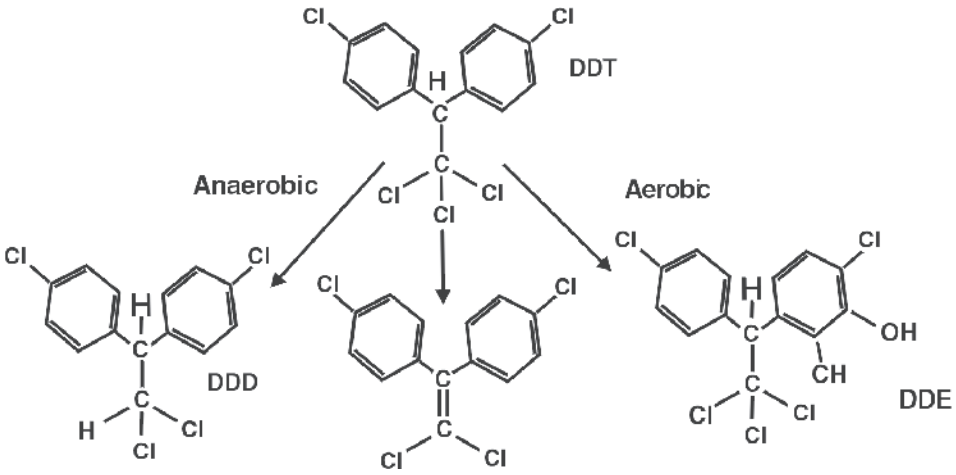
Papers recently added to our internet site: www.groundscience.com

- Treatment, recovery and disposal technology: Bioremediation techniques for petroleum facilities.
- Conceptual model for modelling landfill leachate Parts 1 and 2.
- Assisted desorption and natural degradation of benzene in an organic silt aquifer using low grade oxidants Part 1, 2 and 3.
- Groundwater monitoring.
- Pipe overload and source detection.
- **Look for new papers each week**

Another look at DDT

DDT was used extensively as a pesticide in Australia during the 1950s to the early 1970s. Although it hasn't been used since the early 70s, residues of DDT and it derivatives (DDE and DDD) are still evident in the soil today.

It has been associated with former cattle and sheep dips, market gardens, orchards and plantations, cane fields and some agricultural crops. Hotspot soil contamination has also been found around telegraph poles, old storage areas, concrete slabs and wash out points.



During the 1970s DDT (1,1,1,-trichloro-2,2-bis[p-chlorophenyl]ethane), a chlorinated hydrocarbon, was banned from use in most developed nations because of environmental concerns regarding its ability to cause birth abnormalities and cancer, as hazard to wildlife and for fear of it accumulating in the food chain.

Application rates of this pesticide varied, depending on the agricultural practices, however the highest levels in soils are usually associated with previous cattle dip sites, where levels of 10 000 mg/kg have been found. By comparison, a recent survey of Western Sydney market gardens by Environmental & Earth Sciences found levels of DDT in the soil that did not often exceed 1 mg/kg.

DDE and DDD are transformation products of DDT. Whereas DDD is probably less persistent than DDT and seldom accumulates in aerobic soils, DDE is more persistent that DDT and most likely to be the primary residual in aerobic soil.

Although persistent, DDT and its derivatives slowly degrade in the soil and estimates of half lives in temperate soils have been generally been found to be in the range of 2-10 years. Climate has also been found to have a large influence on persistence as significantly shorter half lives were found throughout tropical areas. Other studies have found that the natural degradation of DDT can also be dependent on a factors such as temperature, presence of metallic ions, iron, light, moisture, organic matter, clay and pH.

It is not necessary to wait for the DDT to degrade as it can also be removed from the soil by other routes such as valorization, leaching and runoff, and uptake by plants and animals. More attention should be given to the removal of DDT by these means, as it is via these paths that it will affect the environment. Recent studies have found that the compound is present in waterways and groundwater and in time some our oceans may actually be a sink for DDT.

As DDT and its derivatives will be present in Australian soils for some time, consideration should be given to ensuring that it is managed so as to protect the environment. Techniques are now becoming available to enhance degradation, however investigations should still be made whenever any land containing residuals of DDT is to undergo a change in land use to either residential or agricultural.

A market garden typical of the type where DDT and its transformation products DDE and DDD may be found.

Environmental & Earth Sciences Pty Ltd

HEAD OFFICE—SYDNEY
"The Coal Loader"
Balls Head Drive
Waverton
New South Wales 2060 Australia

PO Box 380,
North Sydney NSW 2059
Phone: 61 2 9922 1777
Fax: 61 2 9922 1010
e-mail: eesi@zeta.org.au

Internet:
http://www.groundscience.com

Melbourne
102 St Kilda Road
St Kilda
Victoria 3182

PO Box 1090
St Kilda South
Victoria 3182
Phone: 61 3 9593 8770
Fax: 61 3 9593 8771
e-mail: eesi@ozemail.com.au

Perth
Phone/Fax: 61 8 9319 3939

Orange
Phone/Fax: 61 2 6365 8618
e-mail: fiftybuc@netwit.net.au

Byron Bay
Phone: 61 2 6684 8000
Fax: 61 2 6684 8148

Darwin
Phone: 61 8 8947 5061
Fax: 61 8 8947 3593

New Zealand
PO Box 35853
Browns Bay
Auckland
New Zealand
Phone: 64 9 476 4483
Fax: 64 9 476 4485
email: eenz@xtra.co.nz

Dili, East Timor
Phone/Fax: 6729 390 313 437

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