FITZWALTER
Group Pty Limited

pasminco cockle creek smelter

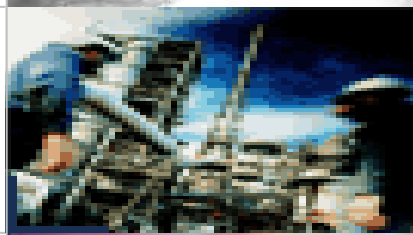
Environmental Assessment Report

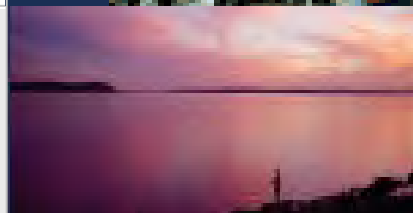
for the

Pasminco Cockle Creek Smelter Site Remediation Project

August 2006

Volume 1 of 3





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Remediation Project

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Statement of Validity

Submission of Environmental Assessment
Prepared under Part 3A of the *Environmental Planning and Assessment Act 1979*.

Environmental Assessment prepared by

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In respect of	Pasminco Cockle Creek Smelter Remediation Project

Applicant & Land Details

Applicant	Pasminco Cockle Creek Smelter Pty Ltd (Subject to Deed of Company Arrangement) 13a Main Road, Boolaroo NSW 2284
Subject Site	Pasminco Cockle Creek Smelter Lands
Land to be developed	13a Main Road, Boolaroo NSW 2284
Lot & DP	Lot 201 DP805914 Lot 21 DP 253122 Lot 1 DP 523781 Lot 23 DP 251322
Project Summary	Remediation of land via concrete slabs and services removal, excavation of contaminated soil, treatment and mixing of the soil; construction of containment cell to contain the soil and other materials with associated effluent treatment plant, long term management of the cell and related lands.

Environmental Assessment

An Environmental Assessment is attached

Declaration

I certify that I have prepared the contents of the Environmental Assessment in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* and regulation and that, to the best of my knowledge, the information contained in this report is not false or misleading.

Signature	
Name	Dennis Zines
Date	10 August 2006



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Abbreviation	Title
1995 Consent	The Consent issued for the PCCS site in 1995 by the then Minister for Planning
AHD	Australian Height Datum
CCCDMP	Conceptual Containment Cell Design and Management Plan
CLM Act	Contaminated Land Management Act 1997
DA	Development Application
dB(A)	decibels
DCP	Development Control Plan
DEC	Department of Environment and Conservation
DNR	Department of Natural Resources
DoH	Department of Health
DoP	Department of Planning
EA	Environmental Assessment
EMP	Environmental Management Plan
EPBC	Environment Protection and Biodiversity Conservation Act 1999
EPA	Environment Protection Authority
ETP	Effluent treatment plant
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
EHC	Environmental Health Centre
FH	Ferrier Hodgson
FW	Fitzwalter Group Pty Ltd
Groundwater RAP	The combination of the CH2M Hill January 2004 report and the Fitzwalter September 2005 report
HAS	Holmes Air Sciences
HD	Hawkes Dam
HILs	Health-based investigation levels
HIS	Heritage Impact Statement
LALC	Local Aboriginal Land Council
IGMP	Interim Groundwater Management Plan
LAS	Lead Abatement Strategy
LEP	Local Environmental Plan
LGA	Local Government Area
LCCS	leachate collection and conveyance system
LMCC	Lake Macquarie City Council
LOS	Level of Service (re traffic)
MEP	Main Entry Precinct
MSB	Mines Subsidence Board
PCCS	Pasminco Cockle Creek Smelter Pty Ltd
PoEO Act	Protection of Environment Offences Act 1997
RAP	Remedial Action Plan
RBL	Rating Background Level (noise related)
REZ	Rail Employment Zone
RO	Remediation Order
RWO	Remedial Works Outline
RWP	Remedial Works Plan
SAR	Site Audit Report
SAS	Site Audit Statement
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
SRoH	Significant Risk of Harm
SMP	Site Management Plan
SWD	South West Dam
VP	Validation Plan
VENM	Virgin Excavated Natural Material
WoSRAP	Whole of Site RAP



[1.0] CHAPTER 1 - Executive Summary

[1.1] Key Messages

a. This EA concludes that, provided the identified mitigation measures are properly implemented, the construction of the project can proceed without adversely affecting the environment;

b. This EA identifies matters which the proponent is willing to commit to in the required Statement of Commitments;

c. The remediation project will produce lands with very low environmental risks. The remediation of the PCCS Lands will satisfy the current RO issued in respect of the Main Site;

d. Remediation is essential to provide for the most beneficial reuse of the PCCS Lands, subject to obtaining appropriate further approvals;

e. Remediation will minimise the future risks of pollution and will allow the redevelopment of the PCCS Lands so as to provide employment and other economic opportunities and benefits, create residential, industrial/commercial and open space development opportunities and benefit transport and infrastructure linkages and town centre planning;

f. This EA demonstrates that the project is able to be carried out within legislative requirements and without generating any unacceptable or material adverse short or long-term impacts; and

g. This EA demonstrates that the project will positively respond to all of the factors listed below relating to the need for the project in such a way that leads to a substantial improvement in the environmental risk of the PCCS Lands.

The EA provides the data and analyses to justify the project proceeding.

[1.2] Context of the Project

Pasminco Cockle Creek Smelter Pty Ltd (Subject to Deed of Company Arrangement - (PCCS)) is seeking to remediate the PCCS Lands (refer Section 2.1) associated with its former lead smelting operations at Boolaroo, near Newcastle. The remediation project is subject to the Part 3A requirements of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The Main Site of the PCCS Lands is currently subject to a Remediation Order (RO) issued under the Contaminated Land Management Act 1997. The RO was issued to PCCS on the 1st of July 2003 by the EPA as the EPA considered the dust, surface water and groundwater leaving the Main Site posed a Significant Risk of Harm (SRoH) to human health and the environment.

Since closure of the Smelter on 12 September 2003, PCCS has undertaken many actions to address the RO. PCCS now proposes to remediate the PCCS Lands principally by excavating contaminated material from the various parcels which comprise the PCCS Lands including the Main Site and placing the materials in a containment cell to be located around the existing on-site eastern slag stockpile.

While this Environmental Assessment (EA) includes contextual information concerning the possible strategic planning and future redevelopment of the site after remediation, this Part 3A application does not seek approval for the redevelopment of the site post remediation, including rezoning, subdivision or redevelopment approval.

This EA addresses the Director-General's Requirements for the approval from the Minister of Planning for the PCCS remediation project. The EA has been prepared in accordance with Part 3A of the Environmental Planning and Assessment Act 1979 for PCCS, on behalf of the Deed Administrators Peter Damien McCluskey and John Menzies Spark of Ferrier Hodgson.

The Incitec-Pivot site (Incitec Site) which is not owned or operated by PCCS is almost completely surrounded by the Main Site. Operations on the Incitec Site are presently continuing, but the company has announced closure by September 2009 in a Media Statement.

The Incitec Site was declared as a remediation site under s.21 of the CLM Act 1997 by the DEC in 2005. Later in 2005 (as reported in the Media Statement), Incitec-Pivot committed to DEC to prepare a voluntary remediation plan for its site, which contains slag waste from the smelter.



Further to the Media Statement, PCCS and Incitec-Pivot have entered into an agreement to work together cooperatively on the remediation and redevelopment of both sites. This includes formal agreement with respect to relocation and maintenance of easements (as necessary) to provide continued access to the Incitec-Pivot site and optimal siting of the PCCS containment cell.

The Part 3A approval which is sought includes provision for the possible acceptance of certain materials located on the Incitec Site. The receipt of any such materials would be subject to satisfactory agreement between PCCS and Incitec-Pivot on commercial terms.

The works described in this EA deal primarily with remediation of the PCCS Lands as the nature of any possible future remediation of the Incitec Site is yet to be determined, although the containment cell proposed for the Main Site will have sufficient capacity to enable the receipt of at least some contaminated material from the Incitec Site. This Part 3A application does not seek approval for the remediation of the Incitec Site.

In parallel with the proposed remediation of the PCCS Lands, PCCS has voluntarily proposed a strategy in respect of the management of potential lead dust exposure on the properties nominated in conditions 42-44 of the 1995 Consent (Lead Abatement Strategy or LAS). The LAS has been developed to provide for reduced exposure for residents of the nominated properties to lead dust deposition such that exposure levels from lead dust deposition are within acceptable limits during everyday living.

It is possible as part of the implementation of the LAS that soil on the nominated properties which has been contaminated by lead dust may be returned to the PCCS Lands for placement into the proposed containment cell.

The approval being sought from the Minister under Part 3A will provide for the handling of the soil received from the nominated properties in the event that it is returned to the PCCS Lands, but will not authorise or require the implementation of the LAS itself which is a voluntary off-site program proposed to be undertaken by PCCS. The owners of the nominated properties will be consulted about the LAS under a set of procedures separate to the Part 3A approval sought from the Minister.

[1.3] **The Need for the Project**

There is a strong need for the project as it will:

a. result in the remediation of the PCCS Lands to agreed standards;
b. minimise any existing prospect of further off-site pollution occurring as a result of the existence of the on-site contamination;
c. minimise ongoing site maintenance costs;
d. provide for substantial redevelopment of the remediated PCCS Lands, including for residential, light industrial and open space purposes, which in turn will provide for substantial employment opportunities; and
e. facilitate local and regional planning.

[1.4] **The Project Description**

The remediation works of the PCCS Lands will involve a number of elements, a number of which will occur concurrently. The works will include the removal and crushing of concrete, excavation of contaminated soils with subsequent refilling, regrading and surface stabilisation with imported fill as necessary, treatment of excavated materials as required, and the emplacement of excavated and other materials into a containment cell which will be progressively sealed by capping which will be imported from off-site.

The project includes the provision of all environmental controls to manage impacts during construction and the construction of an effluent treatment plant and run-off controls to allow successful management of the finished project. The project also provides for the continued approval of the operation of the existing jig on the PCCS Lands to extract lead from lead slag stockpiles.

This EA identifies an appropriate ownership, management and funding structure for the long term management of the containment cell, associated environmental protection infrastructure and the management of the landholdings on the upper parts of Munibung Hill that are not to be redeveloped.



PCCS is to fund the necessary maintenance of the containment cell until able to establish (with actuarial assistance as required) that levies and owner contributions (if any) are sufficient to meet budgeted expenditure requirements.

[1.5] **Environmental Assessment**

The EA addresses the Director-General's requirements, and all other relevant matters required by Part 3A, as well as the Environmental Planning and Assessment Regulation 2000, and other relevant documents including guidelines, applicable to the proposal.

Environmental specialists have been engaged to provide expert opinion and assessment of the key environmental issues concerned with the project. This included assessments of air quality and potential health impacts, water quality and water cycle management, noise impacts, future ownership and management, and a general environmental risk analysis (addressing European heritage and archaeology, Aboriginal cultural and archaeological heritage, flora and fauna, mine subsidence, traffic, visual amenity, waste generation and also social and economic impacts).

The EA concludes that, provided the identified mitigation measures are properly implemented, the construction of the project can proceed without adversely affecting the environment.

This EA identifies matters which the proponent is willing to commit to in the required Statement of Commitments.

A risk profile was prepared to compare the existing condition of the PCCS Lands (post demolition) with the likely condition of the PCCS following completion of the remediation project, by considering issues raised in the Director-General's Requirements based on the assessments in this EA. The comparison leads to the conclusion that the remediation project will produce lands with very low environmental risks.

[1.6] **Project Justification**

The remediation of the PCCS Lands will satisfy the current RO issued in respect of the Main Site. The remediation is essential to provide for the most beneficial reuse of the PCCS Lands, subject to obtaining appropriate further approvals. Remediation will minimise the future risks of pollution and will allow the redevelopment of the PCCS Lands so as to provide employment and other economic opportunities and benefits, create residential, industrial/commercial and open space development opportunities and benefit transport and infrastructure linkages and town centre planning.

This EA demonstrates that the project is able to be carried out within legislative requirements and without generating any unacceptable or material adverse short or long-term impacts. The EA demonstrates that the project will positively respond to all of the factors listed above relating to the need for the project in such a way that leads to a substantial improvement in the environmental risk of the PCCS Lands.

The EA provides the data and analyses to justify the project proceeding, and demonstrates that it can be undertaken without any material adverse impact.



[2.0] CHAPTER 2 - Introduction

PCCS is seeking to remediate the PCCS Lands associated with its former lead smelting operations at Boolaroo, near Newcastle. The remediation project is subject to the Part 3A requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This document is an Environmental Assessment (EA) of the proposed remediation project.

[2.1] **The Remediation Site**

[2.1.1] Site Location and Details

The PCCS Lands are located approximately 13 km south west of Newcastle and just above the northern most point of Lake Macquarie as shown in Figure 2.1. The closest town is Boolaroo which is to the south and has its CBD in the proximity of 500 m from the site.

The PCCS Lands on which the remediation is to take place consist of four distinct lots, being:

a. the 'Main Site' which is the former smelter operations area
b. the 'Triangle Paddock' which is a portion of land to the south-west of the Main Site
c. 'Munibung Hill' which is a portion of land on the north-east and east of the site; and
d. the 'Cockle Creek Pump Station' which is a small portion of land on the east side of Cockle Creek where PCCS pumps water from the creek to the Main Site.

Table 2.1 below identifies lot and deposited plan numbers, and other relevant details for each of the lots referred to above which comprise the PCCS Lands. Figure 2.2 is an aerial view of the PCCS Lands showing the boundaries of the four lots referred to above.

Table 2.1 - Site Identification Details – PCCS Lands

Site Owner	Pasminco Cockle Creek Smelter Pty Limited (subject to Deed of Company Arrangement)				
Street Address	13a Main Road, Boolaroo NSW 2284				
Land Area Reference	Main Site		Triangle Paddock	Munibung Hill	Cockle Creek Pump Station
Lot and DP Numbers	Lot 201 DP 805914		Lot 21 DP 253122	Lot 1 DP 523781	Lot 23 DP251322
Site Areas	107.82 ha	14.58 ha	9.46 ha	59.21 ha	0.2078 ha
Geographical Coordinates	Latitude 32 56 90 S, Longitude 151 37 70 E				
Zoning	4(1) Industrial (Core)	7(2) Environment Protection Conservation (Secondary)	10 Investigation Zone	7(2) Environment Protection Conservation (Secondary)	6(1) Open Space
Local Government Area	City of Lake Macquarie Council				
Parish	Kahibah				
County	Northumberland				
Current land Use	Care, maintenance and clean-up of former Smelter site including actions in response to the Remediation Order, demolition of the smelter structures and investigative and design works in relation to the staged remediation and redevelopment of the site.				
Proposed land Use	Mixture of industrial, residential, commercial and recreational				
Distance from nearest CBD	Approximately 500 m from Boolaroo and 13 km south-west of Newcastle.				
Site Elevation	The Main Site rises from about RL 6 m in the west to 40-80 m in the east. The Triangle Paddock is about RL 2 to 6 m and Boolaroo Heights is about RL 10 – 40 m.				
Site Map	Figures 2.1 and 2.2 of this document; Soil Landscapes of Newcastle 1: 100 000 Map Sheet Report; 1: 25 000 Topographical series Wallsend 9232-3S				

[2.1.2] Relationship with Incitec and Other Sites

The Incitec-Pivot site (Incitec Site) which is not owned or operated by PCCS is almost completely surrounded by the Main Site as shown in Figure 2.2. Operations on the Incitec Site are presently continuing, but the company has announced closure by September 2009 in a Media Statement released on 20 April 2006 (Appendix 1).



The Incitec Site was declared as a remediation site under s.21 of the CLM Act 1997 by the DEC in 2005. Later in 2005 (as reported in the Media Statement), Incitec-Pivot committed to DEC to prepare a voluntary remediation plan for its site, which contains slag waste from the smelter.

In relation to the Main Site, the Media Statement indicated "The demolition of the smelter gives us the opportunity to co-operatively remediate both sites in preparation for other possible uses, which might include light industry and public space, subject to the final land use strategy adopted by the Lake Macquarie City Council."

Further to the Media Statement, PCCS and Incitec-Pivot have entered into an agreement to work together cooperatively on the remediation and redevelopment of both sites. This includes formal agreement with respect to relocation and maintenance of easements (as necessary) to provide continued access to the Incitec-Pivot site and optimal siting of the PCCS containment cell.

The Part 3A approval which is sought includes provision for the possible acceptance of certain materials located on the Incitec Site. The receipt of any such materials would be subject to satisfactory agreement between PCCS and Incitec-Pivot on commercial terms.

Remediation planning for the Incitec Site is only at a preliminary stage. Possible strategies include:

a. remediation solely on the Incitec Site;
b. remediation of the Incitec Site by transfer of wastes to the PCCS Lands; and
c. a joint remediation on both lands.

The works described in this EA deal primarily with remediation of the PCCS Lands as the nature of any possible future remediation of the Incitec Site is yet to be determined, although the containment cell proposed for the Main Site will have sufficient capacity to enable the receipt of at least some contaminated material from the Incitec Site.

The PCCS Lands are also in close proximity to adjacent towns, light industrial areas, Cockle Creek (and Lake Macquarie), and transport and other infrastructure (refer Figure 2.2 and Chapter 5).

[2.1.3] History of the PCCS Lands

Operations on the PCCS Lands were originally established as a conventional lead smelting operation using blast furnace technology. A number of new process operations were introduced over the years of operation with a major expansion period occurring between 1913 and 1918.

Acid production was upgraded from 1923 to 1935. A whole new plant was constructed in 1960 which operated to closure. A zinc refinery was later constructed in 1968.

Underground coal mining formerly took place under a portion of the PCCS site in the 1940s. The site is identified as being located in a Mine Subsidence District. Pursuant to Section 15 of the Mine Subsidence Act 1961, planning applications which propose improvements within a mine subsidence district should be considered by the Mine Subsidence Board (MSB).

In 1995, development consent was granted by the then Minister for Planning for an upgrade of the smelter operations (1995 Consent). A copy of the 1995 consent is attached at Appendix 2.

Smelting operations on the Main Site ceased on 12 September 2003. At closure, plant and associated office buildings occupied approximately 30% of the Main Site and were generally confined to the south-western corner.

[2.1.4] Current Ownership

PCCS is the registered proprietor of the PCCS Lands.

PCCS was placed in voluntary administration on 19 September 2001. At a meeting of creditors on 4 October 2002, Peter Damien McCluskey and John Menzies Sparks of Ferrier Hodgson (FH) were appointed Deed Administrators of the relevant Deeds of Company Arrangement (Deed Administrators).



[2.1.5] Easements and Encumbrances

The PCCS Lands are encumbered by and benefit from numerous easements including those which benefit the Incitec Site previously mentioned. Copies of the relevant folio identifiers and deposited plans for each of the Main Site, the Triangle Paddock and Munibung Hill are included in Appendix 3. The new agreement between PCCS and Incitec-Pivot has further altered these easement arrangements – such that there are no limitations for the proposed containment cell configurations.

Energy Australia has advised both LMCC and PCCS that it will require a future easement across the Main Site for a high voltage (133kV) power line. Energy Australia has advised that the easement would not be required before 2008. There are sufficient options for locating the easement such that it will not be affected by the proposed containment cell described in Chapter 3.

Teralba Colliery (owned and maintained by Oceanic Coal) has Mining Lease 1343 and adjacent Consolidated Coal Lease No. 760. Consultation with Teralba has indicated the potential for economically viable coal deposits under the site.

Teralba Coal has indicated that it has no immediate plans for carrying out mining activities below the PCCS site although the prospect of future mining is not precluded. Any future plan to mine under the Lands will need to include measures to avoid impact on the containment cell and other existing surface developments and improvements.

[2.1.6] Court Order

In proceedings commenced by the Environment Protection Authority (EPA) (now part of the Department of Environment and Conservation (DEC)), the Land and Environment Court made orders (17 November 2003) (Original Court Orders) that among other matters, required the covering of the two major slag stockpiles on the Main Site (see Figure 2.2) to reduce potential dust emissions. The covering of the stockpiles was completed on 7 May 2004 in accordance with the Original Court Orders.

On 26 May 2006, the Land and Environment Court made orders (Amended Court Orders) which amended the Original Court Orders so as to provide for the removal of slag from the stockpiles for the purposes of processing that slag, subject to conditions which address the new operating circumstances.

Copies of the Original Court Orders and the Amended Court Orders are attached as Appendix 4.

On 2 March 2005, the Minister for Planning granted PCCS a modification to the 1995 Consent which allowed PCCS to treat the slag material in the northern stockpile in a mechanical jig to recover a high lead concentrate product for sale. The treated slag would be retained on site and replaced adjacent to the eastern slag stockpile.

This lead recovery process commenced regular operation in 2006 and is expected to continue for 2-3 years subject to its commercial feasibility.

[2.1.7] The Declaration

On 10 September 2002, the EPA declared the Main Site, together with parts of the bed of Cockle Creek and Cockle Bay, as a remediation site under s.21 of the Contaminated Land Management Act 1997. A copy of the declaration is attached as Appendix 5 (Declaration of Remediation Site).

The Declaration of Remediation Site indicated that the EPA had found that contamination at the Main Site posed a significant risk of harm to the environment. It also indicated that there was a significant risk that harm was being caused to various aspects of the environment and to human health by the offsite migration of that contamination.

[2.1.8] The Remediation Order and the Amended Remediation Order

The Main Site is currently subject to a Remediation Order (RO) under the Contaminated Land Management Act 1997 (CLM Act 1997). The RO was issued to PCCS on the 1st of July 2003 by the EPA as the EPA considered the dust, surface water and groundwater leaving the main site posed a significant risk of harm (SRoH) to human health and the environment.



Since smelter closure, PCCS has undertaken many actions to respond to the RO (described in Section 2.2 below). Because of the successful implementation of outcomes achieved by PCCS and because of the passage of time since the issue of the RO, DEC is expected to issue a variation to the original RO later in 2006.

A copy of the RO is included in Appendix 6.

[2.2] Current Status and Condition of the Site

[2.2.1] Demolition

At closure of the smelter, the Main Site contained many structures (including smelter buildings, equipment, tanks, and an effluent treatment plant (ETP), administration buildings, silos, stacks, laboratories, services, workshops, administration buildings etc), contaminated surface material, stockpiles of waste material, wastewater dams, buried wastes and some raw materials used in smelting. Figure 2.3 shows the buildings on the smelter site area at closure.

Since closure of the smelter operations, and as a precursor to the proposed site remediation, most of the main structures have been demolished and a significant amount of materials have also been removed from the site for reuse and or recycling. Demolition is being carried out pursuant to two development consents issued by LMCC dated 24 February 2005 and 23 May 2006 (Demolition Consent).

A small number of buildings will remain on-site for the present including the STS building (currently used as the site office), the Old Laboratory Building on Fotheringham Road (an item of heritage value), the Effluent Treatment Plant (ETP), the Gatehouse, the jig equipment and a few small work sheds/switch rooms as shown on Figure 2.3. The future use of these buildings will be associated with the implementation of the remediation project.

[2.2.2] Actions in Response to the RO

PCCS has undertaken and has planned several actions in compliance with the RO. Most of these actions which are described briefly in outline below are well in hand and the site is now considered to be satisfactorily addressing the RO.

In compliance with the requirements of the RO, the following actions have been taken:

Groundwater RAP:

A Remedial Action Plan (RAP) was prepared (CH2M Hill 2004d). This RAP detailed actions to address the perceived off-site SRoH associated with or arising from contamination of the Main Site following closure of the smelter. It did not provide for the remediation of the PCCS Lands so as to allow future alternative land uses, which is considered in this EA. DEC responded to PCCS indicating (*inter alia*) that the RAP was considered to be an interim document and that a supplementary document would be required before the RAP could be considered as final.

A supplementary document to the CH2M Hill 2004d report was prepared by Fitzwalter in August 2005 (Fitzwalter 2005a) and submitted to DEC after having been reviewed by the Site Auditor appointed in relation to the PCCS Lands. The CH2M Hill 2004d and the Fitzwalter 2005a documents referred to here jointly represent the “Groundwater RAP”. The Site Auditor subsequently provided a letter to DEC supporting the actions proposed in the Groundwater RAP, but noting that further details would be supplied in the future Site Audit Reporting for the site (see below for further details).

DEC replied with a letter dated 17 November 2005 that approved the proposed groundwater pump wells at the western boundary of the Main Site which allowed PCCS to proceed with the installation.

Surface Water Overflows:

The following actions have been or are being undertaken to address surface water overflows on the PCCS Lands:

a. reduction of on-site inventory of residual process materials and wastes;
b. lead recovery from a slag stockpile by a mechanical jig and relocation of the treated slag;
c. demolition and surface site clean up including clean-out of sediment dams and covering of certain waste stockpiles;



d. the addition of salt water dams 1, 1A, 2 & 3 to supplement the other existing dams used for detention of contaminated run-off for treatment prior to discharge; and
e. addition of pumps and pipes to allow full use of the ETP capacity.

Dust emissions:

The following actions have been or are being undertaken to address dust emissions from the PCCS Lands:

a. covering of the two major slag stockpiles and new stockpiles;
b. road watering;
c. de-dusting of buildings and equipment before demolition;
d. wheel wash for demolition trucks;
e. reduction of on-site Inventory;
f. demolition and site clean-up;
g. dust management of jig operation; and
h. site buffer in place between site and Boolaroo and dust monitoring.

Groundwater emissions:

The following actions have been or are being undertaken to address groundwater emissions on the PCCS Lands:

a. installation of a series of groundwater extraction wells along the western boundaries of the Main Site to prevent emissions of contaminated groundwater;
b. onsite pumping and treatment of extracted groundwater; and
c. maintenance and monitoring of extraction system and wells.

The Site Auditor appointed in relation to the PCCS Lands provided a Site Audit Report (SAR) (HLA 2005d) in respect of the interim groundwater controls and monitoring proposed in the Groundwater RAP, and also issued a Site Audit Statement (SAS) (HLA 2005e) under Part 4 of the CLM Act.

Copies of the SAR and SAS, both of which were provided to DEC, are attached at Appendix 7 and Appendix 14, respectively.

The SAR and SAS endorsed the remediation proposed by the groundwater RAP, but also required the preparation of further actions and documentation (i.e. the preparation of an Interim Groundwater Management Plan – (IGMP)) to cover the installation and operation of the groundwater control systems prior to the proposed site remediation. The SAS certified that (subject to demonstration by monitoring) the works proposed in the RAP will adequately manage the SRoH issues off the Main Site and render the Main Site suitable for its intended use, which prior to remediation is that of an unremediated industrial site.

DEC provided its endorsement of the proposed SRoH actions by issuing the letter dated 17 November 2005 referred to above which had the effect of approving the proposed groundwater pump wells at the western boundary of the Main Site.

Notwithstanding the approval of various remediation actions which are designed to address off-site SRoH issues, DEC still requires that PCCS submit further plans of remediation to address dust and surface water issues related to the unremediated PCCS Lands. The remediation proposed by this Part 3A application and which is more fully described in this EA in Chapter 3, has been prepared to satisfy this DEC requirement.

Further details of the progress of on-site groundwater management to date are provided in Chapters 5 and 6 of this EA.

[2.2.3] Present and Future Actions prior to the Site Remediation

The following actions are currently being undertaken on the PCCS Lands on an ongoing basis:

a. site security and OH&S duties;
b. scraping out sediments from Hawkes Dam 2 to be followed by Hawkes Dam 1;
c. running the lead recovery process from the mechanical jig;



d. demolition of most buildings and structures;
e. maintenance of surface and groundwater controls including operation of the ETP;
f. ongoing soil investigations;
g. regular monitoring of compliance with EPL 5042; and
h. excavation field trials on the Cardiff West Industrial Area (described more fully at Chapter 3).

[2.3] **Overview of the Project**

[2.3.1] General Project Description

The project will include the excavation of contaminated soil with subsequent refilling, regrading and surface stabilisation with imported fill as necessary, treatment of excavated materials as required, the emplacement of excavated material and other materials into a containment cell which will be progressively sealed by capping imported from off-site, and the provision of appropriate environmental controls.

The proposed site remediation is described in detail in Chapter 3.

[2.3.2] Project Proponent

The project proponent is the company PCCS.

[2.3.3] Objectives of the Project

The objectives of the project are to remediate the PCCS Lands so that the contamination currently present will no longer represent a significant risk of harm to either on or off-site receptors, and to provide for the future redevelopment of the remediated land for various residential, industrial, commercial and open space purposes, subject to obtaining appropriate approvals, including rezoning and development consents.

[2.3.4] Nature of Part 3A Approval which is sought

Project approval is sought under Part 3A of the EP&A Act for the project described in this EA.

While the EA includes contextual information concerning the possible strategic planning and future redevelopment of the PCCS Lands following remediation, this Part 3A application does not seek approval for that redevelopment or for any particular strategic planning outcome. These matters are primarily the responsibility of the Council and as such separate applications for planning, rezoning, sub-division and redevelopment have been and or will be lodged with Council outside of the Part 3A process, and in accordance with the requirements of the EP&A Act.

In parallel with the proposed remediation of the PCCS Lands, PCCS has voluntarily proposed a strategy in respect of the management of potential lead dust exposure on the properties nominated in conditions 42-44 of the 1995 Consent (Lead Abatement Strategy or LAS). The strategy has been developed to reduce the exposure for residents of the nominated properties that arise from lead dust deposition such that exposure levels from lead dust deposition are within acceptable limits during everyday living.

It is possible as part of this LAS that soil on the nominated properties which has been contaminated by lead dust may be returned to the PCCS Lands for incorporation into the site remediation, and particularly, by placing that material into the proposed containment cell.

The approval being sought from the Minister under Part 3A will provide for the handling of the soil received from the nominated properties in the event that it is returned to the PCCS Lands, but will not authorise or require the implementation of the LAS itself which is a voluntary off-site program proposed to be undertaken by PCCS. The owners of the nominated properties will be consulted about the LAS under a set of procedures separate to the Part 3A approval sought from the Minister.



The components of the LAS can be summarised as follows:

A	Consultation with residents and property owners about the relevant issues, the strategy and voluntary participation.
B	Analysis of lead in soil concentrations at each participating Nominated Property (as required) to identify and document any relevant lead dust contamination for the property owner(s) and the authorities and to identify any recommended action.
C	Development and undertaking of lead abatement measures, to a degree agreed by PCCS and the property owners consistent with this strategy, and specific to the situation at each relevant Nominated Property.
D	Preparation of documentation for the property owner(s) and the authorities identifying the property status following implementation of the strategy. The nature of the documentation in respect of any particular property will depend on whether the owners of that property chose to participate in the strategy.
E	Management of the strategy over the defined time period.

It is expected that agreement on the details of the LAS will be reached with the relevant authorities in a similar time frame to that anticipated for the Part 3A application, allowing both the PCCS remediation and the LAS to be commenced in parallel.

[2.4] **The Need for the Project**

The need for the project is identified below illustrating the benefits and impacts and is discussed in terms of:

a. Remediation Issues and Pollution Risks;
b. Redevelopment Potential;
c. Economics of Site Maintenance; and
d. Local and Regional Planning and Employment.

[2.4.1] Remediation Issues and Pollution Risks

There is an obvious need to remediate the PCCS Lands to reduce the risks of ongoing pollution.

In their present state, the PCCS Lands are heavily contaminated with various metal pollutants which are dispersed over a large area both above and below ground.

The contamination of the PCCS Lands and in particular, the Main Site, comprises approximately:

a. 111,000 m^3 of aboveground Lead Blast Furnace slag;
b. 215,000 of m^3 aboveground ISF slag (Black Sands);
c. between 600,304 to 750,380 m^3 of contaminated soil and rubbish at depth; and
d. between 136,520 to 146,900 m^3 of aboveground wastes.

The slag mounds and rubbish dumps are located in the area of the proposed cell. Contaminated surface soil is scattered across the whole of the PCCS Lands as a result of fallout and contaminated soil at depth is predominantly located in the location of the old smelter plant areas with other isolated areas including the CWE area (refer Chapter 3).

Although significant improvements have been made to the PCCS Lands to reduce pollution risks since the smelter closure in 2003 (as described in this EA), the actions to date do not address the residual high levels of soil contamination on the PCCS Lands. Due to the dispersed nature of the pollutants, there is an ongoing risk of pollutant emissions from the Lands via the air (as dust), via groundwater, and via surface water overflows. The risks translate into possible impacts on human health and the environment via pathways such as ingestion or absorption.

The proposed remediation will accumulate the polluting substances in a centralised cell that through its engineered design and planned ongoing management will provide containment and pollution control so as to manage pollution risks to acceptable levels.

The clear benefit of this lies in the reduction in risk potential and the obtaining of a long term safe environment.

While the above arguments demonstrate an obvious need for site remediation, studies undertaken to date have identified that the costs of remediation are very high.



In recognising this situation, PCCS intends to proceed with the proposed site remediation on the basis that the site will be progressively redeveloped for its highest and best use following progressive remediation. This is to be achieved through a process of site rezoning and progressive subdivisions which will substantially assist in offsetting the costs of on-site remediation and the LAS program. While this document is directed towards gaining approval for the remediation works but not the future site redevelopment, it is critical for the overall success of the Part 3A project that parallel approvals are obtained that allow the highest and most beneficial use of the remediated Lands to be implemented.

[2.4.2] Redevelopment Potential

While the PCCS Lands could be rezoned for purposes other than that allowed under the present zoning, any subsequent use would be conditioned upon by the need for site remediation. The retention of its current heavy industrial use and the remnant contamination would present constraints for its future use. This would result in only a small proportion of the Land's potential being realised which would represent an undesirable economic and social outcome not only for the owner, but also from the government and community viewpoint.

Remediation offers the potential for substantial redevelopment of what is a large area of land in the locality. This will provide additional residential and industrial areas and thus avoid undesirable land sterilisation.

[2.4.3] Economics of Site Maintenance

Without remediation, the owner would still be faced with costs for permanent maintenance of the PCCS Lands and would only be able to derive a small proportion of the potential financial return from the PCCS Lands compared to the return which would be available if the PCCS Lands were remediated. In addition, the liability relating to the contamination of the PCCS Lands would be ongoing and not be diminished because the PCCS Lands would remain subject to the RO, and because of the ongoing potential for liability to third parties. This condition of the site would potentially represent a high risk with respect to future pollution impacts and this would likely reflect in the costs for site maintenance in perpetuity. This position is not an outcome that is acceptable to the Deed Administrators.

[2.4.4] Local and Regional Planning and Employment

While the smelter was in operation it represented a major source of local employment. This employment base has presently been lost from the local area. Using the site as a contaminated industrial site would result in added employment opportunities, but not to the same extent as for the case where the site was remediated.

Despite the smelter offering employment during its operation, the presence of the smelter and its industrial discharges created an environment which did not promote significant economic development of the surrounding suburbs. In fact, data from the 2001 Census showed that the population of Boolaroo decreased by 14.2% between 1996 and 2001, from 1,385 to 1,188 persons. In comparison, the population of Lake Macquarie LGA had increased 4.2% from 170,495 in 1996 to 177,619 in 2001.

The closure of the smelter and the taking of the measures identified in Section 2.2.2 have effectively minimised the immediate pollution issues for the surrounding areas. The potential for renewed interest in the area is already apparent as seen in increased property values in the surrounding properties. However, any economic improvements that could be achieved in the surrounding area would be limited by the effective sterilisation of much of the PCCS Lands from more optimal uses by leaving it unremediated.

Without remediation, expansion of residential and industrial areas would be constrained as would effective road linkages between the Cardiff Industrial Estate and the surrounding residential areas. Leaving the PCCS Lands unremediated is not considered to be the most desirable outcome for the owner, the government or the community.

Staged remediation and redevelopment is essential to obtain the most beneficial reuse of the site and for that reason is the only plan for the PCCS Lands acceptable to the Deed Administrators. Remediation will remove future risks of contamination pollution, minimise potential third party and contamination liability, reduce costs of maintenance of the PCCS Lands, and improve the amenity of the locale. With subsequent redevelopment this will provide employment and other economic opportunities and benefits, create residential, industrial/commercial and open space development opportunities and benefit transport and infrastructure linkages and town centre planning.

[2.4.5] Summary

The above discussion emphasises the very strong need to remediate the site.

The net outcome for PCCS of receiving this Part 3A approval and support from the Council and State Government for the proposed redevelopment will be one where the ongoing pollution liability is substantially reduced through providing a safe and stable containment solution, the cost of remediation would be substantially offset, as would be the cost of ongoing management. At the same time, the benefits of the remediation will flow through to the government and the community.

Overall, there is a strong need for the project to proceed.

[2.5] **Statutory Framework**

[2.5.1] Introduction

This review includes analysis of the relevant Statutory and non-Statutory requirements of the following documents:

a. Part 3A of Environmental Planning & Assessment Act (EP&A Act) 1979;
b. State Environmental Planning Policy (SEPP) 55 Remediation of Land;
c. Lake Macquarie Local Environmental Plan 2004;
d. Contaminated Land Management Act (CLM Act) 1997;
e. PoEO Act 1997 and EPL 5042;
f. 1995 Smelter Consent; and
g. Mine Subsidence Act 1961

[2.5.2] Part 3A of EP&A Act and State Environmental Planning Policy (Major Projects) 2005 (Major Projects SEPP)

The effect of the Major Projects SEPP is that if development is, in the opinion of the Minister for Planning, of a kind described in Schedules 1, 2 or 3 of the Major Projects SEPP, as state significant development, an approval under Part 3A of the EP&A Act will be required and the normal development consent requirements arising under Part 4 of the EP&A Act will no longer apply. The Minister is the approval body for any relevant Part 3A application.
The Major Projects SEPP identifies different types of projects to which Part 3A will apply, which in general terms is development of economic, social or environmental significance to the State or regions of the State.
The carrying out of the remediation of the Site will be a project to which Part 3A applies if it is development of a kind which, *in the opinion of the Minister*, is

(a) 'development for the purpose of remediation of land on:

(b) ….; or land declared as a remediation site under Division 3 of Part 3 of the Contaminated Land Management Act 1997'

As indicated above, the Main Site has, with certain other lands, been declared a remediation site under Division 3 of Part 3 of the CLM Act and the Minister has formed the opinion that the carrying out of the proposed remediation is development of a type described above as evidenced by the issue of the Director-General's Requirements in respect of this remediation project (refer Section 2.7).

If any part of a *'project'* is state significant development, all other development comprised in the project is taken to be a project to which Part 3A applies. Accordingly, even though the Declaration only applies to the Main Site of the PCCS Lands, and the remediation is proposed to be carried out on all four lots which comprise the PCCS lands as described in Section 2.1 of this EA, the whole of the remediation project is a project to which Part 3A applies.



Procedural Requirements under Part 3A

The principal procedural requirements under Part 3A of the EP&A Act which are likely to apply to this application and EA are as follows:

Environmental Assessment Requirements (s75F EP&A Act)

a. The Director-General must prepare environmental assessment requirements (in consultation with relevant public authorities) for the development and notify the proponent of those requirements;
b. The proponent can be required to carry out an environmental assessment containing a statement of environmental commitments for the environmental management and mitigation measures for the site; and
c. DoP can require the proponent to submit a revised environmental assessment

Assessment Panel (s75G EP&A Act)

a. The Minister may refer the application to a panel of experts, a panel of bureaucrats or a Commission of Inquiry to assess any aspect of the project.

Public Consultation (s75H EP&A Act)

a. Once accepted by DoP, this EA must be publicly exhibited for at least 30 days;
b. During this period, any person will be entitled to make submissions to DoP concerning the matter;
c. DoP will be entitled to require the proponent to:

   - submit a response to any of the issues raised in the submissions; and

   - prepare a report that outlines any proposed changes to the project to minimise its environmental impact.

Notification of Determination (s75J EP&A Act)

a. The Minister may approve or disapprove a project; and
b. The Minister can approve a project with such modifications or conditions as the Minister may determine.

[2.5.3] SEPP 55 Remediation of Land (SEPP 55)

The object of this State Environmental Planning Policy (SEPP) is to provide for a NSW State-wide planning approach to the remediation of contaminated land. In particular, SEPP 55 aims to promote the remediation of contaminated land for the purpose of reducing the significant risk of harm to human health or any other aspect of the environment arising from the relevant contamination.

However, under s.75R of the EP&A Act, SEPPs have only limited application in relation to the carrying out of a Part 3A project, and accordingly any requirement for development consent which would otherwise apply to this remediation project, does not apply.

SEPP 55 regulates the types of remediation works which require development consent, assuming that the relevant remediation is not a project to which Part 3A applies, as is the case here.

In addition, cl 6 of SEPP 55 requires that when preparing an environmental planning instrument, a planning authority is not to include land in a particular zone, if the inclusion of the land in that zone would permit a change in use of that land unless:

a. the planning authority has considered whether the land is contaminated;
b. if the land is contaminated, the planning authority is satisfied that the land is suitable in its contaminated state, or will be suitable following remediation, for the purposes for which land in the relevant zone can be used; and
c. if the land requires remediation to be made suitable for any purposes for which land in that zone can be used, the planning authority is satisfied that the land will be remediated before the land is used for that purpose.

Although SEPP 55 will not operate so as to require development consent for this remediation project, it is likely that when LMCC considers any proposal for the rezoning of the PCCS Lands, the carrying out of the remediation or the approval to carry out the remediation, LMCC will be able to form the opinion required of it under cl.6 of SEPP 55.



[2.5.4] Lake Macquarie City Council Local Environmental Plan 2004

The principal environmental planning instrument which, subject to the operation of s.75R of the EP&A Act, would apply to the PCCS Lands is Local Environmental Plan 2004 (LEP 2004). This document establishes the current planning framework for the land use structure of the area surrounding the PCCS Lands. This document takes into account the relevant zoning, development controls and council consents necessary for the project.

The object of the LEP is to achieve development of land to which the plan applies that is in accordance with the principles of ecologically sustainable development by:

a. promoting balanced development of that land; and
b. implementing the Lifestyle 2020 Strategy adopted by the Council on 27 March 2000.

Although LEP 2004 (or any replacement environmental planning instrument) will apply to any future development application lodged in relation to the PCCS Lands, because of the operation of s.75R of the EP&A Act, LEP 2004 does not apply to this remediation project which is controlled under the Part 3A of the EP&A Act.

Further discussion of the possible future site planning and redevelopment are contained in Chapter 4 of this EA.

[2.5.5] Contaminated Land Management (CLM) Act 1997

The general object of the CLM Act 1997 is to establish a process for investigating and (where appropriate) remediating land where contamination presents a significant risk of harm to human health or some other aspect of the environment. Particular objects of this Act relevant to the PCCS Lands are:

a. To set accountabilities for managing contamination if a significant risk of harm is identified;
b. To set out the role of the EPA in the assessment of contamination and the supervision of the investigation, remediation and management of contaminated sites;
c. To provide for the accreditation of site auditors of contaminated land to ensure appropriate standards of auditing in the management of contaminated land; and
d. To ensure that contaminated land is managed with regard to the principles of ecologically sustainable development.

As mentioned previously, the RO applies to the Main Site. Details of the manner in which PCCS has addressed the requirements of these documents and off-site significant risk of harm arising from contamination of the PCCS Lands are set out in Section 2.2.2.

A Site Auditor accredited under Part 4 of the CLM Act has been appointed in relation to the PCCS Lands.

Chapter 9 of this EA sets out how the proposed site remediation will be managed with regard to the principles of ecologically sustainable development, in compliance with the objectives of the CLM Act.

[2.5.6] PoEO Act and EPL 5042

Many activities carried out on the PCCS Lands are subject to the operation of the Protection of the Environment Operations Act 1997 (PoEO Act). The normal operation of the PoEO Act in relation to the Part 3A project is affected by s.75V of the EP&A Act which in general terms provides that an environment protection licence under the PoEO Act can not be refused if it is necessary for carrying an approved Part 3A project, and must be substantially consistent with any relevant Part 3A approval;

Environment Protection Licence 5042 (EPL5042) has been issued under the PoEO Act in respect of the Main Site. EPL 5042 establishes a wide range of conditions in relation to the control and monitoring of emissions from the Main Site.



[2.5.7] 1995 Smelter Consent

On 14 November 1995, the Minister of Urban Affairs and Planning issued a development consent in respect of the Main Site for the upgrade of the then existing plant operations in terms of increased production and improved environmental technology controls (1995 Consent in Appendix 2). The 1995 Consent has since been modified, including on 2 March 2005 to allow for the installation and operation of a jig on the PCCS Lands to process existing lead slag stockpiles.

The continuation of the necessary approval for the operation of the jig forms part of the project described in this EA.

[2.5.8] Coal Mines Regulations Act 1982

Pursuant to Section 15 of the Mine Subsidence Act 1961, planning applications which propose improvements within a mine subsidence district are required to be considered by the Mine Subsidence Board (MSB).

Underground coal mining took place on the site in the 1940s and there is some evidence of subsidence on the Main Site. The MSB has been consulted and the containment cell design addresses the subsidence issues as discussed in Chapter 7 of this EA.

[2.6] **Structure of this EA**

The EA has been prepared in support of PCCS's application for approval from the Minister of Planning under Part 3A of the EP&A Act, for its proposal to remediate the PCCS Lands and to assesses the potential impacts of the proposal with regard to the requirements of Part 3A and in particular the Minister's environmental assessment requirements, which the Director-General of the Department of Planning has notified to PCCS (refer Section 2.7.1 below).

This EA responds to the Minister's guidelines and to the Director-General's environmental assessment requirements together with the issues raised in consultation, by providing a detailed description of the proposed remediation works, presenting an assessment of the potential environmental impacts including those pertaining to the principles of sustainable development, and recommending necessary mitigation measures to minimise and eliminate the potential impacts. In accordance with s.75F of the EP&A Act, this EA also includes a statement of commitments that PCCS is prepared to make for the environmental management and mitigation measures proposed to be undertaken on the PCCS Lands.

The structure of the EA is as follows:

Cover Page and Declaration Form

Table of Contents & List of Abbreviations

Chapter 1 – Executive Summary

Chapter 2 – Introduction – (this chapter)

Chapter 3 – Project Description

Chapter 4 – Strategic Planning

Chapter 5 – Existing Environment

Chapter 6 – Key Environmental Impacts and Safeguards

Chapter 7 – Other Environmental Impacts and Safeguards

Chapter 8 – Statement of Project Commitments

Chapter 9 – Risk Analysis of Project

Chapter 10 – References

Appendices



[2.7] Stakeholder Consultation

Consultation with relevant authorities, adjoining land owners and the community has occurred since the smelter closure in 2003 in relation to investigations into the remediation and redevelopment of the PCCS Lands.

When the project development had sufficiently advanced, DoP was approached in respect of the Part 3A application. DoP then arranged a Planning Focus Meeting (PFM) for the project. Subsequently, Director-General's Requirements were issued which specified consultation requirements relating to the Part 3A process.

This section includes information about the PFM and the Part 3A consultation. Section 2.7.1 contains a table listing the requirements of the Director-General's Requirements indicating where they are addressed in the EA. Section 2.8 contains a similar table indicating the issues raised during the Part 3A consultation and where they have been addressed in the EA.

[2.7.1] Planning Focus Meeting and Director-General's Requirements

The PFM for the remediation project the subject of this Part 3A application was held on the 5th October 2005 at the PCCS Lands. All relevant government authorities were invited and all attendees were provided with preliminary information to assist them to formulate inputs into the Director-General's Requirements for the Environmental Assessment Process under Part 3A of the *EP&A Act 1979*.

The preliminary information supplied at the PFM (included in Appendix 8) detailed the proposed staged remediation and redevelopment strategy, construction stages and approval requirements, proposed containment cell construction, and a preliminary environmental impact assessment.

The minutes of the PFM which are also included in Appendix 8 identify the attendees and the discussions undertaken.

Following the PFM, the DoP issued the Director-General's Environmental Assessment Requirements (Appendix 9). These requirements have been addressed in this EA. Table 2.2 summarises the Director-General's Requirements and identifies the location in this EA where each requirement is addressed.

Table 2.2 – Summary of Director-General's Requirements and Location in this EA document

	Requirement	Location in Report
General Requirements	Executive summary	Chapter 1
	Proposal Description	Chapter 3
	Environmental Impact Assessment	Chapters 5, 6, 7, 8 & 9
	Project Justification	Chapter 9
	Statement of Commitments	Chapter 8
	Certification by the author	At front of document
Key Assessment Requirements	Strategic Planning	Chapter 4
	Remediation Action Plan	Chapter 3
	Remediation Criteria	Chapter 3
	Containment Cell Design	Chapter 3
	Air Quality and Health Impacts	Chapters 5 & 6
	Water Quality, Water Cycle Management and Health Impacts	Chapters 5 & 6
	Noise Impacts	Chapter 6
	Future Ownership and Management	Chapter 3
	General Environmental Risk Analysis	Chapters 7 & 9
Consultation Requirements	Pre- and during EA preparation	Chapter 2



[2.7.2] Department of Environment and Conservation

Consultation with DEC in relation to a wide range of issues concerning the PCCS Lands is an ongoing process.

The Main Site remains subject to EPL 5042 which was initially issued to authorise the then existing smelter operations. In accordance with its obligations under EPL5042 and the PoEO Act (pursuant to which the EPL5042 is issued), PCCS provides regular reports to DEC on the environmental management of the Main Site and there is frequent liaison with DEC including site visits. EPL5042 is renewed annually.

DEC is also consulted regularly in relation to the requirements of the CLM Act, and the RO.

In direct relation to the Part 3A process, DEC attended the PFM and wrote to DoP with issues that were included in the issued Director-General's Requirements.

The air quality consultant retained in respect of this Part 3A application, Holmes Air Sciences (HAS), also consulted with DEC in relation to the potential health impacts assessment as required by the Director-General's Requirements.

In direct response to the Director-General's Requirements (Remediation Action Plan, Remediation Criteria, Containment Cell Design), DEC were also separately issued with copies of the following reports:

a. Remediation Action Plan for PCCS, Boolaroo, NSW – September 2005; (Appendix 11)
b. Conceptual Containment Cell Design and Management Plan – Maunsell/Coffey, September 2005 (Appendix 12);
c. Site Audit Report on PCCS RAP – HLA November 2005 (Appendix 13); and
d. Site Audit Statement on PCCS RAP – HLA November 2005 (Appendix 14).

DEC has not formally advised of any further issues that they wish to be addressed in the EA. Informally, DEC has indicated that they will formally respond as part of the Part 3A process.

[2.7.3] Department of Health

The Department is very familiar with the PCCS Main Site and activities through its former involvement with the Environmental Health Centre (EHC) while the smelter was in operation.

Ahead of the Part 3A process, the Department was consulted in relation to the Lead Abatement Strategy (LAS) which is intended to be undertaken in parallel with the remediation project, although not part of the Part 3A approval process.

Through the Part 3A process, the Department of Health was contacted by HAS in relation to the Air Quality Health Impacts assessment (refer Chapter 6 of this EA) as required by the Director-General's Requirements. DoH informally advised HAS that they were satisfied with the approach being taken by HAS in addressing the Director-General's Requirements.

Subsequently, PCCS formally wrote to DoH seeking the Department's advice as to whether they had any further issues they wished to be addressed in respect of the proposed remediation project.

DoH replied in writing that they were satisfied with the "key assessment requirements" in the Director-General's Requirements and that they will formally respond as part of the Part 3A process (Letter attached in Appendix 10).

[2.7.4] Department of Natural Resources (DNR)

The site investigations into groundwater have required the establishment of many groundwater bores for water quality sampling. In addition, a number of groundwater wells have been established to capture contaminated groundwater before it leaves the site and treat it in the on-site effluent treatment plant. In advance of the Part 3A, these matters were discussed with DNR.



PCCS formally wrote to DNR seeking their Department's advice as to whether they have any further issues they wished to be addressed in respect of the proposed remediation project. Subsequently, PCCS met DNR at the PCCS office at Boolaroo and provided a briefing on details of the project. DNR subsequently provided a letter indicating that "DNR propose to issue a single licence approval for all PCCS remediation works related to the groundwater cut-off wall or its equivalent, any contaminated groundwater interruption bores installed and operated on the PCCS remediation site. The licence will be issued for the stated 5 year period required to complete the remediation works". (Letter attached in Appendix 10).

DNR would also review the document during the exhibition period.

[2.7.5] Lake Macquarie City Council

Since the smelter closure in 2003, Lake Macquarie City Council (LMCC) has been actively consulted about the proposed site remediation and the proposed redevelopment of the site. LMCC is the consent authority for activities that are covered by the LM LEP 2004. Development approvals have been submitted to the Council in relation to demolition approvals, heritage issues, re-zonings and sub-divisions as indicated above and in Chapter 4 of this EA. In addition, Council has been briefed directly in respect to the LAS and in relation to the LMCC preparation of their Land Use Plan (refer Chapter 4 of this EA). LMCC will be continually involved and informed of all works on the PCCS site and be directly responsible for DAs for future developments.

PCCS formally wrote to LMCC seeking advice as to whether it has any further issues it wishes to be addressed in respect of the proposed remediation project. PCCS also provided LMCC with the same four reports that were provided to DEC (as listed in Section 2.7.2).

Subsequently, PCCS met LMCC at the PCCS office at Boolaroo and provided a briefing on details of the project. LMCC indicated the following as issues that needed to be addressed:

a. LMCC wanted to be consulted with respect to regraded levels post remediation, particularly with respect to road layouts;
b. LMCC wanted the details of the long term cell management to address the issue of protection of the containment cell capping;
c. LMCC asked how community soil would be handled after the cell is completed;
d. LMCC wanted the cell to have extensive vegetation cover, particularly on the batters and would want specific details re soils and proposed vegetation; and
e. LMCC were particularly concerned about the traffic impact of trucks bringing fill and capping to the site.

[2.7.6] Community Consultation

Initial Consultation

Since 2002, there have been various published articles which have informed the public about the closure of the smelter, the appointment of the administrators and the site works (including demolition). Community information feedback forums have been held in relation to current activities associated with the planning and redevelopment of the Pasminco Cockle Creek Smelter site.

In addition, PCCS has prepared and distributed a number of newsletters since 2003 to the local community to keep them informed of PCCS activities.

More directly related to the proposed remediation and redevelopment of the PCCS Lands, a community consultation and feedback session was held on the 25th of June 2005 at the school in Boolaroo. Notice of the meeting was given in a newsletter and in advertisements in the local paper. Approximately 60 persons attended.

In general, the community was mostly interested in gathering information about what was happening on the site and what was planned. The local Heritage Society was particularly interested in the possible retention and use of some of the industrial buildings. There was reasonable interest in the possible redevelopment of the site after site remediation.



Community Consultation during the EA Preparation

A specific newsletter was prepared to inform the public about issues pertaining to the Part 3A application and the EA. This was distributed in December 2005 to the nearby communities by letter box drop. There was a corresponding press release and copies of the newsletter were available from the LMCC reception desk. A copy of the newsletter is attached in Appendix 10.

The newsletter summarised previous investigations, described the planning approval process, provided an overview of the proposed cell construction and remediation and the proposed environmental controls. It also outlined some specific areas for early land use planning. The newsletter also included a copy of the draft Director-General's Requirements for preparing the EA. It also described the public exhibition period for the EA and noted the further opportunities which the community will have to provide further comment. Contact details were provided for members of the community who wished to make any input to the EA or make any other comment on the project planning.

No feedback from the newsletter was received from the local community by email, fax, phone or letter.

[2.8] Summary of Issues Raised in the Part 3A Consultation

The issues raised during the Part 3A consultation have been summarised in Table 2.3 which also includes the location where the issues have been addressed in this EA.

Table 2.3 – Summary of Issues Raised during Part 3A Consultation and Location in this EA document

Name of party consulted	Issues Raised	Location in Report
DEC	Satisfied with briefing during the EA preparation including that by the Air Quality Consultant. Awaiting EA exhibition period before commenting further.	Project Description in Chapter 3. Impact Sections in Chapters 5, 6 & 8.
DoH	Satisfied with briefing during preparation of the EA. Awaiting EA exhibition period before commenting further.	Air Quality and Health Impact Sections in Chapters 5, 6 & 8
DNR	The project needs to address legislative groundwater issues.	Project Description in Chapter 3. Impact Sections in Chapters 5, 6.
	Awaiting EA exhibition period before commenting further.	NA
LMCC	LMCC wanted to be consulted with respect to regraded levels post remediation, particularly with respect to road layouts.	Chapter 4 and DA approvals outside of this EA
	LMCC wanted the details of the long term cell management to address the issue of protection of the containment cell capping.	Chapter 3
	LMCC asked how community soil would be handled after the cell is completed.	The owners of the Nominated Properties will have a continued opportunity during the remediation project for sending soil from their properties back to the PCCS Lands. Afterwards, soil will need to go to a contaminated soil landfill.
	LMCC wanted the cell to have extensive vegetation cover, particularly on the batters and would want specific details re soils and proposed vegetation.	Chapter 7 – Flora and Fauna plus subsequent Landscaping plans with the DAs.
	LMCC were particularly concerned about the traffic impact of trucks bringing fill and capping to the site.	Chapter 7 – Traffic.
	LMCC was directly interested in the Strategic Planning for the PCCS Lands post remediation	Chapter 4
The Local Community	A hotline caller wanted to view LMCC's Land Use Strategy A caller wanted to come on site to view the demolition A caller indicated some vibrational damage due to the demolition of the large concrete stack.	PCCS responded to all callers, but these issues are not relevant to the EA. There have been no community inquiries about the proposed PCCS remediation project



[2.9] **Consultation during and after the EA Exhibition**

In accordance with the requirement of Part 3A of the EP&A Act, the Part 3A application and this EA will be on public exhibition for at least 30 days. The community will have the opportunity to make comment on the project and the EA. Part 3A of the EP&A Act defines the procedures for responding to community input.

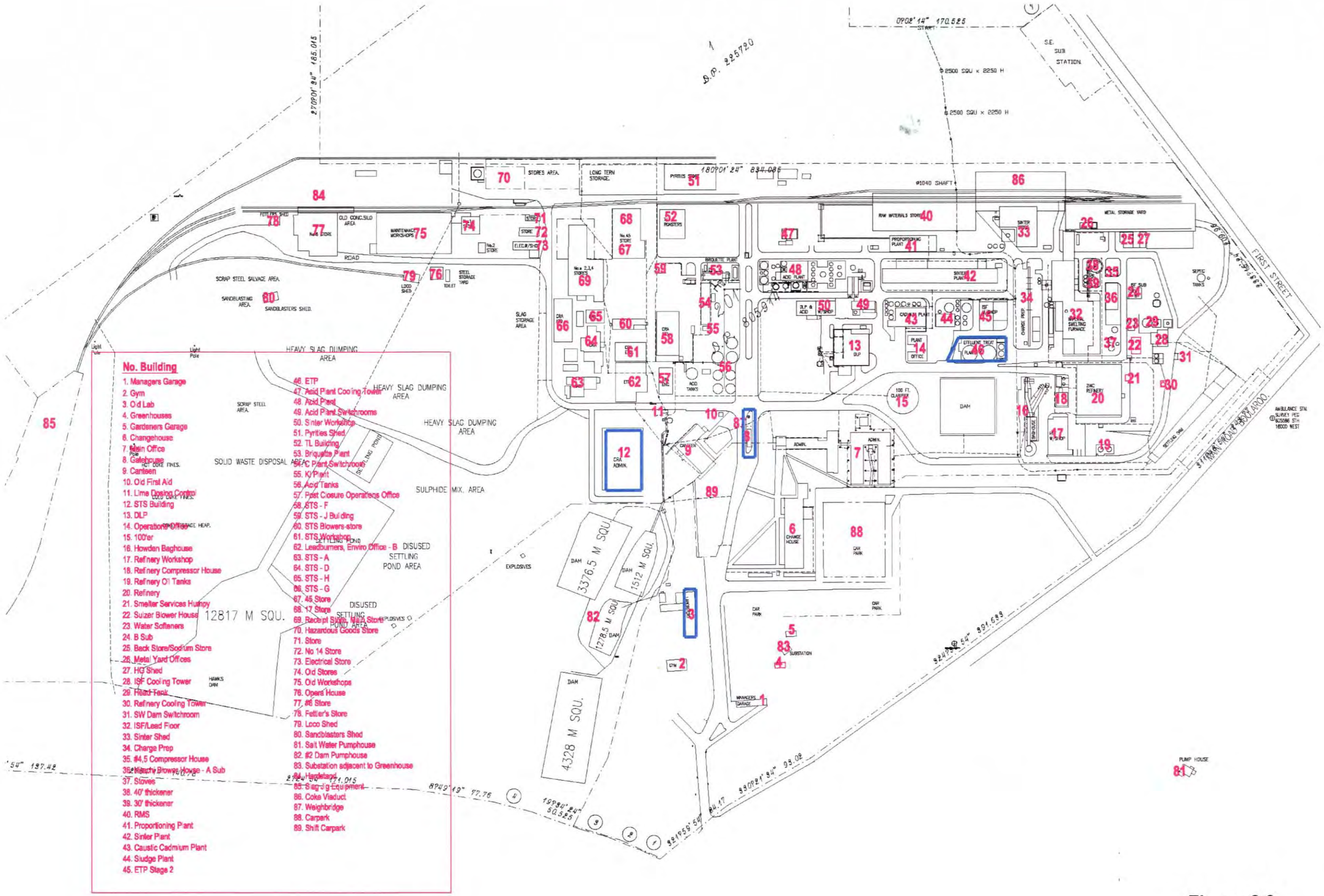


Location of the PCCS site in regional context

Location of the PCCS site in local context

Figure 2.1
Location Plan

Figure 2.2
PCCS Lands



LEGEND
(boxes in blue)

Permanently retained buildings/structures

3 Old Laboratory

Temporarily retained buildings/structures

8 Gatehouse
12 Admin Block
46 ETP

Figure 2.3
Building Identification

[3.0] CHAPTER 3 - Description of the Proposal

[3.1] Overview of the Remediation Project

The Project for which Approval is sought will include:

a. the remediation of the PCCS Lands. Remediation may include a number of different techniques and procedures, but will principally occur by excavating contaminated material from various parts of the PCCS Lands which contain contaminated material and then placing the excavated material and other on-site contaminated material in a capped containment cell (or cells). Where necessary, the excavation will be preceded by the removal of some concrete slabs on the Main Site which may remain following current demolition activities, and by the removal of underground services. After the excavation of any particular area is complete and the site validated and signed off by the Site Auditor as being fit for its purpose, the remediated area will be re-filled and or regraded to achieve expected future development levels with imported fill as necessary. This in turn will be followed by site stabilisation to control surface erosion and dust. Concrete slabs which are removed as part of this process will be crushed on site for later re-use (possibly as road foundation);

b. the possible acceptance onto the Main Site of certain specified waste materials from nominated residential properties in Boolaroo, Speers Point and Argenton as a result of the implementation of the parallel Lead Abatement Strategy and also possibly material from the Incitec Site;

c. the construction and use of a capped containment cell (or cells) on the Main Site for the receipt and long term storage of materials arising from items (a) and (b). Capping will need to be imported from off-site. The cell(s)' location is generally on and around the existing on-site monolith (shown as the eastern slag mound in Figure 2.2) on the PCCS Main Site. The cell dimensions are yet to be finalised, but the cell will be constructed within the boundary as shown in Figure 3.1. The existing ground level at the southern end of the monolith is approximately RL 22 m. Adjacent to this, the monolith is at its approximately maximum RL of 28 m. Using this point as a reference, the maximum height of the future containment cell including its capping will be approximately 34 m (equivalent to 12 m above the ground levels adjacent to the eastern side of the existing monolith). The boundary on Figure 3.1 incorporates the outer extent of a range of different cell shapes considered to date. As illustrated later in this chapter, the cell is expected to occupy only a portion of the noted area on Figure 3.1. At the completion of the site remediation, the surface of the cell(s) will be stabilised and landscaped and will effectively encapsulate the contamination and provide an acceptable and safe long-term management solution to the potential of risk of harm to human health or the environment;

d. construction and use of associated environmental controls during and after remediation. Construction of the cell(s) will be accompanied by the construction of surface and groundwater controls for the cell and a treatment plant to treat potential future leachate and groundwater that may be emitted from the cell;

e. there are certain areas of the Main Site and Munibung Hill in the west that are too steep to develop and also too steep for machinery. While the surface soils of these areas have been affected by lead dust deposition, the above described remediation approach would be unsuitable. For these areas it is proposed to develop and implement a Site Management Plan which will include a Health and Safety Plan, planting of vegetation for dust and erosion control and if practical and necessary, installation and maintenance of settling basins to trap potentially contaminated sediments in run-off; and

f. the continuation of the existing approval for the operation of the existing jig on the PCCS Lands for the processing of lead slag. The operation of the jig will be undertaken in accordance with the controls established by the Amended Court Orders, EPL 5042, and relevant conditions of the 1995 Consent.

[3.2] Background to Current project

Chapter 2 of this EA described the actions taken to address the off-site SRoH matters arising from contamination of the Main Site as required by the RO. PCCS now wishes to remediate the PCCS Lands to provide for the future redevelopment, including change of use, of the PCCS Lands.

The making of the Declaration and the RO, which are discussed in Chapter 2, are associated with the cessation of smelting operations on the Main Site. The site remediation is part of an overall remediation strategy developed for the site by PCCS to facilitate the reuse of the land for a variety of uses including residential, industrial/commercial and open space.



The remediation strategy principally consists of:

a. economic removal of residual materials;
b. remediation and validation of development areas;
c. construction of on-site containment cell(s); and
d. implementation of a long-term Site Management Plan following remediation completion.

The strategy also envisages a staged remediation across the PCCS Lands over a number of years in conjunction with the parallel and subsequent staged redevelopment of the land.

[3.2.1] RAPs applying to the PCCS Lands

The following RAPs have been prepared as part of the documentation supporting various development or rezoning applications submitted to LMCC (as reported in Chapter 4).

a. BTES 2005c: Remediation Action Plan for the Remediation of Contaminated Soils and Fills at the Triangular Paddock Site, Main Road, Boolaroo, NSW, BTES, June 2005.
b. BTES 2005d: Remediation Action Plan for the Remediation of Contaminated Soils/Fill Materials and Groundwater at the Rail Employment Zone, 13a Main Road, Boolaroo, NSW, BTES September 2005 (draft only).
c. EES 2005b: Remedial Action for Cardiff West Estate, Boolaroo, NSW, June 2005

In addition, a Whole of Site Remedial Action Plan (WoSRAP) was prepared by Fitzwalter to document the remediation strategy (Fitzwalter 2005e – Appendix 11) for all the PCCS Lands. The WoSRAP demonstrates the remediation strategy to be technically defensible and environmentally sound and one which will render the lands suitable for its intended use. It is a central document that brings together the various technical remediation design documents and investigations to facilitate the preparation of a SAS for the subject land by the Site Auditor and to achieve endorsement from DEC.

While the WoSRAP provides a full listing of all the supporting investigation reports, two of the more important documents are:

a. Remediation Options for the Cleanup of Soil and Waste Materials at PCCS (Remediation Options Report) (CH2M Hill 2005b dated January 2005); and
b. Conceptual Containment Cell Design and Management Plan (CCCDMP) (Maunsell/Coffey, September 2005). (Attached as Appendix 12).

The Remediation Options Report (which was a key input into the WoSRAP) recommended an initial remediation strategy consisting of a number of components relating to the reuse and recycle of Inventory; the extraction of lead from the slag; construction of a containment cell; and the preparation of a Site Management Plan for the Munibung Hill slopes. While this strategy was adopted in principle, it was necessary to undertake further investigations with respect to the containment cell option to confirm the feasibility and applicability of the proposed solution for the site.

The CCCDMP was prepared to address this need. The CCCDMP investigated the geotechnical, groundwater, material compatibility and handling issues associated with the proposed containment cell option. It also included a preliminary assessment of the location of the cell, a staging plan for excavation and filling with approximate volumes, surface and groundwater controls, and an outline of requirements for appropriate environmental controls. Based on an appropriate land use scenario and in consideration of the existing on-site constraints, the report provided a conceptual design and management plan for an on-site containment cell and concluded that the concept was technically feasible as a remedial option for the existing site and the quantity and types of materials proposed.

Concurrent with the CCCDMP, Maunsell also prepared cost estimates for the construction and operation/maintenance of the containment cell which demonstrated the financial viability of the option and further supported the conclusions of the CH2M Hill 2005b report of the containment cell being the preferred remedial solution for the site.

Further details of the proposed activities related to the project from the CCCDMP are provided in this chapter.



[3.2.2] Audit Review of RAPs applying to the PCCS Lands

The site auditor produced individual Site Audit Statements (SASs) for the two RAPs for Triangular Paddock & Cardiff West Estate referred to above in Section 3.2.1. Subsequently, but in conjunction, the WoSRAP with the supporting documents (including the CCCDMP) were subject to review by the Site Auditor. The Auditor produced a Site Audit Report (SAR) and a Site Audit Statement (SAS) (attached as Appendices 13 & 14, respectively). The SAS certified that the PCCS Lands can be made suitable for the proposed uses if the remediation is undertaken in accordance with the WoSRAP subject to the condition of preparing and implementing Remedial Works Plans (RWPs) specific to the part of the Lands that is proposed to be remediated. Each RWP is required to contain detailed specifications for the remedial works, including all management plans and the Validation Plan (VP). Prior to commencing any remedial works on the PCCS Lands, each RWP is required to be reviewed by the Site Auditor.

[3.2.3] Remediation Works Outline Report

To provide engineering input which forms the basis for the impact assessment in this EA document, Maunsell was commissioned to prepare the Remedial Works Outline (RWO) report (March 2006 – Appendix 15).

The purpose of the RWO was to more closely define engineering activities so as to be able to undertake a more definite environmental assessment of the proposed remediation works on the PCCS Lands (i.e. this document). The activity description in the RWO serves as part of the project description (refer this chapter) and provides the basis for the noise, dust and surface water/sediment/erosion, and traffic assessments (refer Chapters 5, 6 and 7).

In order to achieve the purpose, the RWO detailed requirements for the implementation of the remediation works including:

a. staging plans for excavation, site clean up and cell construction including indicative timeframes and dates for project execution;
b. work areas for excavation and containment cell footprint. This included layouts in plan and approximate quantification of work surface areas;
c. site logistics for remediation works including potential haul routes, personnel required on site, and traffic movements specific to remedial works;
d. methodologies relating to cell excavation, construction and sub surface (groundwater) control measures;
e. preliminary requirements for site validation and quality assurance in so far as it relates to the remediation of the site; and
f. the objectives for environmental management and details of specific environmental controls which are likely to be required during and after the remediation works.

Note that the RWO has used a particular cell layout as a workable example (as described in Section 3.4.3 and shown in the figures in this chapter) and for assessment purposes.

Details from the RWO plus the associated “Water Quality and Water Cycle Management, Maunsell 2006b” (Appendix 16) have been used in this chapter of this EA to describe the proposed project activities.

Note that a detailed design of the containment cell will need to be completed before it can be constructed.

[3.3] **Remediation Criteria**

The WoSRAP (Appendix 11) describes the regulatory approval framework and validation process associated with the remediation strategy and how this will be implemented. Appropriate management measures will be implemented prior to and during the undertaking of the remedial works to ensure the health of humans and the environment is protected. The WoSRAP provides guidelines and principles for these measures. Specific Site Management Plans which are to be prepared prior to commencement as part of the detailed design, will be implemented during the works. Criteria used in the WoSRAP which will apply to the current project are discussed below.



Remediation acceptance criteria

The NSW EPA and ANZECC have issued a number of guidelines relevant to the identification and management of contaminated sites. The guidelines present the health-based investigation levels ("HILs") of individual substances in soil, groundwater and surface water for the various exposure settings (intended land uses – residential, commercial, industrial, open space etc).

Groundwater and surface water

The NSW EPA has endorsed the ANZECC/ARMCANZ (2000) – *Australian Water Quality Guidelines* as an appropriate reference for the evaluation of chemical concentrations in groundwater and surface water. Where there is no specific value within the ANZECC (2000) guidelines, the guideline values in the NSW EPA (1994) – *Contaminated Sites: Guidelines for Assessing Service Station Sites* should be adopted.

Soil

The NSW EPA (1998) – *Guidelines for NSW Site Auditor Scheme* and NSW EPA (1994) – Contaminated Sites: *Guidelines for Assessing Service Station Sites* present the health-based investigation levels of individual substances for the various exposure settings (intended land uses – residential, commercial, industrial, open space etc). These criteria are deemed as suitable to use for the remediation criteria for soil for the proposed land uses for the Site. Appendix B of the WoSRAP provided a consolidated table of these substances and levels for the various land uses, and associated comments and notes.

On-site containment of contaminated materials

The Maunsell/Coffey 2005a report (CCCDMP) outlines the design parameters used in the concept design of the containment cell, outlining the criteria of the materials that the cell was designed to contain. The report notes that the proposed cell is not a landfill but an on-site containment cell and as such has the design criteria have been based on *"as closely as possible the Guidelines for the Assessment of On-site Containment of Contaminated Soil prepared by ANZECC in September 1999. Where no specific criteria or guidance is provided in those guidelines, the NSW EPA (1996) Environmental Guidelines: Solid Waste Landfills (Landfill Guidelines) should be followed for design techniques. The reason for selection of these guidelines is that they are DEC accepted standards that are acknowledged for being fairly conservative and applicable to landfills designed to accept putrescible waste. They are therefore standards that can be adopted for this containment cell and contain a high degree of safety to minimise the risk of infiltration".*

Note that it is intended that the top of the cell be used for light industrial or commercial purposes even though the cell will contain contamination levels in excess of the health based investigation levels for this use. This will need to be agreed with the authorities, but this can be achieved satisfactorily by a combination of the cell capping and engineered construction and ongoing management for the top of the cell as discussed in the CCCDMP.

Off-site disposal of contaminated materials

It is expected that some further materials will be disposed of off-site (e.g. the lead from the jig). Removal of materials from site has occurred since closure (referred to as Inventory Actions in the RO) in line with the RO. The disposal has been and if applicable in the future, will be performed in accordance with NSW EPA (1999) – Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes.

Water treatment

The Main Site is subject to EPL 5042, under which it discharges from the site water treated by the on-site ETP to within limits prescribed by the EPA. Water discharged from the site is monitored and measured in accordance with the licence and reported to the EPA.

It is proposed to continue to treat on-site water under the EPL, either through the existing ETP for the initial stages of the remediation works or through the new dedicated water treatment plant to be constructed as part of the containment cell system. As such, the limits as defined in the EPL at the time will determine the criteria to which the water to be treated.

The EPL and the reported performance of the site against the EPL conditions are respectively reviewed and renewed annually by the EPA. Any revision of the limits established for the EPL should be undertaken in conjunction with the management of the site to ensure the limits are achievable with the activities and treatment facility operating on the site at that time.



It is anticipated the new water treatment plant to accompany the containment cell will be designed to treat the water to such a level such that it can be discharged to the existing sewer system and not require an EPL. However, the details of the treatment facility will be determined by the field investigations and actual measurements taken during the initial stages of the construction of the containment cell. Consultations with the authorities regarding the quantity and quality of the water to be treated, the criteria to be met by the treated water and the options for the facilities to perform the treatment are to be undertaken at this stage.

Further details of the criteria mentioned above are provided in the CCCDMP (Appendix 12), which concluded that based on the adopted criteria, a suitable design was provided for the staged construction of a containment cell over a number of years. The constructed cell and its subsequent long-term operation to manage any associated systems would safely and adequately contain the materials.

[3.4] **Project Details**

[3.4.1] Project Activities

The remediation of the PCCS Lands will require a number of elements, with various elements occurring concurrently. In order for the land areas to be suitable for redevelopment, they will require remediation and subsequent validation. The remediation works will involve three principal construction activities, which may occur concurrently. These are:

a. excavation of contaminated soils with post excavation activities sufficient to stabilise and level the excavated areas ("surface stabilisation"). Post remediation surface shaping (e.g. cut and fill and regrading to proposed development levels) will take place after all remediation activities in a particular area are complete;
b. temporary storage, treatment and possibly mixing of excavated materials as required; and
c. emplacement of excavated and other materials into the containment cell as part of the construction of the containment cell with progressive cell capping.

Ancillary activities include the installation of temporary environmental controls for excavation and the temporary and permanent environmental controls for the constructed cell, including in particular, water, erosion, dust and noise management.

Concrete breaking and removal of base slabs that were part of the smelter operations must precede the site remediation activities described here. The recovered concrete will be crushed for reuse (on or off-site). This activity is to be considered as part of the approval sought unless it is completed beforehand as part of the demolition contract. The project will also involve the removal of in-ground pipes and other services which will occur as part of the excavation activities.

[3.4.2] Proposed Remediation Staging

It is expected that the site remediation (i.e. excavation etc), validation, and audit review process as well as the cell and associated construction could be practically achieved within a period of five years. The definition of the total remediation period as five years assists in identifying the nature of the project definition and in undertaking impact assessment.

For the purposes of illustrating the progress of the remediation over the projected five year period, the five years have been divided into ten, six monthly periods (as shown in Figures 3.4 and 3.5). Planning for the remediation envisages that the excavation of the site will be progressively conducted by an excavation team, remediating one nominated individual site area at a time at an approximately steady rate. The currently proposed remediation areas and their order of remediation are specified below.

Each area of excavation will be supervised by an independent environmental consultant that will be responsible for validating that the site is remediated to meet the standards for its intended use. The excavation works, works reporting and the validation documentation will be subject to audit by the Site Auditor as a pre-requisite to it being signed-off as "remediated land" suitable for its intended future use.

Prior to containment in the cell, excavation materials will be taken to an interim storage area for holding, mixing and treatment as required. This area will be located within the anticipated final footprint of the cell. The area shall be used for material tracking, mixing and treatment to ensure that the material entering the cell meets the construction quality criteria and in addition will allow the steady supply of material to the cell for continuous cell construction.



In parallel with the excavation, a cell construction team will progressively build the cell with the material received from the excavation and from the other material already stored on-site. In practice, the rate of cell construction work is expected to be mostly dependent on the rate of excavation.

To assist in the staged excavation and later redevelopment of the site, the site has been divided into 11 separate development areas as shown in Figure 3.2. Of the 11 defined areas, areas 1-8, plus 10 will require remediation in the form of excavation and subsequent validation. Areas 9 and 11 represent the anticipated final cell location (as defined by the RWO) which is shown in Figure 3.3.

While area 9 is considered to be part of the anticipated final cell location, it is possible that the cell will not fully extend across or even reach area 9 if the estimated volumes are overly conservative. In order to conservatively consider this scenario for the purposes of this environmental assessment, the upper limit of excavation will include the estimated volume of excavation for area 9.

The cell construction has notionally been broken into the 10 cell construction areas as shown in Figure 3.3.

It is proposed to remediate and validate each area to the point where laboratory validation results indicate that the site is suitable for the proposed land use as defined in Section 3.3.

Table 3-1 provides a description of each separate land area to be remediated by excavation. The 9 areas to be remediated and validated have been prioritised in an order in which the excavation is currently considered likely to occur. This order is the result of a current assessment based on a number of factors including location, ease of remediation, interaction with the cell construction, and current views as to their development potential.

Because it is possible that the order of remediation may be re-scheduled for various reasons prevailing at the time, **PCCS is seeking that the Part 3A approval not condition the order of remediation**.

Table 3 1 - Priority of Land Area Remediation

Land Area Number	Description
1	Cardiff West Estate (Clay pits)
2	Triangle Paddock south
3	Railway Employment Zone (including part Salt water and Hawkes Dams)
4	Triangular Paddock north and Main Entry Precinct
5	Boolaroo Heights
6	Munibung Hill Residential (including Freshwater Dam sediments)
7	Munibung Slopes Industrial Estate
8	Boolaroo North
9	Cell Surrounds (including part Hawkes Dam sediments)
10	Mixed Use Zone (including part Salt Dam sediments)
11	Containment Cell

Note that the Cockle Creek Pumping station is not included here as it represents a very minor area of remediation which can be undertaken at any time during the overall works and will have virtually no bearing on the assessment in this EA (except where special mitigation measures are noted).

The areas numbered 1-4 in Table 3.1 are more likely to be remediated early in the remediation program because they have already been the subject of detailed local studies undertaken sufficient to lodge DAs with LMCC for rezoning and subdivision approval as discussed in Chapter 4 of this EA. LMCC has resolved to facilitate the conditional approvals for the noted areas as described in Chapter 4.

The impact assessment in this EA uses the nominated order as per Table 3.1, but also recognises that possible changes may be made to the order of remediation as indicated in Table 3.1.

Excavation and validation etc is expected to be at a relatively steady rate over the 5 year period. Since there are differing amounts of contamination in each of the excavation areas noted in Figure 3.2 and Table 3.1, the time for excavation of each of the areas will not directly correspond to the ten 6 monthly periods used to illustrate the progress of the works. By contrast, the areas nominated in Figure 3.3 for the cell construction have been estimated to approximately correspond to the ten, 6 monthly periods of time.



[3.4.3] Excavation and Cell Quantities

Excavation quantities have been estimated based on the earlier site investigations (CH2M Hill 2004a & b, RES 2004b). The volumes of material to be excavated from the 10 areas have been determined through the estimation of the area of contaminated land, and the anticipated depth of contamination.

It is not always possible to estimate volumes of contaminated materials exactly since the sampling grid for investigative work on contaminated sites often uses a statistical approach. To provide a conservative approach to design, a 25% volume contingency has been applied to the estimated cell volumes (except where aboveground slag material has been accurately surveyed). This leads to the possibility that the volume of material to be placed in the cell may be less than currently estimated. (While it is also possible that there will be a greater volume, this is a less likely outcome due to the inclusion of the 25% contingency).

Including the contingency factor, the maximum excavation volume expected is estimated to be 750,000 m^3 (rounded). On the basis of a relatively steady rate of remediation, this means that 75,000 m^3 is to be excavated during each 6 monthly period. The estimated areas and calculated volumes for each area of land to be excavated are shown in Table 3-2 below.

Table 3 2 - Area Excavation Volumes

Land Area Number	Description	Area (m^2)	Excavation Volume (m^3)	Excavation Volume with 25% (m^3)
1	Cardiff West Estate (Clay pits)	160,300	20,000	25,000
2	Triangle Paddock south	72,687	75,401	94,252
3	Railway Employment Zone (including part Saltwater and Hawkes Dams)	114,800	42,010	52,513
4	Triangular Paddock north and Main Entry Precinct	132,142	49,439	61,798
5	Boolaroo Heights	101,300	20,267	25,334
6	Munibung Hill Residential (including Freshwater Dam sediments)	224,813	43,592	54,490
7	Munibung Slopes Industrial Estate	23,896	4,779	5,974
8	Boolaroo North	122,200	136,478	170,598
9	Cell Surrounds (including part Hawkes Dam sediments)	59,696	96,935	121,169
10	Mixed Use Zone (including part Saltwater Dam sediments)	89,939	111,403	139,254
	Totals	**1,101,773**	**600,304**	**750,380**

In addition to the excavated materials, there are quantities of other materials which may be placed in the cell. These include:

a. on-site slag stockpiles;
b. smelter inventory material to be retained on site including dam sediments;
c. Cockle Creek Mix (a particular smelter by-product which is separately stockpiled);
d. demolition and dump wastes;
e. the LAS materials (Community Soils to be brought from off-site); and
f. Incitec materials (as yet unquantified).

The volumes of the slag stockpiles have been accurately surveyed at 171,000 m^3 already in place plus a further 95,000 m^3 which will require relocation from its existing location on site. The total volume of contaminated materials to be placed (as listed above and including contingencies) is likely to be in the order of 221,900 m^3 giving a total cell volume of about 1,142,900 m^3. This volume excludes the contaminant free cell capping which is currently about 2 m in thickness on the surface of the cell.

Material volumes for *in-situ* materials or materials that will require movement from their current storage are shown in Table 3-3.



Table 3.3 - Other Volumes to be included in the Containment Cell		
Description	**Estimated approximate Volume (m^3)**	**Estimated approximate Volume with 25% contingency (m^3)**
Lead Blast Furnace Slag	111,000 (not to be excavated)	111,000 (known volume)
Imperial Smelting Furnace Slag	155,000 (60,000 not to be excavated, the balance of 95,000 is above ground and will be distributed across the cell)	155,000 (known volume)
LAS (Community Soils)	60,000	75,000
Inventory	1,520	1,900
Demolition and Dump Wastes	10,000	12,500
Cockle Creek Mix	30,000	37,500
Cell Volume Totals including excavated material	**967,824**	**1,143,280**
Volumes that need placing in the cell	**196,520**	**221,900**

In the RWO Report (Appendix 15), the proposed location of the cell was determined having regard to the following approximate boundaries:

a. the existing on-site PCCS road to the south-west;
b. the Incitec-Pivot boundary to the south-east; and
c. the railway easement to the east and north-east.

The height of the cell was also specified to be a maximum of approximately 10 m (including a 2 m capping layer) above the existing ground level (adjacent to the southern portion of the monolith as described in Section 3.1) as this represented the existing maximum height of the monolith plus the 2 m for capping. The north-western boundary of the cell will be determined by the volume of material to be contained in the cell, but will not extend beyond a line approximately 100 m from the PCCS Main Site western boundary. Based on the estimated volumes provided above, the cell will have an approximately rectangular footprint 440 m by 485 m equivalent to an area of about 21 ha (rounded).

As indicated in Section 3.1 of this EA, this represents only one possible scenario for the cell location and height. The precise details of the final cell size and location will be determined by a number of factors including the detailed design of the cell, the actual volumes requiring containment, and shaping and levelling of the redevelopment site. However, the location and maximum size of the cell will be as described in Section 3.1.

[3.4.4] Excavation Activities and Logistics

Excavation of the contaminated soil on the PCCS Lands will involve the following activities:

a. Generally require one or more excavators removing the material, supported by a loader, and haul trucks;
b. Analysis of the material – Sampling and analysis of the material shall be undertaken in accordance with the relevant construction standards in order to characterise the material being removed from the particular site area;
c. Transport of the material – Haul trucks shall be used to transport the material to the cell or to the mixing and treatment area;
d. Site Validation – Sampling and analysis of subsurface material to validate sufficient excavation and removal has occurred; and
e. Development preparation – Preparation of the site for future development with minor backfilling, covering and stabilisation of the excavated area to make it safe and ready for future development activities including site shaping and levelling etc.

Logistics Assumptions

The RWO Report has developed the excavation logistics presented here. It is acknowledged that the logistics have not attempted to optimise the use and matching of equipment nor specify exactly what equipment is to be used as this will ultimately be determined during the tender and construction phase of the remediation contract. In some cases, the dimensions of the particular remediation site will also influence the choice of equipment. The future accepted construction contract will use equipment and scheduling that will respond to the conditions of the Part 3A approval.

Working days and hours

On the basis of work only occurring on week days, there is an effective 100 working weekdays in each 6 monthly period allowing for holidays and wet weather. However, the contractor can use Saturday mornings during the specified hours as necessary and PCCS would be seeking to conduct work at other times for specific purposes.

Excavation Requirements

As stated in Section 3.4.3 above, each 6 monthly period will involve the excavation of a rounded estimate of 75,000 m^3 of contaminated soil. With 100 available days an average daily excavation rate of 750 m^3 will be required during each 6 month period.

Excavation equipment and operations

The required excavator has been assumed to be a 20 to 30 tonne excavator which is typical for this type of work. The excavation rate for this type of excavator has been conservatively estimated at 800 m^3 per day, although it may be possible to achieve up to 1,200 m^3 per day once a crew is established and practiced depending on the physical characteristics of the material type being handled.

Excavators can load directly into trucks or alternatively, a loader can be used between the excavator and the truck. For the purposes of this assessment, it has been assumed that an excavator and a loader will be used. However, in practice, either technique may be applied depending on particular circumstances.

For the purposes of this assessment, 4x2 Rigids trucks have been assumed, although a combination of bogeys and Rigids or even large dump trucks could likely occur.

Based on assessments of the haul route distances, it has been estimated that on average, a turnaround time for truck movements (i.e. load from the excavation area, drive to the cell area, unload and return for the next load, including waiting time) would be 20 minutes for the longer hauls and 15 minutes for the shorter hauls.

On average 3 trucks are expected to be sufficient to service the proposed excavation rate.

Excavation Working Areas

As a general guide, it is proposed to control the amount of exposed soil at any given time during the remediation and validation of the various areas. This will limit the potential impacts caused by runoff of sediment and the generation of dust (both contaminated and uncontaminated).

Post Remediation Site Filling and Regrading

After an area has been remediated, validated and audited as being ready for redevelopment and the remediation excavation team has moved to a new location, regrading and stabilisation of the relevant work site to the desirable development level can take place. The determination of the desired surface levels will be established as part of the overall planning for the remediated site. This process may simply involve the importation and placement of clean soil or may additionally involve some cut and fill activities on the site.

The importation of clean fill will involve trucks with loads suitable for public roads. The source of clean fill has not been fully defined as yet, but there are possibilities for PCCS to accept clean fill from nearby off-site developments as they occur. The acceptance of clean fill may occur at times before or during the remediation process. Materials received on site will be separately stored in “clean” areas to avoid any possibility of cross-contamination.

Typical equipment to be used for the regrading and stabilisation activities are front-end loaders, dozers, trucks and compactors.



Excavation Team

Based on the above, the excavation team will require the following equipment:

a. one excavator – rated to excavate the soil material at 800 m^3 (in-situ) but only needing to produce 750 m^3/day leaving spare capacity;
b. one Loader to load trucks – after initial site clearance, stockpiled material can be loaded into the haulage trucks; and
c. three (4x2) Rigid Dump Trucks – to transport the contaminated material to the mixing area.

In addition to this earthmoving equipment, each team will require access to the following equipment, either as dedicated plant to that area of excavation, or shared with other areas being concurrently excavated:

a. one water cart for dust suppression;
b. one grader for site maintenance, clearing of access roads etc; and
c. one refuelling/maintenance vehicle for equipment maintenance.

Excavation Times in Each Area

As indicated earlier, the different contamination levels in each area will determine the amount of time taken for excavating in each area. Table 3.4 shows the approximate time that the excavation team will spend in each area using the excavation volumes from Table 3.2 and assuming the rate of 75,000 m^3 per 6 monthly period. Note that this table excludes validation, auditing and filling activities.

Table 3 4 - Estimated Excavation Times for Each Area

Land Area Number	Description	Area (m^2)	Excavation Volume with 25% (m^3)	Estimated Excavation Time (months)
1	Cardiff West Estate (Clay pits)	160,300	25,000	2.0
2	Triangle Paddock south	72,687	94,252	7.5
3	Railway Employment Zone (including part Saltwater and Hawkes Dams)	114,800	52,513	4.2
4	Triangular Paddock north and Main Entry Precinct	132,142	61,798	4.9
5	Boolaroo Heights	101,300	25,334	2.0
6	Munibung Hill Residential (including Freshwater Dam sediments)	224,813	54,490	4.4
7	Munibung Slopes Industrial Estate	23,896	5,974	0.5
8	Boolaroo North	122,200	170,598	13.6
9	Cell Surrounds (including part Hawkes Dam sediments)	59,696	121,169	9.7
10	Mixed Use Zone (including part Saltwater Dam sediments)	89,939	139,254	11.2
	Totals	**1,101,773**	**750,380**	**60.0**

The notional excavation staging plan based on the order of remediation and timing from Table 3.4 is shown in Figures 3.4 and 3.5.

Field Testing in CWE

The project description relating to the excavation has been based on a number of assumptions. To enhance the level of knowledge of the site and the proposed excavation techniques and timing and to assist in subsequent environmental impact management during the works, PCCS is to undertake field trials in the CWE area in parallel with the Part 3A process. Areas of CWE will be excavated and remediated with the contaminated material being stored in stockpiles on the main site and within areas near the cell that will be remediated at a later stage. The field trials will monitor the performance and efficiency of the remediation activities and gather actual data for dust and noise generation and groundwater monitoring. The findings will be incorporated into the Environmental Management Plans (EMPs) that are to be used during the remediation project.

[3.4.5] Treatment and Handling

Stockpiling of materials will be required at interim storage and handling areas near the cell which will be used for soil segregation, treatment, and mixing (as necessary) ahead of placement in the cell. The storage, mixing and treatment area will be located within the proposed cell footprint.

A key to the cell construction is to achieve sufficient compaction to avoid future settlement and to provide a stable, solid base for future surface use. Thus it is important to ensure that the materials to be placed in the cell have good compaction characteristics. The treatment area will be used to treat materials to achieve optimal moisture levels as well as having sufficient geotechnical strength and stability. Typical treatments are drying or wetting for the bulk of the material, although some chemical treatment may be required for stabilisation purposes for special small volume wastes. Alternatively or in addition, mixing or blending of different soils will be used to achieve suitable compaction requirements. The detailed design will provide more specific testing detail for each of the different materials to be placed in the cell.

Location of the storage, mixing and treatment in this way will allow the ready supply of the cell from this area and ensures that the same area will be available until the cell is almost complete. In addition, any residual impact from the storage and/or treatment will be contained within the final cell footprint and any leachate generated will be captured within the collection system. The area will also be within the construction water management system and as such handle any contaminated water (ground or surface) that comes from the working of the materials in these areas. These restrictions result in the preferred location for such storage area being towards the north-western extent of the proposed cell footprint.

Drying beds may be required to stabilise various materials with higher than optimal moisture contents prior to their containment. The location of the drying beds is proposed to utilise either the existing hardstand within the industrial grounds to the south west of the site, or within the containment cell anticipated final footprint itself, on top of areas yet to be remediated, so as to ensure that any impact from this drying operation can be contained and will be remediated.

Not all of the excavated material at each stage requires further treatment.

To enable the mixing and treatment of loose *ex-situ* material per 6 monthly period, a notional mixing and treatment team will require the following equipment:

a. one front end loader with Backhoe–capable of transporting and loading 600 m^3 loose ex-situ material per day; and
b. one water cart for dust suppression.

Refuelling/maintenance duties will be taken care of using the cell construction team, which will be operating adjacent to the mixing and treatment area.

[3.4.6] Cell Construction

The CCCDMP provides the concepts of the cell design and construction. As indicated earlier, a final detailed design is yet to be undertaken. This final design will produce details sufficient for construction contractors. This section provides an overview of the equipment and personnel needs.

Material is to be placed within the cell only after the following conditions have been met:

a. Material is physically suitable for construction (post mixing and treatment as required);
b. Material source has been tracked; and
c. Material has been categorised.

Cell construction shall generally progress in a north western direction (refer Figure 3.3) which will have the flexibility to deal with any changes in material volumes requiring containment as work progresses. The construction of the cell is to be completed progressively over the nominal period of 5 years. Figures 3.6 and 3.7 provide an indication of the staged progress of the construction.

To enable stability of the containment cell for ultimate development on top of the cell and for Occupational Health and Safety reasons, material being placed within the cells must be done so under controlled conditions which are set out below.



A dedicated loader will collect the material from the mixing area and deliver it to the tipping face of the cell. At this point a dozer or grader will be used to spread the material evenly before it is compacted using a padfoot compactor/roller.

Material will be placed in the appropriate containment cell (as determined by its categorisation) and cover the entire surface of the current area of construction. Material will be placed in layers and compacted in accordance with the design requirements.

Construction of the cell is likely to follow the following sequential steps:

a. a drainage layer and leachate collection and conveyance system (LCCS) is to be placed at the base of the cell;
b. materials placement; and
c. the conceptual design for the proposed capping for the roof and side walls of the cell consists of the following layers in sequential order from the contained material upwards:
    - Seal Bearing Layer;
    - Natural Material Sealing Layer;
    - Infiltration Drainage Layer;
    - Revegetation Layer (where required– typically side batters of cell); and
    - Hardstand Layer (where required – typically top of Cell) or landscaping.

No gas collection layer is proposed, as the materials to be confined within the cell will be of an inorganic, non reactive nature, and inorganic gas generation is not expected in the cell.

Exposed working areas are to be limited due to the potential for dust generation and erosion.

To minimise the areas exposed during construction works, progressive capping of the cell shall be employed. The nature of the capping layers and materials is discussed in the CCCDMP. Where possible, as soon as an area of the containment cell has been filled in, capping shall be placed upon the material without waiting for the entire construction stage to be completed before capping of that stage commences.

Clean material (either Virgin Excavated Natural Material (VENM) or soils appropriately validated as suitable for capping) will be imported to the site for the purposes of capping and backfilling.

At the excavation rate specified in Section 3.4.4 up to an approximate 75,000 m^3 of excavated material plus 22,200 m^3 (rounded) of other existing material will be placed in the cell in each 6 month period.

A dedicated loader will collect the material from the mixing area and deliver it to the tipping face of the cell. At this point a dozer or grader will be used to spread the material evenly before it is compacted using padfoot rollers.

In order to construct the cell using the noted volumes per stage, the following team and equipment will be required:

a. one loader. The loader will be used to transport material between the mixing area and the tipping face of the cell;
b. one dozer or grader. A dozer or grader will be used to distribute the material evenly at the tipping face, in preparation of final compaction; and
c. two padfoot compactors/rollers.

In addition to this earthmoving equipment, each team will require access to the following equipment, dedicated to that area of cell construction, or shared as required with the mixing and treatment area:

a. one water cart for dust suppression; and
b. one refuelling/maintenance vehicle for equipment maintenance.

Figure 3.8 contains two typical sections through the cell in relation to the existing ground level showing the capping and the typical details at the western extremity of the cell. It is envisaged that the batters of the cell will be vegetated with native grasses and shallow rooted trees to stabilise the sides of the cell. The landscaping details will be provided as part of the detailed design.

[3.4.7] Sub-surface Water Control Measures

Details of the proposed sub-surface water control measures are provided in the CCCDMP (Appendix 11) and the RWO (Appendix 15) Reports.

Existing groundwater flow direction from Munibung Hill site is similar to the topographic gradient directions and is generally towards the north-west. Sub-surface water control measures have been focused into three areas and this is illustrated on Figure 3.9):

a. interim down-gradient boundary capture at the South West Dam;
b. interim down-gradient boundary capture at Hawkes Dam; and
c. permanent down-gradient capture and up-gradient interception of the containment cell footprint.

Interim capture of the groundwater at the down-gradient boundaries of the PCCS site (i.e. at the South West and Hawkes Dams) has been installed. This consists of 3 pumped wells at each boundary collecting the shallow groundwater for treatment before it is discharged from the site in accordance with EPL 5042. These groundwater capture locations provide contingency measures for groundwater leaving the PCCS Main Site until the site is remediated and the cell sub-surface water control measures are installed. These measures are discussed in more detail in Chapter 6 of this EA.

Sub-surface water control measures surrounding the containment cell structure will be installed in order to:

a. prevent groundwater ingress from up-gradient, hence minimising the generation of leachate within the containment cell; and
b. cut off and collect water generated from within the containment cell mass and underlying soils, to prevent this from further migration down gradient and ultimately off-site.

The proposed water control measures are grouped into two types:

a. up-gradient measures: a cut-off wall keyed into bedrock along the eastern boundary of the cell complex accompanied by a drainage trench to direct the groundwater away from building up against the wall. A runoff diversion bund is also to be located immediately up topographic gradient of the cut-off wall / interception drain for the surface water; and
b. down-gradient measures: a drainage trench excavated to the top of bedrock along the downstream perimeter of the cell complex and an internal perimeter drain.

Figure 3.9 shows typical details of the cut-off wall and drainage trench.

Any shallow groundwater under the cell or leachate that is generated from the cell during construction or after remediation is complete will be collected for treatment before discharge from the site.

[3.4.8] Surface Water Management

Figure 3.10 shows the seven water catchments on the PCCS Lands and also indicates the direction of flow of surface water from Munibung Hill across the site and down to Cockle Creek.

The “Water Quality and Water Cycle Management” report (Maunsell 2006b – Appendix 16) contains details on the techniques to be applied to manage the surface water during the site remediation to control pollution and minimise potential impacts. The “PCCS Site Remediation Surface Water Quality” report (Fitzwalter 2006 – Appendix 17) supplements the Maunsell report with a description of the existing water management systems and water quality and that are proposed during and after the site remediation.

Contaminated surface water is currently collected in a series of catch dams on the Main Site and treated in an existing Effluent Treatment Plant (ETP). The location of the existing ETP is shown on Figure 3.2. Details of the existing system are provided in Fitzwalter 2006 Remediation Surface Water Quality report.

The existing surface water system will continue to operate throughout the site remediation, but will be supplemented by works at each excavation site and at the cell storage, treatment and construction areas. The existing ETP will continue for most of the remediation period, but will eventually be de-commissioned and replaced following the commissioning of the proposed new ETP which is to be installed in order to treat any leachate or groundwater emanating from the containment cell. The notional location of the new ETP is shown on Figure 3.9.



The following is a summary of the principles from Maunsell 2006b that will be used to manage the surface water during the remediation process. The principles have been developed to be applicable to activities site wide:

a. divert all clean water around contaminated sites to discharge topographically downstream of the site;
b. separate "clean" and "dirty" water across the site;
c. trap "dirty water" and eroded sediment from disturbed sites, as close to the source of the sediment as practical;
d. runoff from contaminated sites to be treated before discharge to Cockle Creek;
e. minimise the extent of disturbed areas during remediation of any given stage;
f. rapidly revegetate remediated areas where possible. Any areas that are not revegetated should be stabilised;
g. continue ETP operations during remediation;
h. maximise the reuse of treated water on-site;
i. maximise dam storages during remediation operations and minimise any overflows from dams retaining contaminated runoff;
j. maintain the integrity of essential piped drainage networks during remediation; and
k. progressively cover containment cell to minimise leachate. All leachate to be appropriately treated.

[3.5] **Hours of Construction**

It is proposed that remediation works will generally take place in accordance with the following general construction hours specified in the DEC's Environmental Noise Manual:

a. Monday to Friday – 7.00am-6:00pm;
b. Saturday – 7am-1pm (only quiet work between 7am-8am); and
c. No work on Sundays or Public Holidays.

In the event that project activities are required outside of these times for particular reasons such as emergencies, long periods of wet weather, transport of large equipment, adjustment of services or transport infrastructure or the like, then PCCS will liaise with the DEC to obtain permission for these activities to occur.

[3.6] **Operation Phase**

[3.6.1] Containment Cell

As various parts of the PCCS Lands outside the containment cell are remediated, it is intended to subdivide the remediated areas for redevelopment and sale. It is intended that rezoning will be implemented before remediation. This process will also involve the progressive excision of remediated parts of the PCCS Lands from the RO. This will occur in parallel with the remediation works, but does not form part of this Part 3A application.

At completion of the remediation, it is envisaged that the containment cell and its associated leachate effluent treatment plant (new ETP) will be included on a single property title. All external surfaces of the cell will be maintained in a manner that preserves the integrity of the capping layer and the cell containment.

It is expected that during and for a suitable period of time (to be determined during the detailed design phase) following completion of the construction of the cell, measures will be installed to monitor the effectiveness of the structure and its systems.

These measures, which are expected to include such items as down-gradient groundwater and surface water monitoring and periodic sampling (as identified in the IGMP and CCCDMP), will continue to monitor the environmental conditions surrounding the cell until such time as it demonstrated it has reached a stable state. The monitoring will also identify the necessity for any corrective actions etc. The details of the measures will be defined in the construction Site Management Plan (SMP) and Validation Plan (VP) and will be prepared for the containment cell at the detailed design stage.



A long-term SMP will be developed during the construction of the containment cell and implemented following construction completion. The long-term SMP will be such that the actual requirements of the containment cell can be assessed based on field data which will determine the specifications for the plan. The long-term SMP will include such details as:

a. groundwater management (incl. monitoring);
b. surface water management (incl. monitoring);
c. leachate management (incl. monitoring);
d. treatment of water (incl. monitoring);
e. operation of the effluent treatment plant;
f. ownership / responsibility of the cell (see below); and
g. maintenance of the cell.

The new ETP will be designed to treat any leachate that emanates from the cell from either surface water infiltration or from groundwater infiltration (CCCDMP). If contaminated groundwater is still being captured at the boundaries of the PCCS Lands at this time (see below), then it too may be treated in this ETP. It is expected that the initial flows from the cell will represent the peak flows as a result of the period of cell construction being partially open to rainfall penetration. Thereafter, ETP flows are expected to diminish to very low volumes as the cell capping and upstream cut-off walls will effectively limit inflows to the cell to very small percentages of the external rainfall and groundwater flows. Accordingly, the ETP is expected to only require periodic supervision. The ETP will discharge to either the sewer (under an agreement with the water authority) or the creek (under an EPL).

The flat top surface of the cell is planned to be developed for low-rise, light industrial or commercial use. The 1:4 or 1:5 batters of the cell (to the south-west and north-west of the RWO cell layout) will be landscaped and maintained as visual open space. It is probable that the north-east and south-east sides of the cell will be filled or levelled to match the contours of the adjoining remediated lands. All surfaces of the cell and adjacent batters will be maintained to retain their design standards with respect to containment.

[3.6.2] Munibung Hill Lands

As indicated in Section 3.1, a Site Management Plan will be prepared for these areas. It is expected that the existing zoning of these areas which is 7 (2) Conservation (Secondary) will be retained. No active use is proposed for these areas, but rather they are intended to form part of the vegetated landscape associated with the upper slopes of Munibung Hill. It is expected that after a period of vegetation establishment and monitoring, that these areas will become self reliant and require no ongoing management or maintenance. It is possible that some agreement may be reached to incorporate these areas into public ownership.

[3.6.3] Pollution Controls on the Remediated Lands

After remediation and validation, the remediated Lands are not expected to pose any environmental or human health issues. Also, the groundwater flowing through these areas will not pose any contamination issues as any material exceeding the criteria for the intended land use for that area would have been removed or appropriately managed. Thus, the contamination levels in the groundwater flowing through the PCCS lands post-remediation should reflect the background levels of those upstream of the particular area.

Note that this assumes that the discharge of contaminated groundwater onto the PCCS Lands from the Incitec-Pivot site will have been effectively ceased. In this regard, Incitec-Pivot has indicated closure of the plant in 2009 (Appendix 1) followed by remediation which will lead to this outcome.

Monitoring of groundwater will be undertaken throughout the remediation works and possibly for a period afterwards until it is demonstrated that the groundwater from the remediated Lands no longer poses a significant risk of harm as ascribed under the RO. Typically, it is expected that the groundwater quality from the PCCS Lands will improve as a result of the remediation and approach the background groundwater quality. Under the IGMP, there will be regular monitoring and reporting of improvements during the progress which will allow progressive assessment of the success of the remediation and the magnitude of the potential pollution emissions.



As well as the monitoring data, the issue of SRoH will be regularly revisited. The Fitzwalter 2005 and 2006 reports already put forward data supporting the premise that the current emission levels of groundwater from the PCCS Lands do not necessarily represent a SRoH issue. It is envisaged that the monitoring requirements will be specified in the modified EPL applying to the remediation works and that these will initially be based on the program already accepted by DEC for the groundwater well installations as discussed in Sections 2.2.2 and 3.4.7. The monitoring requirements will be assessed in the annual EPL renewal process.

When monitoring results indicate that no further monitoring is required, the groundwater wells that have been installed at the SWD and HD boundaries will be decommissioned.

Similarly, monitoring requirements for dust and surface water are expected to cease at a time to be agreed with DEC. Dust monitoring is expected to cease immediately the remediation works are complete or earlier if the data warrants. Similarly, surface water quality monitoring of water leaving the PCCS Lands is expected to cease once the containment cell is sealed or earlier if the data warrants.

It is envisaged that the EPL that will be a consequence of the Part 3A approval will recognise the eventual ending of monitoring responsibilities.

As indicated above, remediated lands are to be progressively excised from the RO. The RO is expected to be completely extinguished at the completion of the containment cell works and monitoring period.

[3.6.4] Long Term Cell Management

The arrangements for ensuring the ongoing management of the containment cell and STP will incorporate the concepts set out below.

Because the cell will be constructed and operated based on conservative engineering which will be based on sound scientific and engineering data, and having regard to the physical safeguards including surface and sub-surface water management which will be incorporated into the cell's design and construction, it is expected that potential liability for the cell should reasonably be limited to the monitoring and maintenance of the cell integrity.

The proposed arrangements are as follows:

a. the land on which the containment cell and the ETP are located will, through future subdivision of the Main Site, form part of either the 'common property' of a strata scheme or the 'community property' of a community scheme. The common property or the community property as relevant will exclude the surface of the containment cell which will be developed for highest and most beneficial use;
b. other lots, including the surface of the containment cell, within the relevant subdivision will be sold to third parties following completion of the remediation as described in this EA and following the grant of an appropriate subdivision approval. Approval of the subdivision, and approval of future uses of the lots within the subdivision, does not form part of this Part 3A application;
c. the cost of ongoing maintenance of the containment cell will be funded by contributions levied under relevant strata titles or community titles legislation, on the owners of the various lots within the subdivision;
d. it is proposed to let long term contracts (30-40 years) for the construction and maintenance of the cell and ETP. The contractor will be required to obtain and maintain an appropriate level of insurance;
e. it is intended that the owners' corporation will obtain and maintain an appropriate level of insurance in respect of the possible catastrophic failure of the containment cell in addition to the constructor's warranty and defects liability protection negotiated before the commencement of works. The level of the insurance will be established following an actuarial assessment of the possible costs of remedying a catastrophic failure, and is expected to be maintained for a period of approximately 10 years; and
f. PCCS is to fund the construction and maintenance of the containment cell until able to establish (with actuarial assistance as required) that levies and owner contributions (if any) are sufficient to meet budgeted expenditure requirements.



Figure 3.1
Cell Options

MAUNSELL | AECOM

LEGEND:

1 CARDIFF WEST ESTATE
2 TRIANGULAR PADDOCK SOUTH
3 RAILWAY EMPLOYMENT ZONE
4 TRIANGULAR PADDOCK NORTH AND MAIN ENTRY PRECINCT (FORMERLY SUPERLOT 5A)
5 BOOLAROO HEIGHTS
6 MUNIBUNG HILL RESIDENTIAL
7 MUNIBUNG HILL INDUSTRIAL
8 BOOLAROO NORTH (FORMERLY SUPERLOT 5B)
9 CELL SURROUNDS
10 MIXED USE ZONE
11 CONTAINMENT CELL

EXISTING ETP

PROPOSED ETP

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04
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North

50 0 100 200m
1:5000 FULL SIZE A1

Pasminco Cockle Creek Smelter
Site Plan

Figure 3.2

MAUNSELL | AECOM

LEGEND:

CAPPED CONTAINMENT CELLS

1 - 10 CONSTRUCTION STAGING

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03
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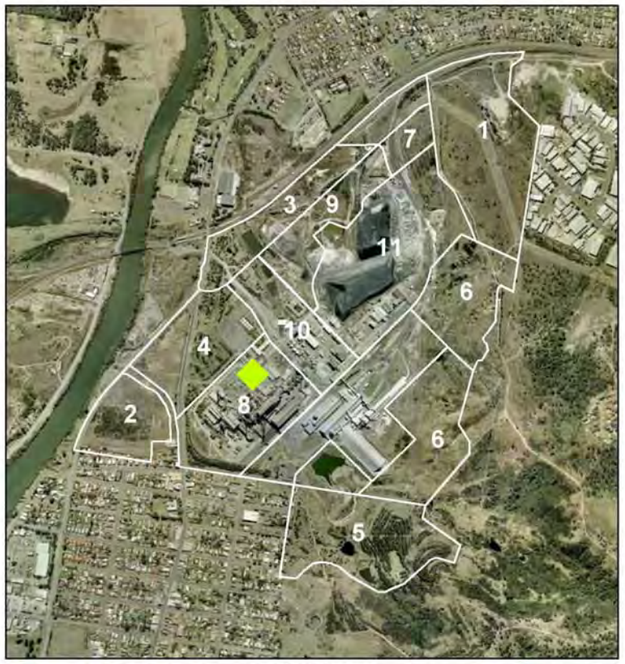
North

20 0 20 40 60 80 100m
1 : 2000 FULL SIZE A1

Pasminco Cockle Creek Smelter
Cell Layout

Figure 3.3

MAUNSELL | AECOM

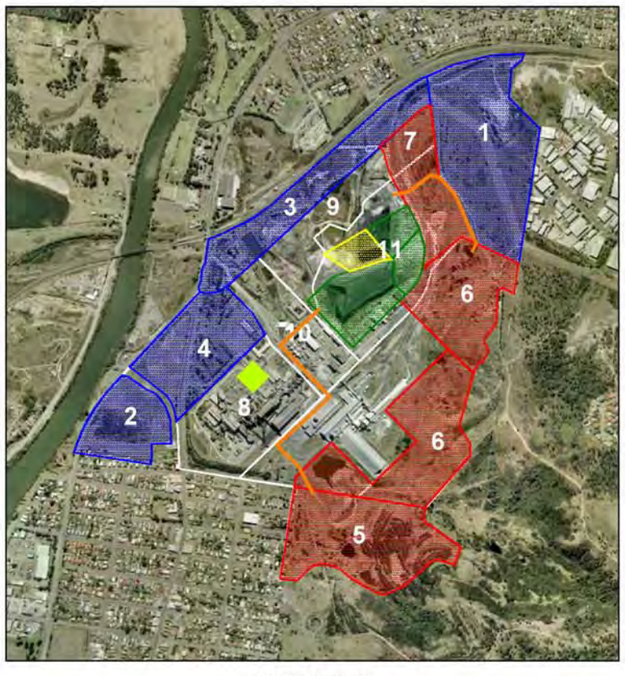


MONTH 0

MONTHS 1-6

MONTHS 7-12

MONTH 13-18



MONTHS 19-24

MONTHS 25-30

LEGEND:

- UNDERGOING REMEDIATION
- VALIDATED
- ACTIVE FILLING
- CAPPED CONTAINMENT CELL
- HAUL ROUTES

MONTHS FROM APPROVAL

LEGEND:

1. CARDIFF WEST ESTATE
2. TRIANGULAR PADDOCK SOUTH
3. RAILWAY EMPLOYMENT ZONE
4. TRIANGULAR PADDOCK NORTH AND MAIN ENTRY PRECINCT (FORMERLY SUPERLOT 5A)
5. BOOLAROO HEIGHTS
6. MUNIBUNG HILL RESIDENTIAL
7. MUNIBUNG HILL INDUSTRIAL
8. BOOLAROO NORTH (FORMERLY SUPERLOT 5B)
9. CELL SURROUNDS
10. MIXED USE ZONE
11. CONTAINMENT CELL

EXISTING ETP

PROPOSED ETP

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North

100 0 100 200 300 400 500m
1: 10000 FULL SIZE A1

Pasminco Cockle Creek Smelter
Excavation Staging Plan - Sheet 1 of 2

Figure 3.4

MAUNSELL | AECOM

MONTHS 31-36

MONTHS 37-42

MONTHS 43-48

MONTHS 49-54

MONTHS 55-60

MONTHS COMPLETE

LEGEND:

- UNDERGOING REMEDIATION
- VALIDATED
- ACTIVE FILLING
- CAPPED CONTAINMENT CELL
- HAUL ROUTES

MONTHS FROM APPROVAL

LEGEND:

1. CARDIFF WEST ESTATE
2. TRIANGULAR PADDOCK SOUTH
3. RAILWAY EMPLOYMENT ZONE
4. TRIANGULAR PADDOCK NORTH AND MAIN ENTRY PRECINCT (FORMERLY SUPERLOT 5A)
5. BOOLAROO HEIGHTS
6. MUNIBUNG HILL RESIDENTIAL
7. MUNIBUNG HILL INDUSTRIAL
8. BOOLAROO NORTH (FORMERLY SUPERLOT 5B)
9. CELL SURROUNDS
10. MIXED USE ZONE
11. CONTAINMENT CELL

EXISTING ETP

PROPOSED ETP

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03
09.06.06

North

100 0 100 200 300 400 500m
1 : 10000 FULL SIZE A1

Pasminco Cockle Creek Smelter
Excavation Staging Plan - Sheet 2 of 2

Figure 3.5

MAUNSELL | AECOM

MONTH 0

MONTHS 1-6

MONTHS 7-12

MONTHS 13-18

MONTHS 19-24

MONTHS 25-30

LEGEND:

ACTIVE FILLING

CAPPED CONTAINMENT CELL

MONTHS FROM APPROVAL

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03
09.06.06

North

50 0 100 200m
1 : 5000 FULL SIZE A1

Pasminco Cockle Creek Smelter
Construction Staging Plan - Sheet 1 of 2

Figure 3.6

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North

50 0 100 200m
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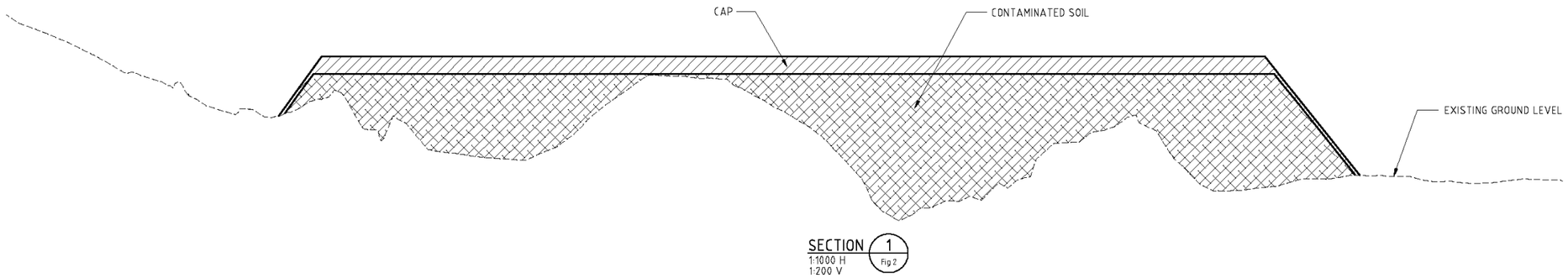
Pasminco Cockle Creek Smelter
Construction Staging Plan - Sheet 2 of 2

Figure 3.7

MAUNSELL | AECOM



SECTION 1 (Fig 2)
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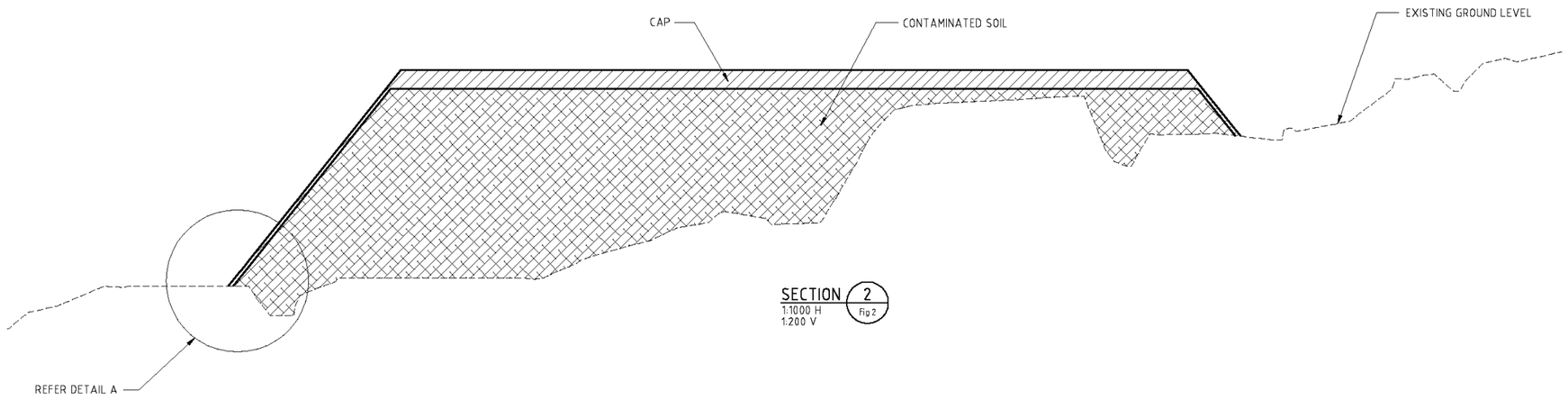
1:200 V



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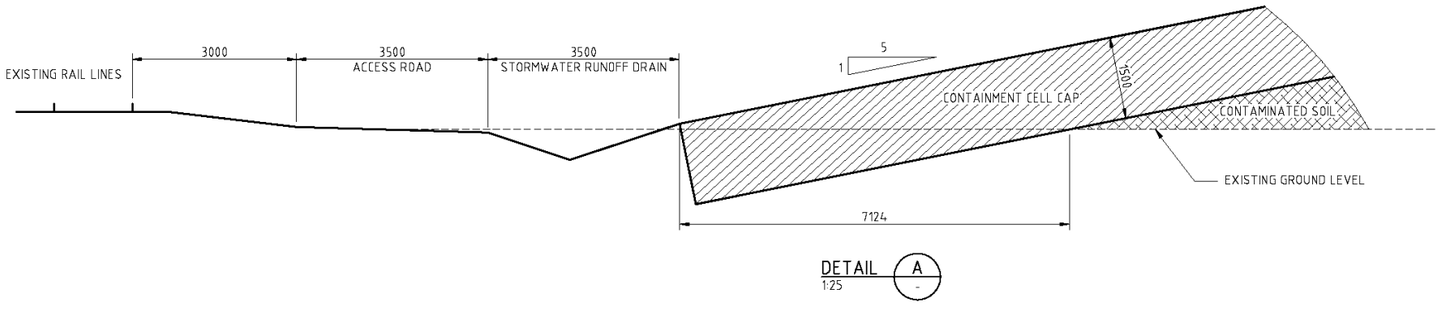

DETAIL A
1:25

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0.25 0 0.50 1.00m
1 : 25 FULL SIZE A1

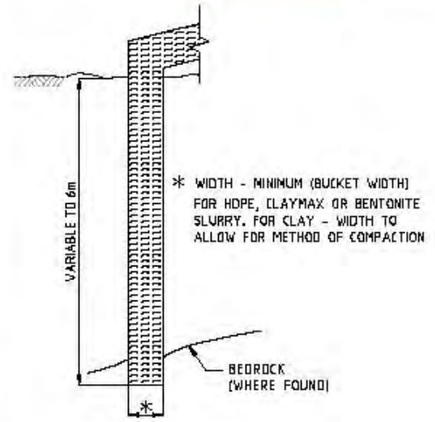
2 0 2 4 6 8 10m
1 : 200 FULL SIZE A1

10 0 10 20 30 40 50m
1 : 1000 FULL SIZE A1

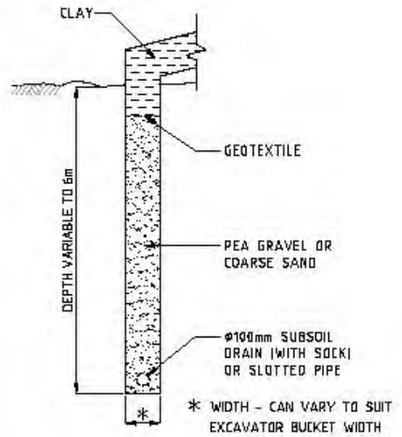
Pasminco Cockle Creek Smelter
Cell Deatils and Sections

Figure 3.8
(refer to Figure 3.3)

MAUNSELL | AECOM



TYPICAL CUTOFF WALL DETAIL
NTS



TYPICAL DRAINAGE TRENCH DETAIL
NTS

LEGEND:

- HAWKES DAM RECOVERY WELLS
- SOUTH WEST DAM RECOVERY WELLS
- UP GRADIENT CUT-OFF WALL
- UP GRADIENT INTERCEPTION DRAIN
- DOWN GRADIENT COLLECTION TRENCH
- PROPOSED CONTAINMENT CELL
- PROPOSED ETP

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North

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Pasminco Cockle Creek Smelter
Sub Surface Water Control Measures

Figure 3.9

MAUNSELL | AECOM

LEGEND:

- CATCHMENT BOUNDARY
- FLOW
- PROPOSED CONTAINMENT CELL

NUMBER	CATCHMENT	AREA (Ha)
1	SOUTH EAST	71
2	SOUTH WEST	17
3	NORTH EAST	34
4	NORTHERN	25
5	OFFSITE	7.3
6	NORTHERN DUMP	34
7	CENTRAL	7.7
8	TRIANGULAR PADDOCK	9.6

NOTE:

THESE CATCHMENT BOUNDARIES AND AREAS HAVE BEEN TAKEN FROM OF THE SURFACE WATER AND WASTEWATER MANAGEMENT REVIEW PRODUCED BY CH2MHILL (OCTOBER 2004) AND THE SITE AUDIT STATEMENT AND SITE AUDIT REPORT: "TRIANGULAR PADDOCK" SITE PRODUCED BY HLA-ENVIRONSCIENCES PTY LTD (AUGUST 2005). NO RESPONSIBILITY IS TAKEN BY MAUNSELL FOR THE ACCURACY OF THIS DATA.

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North

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Pasminco Cockle Creek Smelter
Surface Water Catchments and Flows

Figure 3.10

[4.0] Chapter 4 - Strategic Planning

The Director-General's Requirements specify that the EA must detail the strategic basis for the project with specific reference to the need to remediate the site, proposed future land uses and development of the site, related and relevant existing development approvals and pending applications, and how the remediation outcome will avoid the unnecessary sterilisation of land or potential future land use conflicts. The Environmental Assessment must make specific reference to any remediation-related activities proposed for the site, but not included in the scope of the application for the project.

The need to remediate the site for protection of human health and the environment is discussed in Section 2.2 of this EA. The discussion also included the need to develop the site to fund the cost of remediation. The discussion here addresses the strategic need for development of the site in relation to surrounding land uses.

Note that while the Director-General's Requirements require this contextual information, the approval sought under Part 3A is for the site remediation and does not seek approval for the redevelopment of the site post remediation including the rezoning and/or sub-division of the Site. These matters are primarily the responsibility of LMCC.

[4.1] **Planning Framework and Activities**

[4.1.1] Key Planning Provisions

Prior to 1945 there were no zoning requirements imposed by LMCC on the Site. Ordinance No.105 subsequently covered the Site from 1945 to 1960 within the Northumberland County District Planning Scheme. From 1960 to 1984 the Site was zoned 'Industrial B' (Heavy) and from 1984 to 2004 the Lake Macquarie Local Environmental Plan (LEP 1984) had been the primary zoning instrument.

A new LEP for the Lake Macquarie Local Government Area (LGA) was gazetted on 19 March 2004 (LEP 2004). LEP 2004 did not contemplate any alternative land use(s) for the PCCS Lands at the time other than the existing 4(1) Industrial (Core), 7(2) Conservation (Secondary), Zone 10 Investigation zones and Road Reserve.

[4.1.2] Pasminco Munibung Hill Draft Land Use Principles

While alternative land uses were not envisaged under LEP 2004, in August 2004 LMCC appointed Dickson Rothschild and URS to prepare an urban land use strategy for the Glendale SRA land (incorporating the Glendale sub-regional centre). This study was later expanded following closure of the smelter to include the PCCS Smelter Lands and the southern slopes of Munibung Hill including some parts of Boolaroo.

The main objective of the study was the preparation of a document to guide future possible land uses, planning and development of the Boolaroo, Argenton, and Glendale locality adjacent to and including the PCCS Lands. The broad strategy was to reflect the sustainability principles that underpin the LMCC's Lifestyle 2020 Strategy.

As reported in LMCC's Strategy Committee paper of Monday 21 November 2005 (refer Appendix 18), the proposed strategy was intended by LMCC to ensure that:

a. future development and management of lands within the study area reflects the social, economical and environmental values of the lands;
b. future land uses are compatible with, and integrate with, the adjoining urban areas of Boolaroo, Argenton, Glendale and Cardiff;
c. reinforce the economic opportunities in the Cardiff/Glendale/Warners Bay/Edgeworth corridor;
d. provide opportunities to strengthen local centres in Boolaroo, Speers Point and Argenton; and
e. maintain and enhance visual and landscape qualities of Munibung Hill.

LMCC had proposed to prepare a draft urban land use strategy and supporting documentation for public exhibition in late 2004, however only a structure plan for the Glendale area was exhibited by Council in October 2004.



Following a number of iterations of the Pasminco Munibung Hill Draft Land Use Strategy, in late 2005 LMCC prepared a series of guiding principle diagrams to guide the future development of the PCCS Lands noting that a definitive land use strategy was not possible at this time due to uncertainties regarding the future of Incitec-Pivot, the proposed extent and form of the on-site containment cell and the details of the site remediation strategy. These principles will ultimately provide direction to Council in dealing with applications for rezoning or development while allowing flexibility in the determination of eventual land uses for the Site.

At its meeting on 28 November 2005, Council adopted the land use strategy when it resolved that:

a. "Council adopt the land use principles in Appendix A and Appendix B to guide future rezoning and development application for the Pasminco site and Dekagra Pty Limited land on Munibung Hill; and
b. Council note the Pasminco Munibung Hill Draft Land Use Strategy (Appendix C) prepared by consultants Dickson Rothschild/URS as a background report outlining constraints, opportunities and broad land use principles for the Pasminco site and Dekagra Pty Limited land on Munibung Hill."

In adopting this strategy, Council identified the sustainability of the PCCS Lands for a range of land uses including a mix of light industry, Business Park, institutional, mixed use development and residential uses. The distribution of such uses is subject to resolution of the Incitec-Pivot's future operations and the finalisation of a remediation action plan for the PCCS Lands. Appendix A of the land use strategy, being the principles diagram for the PCCS site, is attached at Appendix 18.

In developing the abovementioned principles, the Pasminco Munibung Hill Draft Land Use Strategy made a number of recommendations and observations about the redevelopment of the PCCS Lands. These included:

a. the need for remediation;
b. the need for employment generation through site redevelopment;
c. the possibility for improved open space connections and ecological linkages as part of the proposed redevelopment of the site;
d. proposed land uses for Pasminco Site may require buffer zones;
e. maintaining visual amenity by placing Restrictions on the Extent of Development and requiring revegetation to shield industrial developments;
f. use of existing infrastructure such as Cockle Creek Railway Station be used effectively and to its fullest capacity;
g. proposed Pasminco Northern Link Road to improve road, cycle and pedestrian connections in the area north of Lake Macquarie;
h. proposed Pasminco Southern Link Road for a future connection from Macquarie Hills through to Munibung Road / Main Road, Boolaroo;
i. redevelopment of the Triangular Paddock must address the visual impact issues;
j. potential to redesign the drainage channels as a more natural watercourse (excluding the piped section under the Incitec-Pivot site) and to incorporate vegetated riparian area to the adjoining development; and
k. revegetation is implemented to reinforce the natural landscape elements of Munibung Hill as a key landscape feature of the Lake Macquarie region.

[4.2] **Concept Development Plans for the PCCS Lands**

Preliminary planning has been undertaken to break the PCCS Lands into smaller portions for staged remediation and development. The staging for remediation was described earlier in this EA in Chapter 3. The selection of the early remediation areas was based on levels of contamination, ease of remediation, avoidance of conflict with the cell construction areas and the ease of subdivision of areas for development and sale. A number of areas have been well defined to be included in the initial remediation stages and details of these areas are provided below.

To provide an early appreciation of the potential for site development and to provide a strategic context for undertaking the subsequent detailed planning, structural concept development plans have been prepared that relate to the remediation staging as shown in Figures 4.1 and 4.2. These plans do not constitute formal Master Plans. They are preliminary in nature awaiting resolution of several issues including:



a. the precise volume and location of the containment cell;
b. the future use of the Incitec-Pivot site;
c. resolution of easements on the site and transport connections to the site;
d. broad definition of finished site levels and engineering constraints; and
e. detailed master planning of the site including design of the future development levels, engineering services and specific site usages.

Figure 4.1 shows a possible scenario for the future development of the PCCS Lands where the Incitec-Pivot site remains as an industrial site. This scenario provides an emphasis on the supply of industrial and commercial land over residential land. Figure 4.2 shows a possible scenario where the Incitec-Pivot site is converted to residential use. This scenario provides an emphasis on the supply of residential land over industrial and commercial land. Note that these concept plans have been produced independently of Incitec-Pivot and as such they do not imply any policy or agreements by Incitec-Pivot as to the future use of its land beyond its public announcement that the fertiliser operation will be shut down by September 2009 (Appendix 1).

PCCS considers that both of the scenarios embrace the Pasminco Munibung Hill Draft Land Use Strategy recommendations and observations mentioned above in Section 4.1.2 by achieving the following outcomes:

a. the extension of the Cardiff Industrial Estate;
b. the extension of the Boolaroo residential areas;
c. connection of Munibung Road to Main Road 217;
d. light industrial or commercial use of the top of the containment cell; and
e. two road intersections to Main Road 217 to service the development of the PCCS lands and to separate the proposed future residential and industrial traffic flows.

[4.3] Current Development Consents

The most significant development consent which has been issued in respect of the PCCS Lands is the 1995 Consent, which authorises the use of the PCCS Lands for a range of activities, including the current operation of the existing jig. The jig is used to process slag stockpiles for the extraction of lead. It is intended to continue to operate the jig until such time as that activity is no longer possible due to the construction of the containment cell.

Section 75ZA(2) of the EP&A Act provides that on the making of any declaration that a project is a project to which Part 3A applies, any development consent that authorises the carrying out of the project ceases to have effect. No development consent exists which authorises the carrying out of the remediation which is the subject of this Part 3A application. However, for the avoidance of doubt and to avoid the possible application of s.75ZA(2) in the event that it is determined that the 1995 Consent in part authorises the remediation of the PCCS Lands (by authorising the operation of the jig), this Part 3A application includes the continued operation of the jig.

[4.4] Planning Activities – Current Status

Site opportunities and constraints have been identified and mapped forming a basis for the broad concept planning of the Site. PCCS is now progressing with a number of additional investigations pursuant to the preparation of an overall site plan. In the interim, the preliminary structural concept plans (as shown in Figures 4.1 and 4.2) have facilitated the preparation of a number of development applications for subdivision and/or to rezone parts of the Site.

[4.4.1] Development Applications for Subdivision

Table 4.1 provides a summary of the development or rezoning applications which have been prepared to subdivide and/or rezone parts of the Site into Super Lots. The land areas noted in the table can be found by referring to Figure 2.2.



Table 4.1 – Summary of Current Development or Rezoning Applications		
Zone	**Name**	**Description**
1	Cardiff West Industrial Estate	Proposed subdivision of Lot 201 DP 251322 to create two new lots and a road reserve (part extension of Munibung Road).
2	Triangle Paddock	Proposed rezoning of Lot 21 DP 152332 from Zone 10 Investigation to Zone 2(2) Residential.
3	Rail Employment Zone	Proposed subdivision of Lot 201 DP 251322 to create a new lot and a road reserve (part extension of Munibung Road). Includes a proposal to subdivide the Triangle Paddock (Lot 21 DP 152332 into two lots and a future road reserve.
4	Main Entry Precinct	Proposed subdivision of Lot 201 DP 251322 to create two new lots. Includes rezoning application to rezone from Zone 4(1) Industrial (Core) to part Zone 2(2) Residential and part 4(2) Industrial (Light).
5	Boolaroo Heights	Proposed rezoning of part Lot 1 DP 523781 from Zone 10 Recreation to Zones 2(1) and 2(2) Residential.

As at May 2006, LMCC was currently assessing the DAs for Zones 1, 2, 3 & 4. LMCC has indicated that previously it did not intend to consider the DA for Zone 5 at the present due to the Incitec-Pivot operations. This decision may be re-visited in the future in light of the announced Incitec-Pivot closure.

It is proposed that the remainder of the PCCS Lands will be further subdivided into Super Lots with the potential for later subdivision. The currently planned subdivisions are shown in Figure 2.2.

[4.4.2] LMCC Proposed Amendment to Lake Macquarie Local Environmental Plan

In March 2006, LMCC agreed to commence the rezoning process of zones 1, 2, 3 and 4 following further representations made by PCCS at a meeting in early February and subsequently clarified in a letter dated 13 February 2006 (see Appendix 19). Council's objective is to commence the rezoning process and facilitate consultation with government authorities pursuant to s.54 of the EP&A Act. Council formally resolved to commence the process at a Council meeting of 6 March 2006 which resolution was in the following terms:

a. "Council resolves, pursuant to section 54 of the EP&A Act 1979; to prepare a draft amendment to LMLEP 2004 to rezone the lands shown on Appendix A (see Appendix 13), from 10 Investigation, and 4(1) Industrial (Core) to accommodate a mixture of residential, commercial and light industrial development, and a realignment of the road reserve for Munibung Road extension, zoned 5 infrastructure;
b. notify the Department of Planning of Council's resolution, pursuant to section 54(4) of the EP&A Act 1979; and
c. public exhibition of the proposed draft LEP amendment is not to occur until such time as the Department of Environment and Conservation (DEC) approve Pasminco's Remediation Action Plan for the discussed smelter site."

[4.4.3] Other Investigations

Further investigations by PCCS to support the development process include:

a. assessing site development levels and cut/fill quantities;
b. assessing drainage and stormwater requirements;
c. confirming services demand and optimising supply points;
d. continuing discussions with government authorities; and
e. continued discussions with Incitec-Pivot and Energy Australia re easements.

[4.4.4] Planning and Social Outcomes

Preliminary estimates of employment opportunities and residential lots have been derived using a number of assumptions using the development scenarios as illustrated in Figures 4.1 and 4.2. These preliminary numbers are only provided to give an order of estimate of the possible outcomes of development of the PCCS Lands and Incitec-Pivot lands and will require later verification once more detailed planning is achieved.



a. Employment opportunities in the order of 1,300-1,600 permanent jobs are envisaged for the industrial and mixed use zones. Temporary jobs will also be created during the development and construction phases; and
b. Depending on the mix of low and medium density zoning, the range of residential lots is expected to be in the order of 250-500. On average, lot sizes may range from 600 m^2 to 1,200 m^2 in area.

The above data shows the potential economic and social benefits of the development of the PCCS lands and demonstrate that the remediation outcome will avoid the unnecessary sterilisation of land or potential future land use conflicts.



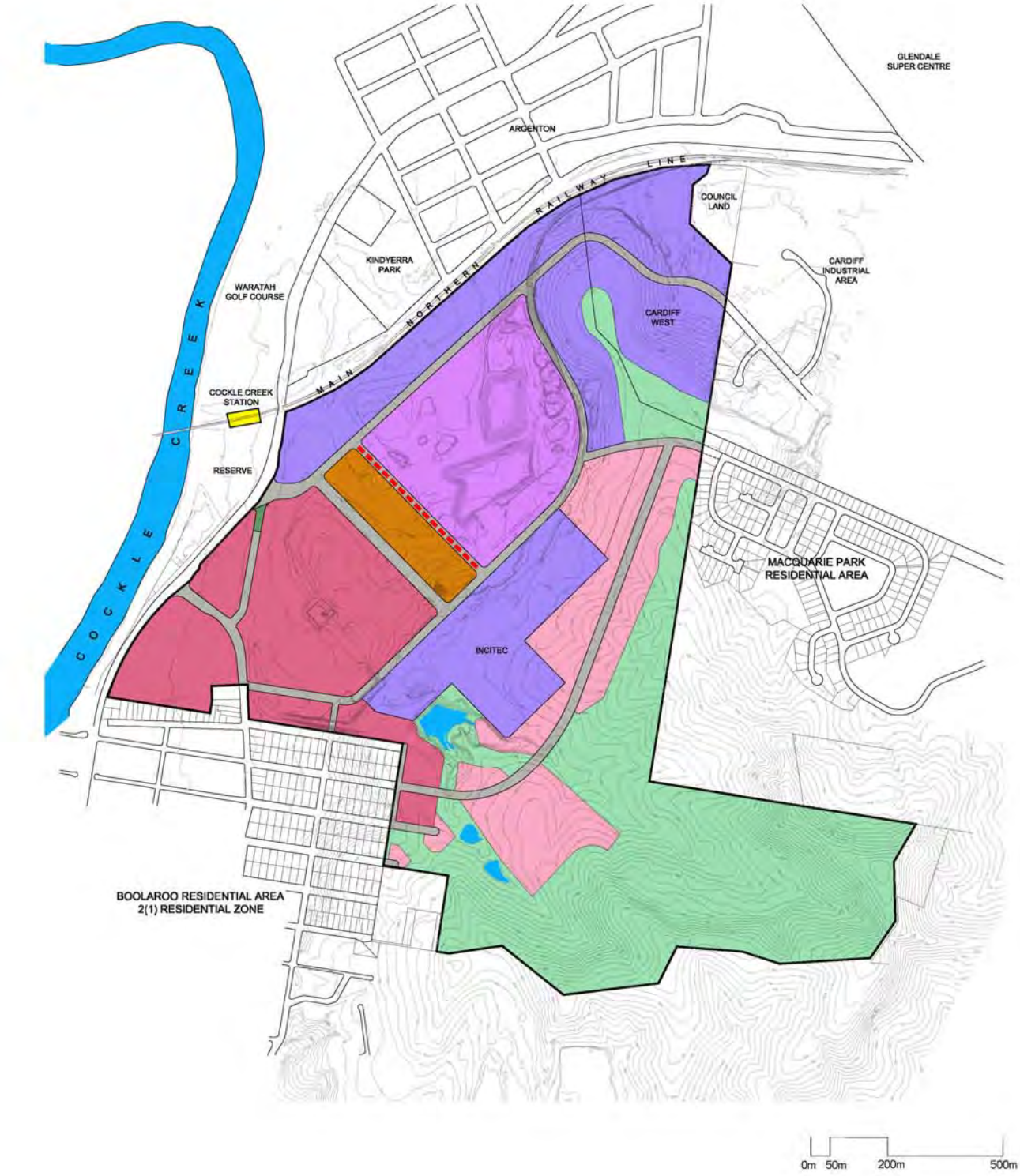

Figure 4.1

PASMINCO COCKLE CREEK SMELTER SITE \ CONCEPT DEVELOPMENT PLAN \ INDUSTRIAL EMPHASIS

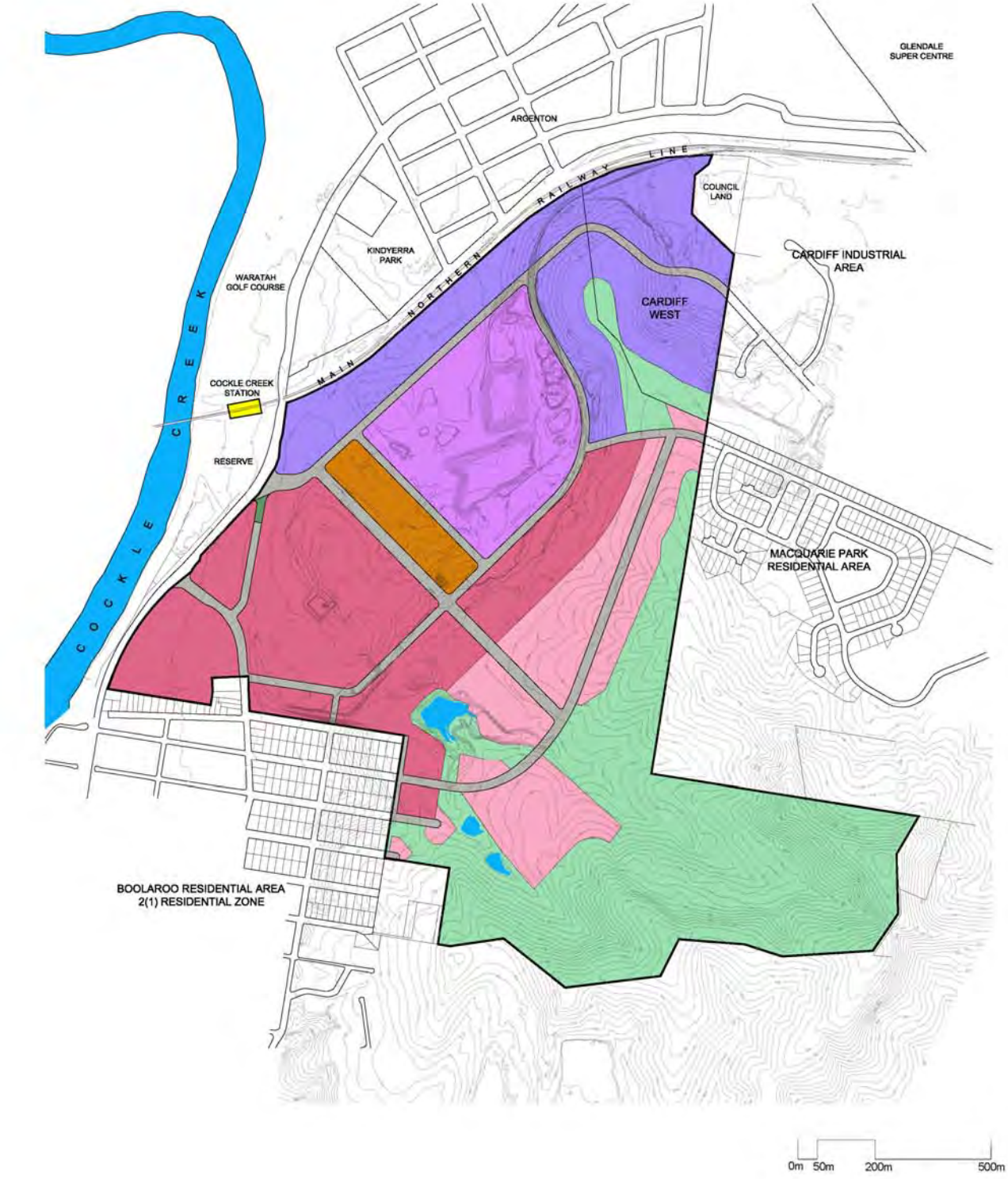

Figure 4.2

PASMINCO COCKLE CREEK SMELTER SITE \ CONCEPT DEVELOPMENT PLAN \ RESIDENTIAL EMPHASIS

[5.0] CHAPTER 5 - Existing Environment

[5.1] Description of the Site Area

[5.1.1] Location and Surrounds

The PCCS Lands are situated approximately 13 km south-west of Newcastle (Figure 2.1). The Main Site forms an irregular shape consisting of the smelter area, extending to the northern waste area and the Clay Pits (within the CWE area), and the upper western slopes of Munibung Hill (Figure 2.2). The area of the Main Site is approximately 122 ha.

The PCCS Lands are surrounded by a number of existing townships. In the north the site is separated from the residential suburb of Argenton by the Great Western Railway. Directly adjoining the site to the south-west is the residential suburb of Boolaroo and to the north-east is Cardiff Industrial Estate. The suburb of Macquarie Hills is to the east of the PCCS Lands and on the eastern side of Munibung Hill.

[5.1.2] Surrounding Buildings, Character and Land Uses

The most dominant land use within the surrounding area is Open Space (Non-Specific Land Use). The open space areas are generally located around Munibung Hill and along Cockle Creek. Most of this land is held in private landholdings, but some is held by Council (especially along the ridge lines).

The closest neighbour is Incitec-Pivot which is an existing operational heavy industrial land use that prior to the demolition of the PCCS plant, remained somewhat insulated from adjacent residential areas by the Pasminco Main Site.

In close proximity is also a large area of low-density residential allotments around Boolaroo and Argenton where there is increased growth and some pressure to provide more land for residential allotments. There is an obvious conflict between heavy industry and increasing proximity of residential land uses.

There is also a large quarry (extractive industry) on the Dekagra / Hawkins Site (to the south of the PCCS Lands) that is still operational but with limited material that could be quarried under the existing zoning boundaries. To the north-east of the Main Site there is the large Cardiff Industrial Estate characterised by large light-industrial allotments. This provides a significant employment base for the region.

Cockle Creek runs adjacent to the site to the western side. This is a tributary from the major water systems to the north-east that feed fresh water to Lake Macquarie. Cockle Creek railway station is approximately 1,200 m to the west of the PCCS Lands and is the main station servicing the local area.

[5.1.3] On-site Uses

The Pasminco Cockle Creek Smelter site has operated as an industrial processing facility from the 1890's until its closure in 2003. It has been primarily used as a smelter for lead and zinc, however various other processing activities have been carried out on-site and it has been used for a number of different functions during this time. Other manufacturing operations have included the production of sulfuric acid and super phosphate fertilisers.

Following the closure of the smelter in September 2003, a strategy for the remediation of the site was developed by the Deed Administrators in conjunction with Fitzwalter Group to facilitate the reuse of the land. The PCCS Lands are currently under a care, maintenance and clean-up program. Demolition activities have occurred on the property to remove most of the existing buildings and plant.

[5.1.4] Zoning

Figure 5.1 shows the zoning of the local area including the PCCS Lands.

[5.2] Physical Attributes of the PCCS Lands

[5.2.1] Soil and Topography

Geology

The PCCS Lands are situated in the lower members of the Narrabeen Group overlying the upper members of the Newcastle Coal Measures. The most important members on the Lands are:

a. Munmorah Conglomerate – occurs on the tops of some ridges and consists of a coarse graded conglomerate with some sandstone lenses;
b. Wallarah Seam – poorly developed across the site but is exposed in the quarry to the south of the site where it consists of carbonaceous shale;
c. Teralba Conglomerate – the major component of the ridges and consists predominantly of conglomerate with some sandstone layers. The member appears to be about 60 m thick in places; and
d. Great Northern Seam to Upper Pilot Seam – consists of inter-bedded coal and tuffaceous bands with minor conglomerate, sandstone and siltstone layers. The tuffaceous rocks, notably the Booragul Tuff and Awaba Tuff, weather to a claystone and eventually clays of low shear strength and are associated with areas of instability.

It is known that, over decades, the lower portion of the Main Site had been extensively levelled by both cutting and filling. In general, areas of deep cover over bedrock represent fill operations while shallow bedrock may have been cut to provide fill material. Most of the fill used to achieve existing grades is known to have been sourced on-site but it could include some imported material such as contaminated earth.

Topography

The Main Site is located on the western slopes of Munibung Hill (164 m AHD). Cutting and filling activities have levelled many of the natural gullies and depressions in the low parts of the site, which were present before site development. Fill material is likely to include industrial by-products and waste materials from the site's industrial processes, including slags.

The Main Site rises strongly from west to east. The western boundary of the Main Site is only a few metres above sea level while the ground level on the eastern side of the eastern slag stockpile (see Figure 2.2) is in the order of 22 m and the upper contour of the residential development on Munibung Hill as indicated in Figure 4.2 is up to about 70 m at its highest point.

Contamination

Based on review of the chemical substances that were detected in soil and groundwater samples analysed as part of previous investigations (CH2MHill 2004b), a list of analytes of concern has been generated to identify the potential contaminants of concern in soil and groundwater, as follows:

a. Metals and metalloids, including arsenic, silver, manganese, antimony, selenium, thallium, cadmium, chromium (III & VI), cobalt, copper, nickel, lead, zinc, mercury and iron (for both groundwater and soil);
b. Sulphur (as Sulphate) and Sulphide (for both groundwater and soil);
c. Petroleum Hydrocarbons (TPHs) (for both groundwater and soil);
d. Ammonia (for groundwater only);
e. Nitrate (for groundwater only);
f. Fluoride (for groundwater only);
g. Reactive Phosphorus (for groundwater only);
h. Monocyclic aromatic hydrocarbons particularly benzene, ethyl benzene, toluene and xylenes (BTEX) (for either groundwater or soil depending on field observations);
i. Polycyclic aromatic hydrocarbons (PAHs) (for either groundwater or soil depending on field observations);
j. Organochlorine Pesticides (OCPs) (for either groundwater or soil depending on field observations); and
k. Phenols (for either groundwater or soil depending on field observations).

The CH2MHill 2004b report contains listings of the concentrations of contaminants around the PCCS Lands. The CCCDMP report (Maunsell 2005) contains a listing of the estimated volumes of contaminated materials in the various areas of the PCCS Lands.

[5.2.2] Surface Water

Details of the surface water regime on the site are contained in the CH2M Hill (2004c) and the Fitzwalter (2006) reports. Fitzwalter 2006 is attached as Appendix 17 and provides details and figures relevant to the following text.

Catchment

The PCCS Lands are contained in the Munibung Hill watershed, which drains westward toward Cockle Creek.

Prior to the development of the smelter site and the neighbouring fertiliser plant, two major gullies joined below the Fresh Water Dam and flowed toward Cockle Creek through the southern portion of the main plant area. This gully has been infilled and built over.

Minor gullies drain into the northern portion of the Pasminco Main Site. The topography of this part of the site, including the gullies, has been significantly modified over time by use of the area as a slag and waste storage area.

Main Site Runoff

Runoff from the northeast catchment is directed around the plant/dump portion of the site by means of a diversion drain which runs along the eastern boundary of the plant/dump site. This diverted water is clean runoff from Munibung Hill and it discharges into a detention basin that flows under the rail line, bypassing the Hawkes Dam catchment and discharging eventually into Cockle Creek (Fitzwalter 2006).

Runoff from the far north of the Main Site discharges into reed beds, then to the LMCC detention basin. Runoff from the southeast of the plant site flows to the Freshwater Dam and dam overflow is diverted under the plant through the 6 foot drain pipe/channel to a discharge location on the site west of the South West Dam (SWD). During storm flow events, this water leaves the site. Runoff from any Freshwater Dam overflow event is considered to be clean runoff (CH2MHill 2004c).

The major features within the plant/dump site surface water runoff system are Hawkes Dams 1 & 2, the South West Dam (SWD), the Effluent Treatment Plant (ETP) system and the saltwater lagoons (CH2MHill 2004c). At the time of closure of the smelter, a number of on-site dams were operational and were used to capture and treat the surface water runoff before it left the site. Collected water is treated in the ETP before being discharged to Cockle Creek under the EPL issued by EPA (Fitzwalter 2005). Since closure, there has been work undertaken on a number of these dams to improve the surface water system as described in Section 2 2.2 of this EA.

The ETP capacity is 90 m^3/hr, which is considerably larger than anticipated requirements during the remediation phase. Additionally, pumps and pipelines directing flow to the ETP have been upgraded, which would allow the full capacity of the ETP to be utilised when required.

The current plant and dump site sub-catchment runoff collection and storage system applying to the Main Site comprises:

a. at the southern end of the plant site, stormwater is collected in the SWD. From the SWD, water is subsequently stored and pumped back to the ETP, via the spray pond, for treatment. In rainfall events that exceed SWD capacity, water is pumped to Hawkes Dam or in extreme rainfall events can overflow offsite to Cockle Creek;
b. at the south western end of the plant site, stormwater runoff is generated from the car park and open grassed areas. This flows offsite without treatment;
c. in the eastern central part of the plant site, runoff flows are diverted to Hawkes Dam for subsequent treatment in the ETP. In the western central part of the plant site, runoff flows overland or via existing underground pipes to the saltwater dams. These dams have been converted to serve as additional storage and can be pumped back to Hawkes Dam;



d. at the northern end of the plant site, runoff is collected in Hawkes Dam. Historically, in larger runoff events Hawkes Dam has overflowed, discharging to Cockle Creek. Under current stormwater management, flows in excess of those that can be stored in Hawkes Dam (up to the pump limits) are being pumped and stored in the recently dredged saltwater lagoons, then later returned to Hawkes Dam before being directed to the ETP for treatment; and
e. effluent from the ETP is either reused onsite or, should it not be required, blended with salt water (as per the EPL) and discharged to Cockle Creek.

The mitigation measures detailed in the Supplementary RAP (Fitzwalter 2005) and discussed in Section 2.2.2 of this EA to reduce the significant risk of harm from surface water run-off will substantially limit the occurrence of overflow events occurring from these dams except during the extreme and less frequent rainfall events.

[5.2.3] Air Quality

Meteorology

Holmes Air Sciences (HAS 2006 – attached in Appendix 20) observed that annually, the most common winds are from the SSW although winds from most other sectors are present. Winds from the WSW, ESE and SE occur the least often. In the summer months winds from the N and SSW prevail while winds in winter are predominantly from the WNW and NW. Calm periods, when winds were 0.5 m/s or less, occur for approximately 11% of the time.

Climate

HAS (2006) used the Bureau of Meteorology climatic information from Nobbys Head Signal Station at Newcastle to assess the local climate. They observed that temperature data show that January is typically the warmest month with a mean daily maximum of 25.6^{o}C. July is the coldest month with a mean daily minimum of 8.4^{o}C. Rainfall data collected at Nobbys Head show that March is the wettest month with a mean rainfall of 122 mm over 12 rain days. Annually the area experiences, on average, 1,145 mm of rain per year.

Existing air quality

During the smelter operation, the local air quality was affected by the gaseous and dust emissions from the smelter. As a requirement of EPL 5042, PCCS has been monitoring lead in dust at a number of sites in the local community. As indicated by the HAS 2006 report, the dust deposition data from 1996 to 2005 show that annual average levels at almost all gauges have been below the DEC goal of 4 g/m^2/month. There were, however, occasions when very high monthly levels contributed to exceedances of the 4 g/m^2/month goal at the Fourth Street monitoring in 1998 and at the Edgeworth monitor in 2004. The high monthly deposition levels were likely to be from localised activities near the monitors since other sites did not record levels of the same magnitude (by examination of the monthly data). The average of all the data from all gauges is 0.9 g/m^2/month.

There was a slight downward trend at all sites from 1996 to, say, 2002. Measured levels then generally appear to have increased from 2002 to 2004 which may be attributed to plant demolition or site clean-up activities. The dust emanation has been temporarily been exacerbated by the on-site demolition, but this work is due for completion by mid to late 2006.

Lead deposition has been monitored with the dust deposition. It has been observed that generally, there has been a steady decline in measured lead deposition levels at each site since 1996 (HAS 2006). The most apparent reduction to measured levels was from 2003 to 2004, which coincides with the closure of the smelter.

The monitoring results show that the on-site mitigation measures plus the buffer zone to the south of the Main Site combined with distance from residences is keeping lead in dust emissions to acceptable levels in the community. Levels are typically more than 90% less than when the smelter was operating and reports from the Environmental Health Centre (EHC) and Department of Health (DoH) correspondingly indicate that blood levels in children in the local community are reducing. PCCS provides regular reports on the monitoring data to DEC under the EPL.



[5.2.4] Groundwater

The 2004 RAP (CH2M Hill 2004a) identified the potential for significant contamination to be leaving the site, through the discharge of groundwater, along the down gradient boundaries, particularly below the South West (SWD) and Hawkes Dams (HD). A minor discharge boundary was also identified at the northern site boundary through the CWE area. (The flow directions of the groundwater are very similar to the surface water flow paths as shown in Figure 3.10).

Groundwater was identified as flowing in a shallow aquifer (1-3 m below the surface level) and in a deeper aquifer (8-20+) m below the surface level in the underlying coal measures).

Further investigations were conducted on the groundwater and geological features so that an appropriate remedial strategy could be selected, designed and implemented (CH2MHill 2004b). These investigations identified that high concentrations of metals, well in exceedance of ANZECC 2000 trigger values, especially Cd, Zn, Co, So, Cu, Ni, Fe, Mn and Pb, were being transported across the western boundary of the PCCS Main Site by the shallow aquifer. The deeper aquifer did not exhibit the high concentrations of metals found in the shallow aquifer, however some metal concentrations above ANZECC 2000 trigger values were present.

The shallow aquifer discharges to Cockle Creek. The deeper aquifer was found to pass under Cockle Creek either naturally or more likely due to the influence of the deep groundwater pumping associated with the coal mines to the west of Cockle Creek (CH2M Hill 2005). This finding suggested that the deep aquifer was not a contributor to off-site significant risk of harm and remedial measures should be best applied to the shallow aquifer.

A conceptual site model of groundwater was developed (Access UTS, 2005) to provide an overall understanding of the groundwater regime and likely contaminant pathways, which has been used to support the development of the remediation options. This model showed that the groundwater generally flowed in a westerly direction, following the topography of the Main Site. It also identified the hydraulic conductivity and mass loading concentrations through a series of slug tests along the main boundaries of interest for both the shallow and deep aquifers.

The installation of extensive cut-off walls and trenches on the western boundary of the Main Site for the shallow groundwater was initially recommended in the January 2004 RAP (CH2M Hill 2004a) however, subsequent more detailed investigations have identified an alternate system whereby groundwater migration from the Main Site can be controlled by the installation of a series of pumped wells at the western boundary of the PCCS Main Site.

RES (2005c) reviews all the groundwater investigations undertaken to date and concluded that the installation of a number of wells will eliminate SRoH issues pertaining to contaminated groundwater affecting environmental receptors off the PCCS Main Site. The report also concluded that the annual mass of contaminants entering Cockle Creek from groundwater leaving the PCCS Main Site has been estimated to be a small fraction of the total mass of these contaminants entering the creek from other non-PCCS related sources.

Initially, RES (2005b) recommended 3 pumped wells in the shallow aquifer at the SWD boundary supplemented by 3 pumped wells in the deep aquifer at HD boundary. This recommendation was endorsed by the Site Auditor and DEC which allowed the installation to proceed. The proposal to pump the deeper aquifer at the HD boundary was based on the early CH2M Hill field investigations that indicated that there was no effective flow in the shallow aquifer at the HD boundary (although the AccessUTS model indicated that flows through the shallow aquifer should occur).

Later drilling during the installation of the pumped wells identified the presence of flow through the shallow aquifer at the HD boundary and the installed system was altered to pump the shallow aquifer at both boundaries. This was consistent with the aim of capturing only the shallow aquifer contamination. The pump systems became functional in April 2006 and are being operated and monitored to measure their efficiency in preventing groundwater flows going off-site from the shallow aquifer.

These pumps will remain in operation until the site is remediated or until they are assessed by monitoring data as being no longer necessary (refer Section 3.6.3).

[5.2.5] Noise

Vipac (2006) (attached in Appendix 21 conducted a noise monitoring survey around the perimeter of the proposed remediation site in accordance with the NSW Industrial Noise Policy to determine the current ambient noise levels at the residences adjacent to the site as a precursor to assessing the potential impacts of the site remediation. The acoustic environment is that of a typical residential area in a small town.

Table 5.1 below presents a summary of the measured ambient and background noise levels measured as L_{Aeq}. This measurement is the Equivalent Continuous Noise Level. The Rating Background Level (RBL) is the median of the overall assessment background noise level calculated using DEC Industrial Noise Policy methodology and is the criterion used in the noise assessment reported in Vipac (2006) which is later discussed in Chapter 6 of this EA.

Table 5.1 – Ambient and Background Noise Levels around the PCCS Site

Location	Period	L_{Aeq}	RBL
Argenton Residential Area	Day	58.5	39.0
	Evening	58.5	37.5
	Night	59.0	37.0
Macquarie Hill Residential Area	Day	46.0	40.0
	Evening	46.0	41.0
	Night	44.0	38.0
Boolaroo Residential Area	Day	52.0	38.5
	Evening	51.0	38.0
	Night	46.5	38.0

All values in dB(A)

Vipac identified the potentially worst affected "sensitive noise receivers" around the perimeter of the proposed PCCS remediation site Lands to be as follows:

a. Argenton Residential District – these are the nearest residential premises to the north of the site, situated on the opposite side of the railway corridor;
b. Cardiff Industrial Estate – these are the nearest industrial premises to the northeast of the site, adjacent to PCCS site;
c. Macquarie Hills District – these are the nearest affected residential premises to the east of the site, adjacent to Munibung hill area;
d. Boolaroo Residential District – These are the nearest residential and/or commercial premises to the south of the site; and
e. Argenton Industrial area – These are the nearest affected industrial premises to the north of the site.

[5.3] General Environmental Factors

[5.3.1] Archaeological Remnants

A Preliminary Assessment of Historical and Industrial Archaeological for the Southern and Northern precincts of the Main Site was conducted by Umwelt (2004c, 2004d) analysing the physical remains (sites and artefacts) of past culture on the site.

The smelter was noted to contain significant historical value due to it being the first ISF plant in the world. Based upon the preliminary archaeological assessment of the site and the proposed demolition of its plant to enable remediation and redevelopment of the PCCS site, the report addressed the need for management of heritage values.

The Umwelt assessment recommended that in order to capture the historical essence of the smelter site before demolition, a comprehensive and extensive recording needed to be made of the heritage aspects. This included such measures as archival recording and monitoring including measured drawings, salvage/recovery, photographs and oral histories. This work has been undertaken in conjunction with the demolition contract.

[5.3.2] Heritage

The Pasminco Cockle Creek Smelter has operated as an industrial smelting and process facility at Boolaroo NSW since the late 1800's. In response to the Umwelt (2004c, 2004d) recommendations and in recognition of the long period for which the smelter had existed at the Boolaroo site, and the significance of the industrial processes that occurred during that time, a Heritage Assessment report and Heritage Impact Statement (HIS) was compiled (CM+, 2004b).

The document was intended to provide a contextual history of the Main Site using secondary and primary materials. It focused on major themes at National, state and local levels to provide a background context for the discussion of the history. The historical overview focused on aboriginal occupation, early settlements, the stages of industrial development and changes on the site. It also provided a physical and significance assessment for the site pre remediation and redevelopment.

This report was submitted as part of a DA (5209/2001) for the demolition of the majority of the buildings. The DA was approved by LMCC for the majority of buildings with a number of accompanying conditions of consent, but several buildings were excluded from the LMCC DA approval due to Council's assessment of their potential heritage significance.

The approved demolition of buildings was deemed necessary due to the buildings themselves containing and being covered with contaminated dust and to facilitate the removal of the contaminated soils and fills from beneath the buildings.

The conditions of consent for the demolition of buildings and structures on the Main Site required the heritage significance to be retained through a process of comprehensive recording. This recording involved measures outlined in the Archaeological Assessment (CM+, 2004b) such as the development of measured drawings, photo logs and taking oral histories.

The consent conditions also required the development of a Heritage Interpretation plan for the Main Site. In accordance with this, Heritage Interpretation guidelines (CM+, 2005) were developed to provide guidelines and principles for the future interpretation of the buildings proposed to be demolished. Issues identified in this 2005 report will form the basis of the Heritage Interpretation Plan (HIP) for the Main Site that will be developed in conjunction with the site redevelopment master planning. The HIP essentially provides the link between the present assessment and recording of the significance of the buildings and the future utilisation of this significance and recording in the preparation of the Heritage Interpretation Plan.

A separate second DA was submitted for the demolition of the buildings excluded from the earlier DA process which included a higher level of recording. In support of the second DA, the NSW Heritage office was also consulted. They concluded that it was unlikely to be feasible to retain the buildings in question due to the contaminated nature and the health risk posed by the buildings. However, they did confirm that building 3 (known as the 'old lab') was to be retained and would be subject to a conservation management plan to guide its future conservation, use and interpretation.

The DA was approved by LMCC in May 2006 which will allow the buildings to be demolished as part of the existing demolition contract.

[5.3.3] Aboriginal Cultural Heritage

A report entitled Aboriginal Cultural Heritage Issues - Exit Strategy for Pasminco Cockle Creek Smelter, compiled by Umwelt in February 2004. This report was subsequently updated and finalised as "Aboriginal Cultural Heritage Issues – Former Pasminco Cockle Creek Smelter Site, December 2004". The Report (which applied to all of the PCCS Lands) identified that a number of Aboriginal Sites recorded by the National Parks and Wildlife Service (NPWS) are present within 3 km of the PCCS Lands. The report establishes the likely location of Aboriginal Sites within the Pasminco lands via a predictive model, establishing that the following landforms are most likely to contain artefacts of Aboriginal significance:

a. the crest of Munibung Hill, which may contain stone artefacts scatters, isolated finds and middens;
b. within areas of original ground surface remains between Cockle Creek and Munibung Hill (i.e. those areas within the Pasminco Lands that have not been significantly disturbed); and
c. rock shelters on the slopes of Munibung Hill.



Surveys of these areas were undertaken by a member of the Koompahtoo Local Aboriginal Land Council, however, the surveys did not discover any previously unrecorded Aboriginal sites not identified by the NPWS, nor did the surveys find any of the sites identified by the NPWS.

All of these areas are above the areas to be remediated and redeveloped and will be subject to the Site Management Plan (as described in Section 3.1 (e) of this EA).

Extensive past uses and heavy disturbance of the sites, particularly the main smelter development zones specifically (by activities such as land filling, dam construction, industrial development, earthworks and soil erosion) provide significantly reduced potential for surficial artefacts on the sites.

Based on this information, it can be concluded that there are no known or likely archaeological constraints to the remediation of the site.

[5.3.4] Existing Flora and Fauna

A report entitled Preliminary Analysis & Issues Paper: Flora and Fauna at Pasminco Cockle Creek Smelter Site was prepared by Umwelt in March 2004 (Umwelt, 2004b). The study area included all PCCS Lands. The fauna study involved a search of the National Parks and Wildlife Service (NPWS) Atlas of NSW wildlife within a 10 km radius of the PCCS Lands. Due to the disturbed nature of the Main Site it was concluded that it was unlikely that the Main Site provided a significant area of fauna habitat.

A similar search was also conducted for the Environmental Protection and Biodiversity Conservation Act (EPBC) Protected Matter Database. The vegetation study involved analysis of the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS) vegetation survey, classification and mapping report.

The report identified one threatened fauna species (Grey-headed Flying Fox) and one threatened flora species (*Angophora inopina*) located near the proposed Cardiff West Industrial area (CWE).

The report concluded that due to the industrial use of the Main Site, vegetation has been significantly reduced in size and from its original condition. A vegetation survey, classification and mapping report was conducted which indicated that the Main Site was largely devoid of native vegetation.

The original Umwelt 2004b report was supplemented by three further studies.

a. Umwelt 2005a – Ecological Assessment for Proposed Development at Former Pasminco Cockle Creek Smelter Site, Boolaroo – Cardiff Industrial Park, Umwelt January 2005;
b. Umwelt 2005b – Ecological Assessment for Proposed Development at Former Pasminco Cockle Creek Smelter Site, Boolaroo – Triangle Paddock, Boolaroo, Umwelt January 2005;
c. Umwelt 2005c – Ecological Assessment for Proposed Subdivision & Rezoning at Former Pasminco Cockle Creek Smelter Site – Rail Employment Zone, Umwelt December 2005; and
d. Umwelt 2006 – Ecological Assessment for Proposed Subdivision & Rezoning at Former Pasminco Cockle Creek Smelter Site – Main Entry Precinct, February 2006.

No threatened fauna or flora species were identified on the Triangle Paddock Site and no threatened fauna are expected to occur on the site other than possible rare visits during movements such as dispersal or migration. No Endangered Ecological Communities or Endangered Populations occur on this site.

A similar conclusion was reached in respect of fauna on the Rail Employment Zone site (Area 3, Figure 3.2 of the Main Site). Hybrids of one threatened species, Angophora Inopina, were located on the site. This occurrence is similar to the findings on the CWE area.

A study on the Main Entry Precinct (Area 4, Figure 3.2 of the Main Site) did not identify any Angophora Inopina but similarly concluded that no threatened flora or fauna species, Endangered Ecological Communities or Endangered Populations are expected to occur on Main Entry Precinct site.

[5.4] **Mine Subsidence**

The Main Site has been identified to be within a Mine Subsidence District. The Main Site extends over an area previously used for shallow underground mining by the Sulphide Corporation in the 1940s. The subsurface below the PCCS Lands may be subject to future mining by Teralba Colliery however, no immediate plans are currently in place.

As part of the CCCDMP (Maunsell, 2005), the 1940s mine workings plans were reviewed. This revealed that fault structures were encountered during mining, which appears to have affected the method of working of the seam and possible contributed to the development of surface subsidence to the east of the railway line. These faults are relatively common and are rarely an issue for civil works.

[5.5] **Traffic Levels and Accessibility**

[5.5.1] Local Traffic

On behalf of PCCS, the consultant Traffix (Traffic Impact Assessment Report, February 2006 attached as Appendix 22) assessed the existing local traffic conditions in relation to access to and from the PCCS Main Site. Historical traffic volume from RTA monitored sites from 1998 to 2003 showed that no significant traffic growth has occurred during the monitored periods.

In addition, Traffix assessed the intersection performance at the following intersections for the morning and afternoon peak hours:

a. Main Road/T.C. Frith Avenue
b. Second Street/T.C. Frith Avenue
c. Second Street/Main Road
d. T.C. Frith Avenue/The Esplanade
e. Main Road/The Esplanade

The Level of Service (LOS) was rated at either A or B which indicates that all of the intersections operate satisfactorily and with moderate delays.

[5.5.2] On-site Traffic

Existing on-site traffic primarily consists of vehicles associated with care and maintenance and the demolition of the Main Site. These vehicles primarily access the Main Site via the existing Main Road entrance. The existing traffic levels have reduced considerably from the previous levels during smelter operation and hence are relatively insignificant in the local area.

Incitec-Pivot Pty Ltd currently access their site though the main road entrance to the PCCS Main Site. Due to the limited capacity of their operations, these trucks also generate minimal impact on local traffic.

[5.6] **Visual Amenity**

A visual assessment was prepared by Conybeare Morrison in August 2004 for PCCS (CM+ 2004a – Appendix 23). This report identified the scenic quality of the area within and from areas that look to the PCCS Main Site. This report detailed guidelines to be followed to retain the natural hills and ridgelines after development.

Visual amenity of the area was also assessed during the preparation of the LMCC Draft Land Use strategy by Dickson and Rothschild in 2005 (Dickson and Rothschild 2005). This report indicated Munibung Hill to be the most visually predominant feature as it is the highest landform with an elevation of 164 m AHD. This forms a regional landmark that is visible from a large proportion of the Lake Macquarie LGA.

Views from the west, north and east are dominated by urban development in the foreground and mid distance, with the upper slopes and the ridgeline of Munibung Hill forming a small proportion of the view. The landscape character of Munibung Hill incorporates different landforms, vegetation and land uses. The hill is grass covered as a result of historical timber harvesting and clearing. Substantial tree cover is present on the northern portion of the hill and along the main ridge running south from the high point of the hill.



Existing land use on the ridges and upper slopes generally consist of grazing or conservation of remnant vegetation. Residential development occurs below the 50 m contour on the southern, western and eastern slopes.

The PCCS plant typically consisted of large scale buildings, compared to residential development in adjoining Boolaroo to the south, and tall stacks on the site which formed landmarks that were visible from a broad area to the south, west and north of the site.

Demolition has since occurred on the Main Site which has reduced the smelter buildings to their existing slab levels. Stacks and larger buildings have been removed and are no longer a conspicuous part of the skyline. Only two small single story buildings have been retained which are not readily visible from the surrounding areas.



Adjoins Map 3

Adjoins Map 4

Adjoins Map 4

Adjoins Map 6

Adjoins Map 8

Adjoins Map 6

Adjoins Map 8

Adjoins Map 11

Adjoins Map 12

Adjoins Map 12

Adjoins Map 13

ZONE INDEX
DRAFT LEP 2002

1. RURAL
- 1(1) 1(1) Rural (Production)
- 1(2) 1(2) Rural (Living)

2. RESIDENTIAL
- 2(1) 2(1) Residential
- 2(2) 2(2) Residential (Urban Living)

3. BUSINESS
- 3(1) 3(1) Urban Centre
- 3(2) 3(2) Urban Centre (Support)

4. INDUSTRIAL
- 4(1) 4(1) Industrial (Core)
- 4(2) 4(2) Industrial (General)
- 4(3) 4(3) Industrial (Urban Services)

5. INFRASTRUCTURE
- 5 5 Infrastructure

6. OPEN SPACE
- 6(1) 6(1) Open Space
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7. ENVIRONMENTAL PROTECTION
- 7(1) 7(1) Conservation (Primary)
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8. NATIONAL PARK
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- 10 10 Investigation Zone

11. LAKE AND WATERWAYS
- 11 11 Lake and Waterways

12. ACQUISITION
- Acquisition (LMCC)
- Acquisition (RTA)
- Acquisition (Dept. of Planning)

13. OTHER
- Proposed Heritage Conservation Area
- Local Government Boundary

DISCLAIMER:

Maps in this series represent the proposed zone boundaries for the Draft Lake Macquarie Local Environmental Plan 2002. These zone boundaries are shown relative to the cadastral boundaries shown on these maps.

Although every care has been taken in the preparation of these maps, Lake Macquarie City Council accepts no responsibility for any misprints, errors, omissions, inaccuracies in these maps or damages resulting from the use of this information.

Information shown on these maps may change at any time prior to final approval of the Minister for Planning and notification in the New South Wales Government Gazette.

Figure 5.1
Zoning

Integrated Survey Grid (ISG 56/1)

SCALE 1:10 000

0 200 500 Metres

ENVIRONMENTAL PLANNING & ASSESSMENT ACT , 1979

DRAFT LAKE MACQUARIE LOCAL ENVIRONMENTAL PLAN 2002

PUBLISHED IN GOVT GAZETTE NO. DATED

LOCALITY **BOOLAROO/CARDIFF**

SHEET INDEX

3 4
6 7 8
11 12 13

CERTIFIED IN ACCORDANCE WITH THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979, AND REGULATIONS.

GENERAL MANAGER DATE

[6.0] CHAPTER 6 - Key Environmental Impacts and Safeguards

[6.1] Air Quality

As part of the EA process, Holmes Air Sciences (HAS) were commissioned to prepare a report presenting an air quality and health impact assessment which specifically responds to the Director-General's Requirements relating to Air Quality Impacts and Health Impacts (refer Appendix 9). HAS consulted with both DEC and DoH as required by the Requirements and as part of the report preparation. This section summarises information from the HAS report (HAS 2006) and also details the mitigation measures that are to be applied to the project to manage air quality and health impacts. The HAS 2006 report is included with this EA as Appendix 20.

The HAS assessment is based on the use of a computer-based dispersion model to predict ground-level dust concentrations and deposition levels in the vicinity of the project area. Estimates of lead concentrations have been derived from dust concentration predictions. To assess the effect that the emissions would have on existing air quality, the dispersion model predictions have been compared to relevant air quality goals.

The HAS assessment is based on a conventional approach following the procedures outlined in the Department of Environment and Conservation's (DEC) document titled "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (DEC, 2005a). This is consistent with the requirements for environmental assessments under Part 3A of the *Environmental Planning and Assessment Act 1979*.

In summary, the report provides information on the following:

a. A description of the proposed operations and the local setting;
b. Air quality goals that need to be met to protect the air quality environment;
c. Meteorological and climatic conditions in the area;
d. A discussion as to the likely existing air quality conditions in the area;
e. The methods used to estimate dust emissions and the way in which emissions from the proposal would disperse and fallout;
f. The expected dispersion and fallout patterns due to emissions from the operations and a comparison between the predicted concentration and fallout levels and the relevant air quality criteria; and
g. Potential control methods to be used to reduce dust impacts.



Table 6.1 summarises the air quality assessment criteria that are relevant to the HAS report and the remediation project. The air quality goals relate to the total burden in the air and not just the contribution from the project. In other words, HAS considered the background levels when using these goals to assess the potential project impacts.

Table 6.1: Air quality assessment criteria

POLLUTANT	STANDARD / GOAL	AVERAGING PERIOD	AGENCY
Total suspended particulate matter (TSP)	90 μg/m^3	Annual mean	NHMRC
Particulate matter < 10 μm (PM_{10})	50 μg/m^3	24-hour maximum	DEC
	30 μg/m^3	Annual mean	DEC
	50 μg/m^3	(24-hour average, 5 exceedances permitted per year)	NEPM
Particulate matter < 2.5 μm ($PM_{2.5}$)	8 μg/m^3	Annual mean	NEPM*
	25 μg/m^3	24-hour maximum	NEPM*
Deposited dust	2 g/m^2/month	Annual mean (maximum increase in deposited dust level)	DEC
	4 g/m^2/month	Annual mean (maximum total dust level)	DEC
Lead	0.5 μg/m^3	Annual mean	NEPM

** Long-term reporting goal, not applied to projects in NSW. Australia has no ambient goal for $PM_{2.5}$ applied on a project basis.*

[6.1.1] Construction

Potential Impacts

Emissions of dust and lead in the dust are the main air quality issues. Lead arising from the remediation works has been given particular focus since impacts of this pollutant have undergone continual investigations both when the smelter was operational and following closure of the smelter in 2003. It is considered that managing impacts of lead will correspondingly manage any other of the metal contaminants on the PCCS Lands.

Particular care must be taken to address the release of lead particles in fugitive dust emissions, particularly from excavation, transportation and deposition of slag stockpiles into the containment cells as part of the PCCS site remediation works. There are potential significant risks to human health issues associated with the release of lead particles due to inhalation, ingestion and absorption of lead from the dust fall out into the air.

During dry conditions, on-site activities associated with the PCCS remediation works have the potential to generate dust. The following activities are those identified as a specific potential source of dust generation:

a. earthmoving activities and excavation. This will include the activities associated with loading, tipping and scraping;
b. movement of vehicles and construction machinery, both within and off the construction site.
c. stockpiling of materials;
d. transportation and movement of slag into the containment cells;
e. build-up of material around erosion and sedimentation controls;
f. mixing of excavated materials prior to emplacement into the containment cells; and
g. compaction during cell construction and material placement.

The HAS report indicates that the most significant dust generating activities will be haulage of material over unsealed surfaces and wind erosion from exposed areas.

The assessment assumes that all haul roads are unsealed (whereas a number are sealed), but that road watering was taking place on a regular basis.



Air Quality Assessment

HAS Report

HAS modelled three 6 monthly periods of the remediation works based on the project description in Chapter 3. The scenarios modelled by HAS were chosen to represent the periods of remediation that would have the greatest potential for air quality impacts at the nearest residential areas since the remediation activities would be closest to the nearest residential areas. HAS noted that the impacts of the works during the other seven 6 monthly periods would be expected to be less than for the modelled scenarios.

HAS concluded that there is potential for short-term exceedances of the PM_{10} goal (24-hour average of 50 $\mu g/m^3$) at nearest residential areas due to proposed activities. Exceedances of the goal may arise when dust generating activities are taking place in close proximity to residential areas and when meteorological conditions are unfavourable. Excavation activities will need to be managed by a real-time management system involving measures that would minimise high dust generating activities at times when adverse weather conditions occurred. Adverse weather conditions mean unfavourable winds for particular residential areas when conditions are dry.

Conservative model predictions of annual averages suggest that cumulative TSP, PM_{10} and dust deposition would be below relevant air quality criteria at residential areas during remediation activities. The implementation of stringent dust control measures, such as regular watering of haul roads and rehabilitation of disturbed land as quickly as practicable, should ensure that air quality impacts are lower than those predicted in the HAS report.

The dispersion modelling has also suggested that the disturbance of lead in the soil will not present any adverse health impacts at nearest residential areas, based on compliance with the air quality goal for lead. Off-site lead deposition due to the remediation activities are predicted to be similar to currently measured levels at monitoring locations around the site and substantially lower than those experienced while the smelter was operating. The control measures to reduce off-site dust impacts would also reduce lead exposure.

The health impacts associated with the remediation would therefore be well within acceptable levels. The strategies proposed to control dust exposure will also reduce lead exposure.

Further Assessment

The data generated by the HAS assessment is very conservative as explained here.

a. the HAS model assumes that the terrain is flat and makes no allowance for surface effects. The ground is actually sloping and there are circumstances that will reduce potential dust impacts. For example, (i) the soil from the Triangle Paddock is known to be quite damp due to the low elevation and the proximity to Cockle Creek which will significantly limit dust generation. The Triangle Paddock features as one of the 3 HAS modelled scenarios. (ii) There is a major mound at the southern extremity of the Main Site which was built during the smelter operation to assist in noise control for Boolaroo residences. This will assist in reducing potential dust impacts on Boolaroo. Similarly, there is a fence between the Triangle Paddock and the adjacent Boolaroo residences that will provide some barrier to dust emissions;
b. the HAS model assumes dust generation from excavation for 365 days per year, whereas the project described in Chapter 3 indicates only 200 effective days per year;
c. all haul roads are assumed to be unsealed, whereas there are many sealed roads on the PCCS Main Site that will be used for haulage;
d. the Pb level assumed in dust was conservatively assumed to be twice the concentration expected on average in the excavated soil; and
e. the HAS methodology (as dictated by appropriate legislation) requires the assessment to be based on the maximum concentrations which possibly can be reached. As noted above, the 3 modelled scenarios give the maximum impacts, while the other 7 are expected to have lower impacts. At the same time, the 3 modelled scenarios are considered to achieve acceptable standards with the recommended mitigation measures.



Factors that could impact on the amount of conservatism are:

a. the concrete slabs that were at the base of the smelter buildings will be broken up and crushed on site. This could occur during the demolition stage (which is prior to the remediation activities), in parallel or post the remediation activities. The concrete will not contain any lead, but the HAS report does not specifically address this impact;
b. it is possible that excavation activities could occur at more than one location at a time under certain circumstances. With adequate spacing between the two excavation sites, it is unlikely that the cumulative dust generation would adversely alter the current HAS predictions. If this scenario became an important consideration, the HAS model would be re-run to model the activities; and
c. capping material is to be brought to site for the cell. The HAS modelling has not specifically considered the trucking required for this activity. Because the capping material is expected to be clay based or similar and trucks or rail entering the site will be covered, and because most of the haul roads to the cell construction area are sealed, this is not considered to be a major source of dust and more importantly, will not contain any Pb or other metal contaminants.

On balance, the assessment gives a high level of confidence that the air quality and health issues can be successfully managed without adverse impacts.

Cumulative Impacts

Importantly, the demolition and the current site clean-up activities will precede the remediation works so that there will be no direct cumulative effects from these different activities.

The jig operation will be undertaken in parallel with the remediation works but is expected to cease after about 2-3 years. Specific air quality mitigation measures already apply to the jig and the cumulative effect with the other remediation works is expected to be minor.

At the same time, the progressive nature of the remediation works will also progressively reduce the amount of contaminated PCCS Land areas. This means that cumulatively, dust impacts (and in particular Pb dust impacts) would be expected to correspondingly decrease over the period of the remediation works.

At the end of the remediation works, Pb dust emissions should be reduced to effectively nil (or as much as can be practically achieved).

Chapter 4 of this EA indicates the plan to redevelop the remediated lands in a staged manner. The redevelopment can theoretically start immediately after the remediation is complete, however there may be some time delay. The delay will occur due to the need to undertake the various activities of planning and design for each land parcel, submission of DAs to LMCC, approval times and then construction, sale and occupation for use. Some of these delays can be minimised, but typically this delay may be in the order of say 1-2 years. The redevelopment issue has two relevant scenarios, as described here.

Scenario 1 – Cumulative dust impacts for off-site receptors

Each redevelopment will be subject to dust control measures as prescribed by LMCC. The redevelopment proponent will also need to consider the cumulative impact of their redevelopment with the PCCS works. Importantly, any redevelopment will not involve any Pb affected dust generation. While the relative location of the redevelopment with respect to the PCCS remediation works is relevant, it is expected that the cumulative impacts would not cause significantly adverse off-site impacts.

Scenario 2 – Pb dust impacts from PCCS Lands to the Redevelopment Area

This scenario can be considered to be almost identical to the situation where under the proposed remediation works, PCCS Lands are to be remediated directly adjacent to existing residential areas. As discussed above, the HAS assessment indicates how this can be satisfactorily achieved, so that this scenario should not present a major problem provided the mitigation measures are properly applied.

Mitigation Measures

In specific circumstances where excavation activities are close to residential areas and measured data demonstrates the need, the excavation activities will need to be managed by a real-time management system involving measures that would minimise high dust generating activities at times when adverse weather conditions occurred. In this context adverse weather means unfavourable winds for particular residential areas when conditions are dry. There is an on-site weather station that can be used to identify daily wind direction and speed to assist in this management process. PCCS has an existing series of air quality monitors in residential areas as part of EPL 5042 which will also be used to support this management process. Correlating actual air quality measurements with on-site activities and prevailing weather data will provide a powerful predictive tool for managing air quality during the remediation works.

The following are further specific controls and approaches that should be implemented to minimise impacts from excavation, transportation, wind erosion, stockpiles and vehicle emissions:

a. regularly manage dust generation from roads with water sprays and water carts;
b. water-carts/trucks to be made available at short notice for use during periods of high dust generation;
c. if dust cannot be adequately controlled, (as evidenced by measured wind speeds and directions combined with on and off-site observations), then activities generating dust are to cease until appropriate controls can be implemented;
d. areas are to be stabilised progressively during construction;
e. all plant is to be maintained regularly to ensure its optimum operating levels and minimise pollutant emissions. Exhaust systems of construction plant vehicles and machinery to be properly maintained in accordance with manufacturer's specifications to ensure exhaust emissions comply with the PoEO Act and any associated regulations;
f. minimising the number of working faces on stockpiles;
g. in certain circumstances (such as for stockpiling fine, dry materials), stockpiles may be temporarily covered or sprayed with water/crusting agent (example Polo Dust Bind) to keep dust to a minimum. The covering of stockpiles is particularly relevant for lead contaminated soils. A polyethylene geomembrane or HDPE liner may also be used if a stockpile is to remain for a long period;
h. all vehicles on site be confined to designated roads;
i. prevent mud tracking onto public roads that may ultimately generate dust (with stabilised site access, cattle grids, wheel wash-downs etc);
j. trucks containing soil will be immediately covered after being loaded and tailgates be effectively sealed prior to leaving site; and
k. trucks will be thoroughly dry-brushed prior to exiting the site to remove any excess dust/material that may be deposited on external roads.

[6.1.2] Operation

Potential Impacts

Section 3.6 of this EA describes the expected condition of the PCCS Lands after the remediation works are complete. On the basis that landscaping and grassing becomes well established on the cell and the balance of the PCCS Lands, then there are limited foreseeable air quality impacts that will be generated during operation after remediation is complete.

One potential air quality impact could arise from surface erosion where landscaping and re-grassing has failed. Another potential impact is connected with the use of temporary roads on the site ahead of future redevelopment.

Mitigation Measures

The recommended mitigation measures are to:

a. ensure that the surface cover over the cell and the site is well established and maintained to avoid the possibility of dust generation; and
b. unsealed temporary roads be maintained and watered periodically (according to frequency of use) to control potential dust generation.



[6.2] Surface Water

The report Water Quality and Water Cycle Management Report *(*Maunsell, 2006b) described the water management procedures that are to be undertaken in conjunction with the remediation works described in Chapter 3 of this EA.

Surface water management measures are proposed to be undertaken in relation to the PCCS Lands before remediation, during the excavation works and the cell construction works (including the mixing and treatment areas) and on the areas of the PCCS Lands after remediation.

The existing surface water management measures and controls will remain in place throughout the remediation works except that:

a. where areas of the Main Site that are part of the current surface water management system are remediated, they will be isolated from the Main Site as being "clean", thus reducing the load on the catch dams and existing ETP. The "clean" areas after stabilisation will not require further pollution management. Eventually, after the remediation is complete, all areas will be "clean" and the existing system will shut down with the cell having its own new ETP; and
b. the excavation areas and the cell construction areas will have their own local water management but the extent of this will be dependent on whether they still lie within the existing water management system which has sufficient capacity for all activities.

The text below in Sections 6.2.1 and 6.2.2 is a summary of the potential surface water impacts of the site remediation works (excavation and cell construction) and the principles used for their mitigation.

The report entitled Pasminco Site Remediation Water Quality (Fitzwalter 2006 – Appendix 17) describes the existing surface water environment of the smelter site (discussed in Chapter 5 of this EA) and assesses the potential environmental impacts associated with the proposed remediation works. The Fitzwalter 2006 assessment specifically addresses the water quality and health issues referred to in the Director-General's Requirements relating to the Part 3A approval application for the proposed works (refer Chapter 2 of this EA). Discussion of this report is included in Section 6.2.3.

[6.2.1] Construction

Potential Impacts

Potential surface water impacts that may arise during the remediation works may include:

a. clean water from catchments upstream of the disturbed areas are allowed to flow over contaminated areas thus becoming contaminated;
b. runoff contaminated (by soil erosion and/or metals) from disturbed areas being cleaned up entering downstream waterways; and
c. sediments being transported from the site on vehicles contaminating clean areas/roadways.

The major potential regional impact is for contaminated surface waters to enter Cockle Creek. Initially this has the potential to affect the creek's ecological environment which may in turn affect human receptors either ingesting the creek waters or by eating fish from the creek.

Mitigation Measures

The proposed staging of the remediation (as outlined in the EA) aims to progressively clean up the smelter site and the PCCS Lands generally. The existing surface water management including the catch dams and the ETP will remain in place throughout the site remediation, although the staged remediation works will require progressive relocation of dams, pumps and piping. Also, once the Main Site is fully remediated, the ETP will eventually be replaced by a new ETP which will be situated at the base of the containment cell specifically for the purpose of treating any emissions from the cell.

The report titled Water Quality and Water Cycle Management Report written by Maunsell 2006b (Appendix 16) provides in-depth details of the mitigation measures which will be used during the remediation of the site. Relevant details are reproduced here.

A summary of the key principles which will be employed during construction and operation on a local and site wide level to manage the potential impacts is as follows:



Local

a. Trap “dirty water” and eroded sediment from disturbed sites, as close to the source of the sediment as practical;
b. Minimise the extent of disturbed areas during remediation of any given stage;
c. Rapidly revegetate remediated areas where possible. Any areas that are not revegetated should be stabilised; and
d. Progressively cover containment cell to minimise leachate. All leachate to be appropriately treated for reuse or licensed discharge.

Site Wide

a. Divert all clean water around contaminated sites to discharge topographically downstream of the site;
b. Separate “clean” and “dirty” water across the site
c. Runoff from contaminated sites to be treated before discharge to Cockle Creek
d. Continue ETP operations during remediation;
e. Maximise the reuse of treated water on-site;
f. Maximise and manage dam storages during remediation operations to minimise any overflows from dams retaining contaminated runoff;
g. Maintain the integrity (as possible) of essential piped drainage networks during remediation; and
h. Continue to monitor water quality on and off site and comply with EPL 5042 requirements

These principles will be incorporated into the Remedial Works Plans and Environmental Management Plans associated with the site remediation works in the form of mitigation measures.

To achieve optimal surface water management during the remediation process, the following water management strategy is recommended to be implemented wherever feasible during the remediation of the PCCS Lands. The key elements of the strategy are summarised below with further detail on the mitigation measures provided immediately after the strategy summary.

Key Strategy Elements

a. Wherever possible during the remediation process, work is to be undertaken from uphill to downhill. This is to be applied both across the site and across any area being remediated;
b. Provide and maintain a network of drains:
    - Directing clean water from catchments above the PCCS and Incitec site around these sites to discharge downstream of the sites; and
    - Directing clean water around areas being remediated;
c. Separate and divert clean runoff from remediated areas as soon as practical;
d. Ensure that the existing dams providing retention storage for the plant and dump site areas meet the 10 year ARI 20 minute duration storm retention criteria. Continue to dredge and/or amplify these dams if necessary to achieve and maintain this capacity;
e. Ensure that a pipe network within and through the PCCS Lands is maintained for as long as it is needed to transport runoff between basins and/or transfer clean runoff across the site (e.g. the 6 foot drain);
f. Ensure that there is suitable runoff retention capacity in existing dams and/or new temporary basins are available for all areas undergoing remediation works at any one time to collect 10 year ARI 20 minute duration storm event flows for those areas;
g. Provide diversion drains for any areas being remediated to direct all contaminated runoff from that segment to the appropriate dams and/or basins. Transfer all water collected in the dams/basins to the ETP, either directly or via an intermediary dam, for treatment before reuse or discharge;
h. Where retention basins are provided on a temporary basis, at the completion of the use of that basin for water retention during remediation works, the collected sediments are to be dredged and treated as contaminated material and the basin removed;
i. Where possible, disturbed areas within each segment are to be minimised;
j. The existing ETP must stay operational until remediation is finalised and the cell is finished or the new ETP associated with the cell is commissioned and can replace the existing ETP;
k. Continue to use saltwater dams as supplementary dam storages during remediation;



l. All stockpiling of contaminated material is to be contained within the footprint of the containment cell. Any stockpiling of contaminated material within other stages is to be kept to a minimum and transferred to the cell area if not needed at the excavation site. Measures to reduce erosion and sediment transport are to be used on all stockpiles; and

m. Monitoring of water quality on and off site is to continue as per EPA licence requirements.

It is expected that the implementation of this strategy reinforced through the EMP for each phase of the remediation work will minimise the risk of any contamination of surface water by pollutants on the PCCS during remediation, thus protecting the environmental values of the downstream receiving waters in accordance with the ANZECC 2000 guidelines.

A further description of the mitigation measures forming part of the strategy is given below.

Drains

Prior to the commencement of any remediation works for any particular area and to the extent feasible, a network of catch drains, diversion drains, and other erosion control measures are to be installed to direct clean stormwater runoff around and/or away from the area to be remediated.

V-drains are also to be installed in appropriate areas / boundaries to catch and drain surface water runoff generated on the area being remediated to the suitable retention dam/basin for treatment. All drains should be lined with materials suitable to handle the design flow velocities.

A network of drains directing clean water from catchments above the PCCS and Incitec site around these sites to discharge downstream of the sites will also be installed. These drains should be extended if necessary to ensure all clean water is kept free from contamination. They will be maintained throughout the remediation works to ensure clean runoff from sites above the PCCS remains uncontaminated.

Sedimentation and Retention Basins/Dams

The provision of source control for the collection of potentially contaminated surface water is the primary water quality management measure. Throughout the progress of the remediation works, storage areas will be provided across the site of capacity sufficient to retain the 10 year ARI 20 minute duration storm event for the areas under remediation. The existing dams, known as Hawkes Dam, South West Dam, the Spray Pond and the Fresh Water Dam have been generally sized to meet these criteria for the main catchments of the whole PCCS site, and are such these dams will be sufficient to provide the retention requirements of these remediation areas. However, as the remediation program progresses, the existing dams may be modified, reduced or removed and as such suitable and adequate alternate retention systems will be installed in their place to cater for the remaining areas undergoing remediation at any time. Based on calculations and methodology presented by CH2MHill (2004), it has been determined this is 150 m^3/ha. These basins will be provided at suitable locations to effectively manage the water flows for the subject areas being remediated.

The capacity of the retention basins / dams will be sufficient to capture the runoff during the design storm event for the entire area(s) undergoing remediation that drain to that basin/dam. It should be assumed that all runoff from clean catchments will be directed around or though the site without requiring treatment within a basin.

Some areas of the site requiring remediation do not presently drain to these existing on-site dams. When remediation of these sites begins, there are two possibilities:

a. install a drainage network that allows contaminated runoff to be directed into an existing on-site dam, that dam may be used to retain contaminated site runoff, provided that the dam is of sufficient capacity to collect the additional runoff volume or can dredged/augmented to provide this storage; and

b. Should the site not be able to be drained to an existing basin or the existing basin not have or be able to be dredged/augmented to the required storage capacity, a new basin will be provided with capacity to retain the 10 year ARI 20 minute duration storm event from the subject area and constructed in accordance with the guidelines provided in Managing Urban Stormwater (Landcom 2004). Runoff retained in the basin will be pumped to the ETP for treatment.

The transfer and storage of water on-site will need to be managed such that the required storage volume is available within the relevant dams and basins. Inventory levels within the storages need to be monitored and reduced as required.



A drainage and pumping network will be provided and maintained to ensure that all 'dirty' water is collected and treated prior to discharge. The drainage and pumping infrastructure will need to be maintained / augmented throughout duration the remediation works to ensure all contaminated water collected can be moved around the site for storage, treatment and reuse.

As the remediation progresses, the storage capacity and drainage and pumping network will need to be checked and any modifications required to maintain the integrity of the system undertaken before new works commence. As areas are progressively remediated and considered 'clean', the retention capacity for water from the remaining contaminated areas will consequently and proportionately decrease.

Stockpiles

The following actions will mitigate erosion of and sedimentation from stockpiles:

a. bunds around stockpiles contain stockpile material and direct water flow away from stockpiles;
b. stockpiles slopes to be no greater than 2:1 (horizontal to vertical);
c. the stockpiling of surplus material will not be undertaken during heavy periods of rainfall;
d. stockpiles will be located away from natural flow paths and watercourses;
e. temporary erosion and sediments control structures will be placed around stockpiles to prevent erosion;
f. stockpiles will be located away from the canopy of any tree that is to be retained; and
g. stockpiles to be retained for long periods will be stabilised.

Vehicle Wheel Cleaning Units

All earthworks vehicles leaving the site onto public roads will pass through an appropriate wheel cleaning unit. All water and sediment from the wheel cleaning units is to be collected and treated before discharge or re-used for dust control measures, where feasible.

A street sweeper unit may also be employed on an as required basis as an extra measure.

All site contractors will need to conform to these commitments. EPL 5042 (or any replacement or amended EPL) will be required to be in force during the remediation works. Monitoring and site supervision will continue throughout the works period. As a result, the potential impacts will be successfully managed to meet avoid exceeding desirable legislative standards for off-site impacts.

Overall, the proposed mitigation measures will avoid unacceptable adverse off-site impacts during the construction phase.

[6.2.2] Operation

As discussed in Chapter 3, the long term operation of the containment cell, the new ETP and the lands on which those facilities will be located, will be managed for the long term to ensure that the cell remains safe and secure for the future. As such, there are no anticipated adverse impacts after the remediation is complete.

The following actions are part of the operation phase of the remediation works that are part of the site management:

a. All soils onsite will be remediated to acceptable limits for their intended use (e.g. the Site Auditor will sign-off the remediation as having achieved an adequate standard for uses such as residential, industrial etc as per the accepted criteria (refer Chapter 3 of this EA)); therefore there will be no further contaminated materials onsite to affect the surface water quality;
b. diversion drains will be constructed diverting clean water runoff around the containment cell; and
c. runoff from capping material will be diverted into the clean water diversion channels.

These channels will be directed to a stormwater holding pond and released at a controlled rate.



[6.2.3] Water Quality and Health Impact Conclusions

Details of any potential health impacts associated with the existing PCCS Lands works are contained within the Pasminco Site Remediation Surface Water Quality report (Fitzwalter 2006 – Appendix 17). The report examines the volumes, concentrations and mass fluxes of untreated surface run-off from the PCCS Lands to Cockle Creek and the potential impacts of the discharges. The report compares data from recent years when the smelter was operating to data since smelter closure in September 2003. Note that untreated surface run-off only occurs during high rainfall periods where the on-site storage and treatment capacities are exceeded.

Volumes, concentrations and mass fluxes of untreated contaminated run-off have markedly reduced since smelter closure.

The report also estimates the annual load of contaminants entering Cockle Creek from the PCCS Lands (post smelter closure) via surface water, treated effluent and from groundwater and compares these loads to those from stormwater from the upstream Cockle Creek catchment as shown in Table 6.2.

Table 6.2 - Estimated Annual Contaminant Load in Water Entering Cockle Creek from the PCCS Site prior to Groundwater Capture. (Fitzwalter 2006)

Contaminant	Annual Mass Entering Cockle Creek in Stormwater (kg/year)[1]	Annual Mass Entering Cockle Creek in Groundwater from the PCCS site (kg/year)[2]	Annual Mass Entering Cockle Creek from the ETP from the PCCS site (kg/year)	Annual Mass Entering Cockle Creek from Surface water from the PCCS site (kg/year)[3]
Lead	4,075	0.258	12.4	3
Zinc	10,158	61.4	92.8	225
Cadmium	105	12.1	13.6	27.6

Note 1 – assuming only 5% of the catchment is urbanised
Note 2 – These figures are based on flows prior to the boundary pump well installations. The newly installed pump wells are expected to effectively collect these emissions for treatment in the ETP reducing the predicted mass by over 90%– refer Section 6.3 of this EA
Note 3 – Further surface water controls being put in place will further reduce discharges via surface water run-off

Table 6.2 demonstrates that the mass load of metals from the PCCS surface water overflows is greater than that from the ETP and the groundwater. All three discharges (individually or cumulatively) are considerably less than the estimated loads from the catchment for Pb and Zn, whereas the estimates show the Cd from the PCCS Lands to be smaller, but of a similar order to that from the catchment.

Table 6.3 shows the water quality in Cockle Creek post smelter closure from January 2004 to December 2005 (2 year average in mg/L). The data are sourced from regular monitoring by PCCS reported to DEC under the EPL. The data shows that the emissions of Pb, Zn & Cd to Cockle Creek from all sources including those estimated in Table 6.2 are relatively small in relation to the volume of the receiving water body, and in particular for Cd are not readily detectable (in mg/L).

Table 6.3 Water Quality Post Smelter Closure: 2 Year Average concentrations (mg/L) – January 2004 to December 2005.

Receiving Water	Lead	Zinc	Cadmium
Cockle Creek	0.008	0.121	0.000

The data presented in Fitzwalter 2006 demonstrates the closure of the smelter operations together with the post-closure site clean-up and improved surface water controls have clearly had a major and beneficial effect on reducing off-site impacts from the PCCS site to Cockle Creek.

The procedures in place for managing the surface water (and groundwater and ETP discharge) from the site at present (prior to the remediation proposed in this EA) are such as to reduce the off-site impacts to levels that are estimated to be relatively minor and arguably not constituting a significant risk of harm.
This is not an argument for not remediating the site, but merely a statement demonstrating the success of current on-site controls.

Without the site being remediated, there are still remaining concentrations of metals such as Pb, Zn, and Cd due to the contamination in the topsoil containing smelter slags and run-off wastes as well as a build up of surface contamination by dust from the smelter operation.



Further reductions in the surface water contamination can only be made by the remediation of the site as proposed in the EA and supporting documents. Until such works are undertaken, surface water flowing offsite will continue to be contaminated to a degree and subsequently have some effect on the quality of Cockle Creek.

The Fitzwalter 2006 report then examines the potential impacts of the proposed remediation. The main conclusions from this assessment are:

"that after the remediation works have concluded, contamination from the surface water entering Cockle Creek will be effectively removed, thus eliminating any potential adverse health impact from the surface water leaving the PCCS site.

However, there will always be residual contamination in Cockle Creek from discharges from the catchment (and also from the creek sediments). Thus, despite removing the discharges from the PCCS site, there may be only small (or even insignificant) declines in the background levels of metals in Cockle Creek".

[6.3] **Groundwater and Leachate**

Chapters 3 & 5 of this EA describe the installation of 3 pumped groundwater wells in the shallow aquifer on each of the South West Dam and Hawkes Dam boundaries to the west of the PCCS Main Site. As described in Chapter 5, the previous investigations had determined that the deeper aquifer groundwater was not considered to be causing any significant risk of harm.

Table 6.2 contains the estimates of groundwater emissions from the site prior to the installation of the pumped wells.

The new pumped wells are designed to effectively prevent this contaminated groundwater from leaving the Main Site and entering Cockle Creek. The captured groundwater is being directed to the existing ETP for treatment before reuse or disposal of the treated water. The flow rate of groundwater collected is being monitored daily with an accompanying regulated monitoring program for water quality. Regular reports will be prepared in accordance with an Interim Groundwater Management Plan (IGMP – in preparation). The IGMP calls for regular reporting and review by the Site Auditor with copies of the reports to be forwarded to DEC. The first monitoring report is due in late 2006.

It is intended to keep this system in place to prevent groundwater discharge from the site until the remediation works are complete in relation to each groundwater path and monitoring demonstrates that they are no longer needed. The installed wells will apply for most of the works period, but there may need to be some modification as the remediation progresses either reducing the need for capture or by requiring relocation of the wells. The regulated monitoring and reporting required for the well installations by the Site Auditor (i.e. via the IGMP) will be used to review progress and performance and determine future actions in conjunction with the remediation stages.

A minor groundwater flow path through the north of the CWE area was originally observed in the CH2M Hill 2004b report. Remediation works on the CWE area include new monitoring wells to demonstrate that the remediation of the CWE area will resolve the issue of contaminated groundwater leaving the site through this pathway that potentially could cause a significant risk of harm.

Groundwater from the Incitec-Pivot site is contaminated and enters the Main Site from the western Incitec-Pivot boundary. This situation will need to be resolved either by Incitec-Pivot alone or in a joint scheme with PCCS (refer Section 2.1.2). Possible solutions for Incitec-Pivot are a cut-off wall and capture system at their boundary or remediation of their site.

Since there is boundary capture of groundwater, no other groundwater works are needed for the site related to the remediation works except in relation to the cell construction.



Chapter 3 describes the proposed groundwater and leachate management systems related to the cell construction which are:

a. upstream surface water and groundwater diversions to prevent entry of water into the cell which could generate leachate. This will minimise groundwater contamination and leachate generation. Collected water will be treated in the existing ETP (or later in the new ETP). The surface water diversion will be put in at commencement of the cell construction, while the up-gradient cut-off wall and diversion drain will be installed as soon as the eastern boundary of the cell is complete; and
b. installation of a leachate and groundwater collection system at the base of the cell. A key part of this installation is a down gradient catch trench. This system will capture all water that travels through or under the cell for treatment. This will be installed late in the site remediation works when the final cell boundary can be established.

Any groundwater or leachate generated during the cell construction will be captured by the boundary well system.

[6.3.1] Construction

Potential Impacts

The potential for contaminated groundwater impacts will remain until the PCCS Lands are remediated and the source of groundwater contamination is removed.

Mitigation Measures

The installed groundwater capture system at the western discharge boundaries of the PCCS aim to effectively prevent off-site discharges. Remediation works at CWE will eliminate the source of contamination from this site boundary. Remediation works at CWE will include the installation of a series of monitoring wells to demonstrate the success of the remediation of that area.
Mitigation measures will include:

a. Monitoring of the performance of the installed pumping and monitoring wells;
b. Regular reporting and review to identify the efficiency of the system;
c. Regular review of the effects of the remediation progress on the pumped wells and the associated monitoring system;
d. The installation of supplementary capture and monitoring wells on an as needed basis.
e. Maintaining the pumping and monitoring system after remediation is complete to a point where it has been demonstrated that there is no further risk of harm from off-site groundwater discharges.

The installed wells together with the proposed mitigation measures are expected to eliminate any significant risk of harm issues related to groundwater emissions during the remediation works.

[6.3.2] Operation

At completion of the site remediation, contamination of shallow groundwater will still be possible from contaminated material below the cell, since the cell is not sealed underneath. This will be limited by the lack of groundwater under the cell due to the upstream cut-off wall and surface water diversions and the restricted contact between the water and the contamination. Also, the installed downstream drain system attached to the cell is designed to capture any groundwater from this source and treat it to acceptable reuse or discharge standards.

The capping on the cell will be designed such that less than 10% of rainfall on the cell top will infiltrate into the cell through a grassed surface. This volume would be expected to decrease further in the future when there are buildings on top of the cell reducing the exposed surface area. This infiltration is expected to generate leachate at a slow rate through the base of the cell. The installed drainage system at the base of the cell will capture this leachate (with groundwater) for treatment.

Potential Impacts

Assuming the groundwater and leachate diversions and capture/treat systems meet their design criteria, then no adverse impacts are expected since no contaminated groundwater will leave the PCCS Lands.



Mitigation Measures

Ongoing funded management of the cell and its diversion/capture/treat systems will be put in place for the long term to ensure that the systems remain operable and efficient and prevent any harmful groundwater emissions.

[6.3.3] Health Impact Conclusions

As the installed groundwater and leachate system under the cell will prevent any discharge of contaminated material from the PCCS Lands, human health and the environment will be protected.

[6.4] **Noise**

This section contains a summary of the potential impacts and mitigation measures that will be employed during the remediation works. More comprehensive information is contained within the Noise and Vibration Management Plan (Vipac, 2006 – Appendix 21).

[6.4.1] Construction

Potential Impacts

Noise will emanate from the equipment on site, from ground vibration (expected to be minor) and from construction trucks, vehicles and personnel. In areas of the site where concrete slabs remain after the demolition phase, rock breakers and concrete crushers will be initially used before excavation creating impact noise. After this, the excavation, filling and grading work will be the noisiest activities due to the excavating equipment and trucks.

EPA criteria for construction noise provides the guideline that the additional construction noise for residential receivers should not result in an increase of more than 10dB(A) for the nominated period of construction beyond the Rating Background Levels shown in Table 5.1. It is unlikely that this guideline will be achievable at all times for the noisier activities of truck loading, although it must be noted that these activities are not continuous over the period. Therefore, peaks can be expected in the noise outputs that may exceed the desired criteria, with intervening periods of activity more closely achieving the EPA guideline.

Based on the modelling undertaken in the Vipac report, daytime exceedances of up to 20dB are predicted for residential receivers and up to 15dB for industrial receivers. However, the modelling is considered to be overly conservative and based on either worst case situations or not taking into account ground effects. Actual noise sources are expected to be much less than estimated in the Vipac report. As an example, during the recent demolition activities on the Main Site, which involved large demolition equipment, elevated demolition activities and relatively little additional noise mitigation measures, noise although audible in adjacent suburbs such as Boolaroo (closest suburb), did not generate any major amenity impact (as measured by the lack of any complaints received through the PCCS Hotline, email, fax or by word of mouth).

That the actual noise impacts are less than predicted (or possibly are not sufficiently noisy to generate complaints from the community) is likely due to the existing factors related to the PCCS Lands that will attenuate the noise impacts to a greater extent than the Vipac 2006 noise predictions.

For example, in relation to remediation of areas to the south of the site (Areas 4 and 8 as shown on Figure 3.2), a large mound was constructed at the southern end of the Main Site for noise attenuation from the smelter operations. The noise report produced in 1998 by Huson & Associates in relation to the mound indicated that the inclusion of the mound would reduce sound levels in the residential area to the south (i.e. Boolaroo) by between 1.5dB(A) and 6dB(A).

Similarly, an existing fence bordering the south side of the Triangle Paddock (Area 2 in Figure 3.2) will assist in noise attenuation. In the centre of the site, the large slag stockpiles (which will be used in the cell construction) will attenuate noise propagation in certain directions.

To provide additional information, PCCS are to undertake noise monitoring during excavation field trials in the CWE area in 2006 to compare to the theoretical predictions in the Vipac report and to provide further data which will be used to improve the management of noise for the balance of the works.

Vibration will occur due to the equipment used for the remediation, backfilling and regrading.



Mitigation Measures

Mitigation measures that may be used during the construction phase for noise management are summarised below. Reference should also be made to the other details provided in the Vipac April 2006 report.

The following outlines general controls and approaches that are to be implemented to minimise noise impacts:

a. limitation of working hours, for example, adherence to the construction hours as specified in the EPA Noise Control Guidelines;
b. site access points and thoroughfares for construction machinery routed as far as possible away from sensitive receivers (residential areas of Boolaroo, Macquarie Park);
c. whenever practical, at the end of shifts, excavation plant may be taken from their work areas and left overnight away from the immediate vicinity of sensitive receivers. Warming up of the plant in the morning would then be conducted away from such receivers;
d. mobile plant such as excavators, front-end loaders and other diesel-engine equipment may be fitted with residential class silencers or exhausts where necessary;
e. regular compliance checks on plant noise emissions and noise monitoring at receiver locations.
f. maintain a community liaison program during the works;
g. if noise activity has to take place that may affect neighbouring properties, the occupants will be warned in advance, particularly in regard to the duration and type of activity;
h. construction noise management sub-plans are to be in place to minimise the upper limit noise rating at site boundaries; and
i. undertake noise monitoring and reporting during the works.

In addition, in some circumstances it may be necessary to:

j. install temporary noise barriers adjacent to the excavation works areas which are located in close proximity to residential areas to avoid line of sight between PCCS machinery and the sensitive noise receivers. This action would only be applied where there were serious complaints from off-site receivers which were substantiated by actual noise measurements.

Vibration management consists mainly of maintaining suitable distances between works activities and receivers.

The application of the above measures and a proactive management approach for each excavation stage will enable noise to be managed to acceptable levels.

[6.4.2] Operation

Potential Impacts

There will be no significant noise generated from the site once remediation is complete. General maintenance vehicles associated with the ETP and site grounds will be the only traffic onsite. This traffic will be minimal and will occur infrequently.

Mitigation Measures

Because the ETP will involve mechanical plant, it will be suitably housed and maintained to moderate any potential noise generation and avoid any adverse impacts.



[7.0] CHAPTER 7 - General Environmental Risk Analysis

[7.1] Heritage and Archaeology

[7.1.1] European and Aboriginal Heritage and Archaeology

As indicated in Chapter 5, two DAs for the demolition of the majority of the buildings on the PCCS Main Site were approved by LMCC with a number of accompanying conditions of consent which have been or are being undertaken. The consents did not address excavation below surface level.

The historical evidence relating to the PCCS Lands and the nature of the contaminated soil as shown from the various investigations on the PCCS Lands suggest that the proposed excavation or land disturbance associated with the remediation works will primarily involve the removal of unstratified fill or the like.

Construction

Potential Impacts

It is possible though not very likely that excavation of the Main Site would uncover historical artefacts and other evidence of past occupation of the site by either or both of European and Aboriginal users. Similarly, there is a low probability of finding and artefacts on either the Triangle Paddock or the Cockle Creek Pumping Station sites. Upper parts of the Main Site and the Munibung Hill site are not to be subject to excavation but rather scraping of the top 25-50 mm of soil where future development is planned or a Site Management Plan for areas which are not to be further developed. The impact assessment for these areas is separately discussed in Section 7.1.2 below.

Mitigation Measures

The following mitigation measures should be applied to minimise the potential impact on sub-surface artefacts of Cultural heritage and Archaeological significance:

a. as part of the environmental induction program, remediation personnel involved in excavation should be given basic training in recognition of artefacts;
b. in the event that any artefact is found, work will cease until a qualified archaeologist has examined the excavation and artefacts and determined an appropriate course of action;
c. in the event of any find of significance, contact will be made with the appropriate authorities in accordance with the relevant applicable heritage legislation; and
d. any items of significance found during excavation will be retained, if practicable, and included in the collection of historical archives and artefacts accumulated during the pre-demolition heritage investigations.

Operation

Potential Impacts

The maintenance and associated operation of the cell will not impact the cultural heritage and archaeology of the parcel of land associated with the cell or other parts of the PCCS Lands.

The Old Laboratory is being retained recognising its heritage value.

The upper parts of the PCCS Lands that are not to be redeveloped are to retain their current zoning and will not be significantly disturbed.

Mitigation Measures

There will be a Conservation Management Plan developed for the ongoing use and preservation of the Old Laboratory and the collection of historical archives and artefacts accumulated during the pre-demolition heritage investigations.

As part of the future development of the remediated PCCS Lands, the Interpretation Guidelines developed through the studies to date through conditions related to the demolition activities will be used to develop a Heritage Interpretation Plan which will reflect in the redevelopment the historical aspects of the past uses of the PCCS Lands.



A Site Management Plan will be prepared (as indicated in Section 3.1) in relation to the management of the upper parts of the PCCS Lands that are not to be redeveloped.

[7.1.2] Aboriginal Archaeology and Cultural Heritage

Studies by Umwelt 2004 indicated that due to extensive past uses and heavy disturbance of the sites, particularly the main smelter development zones specifically (by activities such as land filling, dam construction, industrial development, earthworks and soil erosion), that the potential for encountering artefacts during excavation is significantly reduced. This conclusion particularly applies to the Main Site.

Construction

Potential Impacts

As indicated above, it is unlikely that significant impact will occur to Aboriginal sites or artefacts for the majority of the remediation activities due to the previously disturbed nature of the PCCS Lands. With respect to the upper parts of the PCCS Lands which may be subject to remediation by surface scraping only, there is potential to disturb stone artefacts that may be present in the shallow soils, particularly along the ridge crest and possible on benches adjacent to drainage lines.

Mitigation measures

The following mitigation measures should be applied to minimise the impact on Aboriginal Cultural heritage significance:

a. further consultation with the Koompahtoo LALC involving an invitation for their representatives to observe scraping activities in the ridge crest and any benches adjacent to drainage lines;
b. if required, further archaeological investigations, targeting the ridge crest and any benches adjacent to drainage lines if earlier remediation scraping in these areas indicates potential for discovering further artefacts; and
c. as part of the Environmental Induction program, remediation personnel involved in scraping should be given basic training in recognition of Aboriginal artefacts.

Operation

Potential Impacts

The future use, ownership and management of the upper parts of the Munibung Hill post remediation have yet to be decided in detail. It is possible that areas may be transferred to public ownership as an extension to the public space on top of Munibung Hill.

Mitigation measures

Further consultation with the Koompahtoo LALC (particularly elders of the community) will be undertaken to obtain guidance with respect to managing this area so as to maintain respect for the Aboriginal cultural values of Munibung Hill.

[7.2] **Flora and Fauna**

Overall, the Preliminary Analysis and Issues Paper: Flora and Fauna at Pasminco Cockle Creek Smelter Site prepared by Umwelt in March 2004 (Umwelt, 2004b) concluded that it was considered unlikely that either of the two threatened species that were identified on the PCCS Lands (refer Chapter 5) would be significantly impacted by the proposed development for the PCCS Lands and a preliminary position was reached that a Species Impact Statement (SIS) was not necessary for the remediation project. This was confirmed by the later report entitled “Ecological Assessment for Proposed Development at Former PCCS Site, Boolaroo – Cardiff Industrial Park” which was prepared by Umwelt in January 2005 as the assessed area was the primary area for the Angophora inopina flora species.

The Umwelt January 2005a report entitled “Ecological Assessment for Proposed Development at Former PCCS Site, Boolaroo – Cardiff Industrial Park” included a Section 5A Assessment (eight part test on this area of the Main Site) as required by the EP&A Act 1979 to assess potential impacts of the proposed development on threatened species, endangered populations, endangered ecological communities, or their habitat.



The report identified that no threatened fauna species were identified on the CWE site and none are expected to occur on the CWE site other than possible rare visits during movement events such as dispersal or migration. No Endangered Ecological Communities or Endangered Populations occur on the site.

The report also conducted an Assessment of Significance under the Commonwealth EPBC Act and determined that the project is unlikely to significantly impact potentially occurring threatened or migratory species, or important habitat listed under the EPBC Act.

The Umwelt 2005b report entitled "Ecological Assessment for Proposed Development at Former PCCS Site – Triangle Paddock, Boolaroo conducted similar assessments for the Triangle Paddock.
The report concluded:

"No threatened fauna or flora were identified on the Triangle Paddock site and no threatened fauna are expected to occur on the Triangle Paddock site other than possible rare visits during movement events such as dispersal or migration. No Endangered Ecological Communities or Endangered Populations occur on the site. The proposed development of the site is unlikely to have any significant impact on threatened flora or fauna species." The report also concluded that an SIS was not required.

The Umwelt 2005c report entitled "Ecological Assessment for Proposed Subdivision and Rezoning at Former Pasminco Cockle Creek Smelter Site – Rail Employment Zone, December 2005 was a further study on Area 3 of Figure 3.2 of the Main Site considering State & Commonwealth Legislation. This report similarly reported no threatened fauna species, Endangered Ecological Communities or Endangered Populations occurring on the Rail Employment Zone site.

Hybrids of one threatened flora species, Angophora inopina, were located on the site, occurring as the dominant tree species Angophora inopina – Angophora floribunda Open Woodland. As a precautionary approach, the Umwelt report considered the hybrids as a threatened species for assessment purposes although the legislation did not provide any specific advice on the matter.

The report concluded that the proposed development is unlikely to have a significant impact on the species. Recommendations were provided for Angophora inopina and its hybrids with Angophora floribunda to be used in landscaping in the final development using seed collected from the PCCS Lands.

The Umwelt 2006 report entitled – Ecological Assessment for Proposed Subdivision & Rezoning at Former Pasminco Cockle Creek Smelter Site – Main Entry Precinct, February 2006 did not identify any Angophora inopina on the Main Entry Precinct (Area 4, Figure 3.2, Main Site) and similarly concluded that the project was unlikely to have any significant environmental impacts.

The report recommended that roadside and amenity planting should make use of indigenous species where it is not impractical, to assist in the maintenance of biological diversity in the local area, and to minimise the introduction of non-native species which might become serious weeds or hybridise with local natives.

Construction

Potential Impacts

Umwelt 2005a noted that the proposed remediation at CWE would require the removal of possibly up to half of the one threatened flora species of Angophora inopina or its intergrade with Angophora floribunda. This would similarly affect the REZ area. Based on a regional survey and analysis of Angophora inopina distribution, populations and threat status (Bell 2001), Umwelt considered it unlikely that the proposed remediation would have a significant impact on the species. Despite this conclusion, Umwelt recommended that a reserve be established on the PCCS Lands to ensure the continued viability of the species in the local area.



Mitigation Measures

Despite the conclusion that the removal of Angophora inopina or its intergrade with Angophora floribunda would not have a significant impact on the species, a reserve is to be established on the south and south-west boundary of the CWE area (refer Figures 4.1 and 4.2) to provide an area for the species retention on the PCCS Lands and to contribute to the continued viability of the species in the local area. Advice received from Umwelt (Pers. Comm.) indicates that any attempt to replant species that are to be removed as part of the remediation on the CWE area, would not be successful and accordingly this is not recommended as a part of the mitigation measures. However, replanting via seed collection from on-site species will be undertaken and is expected to be successful.

After remediation of an area (including levelling to the desired landform for subsequent development), the surface will be stabilised to prevent erosion of the topsoil. Depending on the time between the completion of remediation and before development takes place, this could involve re-grassing with local species. When further development takes place on remediated areas, landscaping requirements will be imposed by LMCC as part of their approval role.

The batters of the containment cell will be provided with permanent landscaping using local grass and plant species. Species will be chosen that have short root structures so as to avoid any possible disruption to the cell containment capping. LMCC will be consulted with respect to the choice of the landscape species. The purpose of the landscaping is to provide a low maintenance and long-term stable landform that blends with species that are consistent with LMCC's development guidelines. The landscaping will be monitored and managed until the vegetation growth is well established and is self-sufficient.

As indicated in Section 3.1, the upper parts of the PCCS Lands that are not to be redeveloped will be subject to a Site Management Plan that includes replanting of vegetation that has been historically removed or affected. The approaches used for the new plantings will be as for the batters of the containment cells.

Operation

Application of the mitigation measures for the construction phase will result in an increased level of vegetation cover on the PCCS Lands. The permanent nature of the new conservation area, the cell batters and the improvement to the upper parts of the PCCS Lands will substantially improve the ecological value of the PCCS Lands.

Subsequent development applications to LMCC for the remediated areas will include details of the areas of the allowances for open space, landscaping and drainage in line with LMCC's LEP, relevant DCPs and the principles of the LMCC Munibung Hill Land Use Strategy (refer Chapter 4).

[7.3] **Mine Subsidence**

As part of the CCCDMP (Appendix 12), geotechnical consultants detected that the mine workings were at a sufficient depth and that the majority of the pillars are of adequate long term stability, so that they would not pose an issue to the containment cell being located over the workings. Some minor faults were also identified, however it was concluded that these were not an issue for surface civil works.

Operation

Mine subsidence impacts primarily apply to future development of the site as limited impacts will be caused by the remediation activities. The discussion below relates only to the operation period.

Potential Impacts

The geotechnical studies reported in the CCCDMP also concluded that some geotechnical remediation of the localised spots of existing subsidence and subsurface mine features may be required, depending on the proposed end use of the land.

Mitigation Measures

During any further development of the Main Site in proximity to the Mine Subsidence area, it is expected that the Mine Subsidence Board will be consulted to provide the design criteria for the future design of buildings based on predicted conditions of subsidence, strains and tilts. However, as the development of PCCS Lands post remediation does not form part of this Part 3A application, no mitigation measures are required in relation to mine subsidence during the operational phase.



[7.4] **Traffic**

The traffic levels considered here are those generated as a direct result of the remediation activities. These will be limited to personnel visits for site maintenance or remediation activities, supply of equipment for use on the site and the supply of imported material for capping and to a much lesser extent, site fill.

While future development of the site post remediation (as discussed in Chapter 4 Strategic Planning) will increase traffic in the area, this is not considered in this EA since future development is not part of the approval sought under this Part 3A application.

Construction

Potential Impacts

There are currently about 15 PCCS personnel maintaining the PCCS Lands. Conservatively, this number has been considered to remain steady over the remediation period for this analysis. Demolition personnel will be off the site by December 2006 or earlier and have not been included in these calculations. The proposed remediation works would generate additional traffic as vehicles would be required to transport plant, material and staff to and from the construction site.

Bringing equipment to the site is a one-off and is considered an insignificant impact (as would be the equipment removal on completion). Once on-site, the excavators, loaders trucks etc will remain there until the works are completed. On-site workers associated with the excavation and cell construction would generate daily traffic in the order of an additional 20 trips to and from the site (including auditors and other consultants).

The Traffix 2006 report indicates AADT traffic figures as being of the order of 24,600 (2003) for Main Road 217 which borders the PCCS Lands immediately to the west. Thus the additional personnel traffic to the remediation works is insignificant.

The material requirements for the capping layer are quite substantial. The current concept design thickness of the capping is 2 m of various materials that will need to be brought to site (CCCDMP). The cell layout used in the RWO report which forms the basis of the project description in Chapter 3 has a surface area of about 21 ha. This area is used here to calculate the volume of the capping layers, although it is considered to be conservative since the design has not been optimised and there are contingency allowances included in estimating the volumes of contaminated soil. Also, optimised design may result in a capping thickness of less than 2 m.

Total maximum capping requirements for the concept design are therefore in the order of 420,000 m^3. The different layers of the capping material will have different densities, but it is reasonable to assume an average density of 2 t/m^3 here which results in a total of 840,000 t. Assuming a truck can take a load of 20 t, this equates to 42,000 trucks over the 5 year period or 8,400 per year. Assuming truck deliveries on 250 days per year, this equates to an average of about 26 trucks per day over the 5 year period or say an average of 3.5 trucks per hour.

The predicted increase in traffic would represent a minor increase in traffic compared to the 2003 AADT data

Mitigation Measures

Off-Site Traffic

While the increased traffic arising from the remediation works is minor compared to the road capacity in the vicinity of the PCCS Lands, a possible mitigation measure that could be applied (depending on supply circumstances) is to source capping supplies by rail. The detailed design for the cell and capping is not yet complete and as such, the source of the capping material has not yet been established. Delivery by rail using the existing on-site siding would directly reduce potential truck traffic impacts on the local area. The economics of each supply situation will need to be examined in due course.

An additional mitigation measure is to source capping materials ahead of the start of the remediation works which will add to the time for sourcing and reduce the rate of supply. This will act to diminish any potential traffic impacts.

Additionally, alternative capping designs will be examined to identify if the desired containment design outcomes could be achieved with a thinner capping layer. This would directly reduce the amount of truck deliveries required for capping supply.

Access to the PCCS Lands is to be in accordance with the PCCS safety policy and NSW Occupational Health and Safety Act (2001) and associated Regulations.

On-Site Traffic

Once on the site, it should be possible to use the many internals roads and access points and avoid using public roads unless absolutely necessary. A number of internal routes have been nominated on the Staging Plan (Figure 3.3 and 3.4). These are nominal only and have been based on apparent accessibility from an aerial photograph. The use of internal routes may also minimise the noise impacts on surrounding sensitive receptors.

Where public roads are to be used, such as for staff access or the importation of material, site access points and thoroughfares for construction machinery will be located as far away as possible from sensitive receivers.

All drivers entering a remediation area will be required to be inducted. This induction will include site traffic procedures.

Overall, it is expected that the potential local traffic impact associated with the supply of capping material to the site can be minimised by the judicious use of the rail loop on site which delivers close to the cell construction area.

Operation

It is not envisaged that any significant traffic will be generated from the operation of the cell and mitigation measures are not proposed.

[7.5] **Visual Amenity**

A Visual Impact Assessment report has been prepared by Conybeare Morrison (CM+ 2006) which assesses the visual impact of the finished cell (attached as Appendix 23). This is discussed below under the Operation Impacts section.

Construction

Potential Impacts

Short term impacts on visual amenity would be associated with, construction activities and the presence of plant, equipment and materials in the vicinity of the site. While this is not visually attractive, it will have points of interest for those members of the community who wish to follow the progress of the remediation. The visual impacts during construction are not considered to be important when considering the previous views of heavy industrial equipment, stacks and stockpiles.

Mitigation Measures

Short term impacts on visual amenity would be minimised by ensuring that the construction sites are well maintained and are restored to an appropriate condition commensurate with the adjacent land uses as soon as practicable.

Operation

Potential Impacts

The Main Site after the demolition is complete will contain the two large slag stockpiles (covered in black HDPE) plus assorted stockpiles with a few dispersed buildings and the ETP structures.

At the completion of site remediation and prior to later development on the site, the whole of the site will be re-grassed to stabilise the surface with some selective planting in areas that are not subject to later redevelopment. The cell, which will resemble a hillock (or largish hill), will also be grassed on top with landscaping on its north-west and south-east batter areas and around the perimeter of its top.

From locations on the site and in close proximity to the cell, the containment cell will represent a large and imposing vegetation covered mound or hill.



The CM+ 2006 report compares existing views (photos) of the slag stockpiles with montage photo views of the finished cell. The views chosen represent a selection of distant to close viewpoints from off-site areas that are adjacent to the PCCS Lands plus some close viewpoints from within the PCCS Lands.

Two view comparisons from CM+ 2006 are reproduced in this report as Figures 7.1 and 7.2. Figure 7.1 (top photo) shows a view from within the PCCS Main Site from behind the Old Laboratory building looking northwards towards the slag stockpiles and also showing some buildings that are to be demolished. The location of the Old Laboratory is indicated in Figure 2.3. Figure 7.1 (lower photo) is the same view but with the proposed cell structure with vegetation cover.

Figure 7.2 (top photo) is a 3D image of the site with the existing slag stockpiles viewed from the west with Munibung Hill in the distance to the east. Figure 7.2 (lower photo) is the same image but with a montage of the proposed cell with vegetation cover.

The CM+ 2006 report considers that despite the cell representing a major change in the local landform, that its visual impact will be relatively low from viewpoints external and internal to the PCCS Lands.

Mitigation Measures

The slopes of the cell structure will be vegetated with dense shrubs with a band of informally planted trees along the perimeter edge of the top of the monolith to provide the appearance of a wooded hill. While serving a functional purpose of stabilising the batters and providing a relatively low maintenance environment, the landscaping will also act as a visual mitigation measure. Despite the obvious size of the hill, viewers will perceive it as a sculptured part of the landscape.

The cell is expected to be additionally sensitively contoured to merge with the south-western slope of the spur of Munibung Hill (to the north-east of the cell location). This will provide a practical surface for redevelopment, but will also provide the perception of the cell as being part of the natural landscape from some viewpoints.

It is also expected that as part of the future development of the site that landscaping will be provided at strategic locations on the boundary of the PCCS site. This landscaping on the boundaries will be an important component to moderating direct views of the cell from off the site (as described in CM+ 2006).

Overall, while acknowledging that the cell will result in major change to the topography of the local area of the PCCS site, the visual impact of the cell with the mitigation measures outlined above will be relatively muted. It is expected that over time, the new hill in the area will become part of the background landscape and represent a visually interesting addition for the off-site viewers.

[7.6] Generation of Waste and Hazardous Material

Construction

Potential Impacts

The proposed works have the potential to generate minor amounts of waste materials related to the construction personnel (e.g. food supply, personnel hygiene) and their activities (e.g. packaging wastes).

Mitigation Measures

Mitigation measures to be implemented to minimise construction wastes are outlined below:

a. construction wastes will be separated into recyclable and non-recyclable materials and stored in skips;
b. skips will be collected by a licensed waste contractor on a regular basis and transported off-site for disposal to a licensed landfill or recycling facility as appropriate;
c. all waste disposal will be in accordance with the POEO Act 1997 and the guidelines recommended in the EPA (1999) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes;
d. Waste disposal dockets should be kept and a copy forwarded to the CoS's Project Manager;
e. The construction contractor will supply portable toilets for use by the construction personnel; and
f. Where possible, materials will be imported in bulk to reduce packaging waste.

It is expected that waste generated during construction will be successfully managed with the application of the above mitigation measures.

Operation

Potential Impact

The material in the cell has the potential to generate leachate during the preliminary years of operation. It is envisaged that the amount of leachate produced will be minimal.

Mitigation Measures

A drain leachate collection system will be installed to collect any leachate from the cell. This will then be treated by an ETP to a suitable standard such that it can be discharged either to the sewer network or to Cockle Creek.

[7.7] **Social and Economic Outcomes**

The remediation of the PCCS Lands will reduce and/or eliminate the current pollution risk posed by the contamination in its present state and location. The contaminants currently present on the PCCS Lands will no longer affect surface water and groundwater migrating from the site. This will reduce the pollutant load to the creek and in turn will contribute to the enhancement of the quality of Cockle Creek, its ecology and the local area.

Soils will be remediated and stabilised and landscaped with vegetation enhancing the scenic and ecological quality of the site and the area.

The issue of dust dispersion containing traces of metals will be removed which will represent an improvement in the local air quality.

The site remediation will create some employment directly and indirectly in the locality. Typically, the remediation works are expected to support approximately 20 direct jobs over the five year remediation period.

The remediation of the PCCS Lands will make them suitable for a mix of industrial and residential developments. The remediation will allow the approximate total area of 190 ha to be available for more intensive use than at present or previously.

Industrial development on the site will increase employment in the area. Preliminary estimates of presented in Chapter 4 indicate that employment opportunities in the order of 1,300-1,600 permanent jobs are envisaged for the industrial and mixed use zones.

The increase in employment opportunity will create a need for additional housing in the area which can be served by the residential allotment. This in turn will increase the population density of the area and further enhance the local economy.

Depending on the mix of low and medium density zoning, the range of residential lots is expected to be in the order of 250-500. On average, lot sizes may range from 600 m^2 to 1,200 m^2 in area.

The development of both the industrial and residential areas will generate direct and indirect short term construction employment.

The above data shows the potential economic and social benefits of the development of the PCCS lands and demonstrate that the remediation outcome will avoid the unnecessary sterilisation of land or potential future land use conflicts.

Overall, the project will over time act as a catalyst for significant positive social and economic outcomes.

It is expected that the employment requirements for the remediation works will be largely sourced from the local region and accordingly no mitigation measures are necessary.



[7.8] **Cumulative Impacts**

Cumulative impacts can arise if other development occurs adjacent or in the locality of the PCCS Lands while remediation is taking place. In the case that road works, new industrial development or quarry operations commence in the adjacent areas, cumulative impacts from dust, traffic or noise may become an issue. There are no major projects known to be occurring in the area at present, although it is possible that the remediation of the PCCS Lands may stimulate some external investment in the area. The widening of the 5 Islands Road Bridge to the south of the site is expected to be substantially complete in the near future avoiding any adverse cumulative impacts from that project.

The planned redevelopment of the PCCS Lands after remediation (which does not form part of the Part 3A project) has the potential for cumulative impacts in respect of traffic, noise and dust generation with the remediation works. This EA has analysed the potential impact of the remediation on the new developments. As the redevelopment can only proceed after parts of the PCCS Lands are remediated, the potential cumulative impacts are assessed as being relatively minor.

The large demand for capping materials required by the project may place some pressure on the supply of local stocks for other users. It is possible that more distant suppliers may need to be sourced for the project.

The remediation of the PCCS Lands will contribute to an improvement in the locale as described in this EA. As such, the eventual benefits of the project are seen to far outweigh any short term cumulative impacts.

Mitigation Measures

LMCC in its role of approval authority for further development applications in the area has the ability to manage the potential for adverse cumulative impacts to some degree.

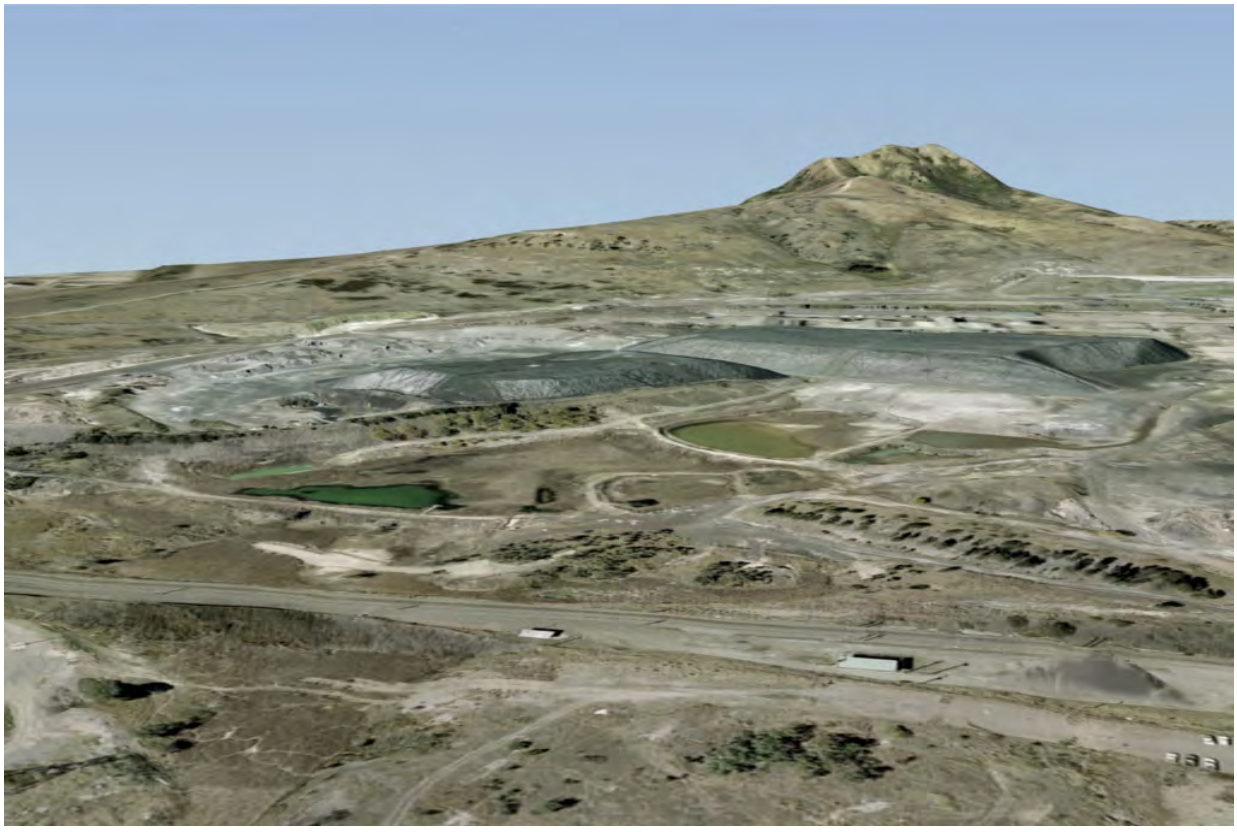


View taken from within the PCCS site, behind the former Laboratory building, which is to be retained for heritage purposes, located on the main internal access roadway (refer to Figure 2.3). The cell structure is clearly seen from this location as shown in the photos below.

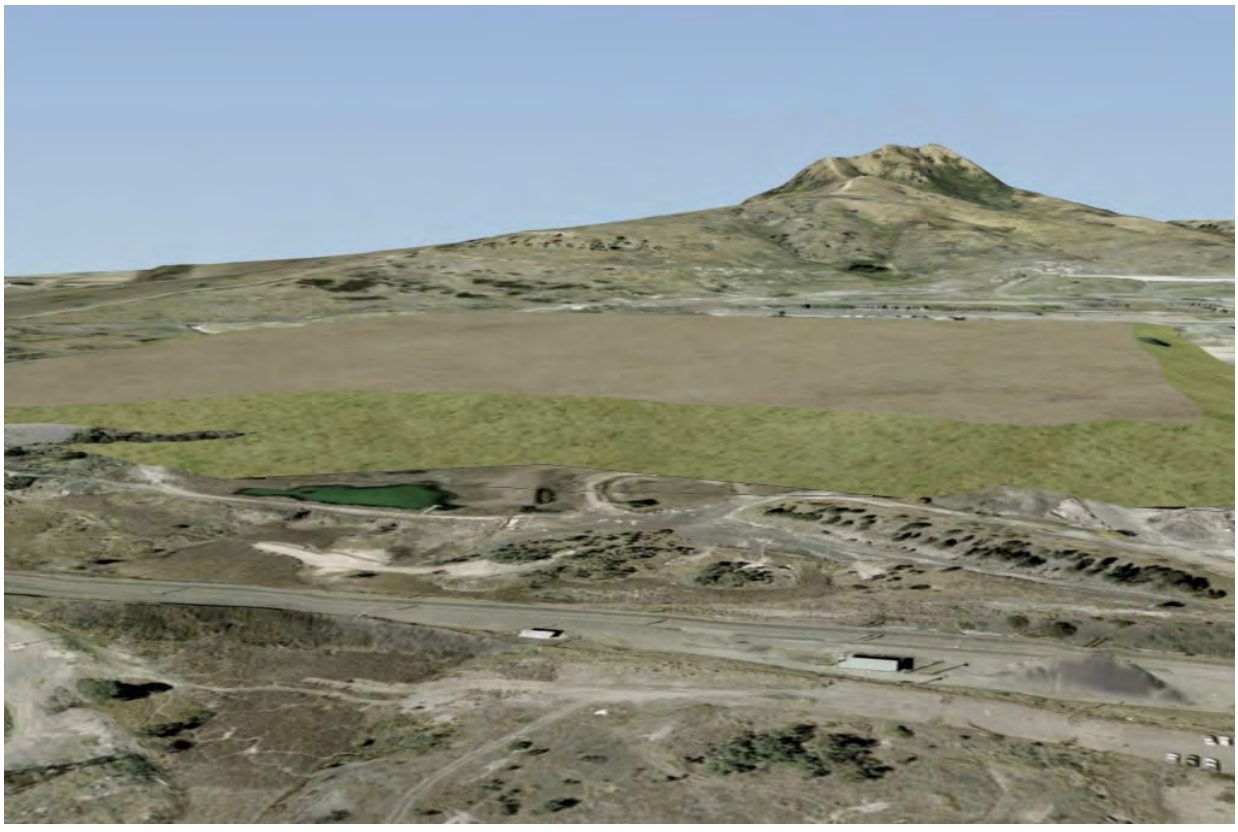
Upper photo: View within the PCCS site behind the former Laboratory building, northwards towards the cell structure with existing buildings to be demolished.

Lower photo: Same view of the site and proposed cell structure with vegetation over.

Figure 7.1: On-site view of present and future containment cell



Upper photo: 3D image of the site with existing cell structures, viewed from the west with Munibung Hill in the distance to the east.



Lower photo: Same view of the site with proposed cell structure with vegetation cover.

Figure 7.2: 3D image of present and future containment cell

[8.0] CHAPTER 8 - Statement of Project Commitments

Section 75F(6) of the EP&A Act states that 'the Director-General may require the proponent to include in an environmental assessment a statement of the commitments the proponent is prepared to make for environmental management and mitigation measures on the site'. In accordance with this requirement, this chapter provides commitments for environmental mitigation, management and monitoring for the project.

[8.1] Mitigation Measures

The proponent commits to implement the measures outlined in Tables 8.1 to 8.13 inclusive to minimise the potential for environmental impacts.

TABLE 8.1 – General Commitments

Mitigation/Management Measures	Timing
The development shall be carried out generally in accordance with the Environmental Assessment prepared by Fitzwalter dated August 2006 including all plans, specialist reports and mitigation measures provided there under.	During construction and operation
The proponent will ensure that all relevant licences or approvals from DEC are obtained and kept up-to-date for the duration of the works.	Prior to construction and during operation
The proponent shall prepare a Remedial Works Plan (RWP) as defined by the Site Auditor for each area of the remediation works which will include its own Environmental Management Plan (EMP), OHS&R Plan (OHSP) and Validation Plan (VP). The plans will be endorsed by the Site Auditor and then submitted to DEC.	Prior to construction
The proponent shall develop an Operational Management Plan (OMP) for managing and funding the containment cell and the ETP and a Site Management Plan (SMP) for the upper parts of Munibung Hill.	Before operation
Construction works shall generally be limited to the hours between 7:00am – 6:00pm Mondays to Fridays and 8:00am – 1:00pm on Saturdays except where approval is obtained from DEC for work outside these hours.	During construction

TABLE 8.2 – Air Quality Commitments

Mitigation/Management Measures	Timing
a. In specific circumstances where excavation activities are in close proximity to residential areas and measured data demonstrates the need, the excavation activities will need to be managed by a real-time management system involving measures that would minimise high dust generating activities at times when adverse weather conditions occurred.	During construction
b. Regularly manage dust generation from roads with water sprays and water carts; c. Water-carts/trucks to be made available at short notice for use during periods of high dust generation; d. If dust cannot be adequately controlled, (as evidenced by measured wind speeds and directions combined with on and off-site observations), then activities generating dust are to cease until appropriate controls can be implemented; e. Areas are to be stabilised progressively during construction; f. All plant is to be maintained regularly to ensure its optimum operating levels and minimise pollutant emissions. Exhaust systems of construction plant vehicles and machinery to be properly maintained in accordance with manufacturer's specifications to ensure exhaust emissions comply with the PoEO Act and any associated regulations; g. Minimising the number of working faces on stockpiles; h. In certain circumstances (such as for stockpiling fine, dry materials), stockpiles may be temporarily covered or sprayed with water/crusting agent (example Polo Dust Bind) to keep dust to a minimum. The covering of stockpiles is particularly relevant for lead contaminated soils. A polyethylene geomembrane or HDPE liner may also be used if a stockpile is to remain for a long period; i. All vehicles on site be confined to designated roads; j. Trucks containing soil will be immediately covered after being loaded and tailgates be effectively sealed prior to leaving site; and k. Trucks will be thoroughly dry-brushed prior to exiting the site to remove any excess dust/material that may be deposited on external roads.	During construction
l. Ensure that the surface cover over the cell and the site vegetation is well established and maintained to limit the possibility of dust generation; and m. Unsealed temporary roads be maintained and watered periodically (according to frequency of use) to control potential dust generation.	During operation



TABLE 8.3 – Surface Water Management Commitments	
Mitigation/Management Measures	**Timing**
a. Wherever possible during the remediation process, work is to be undertaken from uphill to downhill. This is to be applied both across the site and across any area being remediated; b. Provide and maintain a network of drains: c. Direct clean water from catchments above the PCCS and Incitec site around these sites to discharge downstream of the sites; and d. Direct clean water around areas being remediated ; e. Separate and divert clean runoff from remediated areas as soon as practical; f. Ensure that the existing dams providing retention storage for the plant and dump site areas meet the 10 year ARI 20 minute duration storm retention criteria. Continue to dredge and/or amplify these dams if necessary to achieve and maintain this capacity; g. Ensure that a pipe network within and through the PCCS site is maintained for as long as it is needed to transport runoff between basins and/or transfer clean runoff across the site (e.g. the 6 foot drain); h. Ensure that there is suitable runoff retention capacity in existing dams and/or new temporary basins are available for all areas undergoing remediation works at any one time to collect 10 year ARI 20 minute duration storm event flows for those areas, ; i. Provide diversion drains for any areas being remediated to direct all contaminated runoff from that segment to the appropriate dams and/or basins. Transfer all water collected in the dams/basins to the ETP, either directly or via an intermediary dam, for treatment before reuse or discharge; j. Where retention basins are provided on a temporary basis, at the completion of the use of that basin for water retention during remediation works, the collected sediments are to be dredged and treated as contaminated material and the basin removed; k. Where possible, disturbed areas within each segment are to be minimised; l. The existing ETP treatment area must remain operational until remediation is finalised and the cell is finished or the new ETP associated with the cell is commissioned and can replace the existing ETP; m. Continue to use saltwater dams as supplementary dam storages during remediation; n. All stockpiling of contaminated material is to be contained within the containment cell area. Any stockpiling of contaminated material within other stages is to be kept to a minimum and transferred to the cell area if not needed at the excavation site. Measures to reduce erosion and sediment transport are to be used on all stockpiles; and o. Monitoring of water quality on and off site is to continue as per EPA licence requirements.	During construction
p. All earthworks vehicles leaving the site onto public roads will pass through an appropriate wheel cleaning unit. All water and sediment from the wheel cleaning units is to be collected and treated before discharge or re-used for dust control measures, where feasible.	During construction
q. Diversion drains will be constructed diverting clean water runoff around the containment cell	During construction
r. Runoff from capping material will be diverted into the clean water diversion channels. These channels will be directed to a stormwater holding pond and released at a controlled rate.	During operation

TABLE 8.4 – Groundwater Management Commitments	
Mitigation/Management Measures	**Timing**
a. Monitoring of the performance of the installed pumping and monitoring wells; b. Regular reporting and review to identify the efficiency of the system; c. Regular review of the effects of the remediation progress on the pumped wells and the associated monitoring system; d. The installation of supplementary capture and monitoring wells on an as needed basis. e. Maintaining the pumping and monitoring system after remediation is complete to a point where it has been demonstrated that there is no further risk of harm from off-site groundwater discharges.	During construction except e. is post construction
f. Ongoing funded management of the cell and its diversion/capture/treat systems will be put in place for the long term to ensure that the systems remain operable and efficient and prevent any harmful groundwater emissions.	During operation



TABLE 8.5 – Noise Management Commitments	
Mitigation/Management Measures	**Timing**
a. Limitation of working hours, for example, adherence to the construction hours as specified in the EPA Noise Control Guidelines; b. Site access points and thoroughfares for construction machinery routed as far as possible away from sensitive receivers (residential areas of Boolaroo, Macquarie Park); c. Whenever practical, at the end of shifts, excavation plant may be taken from their work areas and left overnight away from the immediate vicinity of sensitive receivers. Warming up of the plant in the morning would then be conducted away from such receivers; d. Mobile plant such as excavators, front-end loaders and other diesel-engine equipment may be fitted with residential class silencers or exhausts where necessary; e. Regular compliance checks on plant noise emissions and noise monitoring at receiver locations. f. Maintain a community liaison program during the works; g. If noise activity has to take place that may affect neighbouring properties, the occupants will be warned in advance, particularly in regard to the duration and type of activity. h. Construction noise management sub-plans are to be in place to minimise the upper limit noise rating at site boundaries. i. Undertake noise monitoring and reporting during the works. j. In addition, in some circumstances it may be necessary to: - Install temporary noise barriers adjacent to the excavation works areas which are located in close proximity to residential areas to avoid line of sight between PCCS machinery and the sensitive noise receivers.	During construction

TABLE 8.6 – Heritage/ Archaeological Management Commitments	
Mitigation/Management Measures	**Timing**
a. As part of the Environmental Induction program, remediation personnel involved in excavation should be given basic training in recognition of artefacts; b. In the event that any artefact is found, work will cease until a qualified archaeologist has examined the excavation and artefacts and determined an appropriate course of action; c. In the event of any find of significance, contact will be made with the appropriate authorities according to relevant legislation; d. Any items of significance found during excavation will be retained, if practicable, and included in the historical archives.	During construction
e. There will be a Conservation Management Plan developed for the ongoing use and preservation of the Old Laboratory. f. As part of the future development of the remediated PCCS Lands, the Interpretation Guidelines developed through the studies to date will be used to develop a Heritage Interpretation Plan which will reflect in the redevelopment the historical aspects of the past uses of the PCCS Lands. g. A Site Management Plan will be prepared in relation to the management of upper parts of the PCCS lands that are not to be redeveloped (refer Section 8.1).	Before and during operation

TABLE 8.7 – Aboriginal Archaeology/Cultural Heritage Management Commitments	
Mitigation/Management Measures	**Timing**
a. Further consultation with the Koompahtoo LALC involving an invitation for their representatives to observe scraping activities in the ridge crest and any benches adjacent to drainage lines; b. If required, further archaeological investigations, targeting the ridge crest and any benches adjacent to drainage lines if earlier remediation scraping in these areas indicates potential for discovering further artefacts;	Before and during construction
c. Further consultation with the Koompahtoo LALC (particularly elders of the community) will be undertaken to obtain guidance with respect to managing this area so as to maintain respect for the Aboriginal cultural values of Munibung Hill	During construction



TABLE 8.8 – Flora and Fauna Management Commitments	
Mitigation/Management Measures	**Timing**
a. A reserve is to be established on the south and south-west boundary of the CWE area to provide an area for the species retention of Angophora inopina or its intergrade with Angophora floribunda on the PCCS Lands and to contribute to the continued viability of the species in the local area. Replanting in the reserve is to occur using seed to be collected from the on-site species. b. The batters of the containment cell will be provided with permanent landscaping using local grass and plant species. Species will be chosen that have short root structures so as to avoid any possible disruption to the cell containment capping. LMCC will be consulted with respect to the choice of the landscape species. The purpose of the landscaping is to provide a low maintenance and long-term stable landform that blends with species that are consistent with LMCC's development guidelines. The landscaping will be monitored and managed until the vegetation growth is well established and is self-sufficient. c. The upper parts of the PCCS Lands that are not to be redeveloped will be subject to a Site Management Plan that includes replanting of vegetation that has been historically removed or affected. The approaches used for the new plantings will be as for the batters of the containment cells (refer Table 8.1)	During construction

TABLE 8.9 – Traffic Management Commitments	
Mitigation/Management Measures	**Timing**
Off-Site Traffic a. A possible mitigation measure that could be applied (depending on supply circumstances) is to source capping supplies by rail. b. Capping materials to be sourced ahead of the start of the remediation works which will add to the time for sourcing and diminish the rate of supply during remediation, thus reducing any potential traffic impacts. c. Alternative capping designs will be examined to identify if the desired containment design outcomes could be achieved with a thinner capping layer. This would directly reduce the amount of truck deliveries required for capping supply. d. Access to PCCS Lands is to be in accordance with the PCCS safety policy and NSW Occupational Health and Safety Act (2001) and associated Regulations.	Prior or during construction
On-Site Traffic a. Maximise use of internal roads. b. Where public roads are to be used, such as for staff access or the importation of materia, site access points and thoroughfares for construction machinery will be located as far away as possible from sensitive receivers. c. All drivers entering a remediation area will be required to be inducted. This induction will include site traffic procedures.	During construction

TABLE 8.10 – Visual Management Commitments	
Mitigation/Management Measures	**Timing**
a. Ensure that the construction sites are well maintained and are restored to an appropriate condition commensurate with the adjacent land uses as soon as practicable. b. The slopes of the cell structure will be vegetated with dense shrubs with a band of informally planted trees along the perimeter edge of the top of the monolith to provide the appearance of a wooded hill (refer Section 8.8). c. The cell where possible will additionally be sensitively contoured to merge with the south-western slope of the spur of Munibung Hill (to the north-east of the cell location.	During construction



TABLE 8.11 – Waste Management Commitments	
Mitigation/Management Measures	**Timing**
a. Construction wastes will be separated into recyclable and non-recyclable materials and stored in skips; b. Skips will be collected by a licensed waste contractor on a regular basis and transported off-site for disposal to a licensed landfill or recycling facility as appropriate; c. All waste disposal will be in accordance with the POEO Act 1997 and the guidelines recommended in the EPA (1999) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes; d. Waste disposal dockets should be kept and a copy forwarded to the site's Project Manager; e. The construction contractor will supply portable toilets for use by the construction personnel; f. Where possible, materials will be imported in bulk to reduce packaging waste.	During construction
g. Leachate collected from the containment cell will be treated by the ETP to a suitable standard such that it can be discharged either to the sewer network or to Cockle Creek.	During operation

TABLE 8.12 – Consultation Commitments	
Mitigation/Management Measures	**Timing**
Existing arrangements will be continued so that the existing community consultation program will be maintained. These include a Project Hotline, a website, email and fax connections and a newsletter. A complaints register is to be maintained (as described in the construction works EMP). The EMP contains directions as to actions that are required to address any complaints received.	Prior and during construction

[8.2] **Environmental Management**

As described in Section 3.2.2, the SAS (Appendix 14) for the WoSRAP requires for the remediation of all PCCS Lands the preparation of a Remedial Works Plan (RWP) specific to the relevant part of the PCCS Lands that is to be remediated. The RWP is required to contain detailed specifications for the remedial works, including all management plans and the Validation Plan.

The management plans are to specifically include an Environment Management Plan (EMP). Prior to commencing any remedial works on the PCCS Lands, each RWP is required to be completed for review by the Site Auditor. All audit reviewed RWPs and associated plans are then to be provided to DEC for their approval.

In addition to Construction EMPs (prepared by the construction contractor), a Site Management Plan (prepared by the manager of the PCCS Lands containing the Cell and the upper parts of Munibung Hill) will *inter alia* address environmental issues relating to the management of those lands.

The EMP would outline environmental management practices and procedures to be followed during site preparation, remediation and cell construction. The EMP would be written to comply with relevant environmental legislation, the requirements of the Site SAS and conditions of any approval and permits.

The EMP would include:

a. A description of all activities to be undertaken;
b. Statutory approvals and other obligations;
c. Details of measures of environmental performance requirements and monitoring and measures to address non-conformances;
d. A description of the roles and responsibilities for all relevant key personnel involved in the remediation works;
e. The management plans and mitigation measures listed in Tables 8.1-8.13 inclusive, plus other relevant consent conditions arising from the Part 3A process.

The Operations Management Plan and the Site Management Plan would follow the headings a. to e. inclusive as per the EMP, but in respect of e., only those parts of Tables 8.1-8.13 inclusive in relation to post construction timing would apply.



[8.3] **Monitoring**

The Main Site is subject to EPL 5042 which currently specifies a number of monitoring requirements. It is anticipated that this EPL will be modified to respond to the Part 3A consent conditions. Monitoring would be undertaken to respond to the EPL applying to the remediation works. Monitoring is expected to include:

a. Air quality parameters
There are existing air quality monitors situated in suburbs surrounding the site. There are also additional monitoring requirements in Boolaroo specifically relating to the Demolition works. It is expected that those systems and their monitoring frequencies will form a substantial platform for the remediation works.

b. Surface water and erosion/sediment control parameters
EPL 5042 requires monitoring of overflows from the Main Site. This will be supplemented by site specific monitoring as specified in each RWP.

c. Groundwater parameters
An existing monitoring program is in place associated with the new pump well installations as described in Chapters 3, 5 & 6. The program has been approved by DEC and there are provisions to modify it as necessary through the IGMP if the program is affected by the remediation works.

d. Noise parameters
Noise monitoring is to be undertaken during the CWE remediation works. Monitoring will check on equipment sound levels and will also record actual noise impacts in Argenton and Cardiff Industrial Estate for different levels of the remediation activities occurring.

This data will be correlated with the predictions from the Vipac 2006 Noise Report to form the basis for future noise monitoring needs.

e. Archaeological parameters
For the most part, this monitoring will be undertaken daily by visual inspection by the remediation contractors. The Koompahtoo LALC will attend during any works undertaken in the upper areas of Munibung Hill that are subject to the Site Management Plan.

f. Flora and fauna parameters
The principal monitoring involved here will relate to the initial healthy establishment of planted vegetation in the new conservation reserve and on the cell. This will be specified in the detailed design phase.

g. Waste parameters
The Project Site Manager will ensure that the remediation contractor meets their requirements by monitoring the contractor's activities several times per week.

h. Consultation parameters
The consultation program has a pro-active component – The newsletter, the website, the recording of complaints and the documentation of all activities in response to complaints. The reactive components are addressing any complaints.
Typically, a newsletter and a website update will occur twice per year. The facilities for community consultation will remain in place until the remediation works are complete.



[9.0] CHAPTER 9 - Risk Analysis of Project

This chapter identifies how the proposed remediation works meet the Ecologically Sustainable Development (ESD) principles, analyses the general environmental risk associated with the completed project and assesses the justification for the project to proceed.

[9.1] **Achievement of ESD Principles**

[9.1.1] Definition of ESD

The CLM Act 1997 defines ESD Principles as follows:
"principles of ecologically sustainable development means the following statements of principle:

Ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs:

a. the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

In the application of the precautionary principle, public and private decisions should be guided by:

   i. careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
   ii. an assessment of the risk-weighted consequences of various options;

b. inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations;
c. conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration; and
d. improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as:
   i. polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement;
   ii. the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and
   iii. environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems".

[9.1.2] Achievement of ESD by the Project

The precautionary principle

Remediating the PCCS Lands is the most effective way of repairing the previous environmental degradation which has resulted from the past uses of the PCCS Lands.

Extensive studies have been undertaken to define the preferred project and to provide certainty that the project will substantially remove the existing environmental risks and provide a long term safe and stable site available for redevelopment. The project outcomes actually remove existing and future threats of environmental degradation.

Inter-generational equity

The remediated PCCS Lands will become available for more extensive and beneficial future uses than at present, thus resulting in improvements for future generations.



Conservation of biological diversity and ecological integrity

Because of past uses, the biological diversity and ecological integrity of the site has been substantially diminished. The project will include a reserve area which will preserve the only threatened flora species found on the Lands. Future landscaping associated with the batters of the cell and the future redevelopments will actually enhance the biological capacity of the cell area beyond its present state. Extraction of contamination from dispersed locations and containment in a cell will also improve the Lands' ecological integrity.

Improved valuation, pricing and incentive mechanisms

The remediation is to be funded by the original polluter through the Deed Administrator. The land values after remediation will be higher than the current situation which will generate funds to offset the high cost of the remediation.

The objective of remediating the PCCS Lands to provide for future redevelopment is directly linked to the achievement of environmental goals. That is, the future uses are only made possible by remediating the PCCS Lands to standards that are appropriate for the future uses.

As a direct consequence of the remediation, there will be significant economic and social benefits to the surrounding communities as well as to PCCS.

[9.2] Risk Profile of Proposed Project

The earlier environmental assessments have indicated that all environmental risks can be successfully managed during the construction period.

Table 9.1 summarises how the Site Remediation project will reduce the existing environmental risks associated with the PCCS Lands. The table compares the existing situation post demolition and the situation after the project is complete by considering issues raised in the Director-General's Requirements. An unweighted assessment has been provided as to the potential risk of the final completed project based on a ranking of high, medium and low. The assessment relies on the information reported in this EA supported by the referenced reports and investigations.

The information presented in Table 9-1 allows the conclusion that the remediation project will produce lands with very low environmental risks.



TABLE 9.1 – Comparison of Environmental Risk of Existing and Future PCCS Lands					
ISSUE	**EXISTING SITUATION**	**POST REMEDIATION**	**FUTURE RISK PROFILE**		
Air Quality	Dust containing metal pollutants can be blown off-site from open contaminated surfaces. Nearby houses have been affected by historical dust deposition.	All pollutants will be contained preventing any future contaminated dust dispersion.	H	M	L
Surface Water Quality	Clean surface water from upstream catchment becomes contaminated when flowing over the PCCS site. Contaminated runoff during high rainfall events enters downstream waterways during high rainfall situations. Open site areas can allow sediment run-off	Smelter wastes will no longer affect surface water quality. New stormwater controls will apply to remediated and redeveloped site.	H	M	L
Ground Water Quality	Groundwater is contaminated and requires a capture system to prevent discharge to Cockle Creek.	The excavation of the contaminated soil will eventually lead to uncontaminated groundwater removing environmental risk for the creek and allowing for the possibility of future groundwater use. Boundary control will become redundant, but ongoing management of groundwater and leachate from the cell will be applied.	H	M	L
Noise	No significant issues	No issues	H	M	L
Built Heritage	Recordings taken before site demolition. Management procedures during remediation will protect presently unknown in-ground heritage.	A Heritage Interpretation Plan (HIP) will be developed based on the Interpretation Guidelines arising from the investigations related to the demolition works. The HIP will be used to assist in a future redevelopment of part of the PCCS Lands which will reflect the historical aspects of its past uses. There will be future management of the retained Old Laboratory with the availability of the records of the smelter site.	H	M	L
Aboriginal Heritage	Management procedures during remediation will protect presently unknown in-ground heritage.	Management of any archaeological items found or cultural areas will be used to preserve archaeological and cultural values of the site.	H	M	L
Flora and Fauna	The existing Lands have been severely affected by past uses.	A reserve will be created which will provide a dedicated area for the growth of the only threatened flora species found on the PCCS Lands. Revegetation of the remediated Lands will add to the local ecological capability.	H	M	L
Subsidence	There are minor issues of subsidence due to previous mine workings	Engineering techniques have been identified to eliminate this risk.	H	M	L
Traffic	No issue	No issue	H	M	L
Visual Impact	After demolition the Main Site will contain miscellaneous slag and other stockpiles with a few retained buildings. The site will resemble a disused industrial site.	Remediation will leave the site with a vegetated covering pending the future redevelopment of the PCCS Lands. The cell will be a large addition to the site, but will be landscaped and contoured to blend into background.	H	M	L
Social & Economic value	The potential future of the site is limited to heavy industrial uses. The liability for site remediation will remain.	The remediated site will allow a substantial increase in future opportunities for redevelopment with associated social and economic benefits. The liability for future remediation will be removed.	H	M	L



Management	The site currently is subject to a Remediation Order (RO) and needs full-time and ongoing management to address significant risk of harm issues.	The remediated site will not be subject to a RO and while ongoing management will still be needed, the requirements will be significantly less onerous as there will no longer be any significant risk of harm issues. The risk of future contamination from the cell will be low due to the engineering design and the proven technology applied.	H	M	L

[9.3] **Justification**

The need for the project was established in Chapter 2 of this EA in terms of the following issues:

a. Remediation Issues and Pollution Risks;
b. Redevelopment Potential;
c. Economics of Site Maintenance;
d. Local and Regional Planning and Employment.

This EA has demonstrated that the project is able to be carried out within legislative requirements and without generating any unacceptable or adverse short or long-term impacts. In fact, the EA has demonstrated that the project will positively respond to all of the factors listed above relating to the need for the project in such a way that leads to a substantial improvement in the environmental risk of the PCCS Lands.

Overall, this EA has provided the data and analyses to confirm the justification for the project proceeding.



[10.0] CHAPTER 10 - References

Chapter 1

Nil

Chapter 2

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Chapter 3

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Chapter 4

Nil

Chapter 5

Access UTS 2005 – Hydrogeological Site Model, Pasminco Cockle Creek Smelter, 13a Main Rd, Boolaroo, NSW. Prepared for Pasminco Cockle Creek Smelter by CH2M HILL Australia Pty Ltd in conjunction with AccessUTS, May 2005.

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Chapter 8

Nil

Chapter 9

Nil