

***MAJOR PROJECT ASSESSMENT:
Car Park Remediation Project
Orica, Botany Industrial Park***



Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

November 2009



Images of the carpark located on top of the encapsulated waste material

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EXECUTIVE SUMMARY

Orica Australia Pty Limited (Orica) proposes to remediate land within the Botany Industrial Park (BIP), known as the Car Park Waste Encapsulation (CPWE) site. The site is located in the suburb of Banksmeadow in the Botany Bay Local Government Area.

The proposed remediation works involve excavation and treatment of approximately 45,000m³ of contaminated material that has been encapsulated and buried beneath a car park on the BIP since 1980. The material, which contains a mixture of ash, sand and peat, is contaminated with chlorinated hydrocarbon waste by-products from a solvent plant that was in operation during the 1960's and 70's. Orica proposes to remediate the material on-site using Directly-heated Thermal Desorption (DTD) technology.

Monitoring has indicated that the encapsulation liner is becoming susceptible to tears and contamination of the surrounding soil and groundwater has occurred. Remediation is required to ensure no further contamination occurs, is required by Orica's Environment Protection Licence and would satisfy the requirements of the *Stockholm Convention on Persistent Organic Pollutants*. The remediation project would take approximately 18 months to complete and would cost \$30 million.

The key issues for the project include the remediation goals; air quality, in particular, compliance with limits; human health impacts and groundwater protection.

During the exhibition period, the Department received eight submissions on the project: 5 from Government agencies (Department of Environment, Climate Change, and Water; NSW Health; Sydney Water; and Randwick and Botany Councils), 2 from special interest groups (Nature Conservation Council and Botany Environment Watch) and 1 from a member of the general public.

None of the government agencies objected to the project. However, they raised several concerns about some of the potential impacts of the project during the assessment process, and sought numerous clarifications on certain aspects of the project. Neither of the special interest groups objected to the proposed remediation of the site. Nevertheless, they were critical of several elements of the project, including the choice of technology and the assessment of the potential human health impacts of the project. The remaining submission raised concerns about the potential traffic, flora and fauna, and heritage impacts of the project.

In addition to the statutory consultation undertaken as part of the EA process, Orica facilitates a Community Participative Review Committee which has met regularly since 1997 to discuss remediation options for the CPWE site.

The Department has assessed the merits of the project and concluded that the project would remove a long-term source of contamination from the area, is consistent with national and state legislation and would enable the site to be returned to productive industrial use. It has also concluded that the impacts of the project can be suitably mitigated to ensure an acceptable level of environmental performance.

The draft project approval includes a range of strict conditions to ensure the project is implemented properly, and provides a mechanism for on-going review and approval through various phases of the project including commissioning, trials and operation. The project also needs to be carried out in accordance with the requirements in the *Contaminated Land Management Act 1997*, which provide for independent review, auditing and validation by an accredited site auditor.

On balance, the Department believes the project is in the public interest and should be approved subject to these strict conditions.

GLOSSARY

Abbreviation	Definition
BIP	Botany Industrial Park
CAR	Protection of the Environment Operations (Clean Air Regulation) 2002
COPC	Chemical of potential concern
CPoP	Commissioning and Proof of Performance (trials)
CPRC	Community Participation and Review Committee
CPWE	Car park waste encapsulation
DECCW	Department of Environment, Climate Change and Water
DTD	Directly-heated thermal desorption
EPL	Environment Protection Licence
ESB	Excavation soil building
FSB	Feed soil building
GLC	Ground level concentration
HCB	Hexachlorobenzene
HCBd	Hexachlorobutadiene
HHIA	Human health impact assessment
OCS	Octachlorostyrene
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethene
RAP	Remedial Action Plan
RBC	Risk-based soil concentrations
SIL	Soil investigation level
TCE	Trichloroethene

1. BACKGROUND

1.1 Project Setting

Orica Australia Pty Ltd (Orica) is an Australian-based global company that produces and supplies mining, chemical and consumer products. Orica has operated a chemical manufacturing facility at Banksmeadow since the early 1940s. The area comprising the Orica facility and adjacent industrial plants operated by Qenos and Huntsman have been collectively referred to as the Botany Industrial Park (BIP) since 1996 (see Figure 1).



Figure 1 - Site Location

From the 1960s, Orica operated a chlorinated solvents plant which produced industrial solvents for use as dry cleaning fluids and refrigerants. The waste products from the solvents plant were stored in drums located on a bed of boiler ash. Over time, the drums corroded leading to contamination of the ash bed and the underlying sandy soil with chlorinated hydrocarbons. In 1980, the contaminated ash and soil was excavated and stored within a synthetic liner which was then buried in the north eastern corner of the BIP. The area was covered with bitumen and referred to as the Car Park Waste Encapsulation (CPWE) site. Suitable technology is now available to remediate this material on site, and numerous national and state statutory instruments require its remediation. Therefore, Orica now proposes to remediate the CPWE site.

The CPWE site is located within the north eastern corner of the BIP, and is covered by a carpark (see Figure 1). The CPWE site comprises 1.4 hectares of land and contains approximately 45,000m³ (70,000 tonnes) of material contaminated with a range of chlorinated hydrocarbon wastes, including:

- hexachlorobutadiene (HCBD);
- hexachlorobenzene (HCB);
- tetrachloroethene (PCE); and
- octachlorostyrene (OCS).

The contaminated material is comprised of sand (26,000m³), ash (10,000m³) and peat (2,500m³). Small quantities of steel, timber, crushed drums and polythene granules are also contained within the encapsulation.

Adjacent land uses to the CPWE site include a mix of industrial and recreational uses. The Qenos Olefines administration building and car park are located immediately to the west of the CPWE and the Hensley Athletics field is located immediately to the east (see Figure 2). Industrial properties are also located to the north and west, including food manufacturing and packaging companies. The nearest residential properties are located in Denison Street, 160m to the east.



Figure 2 – CPWE Boundary and Adjacent Land Uses

1.2 Site Contamination Status

In addition to the primary contaminants identified within the CPWE (HCBD, HCB, PCE and OCS), other contaminants identified include, semi-volatile organic compounds, polychlorinated biphenyls (PCBs), heavy metals, carbon dioxide and methane; and volatile chlorinated hydrocarbons. There is no reported dioxin contamination in the encapsulated waste material.

The liner that encapsulates the material is also contaminated with high concentrations of HCBD, HCB, PCE and OCS and low levels of volatile organic compounds. Routine on-going monitoring has indicated that the liner is becoming brittle and more susceptible to tears.

Recent monitoring results also indicate that the soil surrounding the CPWE has been contaminated; with high levels of HCBD and PCE recorded at the northern end of the eastern embankment. Groundwater in the vicinity has also been contaminated.

Remediation of the CPWE is required in order to comply with various State and Commonwealth legislative requirements. The requirements are summarised in Table 1 and Table 2 respectively.

Table 1: State Requirements

Legislation	Regulation/Guideline	Requirements
<i>Protection of the Environment Operations Act 1997</i>	Environment Protection Licence No. 2148 issued to Orica	Conditions E1-E3 require the CPWE site to be remediated by July 2010
<i>Contaminated Land Management Act 1997</i>	Declaration of Remediation Site No. 21074. The CPWE forms part of the area declared for the Orica Botany Groundwater Plume.	Declaration requires the site to be remediated, however it relates primarily to the groundwater remediation project.
<i>Environmentally Hazardous Chemicals Act 1985</i>	Notice No. 450. The CPWE forms part of the area declared.	Requires written approval of DECCW for remediation works.
<i>Environmentally Hazardous Chemicals Act 1985</i>	Scheduled Chemical Wastes Chemical Control Order 2004	Prohibits the generating, processing, storing, distributing, conveying and disposing of scheduled chemical wastes such as HCB. Requires a licence from the DECCW for processing (treating).
<i>Environmentally Hazardous Chemicals Act 1985</i>	Polychlorinated Bi-Phenyl (PCB) Chemical Control Order 1997	Controls activities such as generation, processing, storing, conveying and disposing of PCB material or PCB wastes. Processing (treating) requires assessment by the DECCW.

Table 2: Commonwealth Requirements

Legislation/Plan	Requirements
Australian and New Zealand Environment and Conservation Council 1996 Hexachlorobenzene Waste Management Plan	Requires the CPWE site to be remediated as soon as possible and preferably in-situ. Requires a risk management plan to be prepared for the CPWE.
Stockholm Convention on Persistent Organic Pollutants	Australia, as a signatory country is required to implement measures to reduce or eliminate persistent organic pollutants in the environment such as those contained in the CPWE.

In addition to satisfying statutory requirements, remediation of the site would provide a number of benefits including the elimination of potential short and long term risks associated with having contaminated and toxic material contained on the site, and allowing future industrial use of the land.

1.3 Remediation Goals

The goals for remediation of the CPWE site are detailed in the *Remedial Action Plan – Car Park Waste Encapsulation*, AECOM 7 May 2009 (RAP). The goals represent the proposed levels for remediating the site to enable future industrial land use and to ensure the long term protection of human health and groundwater. The goals may be amended to more stringent levels following review by an accredited site auditor in accordance with the *Contaminated Land Management Act 1997* and following the commissioning and proof of performance (CPoP) trials.

The remediation goals are comprised of two separate sets of criteria; treatment criteria and reuse criteria. It is important to understand the distinction between the two types of criteria, as they are applied to different elements of the remediation.

Treatment criteria

Treatment criteria apply to the contents of the CPWE, including the liner. The treatment criteria are the levels that the remediation technology will achieve.

Reuse criteria

Reuse criteria apply to the soil surrounding the CPWE, including capping material and landscaped areas and the excavation walls and base. It is likely that this material contains lower levels of contamination than that in the CPWE, or is not contaminated. The reuse criteria represent the levels that are considered safe to remain in the soil.

Application of the treatment and reuse criteria is described in full in the RAP and is depicted in Figure 3.

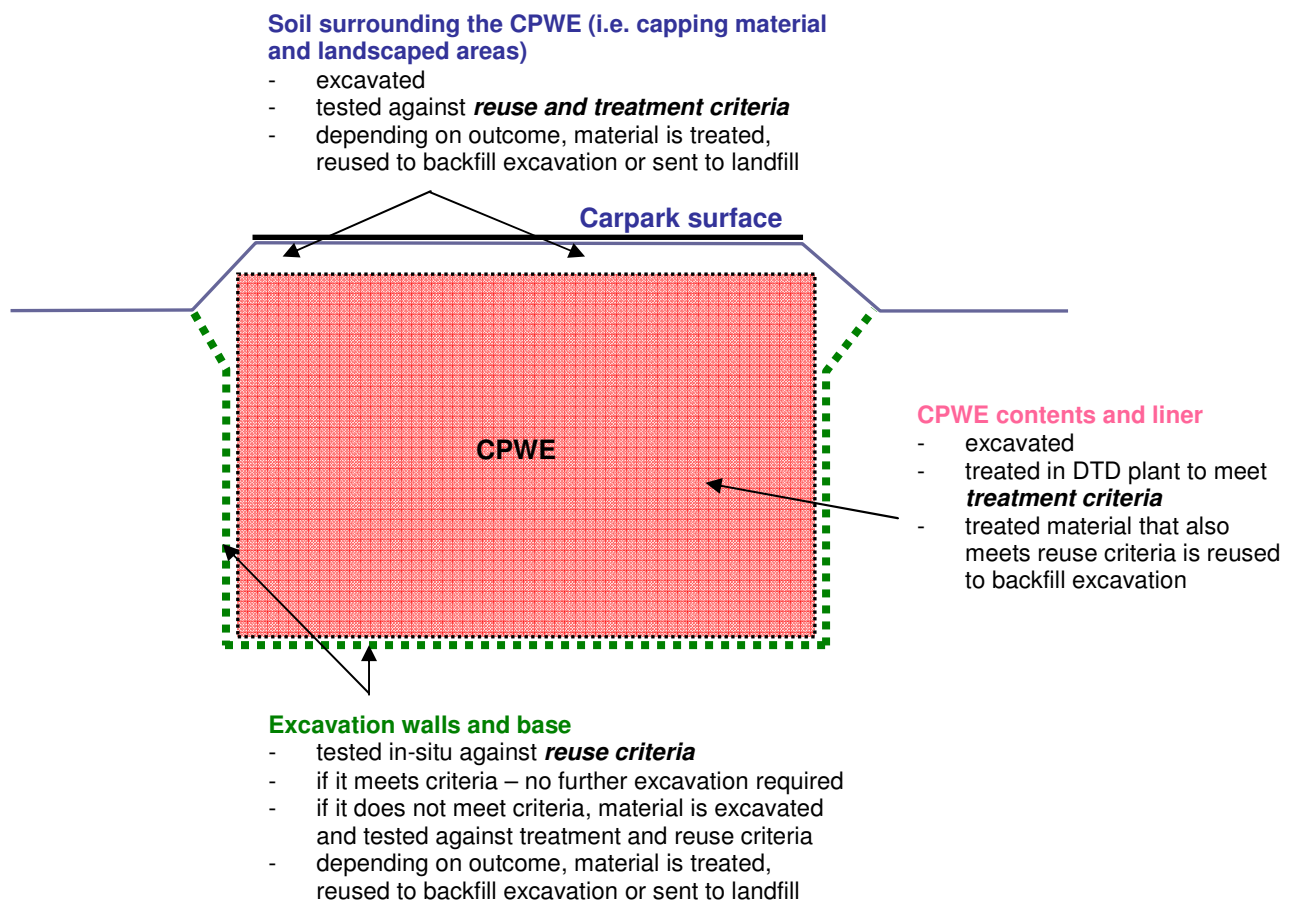


Figure 3 – Application of remediation goals

1.4 Remediation Options Evaluation

A number of options for remediation of the CPWE were investigated by Orica, these are briefly discussed below.

Bioremediation: bioremediation (biological degradation of contaminants) options were researched and trialled from 2004 to 2007. The investigation identified potentially limiting technical issues, including a lack of clear evidence of HCB or OCS degradation and uncertainty regarding the duration of bioremediation activities, which could be up to 15 years. Orica concluded that in the face of these uncertainties and technical issues, and due to concerns about the integrity of the CPWE liner and resultant potential emissions, other remediation options should be investigated.

Indirectly-heated Thermal Desorption (ITD): this option requires excavation of the waste and treatment in an ITD Plant. The process is likely to require transport to another off-site facility for treatment of condensate, an output from the treatment process. Uncondensable gases would also require further treatment including activated carbon treatment and combustion.

In Situ Electrical Conductive Heating (ISTD): this option involves desorption of contaminants *in situ* and therefore excavation would not be required. ISTD involves the installation of a series of heater and vacuum wells in the soil. The off-gas from this process then has to be treated, through a recovery system or destructive system.

Directly-heated Thermal Desorption (DTD): this option requires excavation of the waste and treatment in a DTD Plant. The contaminants are released from the soil and the off-gas is directed for treatment within the DTD plant.

1.5 Preferred Option

The ISTD option was discarded first based on the limited experience of this technology in projects of a similar scale and the risk of adverse impacts on groundwater. Orica then selected DTD technology as the preferred remediation option based on:

- it being a proven technology (used extensively overseas and one DTD Plant has operated at the Allied Feeds site in Rhodes);
- it being relatively simple technology when compared to ITD (even though emissions to air would be marginally higher than ITD) as there are no requirements for secondary treatment of condensate residues;
- it being able to remediate the site quicker than ITD; and
- it being more cost-effective than ITD.

The Department is satisfied that the process for selecting the preferred option was robust, and concurs with Orica that DTD is the most suitable option for remediating the site. The Department considers the proposed technology, if designed and operated in accordance with best practice, is capable of remediating the site successfully with minimal risks to human health and the environment.

2. PROJECT DESCRIPTION

2.1 Project Description

The project involves remediation of the CPWE site by excavation and treatment of the contaminated materials using DTD technology on site. The major components of the project are summarised in Table 1 and illustrated in Figure 4. The Environmental Assessment (EA) for the project was lodged with the Department in July 2007 (see Appendix I), and the final Remedial Action Plan was lodged in May 2009 (see Appendix D).

The key stages of the remediation project, as shown in Table 1 comprise:

- Site establishment;
- DTD plant commissioning and proof of performance (CPoP) trials;
- Excavation and treatment;
- Decommissioning and demobilisation; and
- Reinstatement of the CPWE site.

Table 3: Major Components of the Proposed Facility

Component	Description
Project Summary	Remediation of the CPWE by excavation and treatment of contaminated material using DTD technology on site.
Construction and site establishment	Construction of buildings, plant and facilities including: • First stage of the Excavation Soil Building (ESB) and emission control system; • Water Treatment Plant; • Feed Soil Building (FSB) and emission control system; • Directly-heated Thermal Desorption (DTD) Plant including sealed and bunded area; • Hardstand areas, internal haulage roads, site offices, temporary site sheds, ablution blocks and decontamination units for workers. Total period – 26 weeks.
DTD plant commissioning and proof of performance (CPoP) trials	Test the performance of all major process components including emission control systems using no soil, clean soils and then contaminated soils. The trials would be undertaken in accordance with a detailed CPoP plan and must demonstrate compliance with the project approval and Environment Protection Licence. Total period – 26 weeks, concurrent with site establishment.
Operation (Excavation and treatment)	Includes: • Excavation within the ESB over 5 stages, including sequential construction of the ESB as excavation works progress and deconstruction of completed stages (see Figure 6); • Screening of excavated material within the ESB to remove oversized materials; • Transportation of contaminated soil in covered trucks from the ESB to the FSB along internal haulage roads; • Further screening, drying and testing of contaminated material within the FSB; • Feeding of contaminated material from the FSB into the DTD plant; • Treatment of contaminated material in the DTD plant; • Validation testing of treated material and soils underlying and around the CPWE; • Stockpiling of treated material. Total period – 30 weeks.
Decommissioning and demobilisation	Decommissioning and decontamination of plant and buildings and removal from site. Total period – 14 weeks.
Reinstatement of CPWE site	Reinstatement of the CPWE with validated material and stabilisation with turf. Total period – 14 weeks, concurrent with demobilisation.
Volume	Estimated 45,000m ³ of contaminated material and up to 9,000m ³ of material from the excavation walls and base.
Boundary Readjustment	Realignment of boundaries within the BIP to consolidate land parcels for Orica and Qenos, see Figure 8 and Figure 9.
Capital Value	\$30 million
Jobs	10-15 during construction, 15-20 during operation
Project Length	18 months
Operating Hours	Excavation: 7am-7pm, six days a week; FSB and DTD plant: 24 hours, seven days a week; emission control systems would operate continuously.



Figure 4 – CPWE site and land to be used for remediation activities

2.2 Remediation Process

The remediation process firstly involves establishment of site buildings and the DTD treatment plant. Figure 5 shows the DTD plant under construction at Rhodes, where it is currently being used prior to transfer to the CPWE site.



Figure 5 – DTD plant under construction at Rhodes

A trial phase would then be carried out to test the performance of all process components of the remediation project, including emission control systems and the DTD plant. Samples of material from the CPWE would be extracted and processed through the DTD plant to establish the performance of the plant in removing contaminants. An important aim of the CPoP trial phase is to establish and agree on an emission limit for mercury from the DTD plant.

Following completion of the CPoP trials, remediation works would commence. Remediation activities involve excavation of contaminated material within a covered building fitted with emission control systems (see Figure 6). Excavated material would be transported via covered trucks to the feed soil building where it would be tested to determine contaminant concentrations, screened and homogenised and then fed into the DTD plant for treatment (see Figure 7).

The DTD plant would process the material at very high temperatures (approximately 400°C) to separate the contaminants from the soil. The contaminants separated from the soil would be captured within the DTD plant and further heated (to approximately 1000°C) to decompose the gases into carbon dioxide, water vapour and hydrogen chloride. Gases are further treated to remove hydrogen chloride and then released to atmosphere via a stack on the DTD plant.

Remediated material would be stockpiled until excavation and treatment works are completed. The excavation walls and base would be validated with further excavation and treatment occurring to remove residual contaminants in the soil. The excavation would then be backfilled with validated material. The site would be reinstated and all remediation equipment would be decontaminated, decommissioned and removed from the site. The reinstated site could then be returned to industrial use, consistent with the existing zoning and surrounding land uses on the BIP.



Figure 6 – Excavation Staging – Excavation Soil Building

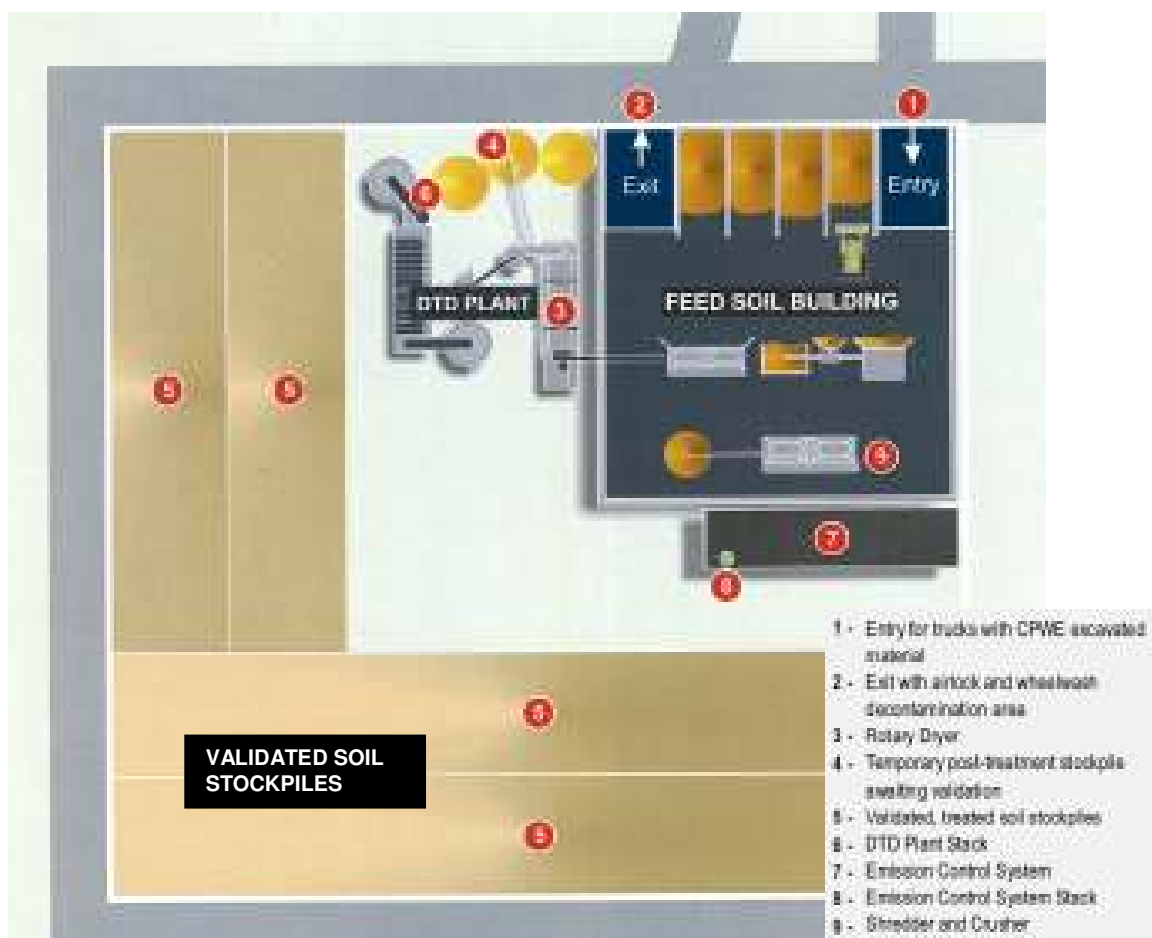


Figure 7 – Feed Soil Building, Directly-Heated Thermal Desorption Plant and Treated Soil Stockpiles

2.3 Boundary Readjustment

During remediation activities, Orica will access land owned by Genos to transport contaminated material in trucks from the excavation to the feed soil building. Genos has provided landowners consent for these activities. Orica and Genos have also agreed to adjust some boundaries within the BIP to consolidate lots and provide less fragmented parcels of land for each company. Figure 8 shows the existing land boundaries of Orica and Genos within the BIP and Figure 9 shows the proposed land boundaries. The proposed boundary adjustments would not affect the proposed remediation activities, and the Department has recommended a condition of approval restricting development on the CPWE site until it is satisfactorily remediated.

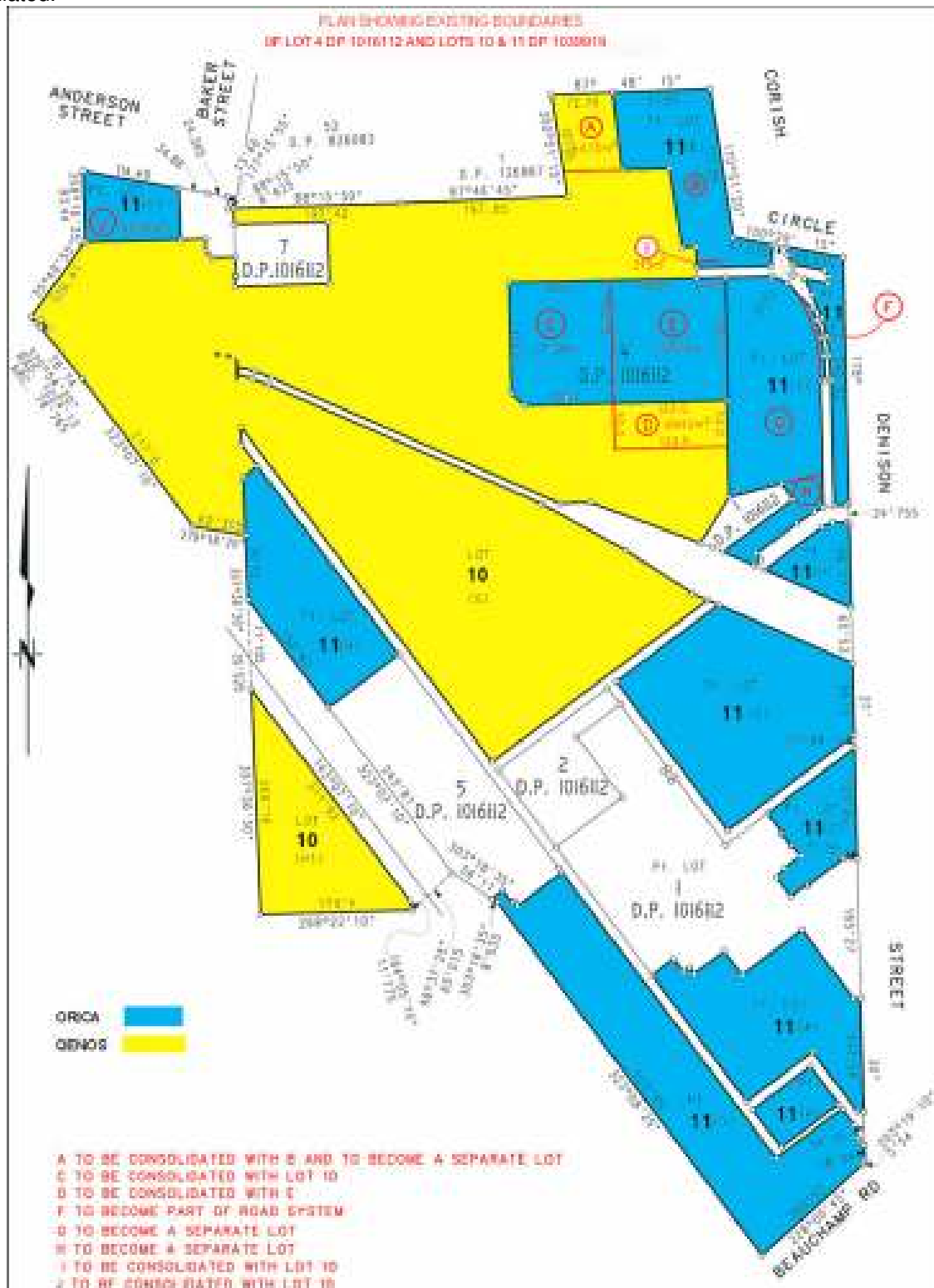


Figure 8 – Existing Property Boundaries

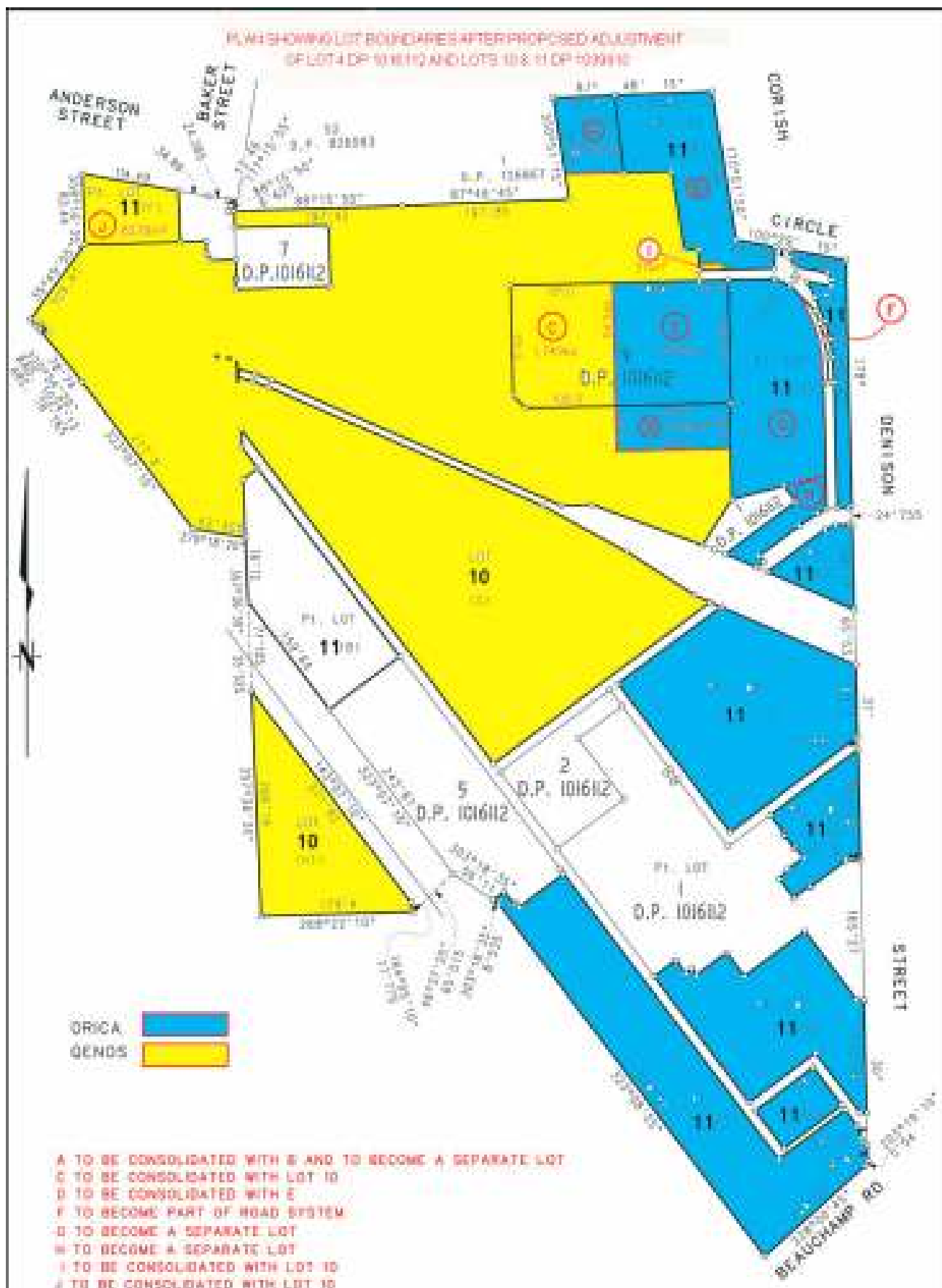


Figure 9 – Proposed Property Boundaries

3. STATUTORY CONTEXT

3.1 Major Project

The project is classified as a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) because it is development for the purpose of remediation of land that is category 1 remediation work on a remediation site, and therefore triggers the criteria in Schedule 1, Clause 28 of *State Environmental Planning Policy (Major Development) 2005*.

Consequently, the Minister is the approval authority for the project. On 4 March 2009, the Minister delegated her powers and functions as an approval authority for certain projects under Section 75J of the EP&A Act to the Director-General. This project application meets the terms of this delegation; and the Director-General may therefore determine the application under delegated authority.

3.2 DECCW Licences

The remediation works will require an Environment Protection Licence from the DECCW under the *Protection of the Environment Operations Act 1997*.

The thermal treatment technology will also be licensed by the DECCW under the *Environmentally Hazardous Chemicals Act, 1985* based on a Technology Assessment carried out in accordance with the *National Protocol for Schedule X Wastes* (ANZECC 1994).

3.3 Permissibility

The project is permissible with development consent under *State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55).

Consequently, the Minister may approve the project.

3.4 Public Exhibition

Under Section 75H(3) of the EP&A Act, the Director-General is required to make the environmental assessment of a project publicly available for at least 30 days.

After accepting the environmental assessment for the project, the Department:

- made it publicly available from 26 July 2007 until 31 August 2007:
 - on the Department's website;
 - at the Department's Information Centre;
 - at the Botany Bay Council Offices; and
 - at Mascot Library and Central (Eastgardens) Library.
- notified relevant State government authorities, Botany Bay and Randwick Councils by letter;
- notified landowners in the vicinity of the site about the exhibition period by letter; and
- advertised the exhibition period in the Sydney Morning Herald, Southern Courier and St. George and Sutherland Shire Leader.

This satisfies the requirements in Section 75H(3) of the EP&A Act.

During the assessment process the Department also made a number of documents available for download on the Department's website. These documents included the:

- project application;
- Director-General's requirements for the environmental assessment of the project;
- EA; and
- Submissions Report and Final RAP.

3.5 Environmental Planning Instruments

Under Section 75I of the EP&A Act, the Director-General's report is to include a copy of or reference to the provisions of any:

- *State Environmental Planning Policy* (SEPP) that substantially govern the carrying out of the project and;

- environmental planning instrument that would (but for Part 3A) substantially govern the carrying out of the project and that have been taken into consideration in the environmental assessment of the project.

The Department has considered the project against the relevant provisions of several environmental planning instruments (including SEPPs 33 and 55; and the *Botany Local Environmental Plan 1995*). The Department is satisfied that, subject to the implementation of the recommended conditions of approval, the project is generally consistent with the aims and objectives of these instruments (see Appendix K).

3.6 Objects of the Environmental Planning and Assessment Act, 1979

The Minister's consideration and determination of the application must be consistent with the relevant provisions of the EP&A Act, including the objects set out in the Act's section 5. The objects of most relevance to the Minister's decision on whether or not to approve the proposed project are found in section 5(a)(i), (ii), (vi) and (vii). They are:

The objects of this Act are:

(a) *to encourage:*

- (i) *the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
- (ii) *the promotion and co-ordination of the orderly and economic use and development of land,*
- (vi) *the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
- (vii) *ecologically sustainable development”.*

The Department has fully considered the objects of the EP&A Act, including the encouragement of ESD, in its assessment of the application. The assessment integrates all significant economic and environmental considerations and seeks to avoid any potential serious or irreversible damage to the environment.

Orica has also considered a number of alternative remediation technologies, and considered the project in the light of the principles of ESD.

The project would ensure appropriate management of land by removing a long term contaminant source and would promote economic use of the land by enabling future industrial land use on the remediated site.

3.6 Statement of Compliance

Under Section 75I of the EP&A Act, the Director-General's report is required to include a statement relating to compliance with the environmental assessment requirements for the project.

The Department is satisfied that the environmental assessment requirements have been complied with.

4. ISSUES RAISED IN SUBMISSIONS

A total of eight submissions were received on the EA. One submission was received from a resident, two from community groups, three from state agencies, and two from local Councils.

In addition to the statutory consultation undertaken as part of the EA process, Orica facilitates a Community Participation and Review Committee (CPRC) which has met regularly since 1997 to discuss remediation options for the CPWE and review project information.

4.1 Summary of Submissions

The key issues raised in submissions included:

- application of the remediation goals and clarification on how they were calculated;
- mercury emissions, associated human health impacts and compliance with the *Protection of the Environment Operations (Clean Air) Regulation 2002*;
- other air quality emissions; and
- protection of groundwater.

Other issues raised in submissions included:

- noise mitigation;
- greenhouse gas emissions; and
- details of the treatment technology.

4.2 Public Authorities

The **Department of Environment, Climate Change and Water** (DECCW) indicated that they could support the project on the basis that it is unlikely to result in adverse impacts to the environment. However, DECCW requested further clarification and analysis on a range of technical issues, including mercury emissions, application and calculation of the remediation goals and management and protection of groundwater.

NSW Health requested further health impact assessment in relation to mercury and the potential impacts of the project on users of the Hensley Athletics field, and provided recommendations which have been incorporated into the conditions of approval.

Sydney Water did not object to the project.

The **City of Botany Bay Council** (CoBB) generally supported the project. CoBB raised issues in relation to groundwater management and air quality impacts. CoBB provided recommendations for emissions monitoring and comparison against the assumptions of the EA. These have been incorporated into the recommended conditions.

Randwick Council did not object to the project and provided a number of recommendations including, requirements to implement noise mitigation measures and traffic control measures.

4.3 Community Interest Groups and Resident

The **Nature Conservation Council** (NCC) supported remediation of the site, but indicated that ITD technology would be preferred with regard to reduced emissions and human health impacts. NCC noted that the entire site where 'heavy ends' contamination is found should be remediated.

The **Botany Environment Watch** (BEW), a local community group indicated that they were not comfortable with the proposal to excavate and destroy contaminated material on site, however they understood that the waste must be destroyed and there are no other suitable alternatives. Other issues included human health impacts on workers, lack of understanding of mercury emissions removal, hazard risk analysis for utilities and resources, noise, vibration and traffic issues.

The resident raised concerns regarding traffic, flora and fauna and heritage.

4.4 Submissions Report

Following the public exhibition period, Orica provided a Submissions Report responding to the issues raised. Subsequent responses were received from the DECCW, NSW Health and the City of Botany Bay Council. Residual issues remained, primarily relating to the calculation of remediation criteria, to which Orica provided further response on 19 March 2008. Further analysis was still required to develop remediation criteria that were acceptable to the DECCW and the Department. Orica spent considerable time refining the remediation criteria and provided an amended Remedial Action Plan (RAP) on 7 May 2009. A copy of the correspondence between Orica and government agencies is included with all submissions in Appendix H.

4.5 Ongoing Consultation

In addition to the consultation requirements of the assessment process, Orica regularly liaises with the community through the Community Participation and Review Committee (CPRC). The CPRC has met regularly since 1997 to specifically discuss options for remediation of the CPWE. The key issues raised by the CPRC in relation to this project include:

- health risks, including safety of workers;
- air quality impacts, including odour;
- noise and vibration;
- visual impacts;
- contamination of groundwater; and
- risks associated with DTD technology (e.g. proven technology, proximity to residents).

The key issues raised in all submissions are addressed in the Department's assessment (see Section 5). The Department is satisfied that the key issues have been adequately addressed through revisions to the Human Health Impact Assessment, Air Quality Impact Assessment and RAP. The proposed conditions of approval would also address issues raised in submissions, particularly in relation to the application of remediation goals, air quality monitoring and implementation of noise mitigation measures.

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

The Department has assessed the project, in accordance with the requirements of Clause 8B of the *Environmental Planning and Assessment Regulation 2000*, and considers the key issues to be:

- remediation goals;
- air quality and associated human health impacts;
- groundwater;
- noise; and
- hazards and risk.

Other issues, including traffic and greenhouse gas emissions have been addressed in the EA, Statement of Commitments and Submissions Report. These issues are summarised briefly in Section 5.6 of this assessment report.

5.1 Remediation Goals

Purpose

As outlined in Section 1.3, the goals for remediation of the CPWE site are detailed in the Final RAP dated 7 May 2009. The goals represent proposed levels for remediating the site to enable future industrial land use and to ensure the long term protection of human health and groundwater. The goals may be amended to more stringent levels following review by an accredited site auditor and the CPoP trials. The goals are comprised of treatment criteria (for the CPWE contents and liner) and reuse criteria (for soil surrounding the CPWE and the excavation walls and base).

Methodology

The remediation goals were developed from:

- the Director-General's requirements (DGRs) for the EA (Appendix J);
- relevant NSW and national guidelines, including the *HCW Waste Management Plan* (ANZECC 1996) and *Scheduled Chemical Wastes Chemical Control Orders* for HCB and PCBs (made under the Environmentally Hazardous Chemicals Act 1985); and
- a project specific health-based risk assessment undertaken by URS (Appendix G).

The remediation goals are comprised of treatment criteria and reuse criteria. The treatment criteria were primarily based on the DGRs and the reuse criteria were developed from the health-based risk assessment which considered the following key receptors:

- adult workers on site;
- off-site residents, approximately 150m east of the site; and
- off-site recreational, Hensley athletics field.

Over the course of the assessment process, the DECCW and the Department liaised regularly with Orica on the methodology for developing the remediation goals. The DECCW sought clarification on various components of the methodology, including the consideration of all exposure groups (workers, residents, recreational) and the protection of groundwater in developing the goals. At the request of the DECCW, a review of the reuse criteria was undertaken by Orica in 2008 to:

- ensure the criteria adopted the most conservative values for the protection of human health; and
- determine whether the criteria provided adequate protection of groundwater.

Orica spent considerable time refining the remediation criteria and provided an amended Remedial Action Plan (RAP) on 7 May 2009, which incorporated criteria for the protection of human health and groundwater. On review of the final RAP, the DECCW and the Department are satisfied that the methodology for developing the goals is appropriate.

In addition, the criteria would be reviewed and approved by a site auditor accredited by the DECCW under the *Contaminated Land Management Act 1997* (CLM Act), prior to the CPoP trials commencing and prior to operation. The CPoP trial process is aimed at demonstrating that the DTD technology can routinely achieve the treatment criteria established for the project. Should the trials identify that improved contaminant removal can be consistently achieved; the treatment criteria would be amended to reflect the more stringent levels.

Application to the remediation project

Application of the remediation goals is best explained by Figure 3, Figure 10 and the flow diagrams presented in the RAP (Table 9 to 11 of the RAP). Figure 3 shows that the goals would be applied to three different soil categories identified at the site:

- the CPWE contents and liner;
- soil surrounding the CPWE; and
- the excavation walls and base.

CPWE contents and liner

This material is known to contain high levels of contaminants and would therefore be excavated, processed in the DTD plant and the treated material assessed against the treatment and reuse criteria. Treated material that complies with both criteria would be used to backfill the CPWE excavation.

Soil surrounding the CPWE

This material may contain similar contaminants but at lower concentrations. It would also be excavated and assessed against the treatment and reuse criteria. Depending on the outcome, the material would be processed through the DTD plant, reused to backfill the CPWE excavation or sent to landfill.

Excavation walls and base

The excavation walls and base may contain contaminants but they are expected to be at lower concentrations, or there may be no contamination present. The material would be tested in-situ. If it meets the reuse criteria it can remain in-situ, if not the material would be excavated, tested against the treatment and reuse criteria and depending on the outcome, processed, reused or sent to landfill.

The process for remediation of scheduled chemical wastes such as HCB and PCB is shown in Figure 10.

	Scheduled Chemical Waste (HCB and PCB)
50 ug/kg	excavate and treat to < 2ug/kg
2 ug/kg	excavate and treat, or dispose
0 ug/kg	remain in-situ

Figure 10 – Remediation Strategy for Scheduled Chemical Wastes (PCB & HCB)

Whilst application of the goals to the three different soil categories is clear, Orica proposes to apply different reuse criteria to different end-use scenarios, such as:

- outdoor scenario – should no buildings be constructed on the site; or
- indoor scenario – should a building be constructed on the site.

Generally, the goals for the indoor exposure scenario are more stringent, as a building placed over the contaminated material would need to be protective of building occupants that may be exposed to contaminants through inhalation. Also, building occupants are likely to spend more time on the site, than if the site remained undeveloped.

At this stage, it is not clear what the intended future use of the site would be. Orica has indicated their intention to remediate the site to the indoor criteria in order to ensure the most beneficial reuse of the remediated site. However, Orica raised concerns about the unknown extent of contamination beneath

the liner, as they have been unable to sample extensively without causing damage to the liner. As such, the full extent and concentration of contaminants beneath the liner is unknown. Orica has allowed a 20% excavation contingency, which would involve excavation of a further 9,000m³ of soil beneath the encapsulated material. It is anticipated that excavation of this volume of material is likely to capture the majority of contaminant leakage from the liner; however, this would only be confirmed once the encapsulated material has been removed and the base materials can be sampled.

The Department and the DECCW has liaised extensively with Orica to determine the most appropriate means for dealing with the base materials, such that the best remediation outcome can be achieved.

Orica will excavate up to a maximum volume of 9,000m³ from the walls and base of the excavation and treat the material to the indoor criteria, with the exception of material that already meets the indoor criteria, which would be stockpiled on site for backfilling the excavation once validated. If the contamination is found to extend considerably further and would require excavation of a greater volume of material, the Department and the DECCW consider it appropriate to allow Orica to apply the outdoor criteria to the base materials. As the outdoor criteria are less stringent than the indoor criteria, the Department and the DECCW recommend that the site be capped to prevent water infiltration to the subsurface, and require routine groundwater monitoring to be undertaken. The recommended conditions detail the groundwater monitoring requirements if this option is implemented. The conditions also require a covenant to be placed on the site ensuring that the cap is implemented and maintained for the long-term.

Conclusion and recommendations

The Department concludes that the treatment criteria would achieve an appropriate level of contaminant removal from the encapsulated material. Application of the indoor reuse criteria is the ultimate goal, however if excessive quantities of contaminated material is found, the outdoor reuse criteria would be applied to the base materials. The Department is satisfied that the recommended conditions provide for adequate protection of human health and groundwater should the outdoor criteria be applied.

The remediation goals would be further reviewed through the CPOp trial process which would involve review and approval by a site auditor accredited by the DECCW under the CLM Act. The recommended conditions incorporate these requirements and also require the Director-General's approval prior to progressing to full operation. The range of recommended conditions would ensure that the remediation goals are appropriately applied such that human health and groundwater are protected.

5.2 Air Quality and Human Health Impacts

Methodology

Air emissions from the project and their potential to impact on human health and local and regional air quality were assessed through various air quality, human health risk, mercury impact studies and independent reviews. A list of the assessments and reviews is provided in Table 4.

Table 4: Air Quality, Human Health, Mercury Assessments and Independent Reviews

Issue	Assessment
Air quality	• <i>Air Quality Impact Assessment for Remediation of the Car Park Waste Encapsulation at the Botany Industrial Park</i>, Pacific Air and Environment, 14 December 2007
Human health	• <i>Proposed Car Park Waste Encapsulation Remediation, Human Health Impact Assessment</i>, URS, 30 November 2007; • <i>Orica Botany Consolidated Human Health Risk Assessment</i>, URS 2005; • <i>HCW Waste Management Plan Human Health Risk Assessment</i>, URS 2002.
Mercury	• <i>Mercury Health Impact Report for the Remediation of the CPWE</i>, Orica Botany, URS, 21 December 2007; • <i>Preliminary Mercury Emission Control Report</i>, Focus Environmental, 11 January 2007; • <i>Detailed Mercury Emission Control Report</i>, Focus Environmental, 19 December 2007.
Independent reviews	• <i>Orica Car Park Encapsulation Mercury Removal Technical Expert Advice</i>, MWH Global, 14 February 2008; • <i>Independent Technical Review: CPWE Mercury Emissions – Human Health and Environmental Risk Review Task</i>, ENSR Australia, 21 February 2008.

Air Quality

The air quality impact assessment (AQIA) modelled emissions from the CPWE remediation, along with existing emissions from the BIP and regional background levels of pollutants to provide a cumulative assessment of emissions for comparison with relevant criteria.

Human Health

The human health impact assessment, URS November 2007 (HHIA) considered the potential impacts on human health of current emissions from the CPWE, impacts during excavation and remediation, and cumulative impacts. The assessment focussed on the following key groups of people:

- employees of Orica in adjacent work areas;
- employees of other businesses within the BIP;
- employees in areas outside the BIP;
- users of recreational areas; and
- residential areas, including schools.

Workers involved in the CPWE remediation project were not included in the assessment and will be addressed in accordance with the risk assessment processes defined by the NSW Occupational Health and Safety Regulations.

Mercury

The mercury health impact report estimated mercury emissions from the DTD plant and other sources on the BIP and predicted ground level concentrations at a range of receptor locations. The assessment also considered mercury accumulation in soil and food and toxicity to humans. The mercury emission control reports reviewed the best available mercury emission control technologies that could be applied to the DTD plant.

Independent Reviews

The CPRC commissioned Dr Garry Smith of HLA ENSR to conduct an independent review of the mercury health impact assessment prepared by URS. The independent review concluded that the methodology and assumptions were consistent with recognised and practised methodology in Australia and that the conclusions of the report were sound.

The CPRC also commissioned MWH Australia to conduct an independent review of the mercury emission control reports. The review provided a number of recommendations, some of which have been incorporated into the recommended conditions of approval. A copy of both reviews is provided in Appendix F.

Potential impacts

Current emissions from the CPWE

Air emissions and groundwater monitoring has been undertaken at the CPWE site since 1997. The HHIA concluded that the risks to human health associated with air emissions from the existing CPWE are acceptable in all areas (on and off-site). Groundwater monitoring indicated low levels of organic analytes but these are not considered to pose a risk to human health or the environment. Further discussion of groundwater is provided in Section 5.3.

Whilst emissions from the CPWE present no risk to human health, it is beneficial over the long-term to remove the source of emissions through remediation.

Potential impacts of CPWE remediation

The DTD treatment process involves heating materials to high temperatures, thereby releasing contaminants from the soil in gaseous form. The gases are further treated before release to atmosphere via a stack on the DTD plant. These are the primary emissions from remediation activities.

The AQIA identified other sources of air emissions from remediation activities as:

- fugitive emissions from:
 - excavation;
 - relocation of the ESB;
 - transportation of material from the ESB to the FSB;
 - treated soil stockpiles; and
 - reinstatement earthworks.

- stacks venting treated air from the ESB and FSB; and
- fuel combustion emissions from vehicles and machinery.

The primary pollutants of concern from all project sources include:

- volatile chlorinated organic compounds, including HCB, HCB, PCB and others;
- mercury (Hg), hydrogen fluoride (HF) and sulphuric acid (H₂SO₄); and
- vehicle and machinery exhaust emissions including oxides of nitrogen (NO_x), carbon monoxide (CO), sulphur dioxide (SO₂) and fine particles (PM₁₀).

The AQIA concluded that the DECCW air quality assessment criteria would be easily met for most of the pollutants assessed. Relevant limits in the HCB and PCB Waste Management Plans would also be met. Some substances required more detailed assessment to determine whether compliance with relevant criteria could be achieved. These substances included mercury, nitrogen dioxide, hydrogen fluoride and sulphuric acid. The results of the more detailed assessments are discussed below.

The HHIA identified a number of chemicals of potential concern (COPC) likely to be released during remediation works with the potential for human health impacts. These are split into two categories, including COPC that are significant with respect to inhalation exposures and COPC that are persistent and bioaccumulative with multi-pathway exposures. The COPC are listed in full in Section 5 of the HHIA and include PCE, TCE, HCE, HCB, PCBs, dioxins and mercury.

The HHIA quantified the risks to human health from the following three scenarios:

- inhalation (acute and chronic) exposure to COPC during normal emissions from CPWE remediation;
- inhalation (acute and chronic) exposure to COPC during worst-case upset conditions during CPWE remediation; and
- multiple pathway exposure to persistent and bioaccumulative COPC during normal emissions from CPWE remediation.

The key conclusions of the HHIA are summarised below:

- the maximum ground level concentrations in all off-site areas (at the boundary of the BIP) during normal and upset conditions of remediation were less than the relevant acute exposure assessment criteria. Therefore, no short-term irritation or injury effects are expected as a result of emissions from CPWE remediation;
- long-term exposure of workers to emissions from the CPWE remediation, as well as cumulative exposures in areas surrounding the CPWE site, were less than the target risk values adopted. Therefore, risks to workers in all areas surrounding the CPWE site are considered to be acceptable;
- long-term exposure of recreational users of the adjacent Hensley athletics field to emissions from the CPWE remediation, as well as cumulative exposures in areas surrounding the CPWE site were less than the target risk values adopted. Therefore, risks to recreational users of Hensley athletics field and surrounding areas are considered to be acceptable;
- potential exposure (both inhalation and multi-pathway) of residents to emissions from the CPWE remediation, as well as cumulative exposures are less than the adopted risk targets considered representative of acceptable and zero (negligible) risks;
- total cumulative risk to human health from the CPWE remediation and all other emission sources in the area, for all receptor groups are less than the acceptable and negligible levels adopted; and
- exposure of workers and consumers of any food products made in nearby food manufacturing facilities were assessed and considered to be low and acceptable.

In summary, evaluation of risk to human health for residents, recreational users of areas surrounding the CPWE and workers on the BIP, from emissions from the CPWE remediation during normal and upset conditions and including cumulative risks is considered to be low and representative of negligible risks.

NSW Health reviewed the HHIA and subsequent information provided in the Submissions Report. Residual issues raised by NSW Health related to the air quality pollutants PM₁₀ and NO₂. These issues are discussed in Table 7.

Mercury (Hg)

The AQIA identified uncertainty regarding compliance with the stack concentrations and the DECCW criteria for ground level concentrations of mercury (being the *Protection of the Environment Operations (Clean Air) Regulation 2002* (CAR)). The uncertainties relate to the amount of mercury that would be removed during processing, the extent to which mercury would be captured in the emission control systems, and the form the mercury would take in the treatment process (i.e. inorganic or organic).

In summary, modelling could not confirm whether the DECCW criteria for mercury emissions (0.2mg/m^3) could be achieved from the DTD stack, however mercury discharged via the emissions control systems on the ESB and FSB would meet the criteria. The predicted worst-case DTD stack emissions during normal operations are 1.16mg/m^3 which are considerably greater than the CAR limit of 0.2mg/m^3 .

Additional modelling presented in the Orica Submissions Report provided revised results for predicted ground level mercury concentrations, based on additional monitoring of background concentrations. With revised background mercury concentrations, cumulative mercury concentrations with the CPWE project were reduced, see Table 5.

Table 5: Revised Mercury Concentrations

Pollutant	Maximum off-site Hg concentration (1-hour average) ug/m^3			
	Original modelling	Revised modelling	DECCW criteria for inorganic Hg	DECCW criteria for organic Hg
Mercury	0.85	0.31	1.8	0.18

The revised modelling indicates that the DECCW criteria for inorganic mercury could be met, however, given the uncertainties regarding the form that mercury could take in emissions; it is unknown whether the criteria for organic mercury could be met.

Commissioning and Proof of Performance (CPoP) Trials

The CPoP trials that would be undertaken prior to operation of the project would provide more detail on the uncertainties outlined above. It is expected that the trials would clarify mercury removal rates, levels captured in the emission control systems and the form of mercury emissions from the DTD plant. This would provide certainty as to whether the DECCW criteria could be met for both inorganic and organic mercury from the DTD stack and subsequently at ground levels off-site. It would also identify the need for further emission controls such as carbon injection into the baghouse and/or operational adjustments to the acid gas scrubber.

Exemption Application

To enable the DECCW to issue an Environment Protection Licence for the project, Orica sought an exemption from the stack emission CAR limit of 0.2mg/m^3 to enable Orica to progress with site establishment and CPoP trials. An exemption application was submitted to DECCW on 21 December 2007 aimed at addressing two key requirements of the DECCW, including:

- 1 demonstration that it is not practical to comply with the CAR limit, after best available technology has been implemented to provide maximum emission reductions; and
- 2 an assessment demonstrating that non-compliance would not have an adverse effect on public health, property or the environment.

The application included a Technology Assessment to address point 1 above, and a Mercury Health Impact Report to address point 2. The application sought approval for the following:

- approval and licensing of an interim stack emission concentration limit for the DTD stack of 1mg/m^3 , and for Type 1 and Type 2 substances in aggregate of 1.8mg/m^3 (where mercury forms part of the aggregate);
- commissioning trials that include evaluation separately and in combination of carbon injection and scrubber operation to minimise mercury emissions, with a target of meeting the CAR stack emission limit of 0.2mg/m^3 ; and
- a reduction of the interim stack emission concentration limit and Type 1 and Type 2 substances in aggregate for ongoing operations, to reflect the outcome of commissioning trials.

The application was approved by the Environment Protection Authority (EPA) Exemption Board and the Director-General of the EPA on 15 April 2008, subject to conditions (see Appendix C). In summary, the conditions require:

- the exemption applies to the main gas stack only (DTD plant);

- the exemption applies only to material from and surrounding the CPWE;
- Orica must conduct detailed trials of mercury control technologies;
- the remediation must apply best practice mercury emission controls; and
- the exemption operates from 1 January 2009 to 31 December 2010.

In relation to the exemption, DECCW acknowledges that the exemption is likely to expire during the life of the Project and that an extension would be required. Orica would need to apply to DECCW for an extension to the exemption. DECCW has advised the Department that they would commence the extension process early next year.

Trials of mercury control technologies must be approved prior to their commencement.

Independent Review

The CPRC commissioned MWH Australia to conduct an independent review of the Technology Assessment. The review confirmed that it is difficult to accurately predict the mercury removal efficiencies of the DTD plant without undertaking trials to establish the best available control technology. To address the uncertainty, the review provided a number of recommendations. Many of the recommendations related to trialling control technologies in the DTD plant at the Rhodes site. However, undertaking trials at the Rhodes site is outside the scope of this project. In addition, the contaminants and concentrations at Rhodes vary, with mercury not a significant issue for the Rhodes remediation project. However, the review provided some relevant recommendations that are also reflected in the conditions of the EPA Exemption Order. These include:

- the facility should be designed to allow injection of Powdered Activated Carbon (PAC) and/or MerQsorb and should be available when the equipment is installed at the Orica site; and
- a detailed plan for the CPoP trials should be prepared, including minimising risk by using material containing low levels of mercury in the early stages of each trial plant configuration.

These recommendations are important measures for minimising mercury emissions from the project and are reflected in the EPA Exemption Order and the Department's recommended conditions of approval.

Human health impacts from mercury emissions

Further assessment of the human health impacts associated with mercury emissions was undertaken for the Exemption Application.

The assessment estimated the mercury emissions from the DTD plant and other sources on the BIP, using a conservative assessment to address any uncertainty associated with the form of mercury in the emissions. The predicted DTD plant emissions during normal operations are 1.16 mg/m³ which are considerably greater than the CAR limit of 0.2 mg/m³. This value was used as a worst case emission estimate for the human health impact assessment. Worst case background concentrations were also used for the assessment.

The assessment considered the total exposure to mercury and compared this against current estimates of exposure considered to be safe and not associated with adverse health effects. Based on the worst case estimates of total exposure to mercury, the health impacts for the groups assessed were negligible with total intakes being less than those considered safe or acceptable.

In relation to environmental impact, the assessment concluded that the short term incremental emission is insignificant in relation to background levels of mercury.

NSW Health in their second submission did not raise any remaining concerns in relation to mercury impacts.

The Department is satisfied that the mercury health impact assessment demonstrates that worst case emissions from the DTD plant of 1.16 mg/m³, well above the CAR limit of 0.2 mg/m³ and the level of 1 mg/m³ expected from the DTD plant, would have a negligible effect on human health for residents, recreational users and workers in the vicinity of the CPWE. The assessment confirms that under worst case conditions, the health impacts would be safe and acceptable.

The Department is satisfied that the conditions contained in the exemption approval granted by the DECCW provide for the implementation of the best available control technologies to reduce emissions.

The recommended conditions require Orica to provide a copy of any notice from the DECCW varying the emission limits for mercury for the operational phase of the project. They also require Orica to implement an air quality monitoring program to enable actual emissions to be monitored and reviewed against the predictions made in the EA, Submissions Report and the mercury health impact assessment.

Other air emissions

Further assessment of emissions of nitrogen dioxide, hydrogen fluoride and sulphuric acid were presented in Orica's Submission Report. The results are summarised in Table 6.

Table 6: Other air emissions

Issue	Assessment	Recommendation
Nitrogen dioxide (NO ₂)	- Annual-average NO₂ criterion would be met at the nearest sensitive receptors, however the 1-hour average criterion would be marginally exceeded. - Additional modelling concluded that emissions from the DTD stack would meet the DECCW criteria and health based guideline values for NO₂.	- NSW Health recommended that ambient air monitoring of PM₁₀ and NO₂ be undertaken at the Hensley athletics field. - The proposed conditions incorporate NSW Health's recommendation.
Hydrogen fluoride (HF)	Additional modelling concluded that ground level concentrations would meet the DECCW criteria.	Submission of a CPoP report confirming that DECCW criteria can be routinely achieved.
Sulphuric acid (H ₂ SO ₄)	- Modelling indicated that the DECCW criteria could be met, however there are some uncertainties regarding emissions from the remediation process. - CPoP trials would determine stack emission concentrations that would enable Orica to meet the DECCW criteria for ground level concentrations and determine if additional emission controls are required.	Submission of a CPoP report confirming that the DECCW criteria can be routinely achieved.

Odour

The AQIA predicted the odour concentrations from volatile chlorinated organic compounds. PCE was predicted to be the most likely source of odour, accounting for 80% of the total impact. The odour assessment concluded that the maximum ground level concentration of total odour on the BIP would be 0.37 odour units (ou) which is well below the DECCW odour guideline of 2 ou. Therefore, off-site odours from the CPWE remediation project are unlikely to be detectable at any time.

Management measures

As detailed above, the primary impacts of remediation relate to compliance with the CAR limits for mercury emissions. Orica proposes a number of measures for managing these impacts, including:

- exemption from the CAR for mercury emissions for the CPoP trials. This would enable Orica to trial various mercury emission control technologies and establish an emission limit for the operational phase; and
- a detailed plan for the CPoP trials would be prepared to the satisfaction of both DECCW and the Director-General prior to commencement. The CPoP trials would test all major process components, including air pollution control equipment, confirm that the technology can meet relevant criteria and EPL requirements and provide procedures for monitoring, implementing operational changes and dealing with non-compliances.

NSW Health noted concerns regarding PM₁₀ and NO₂ emissions, and proposed monitoring at the Hensley Athletics field during operation. This requirement has been included in the recommended conditions of approval.

Conclusion and recommendations

The Department is satisfied that the proposed management measures would ensure that mercury emissions are adequately managed such that impacts on human health and the environment are negligible.

The proposed conditions are structured such that approval must be received prior to progressing to the operational stage of works, ensuring that remediation works would only progress once compliance has been demonstrated.

They also require the appointment of an Independent Environmental Expert (IEE) for the project. At the request of the Director-General, the IEE could review the CPoP trial plan, monthly reports, including results of the CPoP trials and the Air Quality Monitoring Program. This independent review process is separate to the site auditor process, and has the flexibility to respond to requests from the Director-General or the community to review specific project information. This role would ensure that technical air quality issues are identified and addressed throughout the project.

5.3 Groundwater

The EA provided a brief analysis of groundwater and following requests from the DECCW, further assessment of groundwater and the potential impacts associated with remediation were undertaken and presented in the final RAP.

Groundwater conditions

Groundwater monitoring has been undertaken on a six monthly basis at the CPWE site since 1997. Groundwater depth, flow direction and monitoring locations are shown in Figure 11. Groundwater is encountered between 9 and 10 metres deep, which is approximately 4m below the base of the CPWE. Groundwater underneath the CPWE was calculated as flowing in a south-westerly direction, across the BIP toward the groundwater containment lines established as part of Orica's groundwater treatment plant. This flow direction is consistent with regional groundwater flows.

Six monthly monitoring has identified the following with respect to groundwater contamination in the vicinity of the CPWE:

- groundwater has low levels of HCBd and HCB contamination which is most likely attributable to the CPWE;
- low levels of volatile chlorinated hydrocarbons (CHCs) are present to the east of the CPWE beneath the Hensley Athletics field;
- some groundwater contamination is associated with historic land uses, including 1,2-Dichloroethane (EDC) which has not been recorded in the CPWE material; and total petroleum hydrocarbons (TPH) and monocyclic aromatic hydrocarbons (MAH) which are most likely from a disused fuel pipeline to the north-east of the CPWE; and
- contaminant levels do not pose a risk to human health or the environment.

Potential impacts

The potential impacts of remediation were identified, including:

- long-term leaching of contaminants from the remediated site, should residual contamination remain in the treated material; and
- encountering contaminated groundwater during excavation of the CPWE.

The potential for leaching of contaminants from remediated material used to backfill the CPWE excavation has been considered and remediation goals have subsequently been developed to address this potential impact.

The primary source of groundwater contamination, being the CPWE material, would be removed by remediation activities. However, existing levels of HCBd and HCB are likely to remain in the groundwater. Orica does not propose any remediation of groundwater as part of the project. The justification for not remediating the groundwater includes:

- existing contaminant levels do not pose a risk to human health or the environment;
- the contaminant source would be removed, thereby ensuring no further contamination of groundwater; and
- the contaminants HCBd and HCB are not highly mobile and are unlikely to move from the existing areas of contamination.

Contamination from other sources not caused by Orica's activities, such as TPH and MAH contamination would not change as a result of remediation activities. Removal and treatment of the CPWE material would not remove these sources; therefore it is likely that this type of contamination will continue to be recorded in groundwater in the vicinity. The Department acknowledges that it is not

the intention of this project to remediate groundwater, particularly from other sources identified outside of Orica's area of operations.

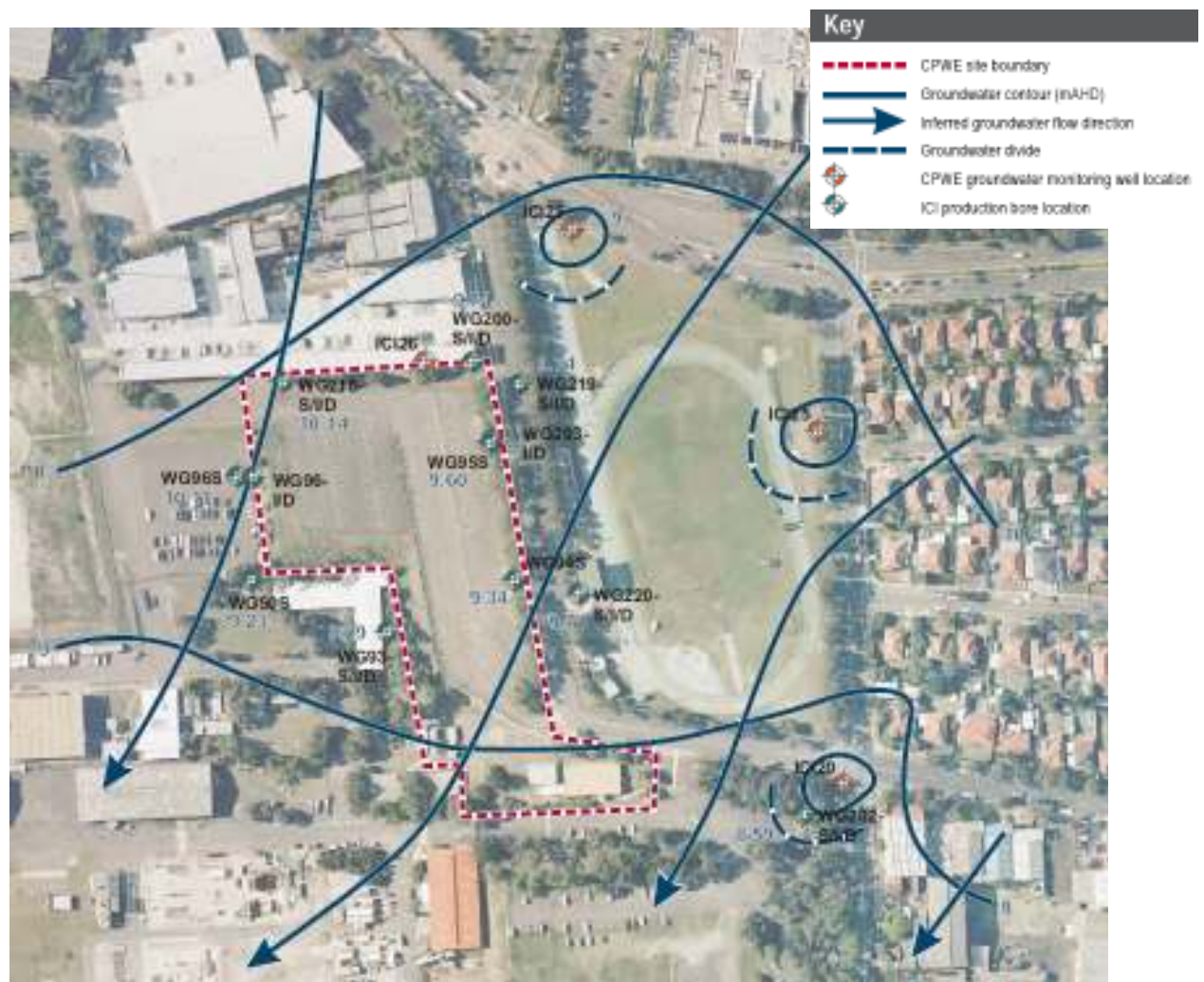


Figure 11 – Groundwater depth, flow and monitoring locations

Excavation of the CPWE is unlikely to encounter groundwater, however this will depend on the final depth of excavation which would only be determined during remediation activities as the excavation base material is tested against the reuse criteria. Procedures for managing contaminated water, including groundwater are described in the RAP and include minimisation (through separation of clean water from contaminated areas) and disposal to sewer. The Department is satisfied that these procedures are adequate for managing contaminated water, should it be encountered.

Remediation goals

Following DECCW's request, Orica developed remediation goals specifically for the protection of groundwater. In many cases, the goals for protection of groundwater are more stringent than those for the protection of human health. As discussed in Section 5.1, the most stringent reuse criteria (indoor) would be applied, up to a maximum volume of 9,000m³ excavated from beneath the liner. Application of the indoor criteria would ensure that groundwater is adequately protected.

However, if the contamination is found to extend considerably further and would require excavation of a greater volume of material, the Department and the DECCW consider it appropriate to allow Orica to apply the outdoor criteria to the base materials. As the outdoor criteria are less stringent than the indoor criteria, the Department and the DECCW recommend that the site be capped, to prevent water infiltration to the subsurface, and require routine groundwater monitoring to be undertaken. The recommended conditions detail the groundwater monitoring requirements if this option is implemented, including the requirement for contingency measures should monitoring indicate that contaminant concentrations are increasing. The conditions also require a covenant to be placed on the site ensuring that the cap is implemented and maintained for the long-term.

Conclusion and recommendations

As the project would remove a significant contaminant source from the site, the long-term risks to groundwater quality would be minimised. The primary goal is to remediate the site to the indoor reuse criteria which includes stringent groundwater protection criteria. However, should the outdoor criteria be applied, the Department is satisfied that the recommended conditions provide for adequate protection of groundwater.

5.4 Noise

The nearest residents are located approximately 160m to the east on Denison Street. Other receivers include workers in the Qenos administration building directly to the west and recreational users of the adjacent Hensley athletics field to the east.

Noise generated on the BIP is currently controlled by Environment Protection Licences (EPL) held by Orica, Qenos and Huntsman. All licences are consistent in relation to noise limits at the nearest residential receivers on Denison Street; being 65, 55 and 50dB(A) for day, evening and night time respectively.

For the CPWE project, Orica has committed to achieving the EPL limits for the construction and operational phases. This is considered a conservative approach compared with what is required by the DECCW's *NSW Industrial Noise Policy, 2000* (INP). In order to achieve these limits, Orica propose a noise level for CPWE remediation activities 10dB(A) below the EPL limits, being 55, 45 and 40dB(A) during the day, evening and night time respectively.

In addition to the limits for residents, Orica established limits for recreational and industrial receivers based on the INP and proposes that noise from CPWE remediation activities also be 10 dB(A) lower than the INP criteria for these receivers.

The primary noise sources during construction and operation include:

- erection of the ESB and FSB;
- sheet piling works in the excavation (if required, dependent on the final depth of excavation);
- excavation;
- transport of material within the site via trucks;
- operation of the DTD plant; and
- reinstatement of the excavation.

Noise modelling undertaken for the EA predicted that the project specific noise goals (10dB(A) below the EPL limits) would be exceeded, with levels of 68dB(A) at the nearest residences during the day when sheet piling works are undertaken; and levels up to 49dB(A) during the night time period during construction and operation (during adverse weather conditions). Noise goals would be exceeded at the Hensley athletics field during the majority of construction and operational activities. Day time noise goals would be met for industrial receivers within the BIP, with the exception of sheet piling activities. The noise assessment also concluded that the potential for sleep disturbance for residences would be low.

The predicted exceedances must be considered in the context of the existing EPL limits as the assessment provided a conservative level of 10dB(A) below the EPL limits for both construction and operation. The EPL limits are 65, 55 and 50dB(A) at the nearest residences for day, evening and night time respectively. Therefore, a level of 68dB(A) during sheet piling activities would result in only a marginal exceedance of the EPL limit and a level of 49dB(A) during the night time period is likely to meet the EPL limit of 50dB(A). Compliance with the EPL noise limits would be dependent on other activities occurring on the BIP at the same time as the remediation activities. Therefore, scheduling of the noisiest activities such as sheet piling should be considered in relation to other site activities.

The requirement for sheet piling works would only be determined once the depth of excavation of contaminated material is known. Sheet piling works are a short-term construction activity generating noise that cannot easily be mitigated. These activities would be limited to day time periods and Orica has committed to implementing a noise management plan which would consider appropriate scheduling of these activities and include procedures for notifying affected residences prior to undertaking such work.

The Department considers that the short term noise impacts associated with sheet piling are minimal, given that they would be undertaken within a large industrial site that has operated in this location for over 50 years, and given the long term benefits provided by remediating the site. The Department has reflected Orica's commitment to implement a Noise Management Plan in the recommended conditions.

Orica also proposes to implement various noise mitigation measures on plant and equipment, given that noise levels are predicted to exceed the project specific goals. These measures include:

- design and location of plant components to maximise shielding;
- a reduction in noise from the ECS and DTD plant fans to ensure no exceedance of night time criteria; and
- a reduction from all processes/plant located at height.

Provided the detailed mitigation measures included in the EA are implemented to control noise, the Department is satisfied that disturbance to residents would be minimised. The noise limits contained in Orica's existing EPL for the site have been replicated in the recommended conditions to ensure consistency. The Department recommends that the mitigation measures described in the EA be implemented and a Noise Management Plan be put in place for construction and operation. The Department requires that the Noise Management Plan be provided prior to commencement of the CPoP trials, describing the monitoring to be undertaken to ensure compliance with the noise limits throughout the project.

5.5 Hazards and Risk

A Preliminary Hazard Analysis (PHA) was undertaken as part of the EA. The PHA identified the following hazards:

- hazardous materials, such as contaminated soil and the formation of dioxins through the combustion process;
- potentially hazardous incidents and representative incidents, including;
 - failure of the emission control systems;
 - transport incidents;
 - DTD plant incidents;
 - external events; and
 - worst case or 'extreme' scenarios.

A risk assessment was carried out for each of the identified hazards and considered fatality and injury/irritation risk levels; risk to sensitive receptors and food industries; risk to the biophysical environment; adequacy and relevance of safeguards; and effect on cumulative risk from the BIP.

From a review of the PHA, the Department concluded that overall, the proposed development is beneficial as it would remove existing contaminants at the site and at the BIP. Risk levels are very low and are within the Department's risk criteria and the project would not increase the off-site risk from the BIP. The potentially hazardous incidents identified did not have a significant effect outside of the immediate incident area.

The Department has recommended a number of routine pre-construction and pre-commissioning hazard studies be carried out in accordance with the Department's *Hazardous Industry Planning Advisory Papers*. These are incorporated into the recommended conditions of approval.

5.6 Other Issues

Other issues and impacts associated with the project are summarised in Table 7.

Table 7: Other Issues

Issue	Assessment
Traffic	• During the peak construction period there would be an additional 96 vehicle movements per day, comprising 90 light vehicles and 6 heavy vehicles. This represents less than 1% of existing traffic volumes on the surrounding road network and would therefore have a negligible impact on traffic flows and road capacity; • During operation, trucks would use internal haul roads to transport material between the ESB and FSB. External vehicle movements would result from additional staff, equating to 60 light vehicle movements per day, which is less than 1% of existing traffic volumes. Therefore, operational traffic would have a

Overall, the Department believes that the project has been adequately justified on economic, social and environmental grounds; it is in the public interest and should be approved subject to strict conditions.

8. RECOMMENDATION

It is recommended that the Director-General:

- consider the findings and recommendations of this report;
- approve the project application, subject to conditions, under section 75J of the *Environmental Planning and Assessment Act 1979*; and
- sign the attached project approval (see Appendix B).

dkitto 4/11/09

David Kitto
Director

[Signature] 8/11/09

Richard Pearson
Deputy Director-General

Deana Burn
Major Development Assessment
Tel: 9228 6305

[Signature] 5.11.09

Chris Wilson
Executive Director

[Signature]

Sam Haddad
Director-General

12/11/2009

LIST OF APPENDICES

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APPENDIX A – SUMMARY OF CONDITIONS OF APPROVAL

Aspect	Condition	Requirement
Schedule 2: Administrative Conditions		
Limits of Approval	5, 6	Limits project approval to 5 years and requires the project to be completed within 2 years of commencement.
	8	Limits the project approval to treatment of contaminated material from the CPWE site only..
Staging of Works	9	Requires written approval of the Director-General prior to commencing CPoP trials, operation, decommissioning and site reinstatement.
Statutory Requirements	10	Requires the proponent to complete a Technology Assessment in accordance with relevant legislation.
	11	Requirement for appointment of an independent site auditor accredited under the <i>Contaminated Land Management Act, 1997</i> .
Development of land	13	Restricts development of the site until it is satisfactorily remediated.
Schedule 3: Specific Environmental Conditions		
Remediation	20-24	- Requires the RAP to be approved by an accredited site auditor; - Specifies treatment and reuse criteria, in particular, application of the indoor reuse criteria to base materials up to a maximum volume of 9,000m³; - Details application of the outdoor criteria and the requirement for site capping and groundwater monitoring if this option is implemented.
CPoP Trials	26-28	Requires a detailed plan for the trials prior to commencement and outlines the minimum requirements for conducting the trials, including any supplementary trials.
Air Quality	29-31	Sets limits for air emissions consistent with the <i>Protection of the Environment Operations (Clean Air) Regulation 2002</i> and the EPA Exemption Order dated 15 April 2008. Requires DECCW agreement and Director-General approval of a concentration limit for mercury for operation.
	34	Requires completion of mercury control trials in accordance with the EPA Exemption Order.
	35-36	Details air quality monitoring and reporting requirements incorporating recommendations from NSW Health.
Water	38-42	Details the requirements for management of contaminated water, stormwater and the need to obtain relevant approvals from Sydney Water.
Hazards	43-45	Details pre-construction and pre-commissioning hazard studies and the need to maintain the integrity of existing pipelines surrounding the CPWE.
Noise	46-48	Describes noise limits, hours of work and requirement to implement a noise management plan prior to commencing CPoP trials.
Schedule 4: Environmental Management, Review and Reporting		
Environmental Management	49-51	Requires: - Operation Environmental Management Plan; - Appointment of an Independent Environmental Expert; and - Independent Environmental Audit.
Reporting	52-56	Requires: - Monthly reports; - Incident reporting; - Validation Report and Site Audit Statement, prepared by the accredited site auditor.
Schedule 5: Community Consultation		
Community Consultation	57-58	Requirement to continue community consultation via the Community Participation and Review Committee and make documentation available to the public.

APPENDIX B – CONDITIONS OF APPROVAL

See separate document on website titled 'Project Approval'.

APPENDIX C – EPA EXEMPTION ORDER

See separate document on website.

APPENDIX D – FINAL REMEDIAL ACTION PLAN

See separate document on website titled 'Remedial Action Plan', dated 7 May 2009.

APPENDIX E – MERCURY REPORTS

- *Mercury Health Impact Report for the Remediation of the CPWE, Orica Botany*, URS 21 December 2007;
- *Preliminary Mercury Emission Control Report*, Focus Environmental, 11 January 2007;
- *Addendum Report*, Focus Environmental, 11 February 2008.

These reports are 'commercial-in-confidence' and are not included on the website.

APPENDIX F – INDEPENDENT REVIEWS

- *Orica Car Park Encapsulation Mercury Removal Technical Expert Advice*, MWH Global, 14 February 2008;
- *Independent Technical Review: CPWE Mercury Emissions – Human Health and Environmental Risk Review Task*, ENSR Australia, 21 February 2008.

The reviews considered reports that are ‘commercial-in-confidence’ and are therefore not available on the website.

APPENDIX G – SUBMISSIONS REPORT

Including:

- *Air Quality Impact Assessment for Remediation of the Car Park Waste Encapsulation at the Botany Industrial Park*, Pacific Air and Environment, 14 December 2007;
- *Proposed Car Park Waste Encapsulation Remediation, Human Health Impact Assessment*, URS, 30 November 2007.

See separate reports on website.

APPENDIX H - SUBMISSIONS

See separate document on website titled 'Submissions'.

APPENDIX I – ENVIRONMENTAL ASSESSMENT

See separate document on website.

APPENDIX J – DIRECTOR-GENERAL’S REQUIREMENTS

See separate document on website.

APPENDIX K – CONSIDERATION OF ENVIRONMENTAL PLANNING INSTRUMENTS

Section 75I(2) of the *Environmental Planning and Assessment Act 1979* requires that reference be made to the provisions of any environmental planning instrument that would (but for Part 3A of the Act) substantially govern the carrying out of the project. Consideration of the proposed development in the context of the objectives and provisions of the relevant environmental planning instruments is provided below.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

SEPP 33 applies to the facility as a potentially hazardous industry. SEPP 33 aims to identify proposed developments with the potential for significant off-site impacts, in terms of risk and/ or offence (odour, noise etc). A Preliminary Hazard Analysis was conducted to assess the hazards and risks associated with excavation of contaminated materials and treatment in the thermal desorption process. The analysis indicated that the project would comply with the relevant guidelines for hazard and risk and the Department is satisfied with this analysis.

State Environmental Planning Policy No. 55 – Remediation of Land

SEPP 55 applies to the project. SEPP 55 aims to ensure that potential contamination issues are considered in the determination of a development application. The project involves remediation of known contamination. In accordance with SEPP 55, Orica would notify the Department and Council prior to commencement of works and on completion of works. The Department is satisfied with the consideration of SEPP 55 in the EA.

Botany Local Environmental Plan 1995

The proposed facility is located on land zoned 4(a) Industrial. The objectives of the zone are to ensure industrial development contributes to economic and employment growth in the area whilst not adversely affecting the environment. The Department is satisfied that the project is consistent with the objectives of the zone. The Department is satisfied that the EA has adequately assessed special provisions contained in the LEP that are relevant to the project and concludes that the project generally complies with the aims and objectives of the LEP.