

Orica Botany Groundwater Project Community Liaison Committee Newsletter

Issue 9

April 2002

Summary of Meeting No. 14

Community Liaison Committee (CLC) Meeting No. 14 was held on Tuesday 5 March 2002 at Botany Town Hall.

New Community Participants

Two additional community members, suggested by Mrs Nancy Hillier (local resident and representative from Botany Environment Watch), will be invited to attend future CLC meetings.

Voluntary Remediation Agreement

The Stage 3 Voluntary Remediation Agreement between Orica and EPA NSW expired in December 2001. A Stage 4 Agreement describing the investigation, research and remediation modules and goals for the Orica Botany Groundwater Project is being finalised by EPA NSW.

Annual Report

Under the Voluntary Remediation Agreement, Orica must issue to EPA NSW an Annual Report summarising the year's activities and progress towards the Agreement's goals. Orica issued the Report for 2001 in February 2002, with copies to other key Regulators and to CLC members.

Monitoring Program

The most recent round of groundwater and surface water monitoring was conducted in January 2002. It indicated that contamination in the shallow groundwater was not moving across Orica Southlands Block 2 between Springvale and Floodvale Drains. A new deep groundwater monitoring point was also installed, situated between existing monitoring points on Orica Southlands and near Foreshore Road.

Surface water results showed lower contaminant concentrations in Springvale Drain and Penrhyn Estuary than had been measured in the previous 18 months. Only one location in Springvale Drain – just upstream of Orica's stormwater pipes – showed an increasing trend.

Biota monitoring (which involves the collection of marine animals – particularly fish – and analysis of them for specific contaminants) also forms part of Orica's monitoring program. This type of monitoring, however, may be used on an as-needs basis to gauge the impact of completed major remediation modules. Monitoring by Orica in 1989 to 1998 established the baseline conditions.

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Focus on *Bioremediation*

What is Bioremediation?

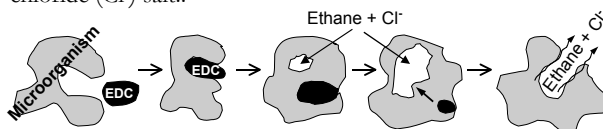
The US EPA describes bioremediation as “a treatment process that uses naturally occurring microorganisms (yeast, fungi, or bacteria) to break down, or *degrade*, hazardous substances into less toxic or nontoxic substances. Microorganisms ... eat and digest organic substances for nutrients and energy.”¹

Microorganisms are like us: they need food to grow on, and something to breath. We can use doughnuts for food (and get lots of carbon and energy to make us fat!), while breathing oxygen. In this case the doughnuts are *electron donors* and oxygen is an *electron acceptor*. Microorganisms, however, can use other compounds as electron acceptors to 'breath', such as nitrate, sulphate, iron, and even chlorinated hydrocarbons (CHCs)! They can even use CHCs as their electron donor doughnuts while breathing oxygen.

We can encourage either the breathing or eating of a chemical compound by changing the environment from one that is *anaerobic* (no oxygen present) to *aerobic* (oxygen present). By adding *electron donors* (such as vegetable oil) we will encourage anaerobic conditions and then the microbes will use the compounds as *electron acceptors* and 'breath' them. By adding *electron acceptors* (like oxygen) we create aerobic conditions that encourage microorganisms to use the compound as an electron donor while breathing the oxygen. If the right microorganism to do the job is not present, we can *augment* by adding extra (*non-indigenous*) microorganisms.

Orica Botany Groundwater Project

The groundwater at Orica's manufacturing site contains a lot of natural dissolved organic carbon and almost no dissolved oxygen. Under these condition the microorganisms will 'breath' CHCs, and remove the chlorine atoms, while using the natural organic carbon as an electron donor (the doughnuts). Laboratory-scale trials have shown that the naturally-occurring (*indigenous*) microorganisms while eating electron donors will breath EDC (ethylene dichloride, the main focus of Orica's bioremediation efforts), converting it to ethane gas and chloride (Cl) salt:



¹ From *A Citizen's Guide to Bioremediation*, EPA 542-F-96-007, United States Environmental Protection Agency, April 1996.

Reactive Iron Barrier

Based on successful trials of a pilot-scale reactive iron barrier to capture and destroy a range of chlorinated hydrocarbons (CHCs) found in the groundwater flowing under Orica's site, a full-scale barrier has been designed. The preferred location is on Orica Southlands, which is an undeveloped block of land to the southwest of the manufacturing site.

Expressions of Interest for installing the full-scale barrier have been sought from 18 contractors in Australia, North America and Europe. Some of the respondents did not have all of the experience or capabilities required, so some consortia may be formed prior to formal tendering.

Orica plans to begin purchasing the iron for the barrier this year from a local supplier, but it will take some time to produce and stockpile the required quantities. Orica will also try to use local construction contractors. Installation is currently planned for 2003.

Springvale Drain Sediment Removal and Drain Reconstruction

Orica has restored the original alignment of Springvale Drain running through Orica Southlands. About 1000 m³ of contaminated sediments were excavated from the original section of the Drain. The sediments are being stored in sediment containment structures pending testing to determine treatment and disposal options. The sampling and analysis was conducted in March 2002.

Shallow EDC Plume Containment

Orica had designed a process for extracting and treating shallow groundwater affected by a shallow plume of EDC (ethylene dichloride, a CHC formerly produced and stored on the manufacturing site). However, this technology is not Orica's preferred method for remediating EDC-affected groundwater – bioremediation is (see *Focus on ...* on the front page). As a consequence of this and of resistance to the development proposal, Orica withdrew its Development Application for the process in January 2002. This change in Orica's remediation strategy is reflected in the Stage 4 Voluntary Remediation Agreement.

Bioremediation Field Trials

As reported previously, Orica is designing field scale bioremediation research trials, building on the successful completion of laboratory scale trials by GeoSyntec Consultants in Canada. The proposed trials will see nutrients (but not additional microorganisms) injected into the shallow and deep groundwater to promote natural biological destruction of the EDC in the groundwater. The

nutrients (which include ethanol, corn oil and a soap-like compound called potassium oleate) are non-harmful to the groundwater and will break down completely, leaving no undesirable residues.

The trials are expected to last 8 to 18 months, starting in late 2002. Orica will fully inform DLWC, EPA NSW and Botany Bay City Council as the proposal is being developed to facilitate the approvals process.

CRC for Nano-Sized Iron Particles

Work by the Cooperative Research Centre (CRC) for Waste Management and Pollution Control is continuing on the development of a commercially viable process for forming nano-sized iron particles. The particles are about one ten-thousandth of a millimeter in diameter, which makes them much more reactive and easier to install in reactive iron barriers than more conventional iron granules (which are about 1000 times larger). The CRC is also investigating ways of enhancing the particles' storage life and developing new applications and markets.

The project team includes the University of NSW, CSIRO, EPA NSW, Sydney Water Corporation, Orica and Cleanaway.

In-Well VOC Probes

Orica has been asked to assist in another CRC project. This one involves field trials of a monitoring probe that can be placed in monitoring wells to continuously measure concentrations of volatile organic compounds (VOCs), including CHCs. Two existing locations on the manufacturing site are being evaluated to assess their suitability for the trials. β

Acknowledgements

Thank you to Dr David Major of GeoSyntec Consultants Inc., Canada, for assisting in preparing *Focus on Bioremediation*.

About this Newsletter

This newsletter aims to keep the Randwick and Botany communities informed about progress of the Orica Botany Groundwater Project. The newsletter is prepared by Orica on behalf of the CLC following each meeting of the CLC. Meetings are held roughly every 3 months.

Who Receives this Newsletter?

This newsletter is distributed throughout the suburbs neighbouring Orica's Botany Site including Banksmeadow, Botany, East Botany, Hillsdale, Matraville and Pagewood.

Meeting No. 15 will be scheduled for June or July 2002, probably at 1 p.m. in Botany Town Hall. If you wish to enquire about the CLC or its meetings, please call Orica's Community Hotline on 1800 025 138.