



23 February 2017

ENVIRONMENTAL IMPACT STATEMENT

Orica Kooragang Island Remediation Program

Submitted to:
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Orica Australia Pty Ltd
15 Greenleaf Road
Kooragang Island,
NSW 2034

REPORT



Report Number. 1418917_063_R_Rev2(a)





STATEMENT OF VALIDITY

Prepared under Part 4, Division 4.1 of the <i>Environmental Planning and Assessment Act 1979</i>		
Environmental Impact Statement prepared by:		
Name:	Gavan Butterfield Todd Robinson	
Address:	124 Pacific Highway St LEONARDS NSW 2065 New South Wales, Australia	
In respect of:	Orica Kooragang Island: Remediation Program – Environmental Impact Statement	
Applicant name:	Orica Australia Pty Ltd	
Proposed development:	Development consent to implement remediation works required under Management Order 20131407 of the <i>Contaminated Lands Management Act 1997</i> .	
Land to be developed:	Partial Lot 2 and Partial Lot 3 in Deposited Plan (DP) 234288 To be developed within the local government area of Newcastle City Council. The opinions and declarations in this Environmental Impact Statement are based upon information obtained from the public domain and Orica Australia Pty Ltd in addition to representatives of Government agencies and specialist consultants. Pursuant to clause 6(f), Part 3, Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i> , it is declared that this Environmental Impact Statement:	
Declaration:	■ Has been prepared pursuant to Part 4, Division 4.1 of the <i>Environmental Planning and Assessment Act 1979</i>, and with regard to the form and content requirements of clause 6 and clause 7 of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i>, and the Secretary's Environmental Assessment Requirements (SSD 7831) dated 18 August 2016. ■ Contains information relevant to the environmental assessment of the development that is accurate at the date of preparation; and ■ Contains information that to the best of our knowledge is neither false nor misleading.	
Signature:		
Name:	Gavan Butterfield	Todd Robinson
Title	Principal Environmental Scientist	Principal Environmental Planner
Date:	23 February 2017	23 February 2017



Secretary's Environmental Assessment Requirements	Principal Chapter of the EIS addressing the SEAR
<i>The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.</i>	Noted
■ In addition, the EIS must include a:	
■ Detailed description of the development, including: Existing operations carried out on the site and how the site operates lawfully under the Environmental Planning and Assessment Act 1979 (EP&A Act) including any reliance on existing use rights and/or planning approvals and how these will be consolidated	Chapter 5
– Need for the proposed development;	Chapter 1
– Justification for the proposed development;	Chapter 1 Chapter 3 Chapter 17
– Likely staging of the development - including construction, and Operational stage/s;	Chapter 4
– Likely interactions between the development and existing, approved and proposed operations in the vicinity of the site;	Chapter 4 Chapter 5
– Plans of any proposed building works.	Chapter 4
– Contributions required to offset the proposal.	N/A
■ Demonstrate that the site is suitable for the proposed use in accordance with State Environmental Planning Policy No 55 – Remediation of Land;	Chapter 2
■ Consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments;	Chapter 2 Chapter 5
■ Consideration of issues discussed in Attachment 2 (public authority responses to key issues);	Refer to relevant key issue chapter below.
■ Risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment;	Chapter 7
■ Detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes:	Noted



Secretary's Environmental Assessment Requirements	Principal Chapter of the EIS addressing the SEAR
– A description of the existing environment, using sufficient baseline data;	Refer to relevant key issue chapter below.
– An assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes;	Chapter 2 and relevant key issue chapter.
– A description of the measures that would be implemented to avoid, minimise, and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and	Refer to relevant key issue chapter below.
▪ A consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS	Chapter 16
The EIS must also be accompanied by a report from a qualified quantity surveyor providing: ▪ A detailed calculation of the capital investment value (as defined in clause 3 of the Environmental Planning and Assessment Regulation 2000) of the proposal, including details of all assumptions and components from which the CIV calculation is derived; ▪ A close estimate of the jobs that will be created by the development during the construction and operational phases of the development; and ▪ Certification that the information provided is accurate at the date of preparation.	Chapter 4 Preliminaries
Key issues	
The EIS must address the following specific matters	
■ Contamination – including: ▪ a contaminated land assessment carried out in accordance with the requirements of Management Order (20131407) for the site; ▪ a Remedial Action Plan approved by the EPA detailing the works to remediate the site, which includes: – characterisation of the nature and extent of contaminated material and any contaminated groundwater plumes; – details of the proposed remediation process, including treatment methodologies and processes; – justification for the proposed treatment and remediation criteria; – details of proposed remediation management measures including the management of excavated material, stockpiles and wastewater; – a site validation plan; and – details of compliance with the Contaminated Land Management Act 1997.	Chapter 8 Appendix C



Secretary's Environmental Assessment Requirements	Principal Chapter of the EIS addressing the SEAR
▪ details of the final landform following remediation and the suitability of any fill material; ▪ on-going management of the site following remediation works; and ▪ details of the final use of the site.	
■ Soil & Water – including: ▪ an assessment of the potential soil, groundwater and surface water impacts of the development, including a detailed description of surface and groundwater conditions pre and post remediation works; ▪ an assessment of existing and proposed stormwater controls, including a detailed description of the adequacy of sediment basins; ▪ details of licensing requirements, groundwater works, dewatering and management of contaminated water; ▪ identification of potential conflicts with other water users, including other licensed users and recreational users; ▪ a detailed description of the mitigation and management controls that would be put in place to manage erosion and sediment, stormwater, groundwater and acid sulphate soils (if present) during and after remediation works; and ▪ details of proposed surface and groundwater monitoring activities and methodologies.	Chapter 9
■ Human Health and Risk – including: ▪ an assessment of the potential risks (on site and off site) associated with the disturbance and long-term containment of contaminated material; and ▪ details of mitigation and management measures to minimise human health risks and ensure the safety of workers during the development.	Chapter 10
■ Waste Management – including: ▪ accurate estimates of the quantity and classification of the potential liquid and non-liquid waste streams of the development; ▪ a description of storage, treatment (including immobilisation of contaminants), disposal and re-use for all waste generated by the development; and ▪ details of procedures for the assessment and management of contaminated material.	Chapter 11



Secretary's Environmental Assessment Requirements	Principal Chapter of the EIS addressing the SEAR
■ <i>Traffic and Transport – including</i> ■ <i>accurate predictions of the traffic generated by all phases of the proposal.</i>	Chapter 4
■ <i>Air Quality and Odour – including:</i> ■ <i>- a quantitative assessment of the air quality and odour impacts of the development on surrounding receivers, in accordance with relevant Environmental Protection Authority guidelines;</i>	Chapter 12
■ <i>Noise and Vibration – including:</i> ■ <i>an assessment of all noise and vibration impacts on surrounding sensitive receivers; and</i> ■ <i>details of the proposed noise and vibration management and monitoring measures.</i>	Chapter 13
■ <i>Cumulative Impacts – including</i> ■ <i>an assessment of the cumulative impacts of the proposal in relation to existing on-site operations, surrounding industrial facilities and other nearby approved and proposed development.</i>	Chapter 15
■ <i>Biodiversity – including</i> ■ <i>an assessment of biodiversity impacts arising from the proposed remediation works, including details of potential impacts upon groundwater dependant ecosystems, in accordance with the Framework for Biodiversity Assessment or relevant Office of Environment and Heritage guidelines.</i>	Chapter 14
<i>Plans and Documents</i> ■ <i>The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Environmental Planning and Assessment Regulation 2000. These documents should be included as part of the EIS rather than as separate documents.</i>	Noted.
<i>Consultation</i> ■ <i>During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and potentially affected landowners.</i> ■ <i>In particular you must consult with:</i> ■ <i>Newcastle City Council;</i> ■ <i>NSW Health;</i>	Chapter 6



Secretary's Environmental Assessment Requirements	Principal Chapter of the EIS addressing the SEAR
▪ <i>Environment Protection Authority;</i> ▪ <i>Department of Primary Industries;</i> ▪ <i>Office of Environment and Heritage;</i> ▪ <i>SafeWork NSW;</i> ▪ <i>Port of Newcastle;</i> ▪ <i>Roads and Maritime Services; and</i> ▪ <i>Nearby land owners and occupiers that may be affected by the proposal.</i> ■ <i>The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.</i>	



EXECUTIVE SUMMARY

Introduction

This Environmental Impact Statement has been prepared on behalf of Orica Australia Pty Ltd to support a State Significant Development application under Part 4 (Division 4.1) of the *Environmental Planning and Assessment Act 1979*. Division 4.1 of this Act identifies the Minister for Planning as the consent authority for development that is identified as State Significant Development.

The State Significant Development application is seeking to obtain development consent to install a cap and containment remediation system at Orica's Kooragang Island Facility to address on-site arsenic contamination located in a small area in the north-western portion of the Orica Facility (Kooragang Island Remediation Program).

The remediation system is designed to prevent, to the extent practicable, further off-site migration of arsenic and in so doing, address the objective of Management Order 20131407 issued under the *Contaminated Land Management Act 1997* (Appendix B). Previous tasks completed to meet the requirements of the Management Order and to support the final design of the Proposal include detailed site investigations, the identification of feasible remediation technologies, hydrogeological modelling and groundwater monitoring. The outcomes of these investigations are detailed in the Remediation Action Plan, which has previously been submitted to the NSW Environment Protection Authority for approval (Appendix C). The Kooragang Island Remediation Program seeks approval to implement the proposed remediation works specified within the Remediation Action Plan.

The cap and containment system involves the installation of a low permeability cut-off wall to a depth of approximately 12 metres below ground level and integration of a low permeability capping system. The Project is located independently from existing site operations and therefore does not require altering the existing approvals.

This Environmental Impact Statement has been prepared by Golder Associates on behalf of Orica Australia Pty Ltd, as the Proponent, to support the Project as described in Chapter 4 of this Environmental Impact Statement. It has been prepared in accordance with the Secretary's Environmental Assessment Requirements issued 18 August 2016 by the Department of Planning and Environment, in accordance with the *Environmental Planning and Assessment Act 1979* and Schedule 2 of the *Environmental Planning and Assessment Regulations 2000*.

The Proponent

Orica Australia Pty Ltd is an independent, Australian-owned company with a global reach in more than 100 countries worldwide. Orica operates a manufacturing facility located at Greenleaf Road, Kooragang Island. The proposed remediation works are located on vacant land on the north western portion of this site.

Remediation Options

Consideration of remediation options for the Site has been extensive, and includes a comprehensive Feasibility Assessment and a workplan with input from technical workshops and consultation with stakeholders including the NSW Environment Protection Authority. The suitability of identified remediation options were assessed against the remediation objective, technical and implementation feasibility, operability and the potential to impact upon safety, health, environment and community values. Through this process the installation of the cap and containment remediation system was identified.

Consultation

A comprehensive consultation process has been underway for a number of years to address the requirements of the Management Order. This includes the development and implementation of a communication strategy.

To support the Project, consultation has been undertaken with a number of government agencies and stakeholders including:



- Nearby property owners, businesses and lessees;
- Newcastle City Council;
- NSW Health;
- Environment Protection Authority;
- Department of Primary Industries;
- SafeWork NSW;
- Port of Newcastle;
- Community Reference Group; and
- Industrial neighbours.

Environmental Management

The various components of the biophysical, social, and economic environment have been considered in this Environmental Impact Statement. Environmental aspects and associated potential impacts have been identified based upon the previous extensive documentation completed for proposed remediation works in accordance with the *Contaminated Lands Management Act 1997*, in addition to a risk assessment process, ongoing stakeholder consultation and the Secretary's Environmental Assessment Requirements for the Project.

Draft Compilation of Mitigation and Management Measures

The Environmental Impact Statement includes a draft compilation of measures outlining environmental management and monitoring during construction and operation of the Kooragang Island Remediation Program. These commitments aim to further reduce potential impacts of the Project while considering the existing management measures in place for the Orica Facility. These measures will also be detailed within a Construction Environmental Management Plan and Long-Term Environmental Management Plan.

Next Steps

Orica Australia Pty Ltd is seeking approval from the Minister for Planning to obtain development consent to install a cap and containment remediation system at Orica's Kooragang Island facility to address on-site arsenic contamination. The next steps in the process are:

- **Exhibition of the Environmental Impact Statement** for a minimum of 30 days and invitation to the community and stakeholders to make submissions.
- **Consideration of submissions.** Submissions received by the Secretary of the Department of Planning and Environment would be provided to the Proponent and any relevant public authorities. The Proponent may then be required to prepare and submit a submissions report, which contains responses to issues raised in the submission, and/or further design development and subsequent environmental impacts.
- **Determination of the Development Application.** The Secretary of the Department of Planning and Environment provides an Environmental Assessment Report on the Development Application to the Minister for Planning (or delegate), who then makes a decision on the Project and, if approved, can set Conditions of Approval.



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Secretary's Environmental Assessment Requirements (SSD 16_7831)

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APPENDIX C

Remediation Action Plan: Kooragang Island Remediation Program

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APPENDIX I

Important Information Relating to this Report





CHAPTER 1 INTRODUCTION

1.1 The Site

The Kooragang Island Remediation Program (the Project) is located within an area of approximately 4,200 m² (the Site) as shown in Figure 1.1. The Site consists of the identified extent of on-site arsenic contamination (refer to Section 3.3 and the Remediation Action Plan (RAP) in Appendix C for how this was identified), an area that incorporates the remediation works and a temporary amenity area during construction.

The Site is located within a north-western portion of the facility (Figure 1.1) and is located on a part of Lot 2 and Lot 3 DP 234288. It is currently a vacant area that contains grass and an internal access road.





1.2 Site Context

Orica Australia Pty Ltd (Orica) operates a manufacturing facility located at Greenleaf Road, Kooragang Island (KI) (the Facility), which produces ammonia, nitric acid and ammonium nitrate. Ammonium nitrate produced at the Facility is primarily supplied to mining operations in the Hunter Valley, where it is a raw material in the manufacture of explosives.

The Facility first commenced operations in 1969, with an ammonia plant, a nitric acid plant and an ammonium nitrate plant. The ammonia plant reforms natural gas in furnaces to produce hydrogen, which is combined with nitrogen (from air) to produce ammonia. Until 1994 the Vetrocoke process was used to remove (scrub) carbon dioxide from the process gas stream prior to the production of ammonia. The Vetrocoke process utilised a solution containing potassium carbonate and arsenic trioxide to remove the carbon dioxide.

Historically, the Site contained a sludge disposal pit, which was used for the disposal of solids and liquids from the spent arsenic waste inventory of the Vetrocoke process. The pit, located to the west of the ammonia plant, covered an area of approximately 1,500 square metres (m²) and was originally unsealed, although it was upgraded during its operational life with the installation of a concrete slab at the base, bitumen coating of bund walls and installation of a geosynthetic liner during the 1980s.

The NSW Environment Protection Authority (EPA) was notified of soil and groundwater contamination in the general vicinity of the previous sludge disposal pit (within the Site) under Section 60 of the *Contaminated Land Management Act 1997* (CLM Act). In November 2005 the Facility was declared a remediation site under the CLM Act - Declaration of Remediation Site No. 21089. This declaration included the Site that is the subject of the proposed Project.

Since 2003, Orica has completed several voluntary remediation agreements at the Site. As part of the Stage 1 Voluntary Remediation Agreement, Orica undertook remediation of soil beneath the former sludge disposal pit (above the groundwater table), the bund walls and the soil surrounding the pit. The soil was removed by excavation followed either by off-site disposal or treatment and off-site disposal.

Further investigations and field trials were subsequently undertaken under voluntary remediation agreements or a voluntary management proposal including trialling an in situ remediation process.

1.3 Need for the Project

On 28 July 2014 the NSW EPA issued a Management Order (MO) (Order Number 20131407; Declaration Number 21089; Area Number 3183) to Orica under Section 14 of the CLM Act (Appendix B).

The MO detailed the remedial actions to be implemented by Orica, these tasks included:

- identification of a remedial technology,
- development of a remediation action plan, design and implementation a remediation system,
- groundwater monitoring,
- development and implementation of a communication strategy; and
- development and implementation of a long-term environmental management plan.

These tasks have been detailed in the Remediation Action Plan (RAP), which has been submitted to the NSW EPA and is provided in Appendix C.



As specified within the MO, the key action in relation to the implementation of the remedial technology is:

- 1) *Implement works that will prevent, to the extent required by Action 1c, the further offsite migration of arsenic in groundwater. In planning the works, all necessary steps are to be taken to ensure the remedial work is implemented and commissioned by 31 December 2017.*
 - a)
 - b) *Prepare and submit to the EPA for approval a Remediation Action Plan (RAP) which is in accordance with the remedial method identified in the approved workplan and which documents the remediation strategy, system design, implementation approach, identification of regulatory licences, approvals and remediation end points. [30 June 2016]*
- 2) *Implement the proposed remediation works*
 - a) *Apply for necessary approvals from the relevant consent authorities for the proposed works...*

Orica has completed the activities associated with Action 1 and submitted a Remediation Action Plan (RAP) for the remediation program to the NSW EPA for approval. Orica is seeking approval to implement the proposed remediation program (Kooragang Island Remediation Program) in accordance with Action 2 of the MO.

In accordance with *State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55), the Project is classified as Category 1 remediation works. With regard to the assessment of Category 1 remediation works, SEPP 55 specifies that proposed remediation works *require approval* where the environmental impacts of the method of remediation are demonstrated to pose a less significant risk to human health or the environment than if the land were not remediated in that manner. It is considered that the Project provides improved health and environmental outcomes in comparison to the “do nothing” option.

1.4 Proponent

Orica is an independent, Australian-owned company with a global reach in more than 100 countries worldwide.

Orica is the largest provider of commercial explosives and blasting systems to the mining and infrastructure markets, a global leader in the provision of ground support in mining and tunnelling, and the leading supplier of sodium cyanide for gold extraction.

Orica has a strong portfolio of manufacturing and distribution assets strategically located across Australia, Pacific, Asia, The Middle East, Africa, Latin America and North America which enables Orica to provide valuable supply chain capabilities for its customers.

The Kooragang Island Facility primarily manufactures ammonia, nitric acid and ammonium nitrate, which are utilised in the manufacture of commercial explosives for the mining and quarrying industries.

Orica's Kooragang Island Facility in the context of the Port of Newcastle is shown in Figure 5.1.

1.5 Assessment Process

This Environmental Impact Statement (EIS) has been prepared in accordance with Part 4 of the EP&A Act and the *Environmental Planning & Assessment Regulation 2000* with the Project having been identified as a State Significant Development (SSD 7831). The environmental impact assessment process seeks to ensure that the community is consulted and that all relevant environmental matters, including issues raised by the community, are considered during the development and assessment of the proposal.

This EIS addresses the Secretary's Environmental Assessment Requirements (SEARs) (refer Appendix A), which were issued for the proposed remediation works on the 18 August 2016 by the Secretary of the NSW Department of Planning and Environment (DPE) following consultation with government stakeholders to scope the environmental assessment requirements.



The EIS will be placed on public exhibition, in accordance with the EP&A Regulation during which time the community and all other stakeholders may lodge submissions. Following the public exhibition, all submissions will be forwarded to the Proponent by the DPE. Following exhibition, the Secretary of the DPE may require the preparation of a submissions report to address the submissions made during exhibition. An assessment report by the DPE will then be prepared to assist the determining authority in their determination of the Project.



CHAPTER 2 STATUTORY FRAMEWORK

The Secretary's Environmental Assessment Requirements ■ consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments	Chapter 2
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2.1 Commonwealth Legislation

Environment Protection and Biodiversity Act 1999

The *Environmental Protection and Biodiversity Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas and species, populations and communities and heritage items. The approval of the Commonwealth Minister for the Environment is required for:

- An action that has, would have, or is likely to have a significant impact on matters of National Environmental Significance (NES matters);
- Actions that are likely to have a significant impact on the environment of Commonwealth land;
- Actions taken on Commonwealth land that are likely to have a significant impact on the environment anywhere; and
- Actions by the Commonwealth that are likely to have a significant impact on the environment anywhere.

NES matters include world or national heritage values; wetlands of international significance; the Commonwealth marine environment, nuclear actions, listed threatened species and ecological communities and listed migratory species.

The requirement for a Commonwealth approval is assessed through a referral process to the Commonwealth Department of the Environment (DOE). If the Commonwealth Minister for the DOE determines that a proposal is likely to have a significant impact, the proposal would become a controlled action and approval of the Commonwealth Minister is required. The need for a referral is based on two triggers. The first is that it must relate to NES matters. The second is that it must have a significant impact on such matters.

Based upon the assessment completed in this EIS, a referral will not be made to the DOE as it is considered the Kooragang Island Remediation Program is not likely to impact upon NES matters.

2.2 NSW State Legislation

Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and associated regulations are the primary legislation for establishment of controls on land use planning, establishing the framework for environmental planning and assessment in NSW.

The relevant objects of the EP&A Act are:

- a) *To encourage:*
 - i) *The promotion and co-ordination of the orderly and economic use and development of land...*
 - vi) *The protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats;*



vii) *Ecologically sustainable development...*

b) *to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and*

c) *to provide increased opportunity for public involvement and participation in environmental planning and assessment.*

The EIS confirms that the proposed remediation works are consistent with the relevant objects of the EP&A Act.

2.3 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) is the primary Act under which contaminated land located in NSW is regulated by the NSW EPA. Under the CLM Act, the NSW EPA regulates contaminated sites where the contamination is Significant Enough to Warrant Regulation (SEWR). Contaminated sites that are not regulated by the NSW EPA are managed by local councils through land use planning processes.

Orica has entered into agreements with the NSW EPA under the CLM Act 1997 to manage arsenic contamination identified on the Site. This includes a number of Voluntary Remediation Agreements (VRA, Stages 1 to 3) and Voluntary Management Proposal (VMP, Stage 4). On 16 November 2005 the NSW EPA declared Lot 3 DP 234288 to be a remediation site under the “Contaminated Land Management Act (1997) – Declaration of Remediation Site No. 21089”.

On 28 July 2014 the NSW EPA issued a Management Order (MO) (Order Number 20131407; Declaration Number 21089; Area Number 3183) to Orica under Section 14 of the CLM Act 1997, which included objectives, principal features, milestones, reporting and approval requirements for the remediation of the identified arsenic contamination at the former arsenic sludge disposal pit. This declaration addresses the Site, which is the subject of this Project.

2.4 Environmental Planning Instruments

Within the framework of the EP&A Act, Environmental Planning Instruments (EPIs) are the collective name for Local Environment Plans (LEPs) and Statement Environmental Planning Policies (SEPPs). The provisions of EPIs are legally binding with one primary function being the specification of approval pathways for development.

Approval Pathway

For the proposed remediation work the approval pathway relevantly includes the following SEPPs:

- *State Environmental Planning Policy (Three Ports) 2013*
- *State Environmental Planning Policy No 71—Coastal Protection*
- *State Environmental Planning Policy No. 55 – Remediation of Land*
- *State Environmental Planning Policy (State and Regional Development) 2011*

State Environmental Planning Policy (Three Ports) 2013

State Environmental Planning Policy (Three Ports) 2013 (Three Ports SEPP) identifies that the Site is zoned SP1 “Special Activities”. This zoning permits ‘Environmental Protection Works’ as an activity that is permitted with consent.

State Environmental Planning Policy No 71—Coastal Protection

State Environmental Planning Policy No 71 – Coastal Protection (SEPP 71) identifies that the Site is located within the coastal zone, as specified within the *Coastal Protection Act 1979*.



State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) provides a state-wide planning approach for the remediation of contaminated land. In particular, SEPP 55 provides for Category 1 and Category 2 remediation.

Projects classified as Category 1 remediation works require development consent, while projects classified as Category 2 do not require development consent. Table 1 provides an assessment of the proposed remediation works against the Category 1 remediation works triggers identified in clause 9 of SEPP 55.

Table 1: SEPP 55 Category 1 Remediation Work Triggers

SEPP 55 Clause 9 'trigger'	Assessment against proposed remediation works
a) Designated Development	No. The proposed remediation works are not considered to constitute "designated development" under Schedule 3 of the <i>EP&A Regulation 2000</i> as they do not propose the treatment or storage of more than 30,000 m ³ of contaminated soil and they do not involve the disturbance of an aggregate area of more than 3 hectares of contaminated soil.
b) Carried out or to be carried out on land identified as critical habitat	No.
c) likely to have a significant effect on a critical habitat or a threatened species, population or ecological community	No.
d) Development for which another State environmental planning policy or a regional environmental plan requires development consent.	Yes. Under the Three Ports SEPP, Orica Kooragang Island site is zoned as SP1 'Special Activities'. 'Environmental Protection Works' are identified as being permitted with consent for the land use zone.
e) carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument: i) coastal protection, ii) conservation or heritage conservation, iii) habitat area, habitat protection area, habitat or wildlife corridor, iv) environment protection, v) escarpment, escarpment protection or escarpment preservation, vi) floodway, vii) littoral rainforest, viii) nature reserve, ix) scenic area or scenic protection, or x) wetland.	Yes. The proposed works are to be carried out within the area of SEPP 71 Coastal Protection.



SEPP 55 Clause 9 'trigger'	Assessment against proposed remediation works
f) carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Western Lands Commissioner).	No. Refer to Section 2.6 discussing the development control plan of Newcastle City Council.

Therefore in accordance with SEPP 55, the proposed remediation works are classified as Category 1 remediation works. In accordance with SEPP 55, Category 1 remediation works require a RAP to be submitted with the EIS. This is provided in Appendix C and has also previously been submitted to the NSW EPA in accordance with the MO and as further discussed throughout the EIS.

With regard to the assessment of Category 1 remediation works, SEPP 55 specifies the consequences of not carrying out the remediation work need to be considered. Specifically SEPP 55 specifies that remediation works *require approval* where the environmental impacts of the method of remediation are demonstrated to pose a less significant risk to human health or the environment than if the land were not remediated in that manner. Thus, there must be substantial planning justification by a determining authority to refuse an application for remediation.

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 identifies development that is classified as State significant development and State significant infrastructure. Schedule 1 State significant development – General identifies development that is classified as State significant development.

Schedule 1, Clause 24 addresses Remediation of Contaminated Land and includes:

- (1) *Development for the purpose of remediation of land that is category 1 remediation works on significantly contaminated land if the work is required to be carried out under the Contaminated Lands Management Act 1997 by a management order that requires:*
 - (a) *the taking of action of the kind referred to in section 16 (d) or (g) of that Act, or*
 - (b) *the preparation of a plan of management that provides for the taking of any such action.*

As the remediation works are classified as Category 1 remediation works (in accordance with SEPP 55, refer to Table 1) and subject to a MO issued under the CLM Act 1997, the remediation action is declared State significant development. As such, the remediation action requires development consent under Part 4 of the EP&A Act and the Minister for the Department of Planning and Environment is the consent authority.



SUMMARY OF IDENTIFIED PATHWAY FOR THE ORICA KI REMEDIATION WORKS

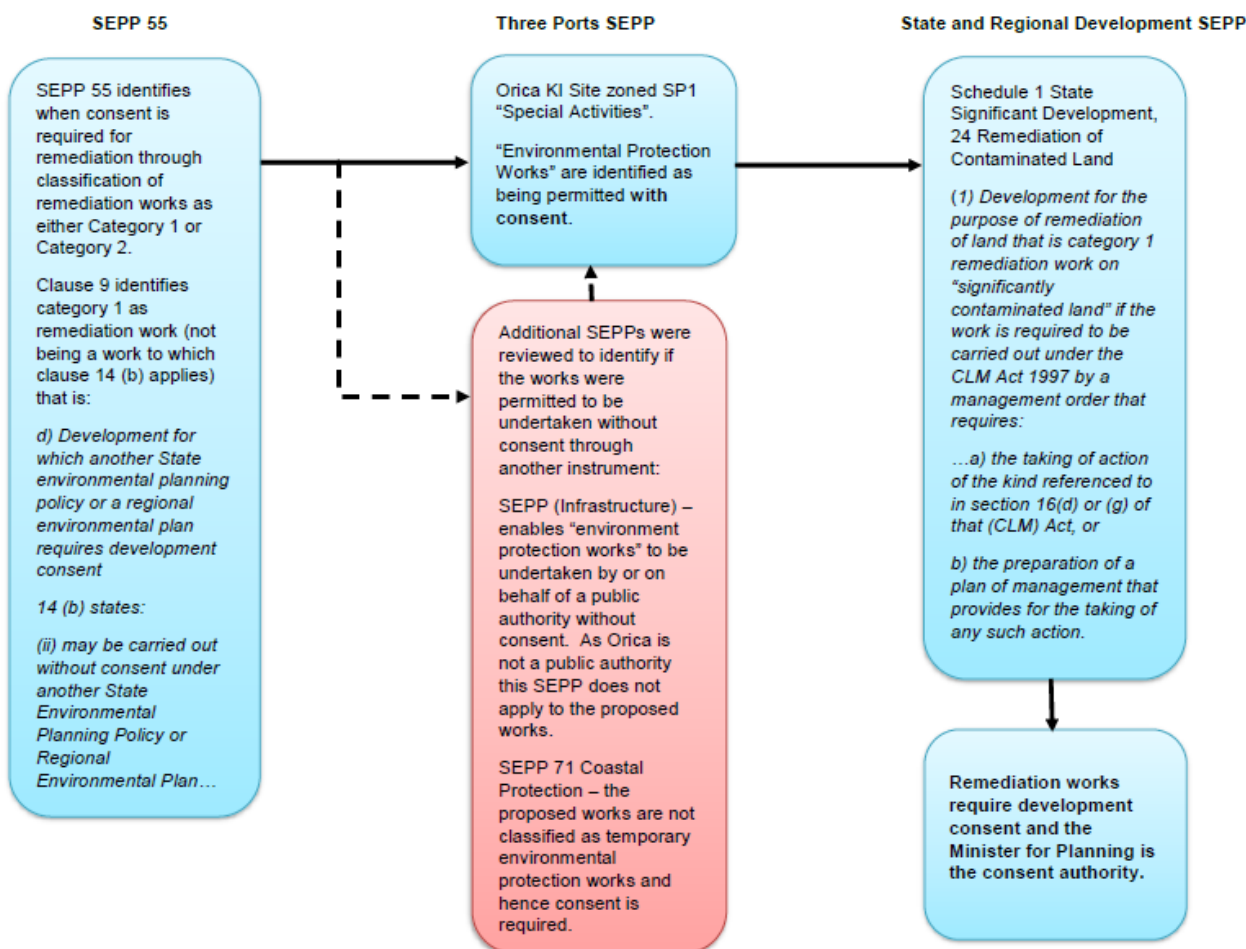


Figure 2.1: Summary of approval pathway for the Kooragang Island Remediation Works

2.5 Further relevant NSW legislation

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environment protection legislation administered by NSW EPA.

The POEO Act provides a single integrated licensing arrangement to control the air, noise, water and waste impacts of an activity. The NSW EPA is the regulatory authority for the licensing of activities specified under Schedule 1 of the POEO Act (scheduled activities). Licences can also be issued to regulate water pollution from activities that are not in Schedule 1. The POEO Act provides the key mechanisms for protecting the environment. It also provides the regulatory regime for waste management under the *Protection of the Environment Operations (Waste) Regulation 2005*.

All works completed as part of the Kooragang Island Remediation Program will be conducted in compliance with the relevant requirements of the POEO Act and regulations.

2.6 Local Planning Framework

While the land is zoned in accordance with the Three Ports SEPP, the land is also located within Newcastle Local Government Area (LGA).



Newcastle City Council – Development Control Plan 2012

“Newcastle City Council Development Control Plan 2012” (DCP) incorporates a number of Technical Manuals addressing specific issues, including one for Contaminated Land Management. This manual predominantly provides guidance for Category 2 remediation work. However, the manual also identifies Category 1 remediation work as requiring development consent as defined by SEPP 55. In so doing it refers to clause 9 of SEPP55, consistent with the ‘approval pathway’ outlined in Section 2.4.



CHAPTER 3 MANAGEMENT ORDER

This chapter of the EIS provides a description of the Management Order (MO) including remediation objectives and the extent of remediation. It should be noted that this chapter summarises sections of the RAP, which is provided in full in Appendix C.

The Secretary's Environmental Assessment Requirements ■ Justification for the proposed development	Chapter 3
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3.1 Management Order Overview

As identified previously within the EIS, on 28 July 2014 the NSW EPA issued a Management Order (MO) (Order Number 20131407; Declaration Number 21089; Area Number 3183) to Orica under Section 14 of the CLM Act 1997. The MO included objectives, milestones, reporting and approval requirements for the remediation of the identified arsenic contamination at the former arsenic sludge disposal pit located within the Site.

The MO presents requirements for identification of a preferred remediation approach for the Site, based upon required planning, investigation and groundwater modelling to inform a detailed design for remediation. The RAP (Appendix C), is the culmination of this process, capturing the outputs from previous remediation documentation in addition to documenting the design and performance metrics for the overall approach.

The requirements are set down in Action 1 of the MO:

- 1) *Implement works that will prevent, to the extent required by Action 1c, the further offsite migration of arsenic in groundwater. In planning the works, all necessary steps are to be taken to ensure the remedial work is implemented and commissioned by 31 December 2017.*
 - a) *Prepare and submit a plan (workplan) to the EPA which clearly identifies the remedial method that will be implemented at the site and describes activities to:*
 - i) *Undertake investigations and trials of remediation works to develop the design, construction and performance and specifications of a remediation system or process to meet the remedial outcome described in '1.' above. These investigations and trials may include aquifer pump tests and groundwater modelling.*
 - ii) *As necessary, undertake treatability trials to confirm the design, construction and performance specifications to meet required treatment criteria, and/or management of waste streams. These works may include bench scale and pilot scale testing of component parts of the works, and of any waste management.*
 - iii) *Undertake investigations to support the development of performance specifications and remediation endpoints of the proposed works.*
 - iv) *If necessary, undertake a field trial of the proposed remedial works based on the outcomes of tasks (i) and (ii), above.*
 - b) *Identify performance criteria for the identified remedial method and submit the performance criteria to the EPA;*
 - c) *Upon the agreement of the workplan and performance criteria by the EPA, implement the approved workplan and submit the required deliverables in accordance with the schedule in the approved workplan;*



- d) *As appropriate, formally request landowner consent for access to relevant off site areas required for proposed works. This may include in-principle agreement with finalisation of the agreement after detailed design of the proposed works is complete.*
- e) *Prepare and submit to the EPA for approval a Remediation Action Plan (RAP) which is in accordance with the remedial method identified in the approved workplan and which documents the remediation strategy, system design, implementation approach, identification of regulatory licences, approvals and remediation end points.*

Actions 1 (a), (b) and (c) were addressed in late 2014 and through 2015 with completion of the workplan document, detailed soil and groundwater investigations (Report Modules A through E) together with an integrated groundwater modelling program. These documents are referenced as follows:

- Golder (2014a) *Orica Kooragang Island – Workplan – Arsenic Management Order* (147623010_017_R_Rev1 dated 22 December 2014);
- Golder (2016a) *Orica Kooragang Island: Arsenic Management Order – Remediation Investigations:*
 - Module A: *Background Information* (1418917_012_R_Rev0_ModA);
 - Module B: *Environment Investigation* (1418917_013_R_Rev0_ModB);
 - Module C: *Geotechnical Investigation* (1418917_014_R_Rev0_ModC);
 - Module D: *Hydrogeologic Conceptual Model* (1418917_015_R_Rev0_ModD); and
 - Module E: *Contaminant Distribution* (1418917_016_R_Rev0_ModE).
- A.D.Laase Hydrologic Consulting (Laase, 2016a) *Orica Kooragang Island – Steady-State Groundwater Flow Model*; and
- A.D.Laase Hydrologic Consulting (Laase, 2016b) *Design Evaluation of a Cap and Cut Off Wall for Orica Botany Kooragang Island, Former Sludge Disposal Pit.*

3.2 Remediation Objectives

The stated overall objective within the MO is to “Implement works that will prevent, to the extent required by Action 1c [of the Management Order], the further offsite migration of arsenic in groundwater”. In planning the work, all necessary steps are to be taken to ensure the remedial work is implemented and commissioned by 31 December 2017”.

To achieve the MO objectives and based on the selected cap and containment remediation option (refer to Chapter 4), the specific remediation objective is to install a cap and containment system designed within the practical constraints associated with the conditions at the Site.

The cap and containment system will effectively segregate the residual source of arsenic from the surrounding groundwater system by significantly reducing the flux of groundwater through the identified arsenic contamination. The reduction in the groundwater flux through the source area will also reduce the contaminant mass flux of arsenic migrating off site.

3.3 Remediation Extent

The extent of the remediation was developed in consideration of the following:

- Remediation objectives;
- Consideration of the remediation option selected (Cap and Containment);
- Remediation investigations to delineate the on-site extent of arsenic contamination at the former arsenic sludge disposal pit;



- Groundwater modelling to understand the reduction in the flow of groundwater through contaminated soil with the construction of the remediation system; and
- Practicable constraints associated with existing Orica facility infrastructure and boundary restrictions.

Provided below are the key elements which have defined the extent of remediation, and as such, the alignment and depth of the containment wall. For a detailed technical description of the considerations that have defined the extent of remediation incorporated into the remediation design refer to Section 8 of the RAP (Appendix C) addressing remediation design development.

3.3.1 Contamination Assessment

The remediation investigations, as presented in Modules B and E (Golder, 2016a), considered the extent of arsenic contamination in the vicinity of the former sludge pit. For the eastern, southern and vertical 'extent' of contamination a conservative qualitative assessment approach was taken, identifying 40 mg/kg as the level of arsenic contamination in soil requiring isolation into the containment cell.

The 40 mg/kg target concentration was derived from previous column and leach testing work undertaken on contaminated soils. It was estimated that leaching of arsenic from soils containing 40 mg/kg would be negligible and would be readily naturally attenuated by the residual soils.

The vertical depth of the contamination is approximately 8 m below ground level (bgl). The final wall target depth will be 12 m bgl. This depth was selected to provide a reasonable margin beyond the characterised depth of arsenic contamination and was also based on consideration of the hydrostratigraphy conceptual model and associated groundwater modelling outputs.

3.3.2 Practicable Extents

The remediation investigations indicated that arsenic contamination was present up to the northern and western site boundaries of the Orica facility. Within the context of the MO, these boundaries therefore form a remediation extent. The construction constraints mean that installation of the cut-off wall at the boundary was not possible and required a minor 'set-back' to enable operation of the construction machinery. Notwithstanding these practicable extents, the remediation design and associated groundwater modelling has indicated that further off-site migration from arsenic contaminated soils will be significantly reduced.

3.4 Remediation Options

As identified within Section 3.1, a workplan (Golder, 2014) has previously been prepared and submitted to NSW EPA in 2014. This workplan set out how the objectives of the MO were to be achieved, as well as outlining the investigations and trials required to ensure the appropriate development of the remediation design. The review and selection of the remediation options, as presented in the RAP (Golder, 2016b) and the Workplan (Golder, 2014a), is summarised in this section.

The review and consideration of remediation options for the identified arsenic contamination on the Site built upon extensive information gathered during VRAs (Stages 1 to 3) and VMP (Stage 4) for the Site. This included detailed literature reviews, assessment of the processes that naturally attenuate arsenic in the aquifer, bench scale remediation trials and field trials. This culminated in the Feasibility Assessment (Orica, 2013) that identified short-listed remediation options considered capable of meeting the feasibility assessment remediation goals.

3.5 Remediation Options Review

Following on from the Feasibility Assessment, the workplan was developed, which included the key objective of identifying the remediation method to be implemented at the Site to achieve the objective of the MO. In summary, this process included two stages:

- Screening of all available remediation options to short-list those capable of meeting the objective of the MO; and
- Evaluation and ranking of the short-listed options to select a preferred remediation option.



Screening of potential remediation technology alternatives for arsenic contaminated groundwater was undertaken in two workshops (July and September 2014).

At both workshops, all available remediation options were screened against the remediation objectives including consideration of the advantages and disadvantages of each option in terms of:

- Potential ability to meet the remediation objective (noting that this was refined for the second workshop);
- Technical feasibility;
- Potential to impact on safety, health, environmental and community values;
- Uncertainties and data gaps which must be addressed; and
- Relative cost.

Based on the outcomes of the two workshops the feasible remediation alternatives retained for further evaluation were:

- **On-site excavation and off-site disposal (“dig and dump”)**

Excavation and off-site disposal to a licensed landfill of approximately 30,000 m³ (3,900 m² and 7 m deep) of contaminated soil. Soil may require treatment prior to disposal. Shoring and dewatering of the excavations would be required to facilitate the excavation of the soil. Extracted water would require treatment and disposal. The excavation would need to be validated and backfilled with validated fill materials.

- **On-site groundwater extraction with aboveground treatment (“pump and treat”)**

Groundwater extraction and aboveground treatment to contain arsenic contaminated groundwater such that arsenic mass flux is reduced. Arsenic contaminated groundwater would be pumped from approximately 12 wells (8 shallow and 4 deeper wells) located in an L-shaped configuration along the northern and western boundaries (80 m) to contain the migration of dissolved arsenic. Extracted groundwater, approximately 70 m³/day, would be treated in an aboveground treatment system by chemical precipitation and coagulation. Treated water would be disposed to the site effluent system. Iron-arsenic sludge would be dewatered as far as practicable, stabilised (on site or off site) and disposed of to an appropriately licensed waste facility.

- **On-site Cap and Containment (“cap and contain”)**

Cap and containment would comprise the construction of low permeability barrier walls to enclose the on-site contamination on four sides. No underlying low-permeability founding layer (base layer) has been identified beneath the source area, effectively making it a “hanging” low permeability barrier with an uncontained base layer. A cap would be constructed to minimise rainfall infiltrating and mitigate the flow through the impacted soil and aquifer material.

- **On-site Permeable Reactive Barrier (PRB):**

A PRB would be constructed in an L-shaped configuration along the northern and western boundaries with a total length of approximately 80 m to a depth of approximately 9 m. Based on arsenic concentrations in groundwater the thickness of the barrier may vary along its length ranging from 1 to 4 m. It is also likely that a low-permeability layer may be required to reduce vertical migration of groundwater within the PRB. The PRB would comprise granular Zero Valent Iron (ZVI) to create an in situ permeable treatment zone designed to intercept and treat the arsenic in the groundwater. Arsenic would be removed from the dissolved phase in the groundwater through adsorption on the iron surface and precipitation of stable, non-reactive minerals within the PRB.



The four retained options were further evaluated on the basis of:

- Effectiveness in meeting the remediation objective;
- Implementability – level of effort and complexity required to install the system;
- Operability – level of effort and complexity required to operate the system;
- Safety, health, environment and community (SHEC) – effort required to manage or mitigate potential impacts to SHEC values *during implementation of remediation*; and
- Cost – present day value of capital and operational and maintenance costs over the Project period.

3.6 Remediation Option Ranking and Selection

Ranking of the selected remediation alternatives was undertaken against the assessment and evaluation criteria and quantified using a weighted ranking scale (Golder, 2014a). At the completion of the ranking, on-site cap and containment was considered the most implementable, and operable remediation approach with the lowest cost and SHEC impacts with regard to achieving the MO objective. The cap and containment option was submitted to the NSW EPA as part of the Workplan (Golder, 2014a) developed in accordance with the MO.

3.7 Remediation Option – Cap and Containment

Based on the evaluation and ranking of the identified remediation options, to meet the objective of the MO, cap and containment was identified as the preferred remediation option for the Kooragang Island Remediation Program. This remediation technology consists of the installation of a low permeability subsurface wall to minimise the flow of groundwater through the impacted soil in the on-site source area and a surface capping system to reduce infiltration. The cap and containment approach provides isolation of arsenic located on the Site and prevents, to the extent practicable, the further off-site migration of arsenic in groundwater.

To evaluate the effectiveness of the final remediation system Orica will develop a Long-Term Environment Management Plan (LTEMP) in addition to the continuation of a Groundwater Monitoring Program.



CHAPTER 4 PROJECT DESCRIPTION

The Secretary's Environmental Assessment Requirements	
■ A detailed description of the development, including: – Likely staging of the development; – Likely interactions between the development and existing, approved and proposed operations in the vicinity of the site; – Plans of any proposed building works; and – Contributions required to offset the proposal.	Chapter 4

4.1 Project Description Overview

The Kooragang Island Remediation Program will install a cap and containment remediation system to enclose arsenic contaminated soil. This will involve the construction of a soil-bentonite cut-off wall (approximately 75 m by 50 m) to enclose the on-site contamination with a cap constructed to minimise rainfall infiltrating and mitigate the flow through the impacted soil and aquifer material.

The proposed remediation works will be undertaken independent of existing Facility operations with the only interaction consisting of utilising an access road for traffic generated by the Project predominantly during the construction period.

A site layout is provided in Figure 1.1.

4.2 Construction Methodology

The construction methodology of the cut-off wall and cap is detailed in this section. Utilising standard construction hours, the construction is proposed to take place over a period of approximately five months.

4.2.1 Cut-off Wall Construction

The cut-off wall alignment (Figure 4.2) and depth are designed to address the extent of remediation as discussed in Chapter 3 of the EIS. The cut-off wall will be installed to meet the following specifications:

- Nominal depth of 12 m below ground level
- Nominal thickness of 0.8 m
- Permeability of at least 1×10^{-9} m/s

Due to construction constraints, the cut-off wall will be located approximately 1.6 m from the Facility boundary fence to the west and north of the Site. A hydraulic excavator with a cable-suspended clamshell grab will be used to construct the cut-off wall along the western and northern boundaries. The crane and clam-shell grab enables the cut-off wall to be installed in close proximity to the neighbouring boundary without requiring access to the neighbouring sites. A specialist long-armed excavator will be used to construct the remainder of the cut-off wall.

A graphic demonstrating the cut-off wall construction process is detailed in Figure 4.1.

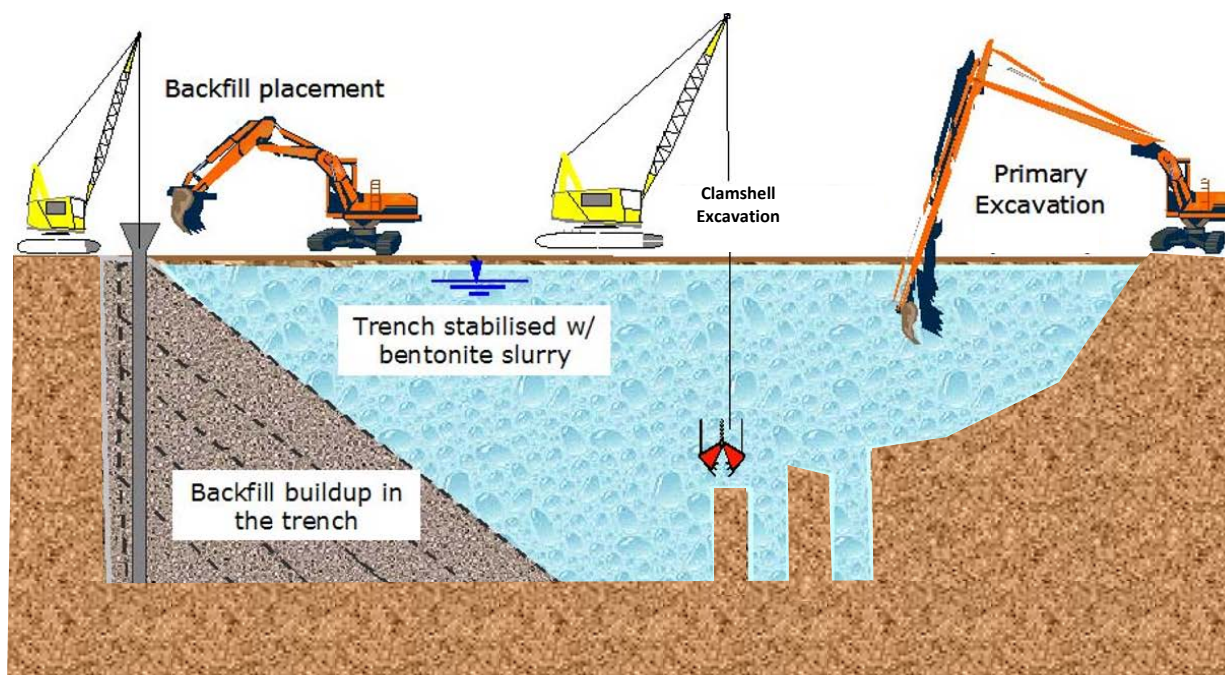


Figure 4.1: Schematic demonstrating the stages of the cut-off wall installation

Throughout the excavation process the stability of the excavated trench will be maintained by back filling the open trench with controlled density bentonite slurry. This will provide a positive hydraulic head across the walls of the trench to maintain trench wall stability. The excavated soil will be mixed with bentonite slurry, and if necessary, imported clays. The mixture will be used to back-fill the stabilised trench to form the low permeability cut-off wall.

Mix testing has been undertaken on behalf of Orica to assess the proportion of bentonite slurry required to achieve a permeability of greater than 1×10^{-9} m/s. The testing included particle size distribution determination as per Australian Standard (AS) 1289.3.3.1 and triaxial permeability as per AS1289.6.7.3. Based on the results of this testing, soil-bentonite was confirmed as a suitable construction technique. The selected cut-off wall contractor has completed additional testing to confirm the mix design, using groundwater and soil core materials sourced from the Site.

Spoil generated during the wall construction process will be placed within the cut-off wall system where feasible. The potential for substantial volumes of solid waste to be generated is relatively low, with the amount of surplus spoil anticipated to be 10 – 30% of the wall volume based on the initial testing undertaken. Any such surplus materials which cannot be contained, or otherwise re-used on site and for which off-site disposal is deemed appropriate will be classified and managed in accordance with the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014).

The Construction Environmental Management Plan (CEMP) outlines control measures that will be used to manage erosion and sediment generated during construction in addition to excavation water management during construction. Further detail on this issue is provided in Chapter 9 Soil and Water.

Soil-bentonite cut-off walls have been extensively used at remediation sites since the 1980s and are generally considered to be extremely durable because their only constituents are stable geological materials (i.e. soils and bentonite clay). The predominant constituent is excavated soil from the wall alignment at the Site. This material has, by definition, already come to general geochemical equilibrium in the Site subsurface conditions. Further, at the Facility, subsurface conditions identified in the remediation investigations are considered non-aggressive to soil-bentonite walls, with potentially unfavourable characteristics such as low pH or significant sulfate, ammonia or volatile organic compounds (VOC) concentrations not being detected in the soil or water. The predominant contaminant, arsenic, is not known to influence long-term soil-bentonite wall performance.



4.2.2 Cap Construction

Following construction of the cut-off wall, capping will be installed. The primary purpose of the capping system is to limit surface water infiltration within the footprint of the wall alignment. The overall concept involves a layered capping system with a composite liner, comprising a linear low-density polyethylene (LLDPE) geomembrane underlain by a geosynthetic clay liner (GCL) integrated into a landform.

The capping system has been designed to reduce infiltration to less than 1% of total annual rainfall to achieve the required cap and containment performance. The capping system is designed as follows, from top to bottom:

- Bearing layer: formed by selected on-site materials to provide support for the geosynthetic liner system.
- Geocomposite Clay Liner (GCL): placing the GCL underneath the LLDPE geomembrane will minimise leakage through any defects in the geomembrane.
- LLDPE geomembrane: the primary liner layer.
- Subsurface drainage: a layer of drainage sand and drainage pipes at maximum 25 m intervals to significantly reduce infiltration through the liner. The sand layer will also minimise the risk of damaging the LLDPE geomembrane during construction of the overlying layers.
- Geotextile layer: to minimise fines entering the sand layer.
- Surface layer: comprising 400 mm thickness of revegetation soil and grass, and/or road base with spray seal.

The final landform of the cap system will include a minimum 2% slope for surface water drainage and a 1-in-3 batter slope around the perimeter of the cap, with a 9 m wide ramp to provide access to the platform area (Figure 4.2).





4.2.3 Temporary Amenity Area

The Kooragang Island Remediation Program will result in the generation of approximately 18 jobs during construction. To support these workers, construction amenities will be provided as shown in Figure 1.1, adjacent to the roadway. The amenity area will be removed once construction is completed.

4.2.4 Traffic and Access

Access to the Site will be via an existing roadway located on the Orica Facility as identified in Figure 1.1.

There will be only minor increases in traffic as a result of the construction activities, with the transport of plant and equipment and raw materials to Site. This access route has sufficient existing capacity for the small number of traffic movements required to transport equipment and materials during the construction phase. It is anticipated that during the cut-off wall construction there will be less than 30 traffic movements associated with equipment and materials transport. A similar number is expected during the construction of the cap.

The CEMP will include a plan for managing traffic associated with the proposed works, in particular ensuring contaminated soil is not tracked off site by vehicle movements (refer to Chapter 9).

4.2.5 Performance Criteria Overview

The performance of the remediation system will be achieved through the design and construction of the engineered solution. They comprise the cut-off wall to isolate potential continuing sources of arsenic impact to groundwater and an integrated capping system to minimise infiltration of rainwater and surface run-off.

Validation of the performance of the remediation system will be achieved through a combination of construction quality control (CQC) and assurance (CQA) programs during the installation of the system, in concert with validation through assessment of hydraulic performance post construction. Detailed information on the CQC and CQA and hydraulic verification programs is provided in the RAP (Appendix C).

The CEMP will include appropriate mitigation and management measures including specifying controls for soil and water, air quality, noise and waste in addition to the transport, handling, storage and use of fuel and further products (i.e. bentonite) in accordance with relevant Australian Standards.

The RAP has been subject to a third party independent review. Orica commits to ensuring that the remediation works program is subject to an independent review to assess the adequacy and appropriateness of the proposed remedial strategy, and the effectiveness of the remedial works in minimising the migration of contamination from the Site.

4.3 Operation

Once constructed, the cap and containment system will have negligible impacts upon air quality and noise. During the operational phase the cap will be subject to monitoring to ensure the ongoing effectiveness of the system in meeting the remediation objective. These requirements will be documented within the LTEMP.

4.4 Project Benefits

The installation of a cap and containment system will provide isolation of the arsenic (contained in soil and groundwater) located on the Site and prevent, to the extent practicable, the further off-site migration of arsenic in groundwater. The containment system's low permeability subsurface cut-off wall will minimise the flow of groundwater through the impacted soil in the on-site source area and the surface cap will significantly reduce infiltration of rainwater into the containment cell. As such, the cap and containment remediation system provides a proven and durable remediation option that has been identified as the preferred remediation approach following a comprehensive evaluation and ranking process of potential remediation technologies (as outlined in Chapter 3). It is noted that this type of remediation technology has been developed and successfully implemented at many sites in New South Wales, including in the Newcastle area and on Kooragang Island. Examples in the Newcastle area include a cut-off wall containment cell installed at the Koppers Carbon Materials & Chemicals Pty Ltd site in Mayfield, NSW and the BHP Hunter River



Remediation Project near Kooragang Island. Orica has also successfully completed the installation of a cut-off wall and containment cell at its Former ChlorAlkali Plant in Botany, NSW.

4.5 Summary of Capital Investment Value

The capital investment value of the project is AUD 6.5 Million. The estimated costs for the major construction items can be summarised as follows:

■ Civil Works preparing land for cut-off wall	AUD 1.4 Million (M);
■ Cut-off Wall Installation	AUD 1.3 M
■ Capping Layer	AUD 1.0 M;
■ Testing and Validation	AUD 0.8 M; and
■ Investigations and Design	AUD 2.0 M.

Orica has engaged Currie & Brown (Australia) Pty Ltd (C&B) to verify the Capital Investment Value estimation in accordance with the definition contained in the State Environmental Planning Policy (Major Development) 2005.

A Quantity Surveyor's Certificate of Cost to verify the Capital Investment Value was prepared by C&B. Their correspondence, dated 23 January 2017, is presented in **Appendix D**. Their estimate of costs verifies the information summarised above.

The ongoing operational costs of the project are low and include maintenance activities for any grassed areas and ongoing groundwater monitoring to verify the system effectiveness.

During the construction phase it is estimated that there will be 18 jobs created. There will be no additional jobs created during the operational phase of the project.



CHAPTER 5 EXISTING OPERATIONS AND ENVIRONMENT

This chapter of the EIS addresses the existing operations and environment of the Site. This includes identification and discussion of the surrounding land use, the Orica Facility and the Site including the existing topography, contamination and existing climate.

The Secretary's Environmental Assessment Requirements	
Existing operations carried out on the site and how the site operates lawfully under the <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act) including any reliance on existing use rights and/or planning approvals and how these will be consolidated.	Chapter 5

5.1 Site Locality and History of Development

Kooragang Island is located within the Port of Newcastle, approximately 3 km north of Newcastle Central Business District (CBD).

The island was developed in 1951 as part of the Hunter River Islands Reclamation Scheme, which joined Dempsey, Moschetto and Walsh Islands within the Hunter River with dredged sand and fill material. The development was completed in 1960 and officially named in 1968. The island covers an area of approximately 2600 hectares and areas of it have been designated for industrial development and port related activities. The Orica facility, which is located on Kooragang Island, has manufactured ammonia, nitric acid and ammonium nitrate since it was commissioned in 1969.

The Site is located on a section of Kooragang Island that forms a promontory, separating the north and south arm of the Hunter River. The Orica facility is situated on the south-eastern most part of Kooragang Island.

5.2 The Site

The Site is located within the north-western portion of the Orica Facility (Figure 5.1) and is accessed via an internal roadway of the Orica Facility located at 15 Greenleaf Road, Kooragang Island, NSW. The Site is currently utilised as vacant land. It is relatively flat and located at an elevation of approximately 2 m – 4 m Australian Height Datum (AHD). The Orica Facility is approximately 22 hectares, with the Site an area of approximately 4,200 m² within the Facility.

5.3 Site Ownership and Land Use

The Site (as shown in Figure 5.1) is zoned SP1 Special Activities pursuant to the Three Ports SEPP and is owned by Orica IC Assets Pty Ltd. The Site comprises partial areas of:

- Lot 2, DP 234288; and
- Lot 3, DP 234288.





5.4 Existing Approvals

The Site is subject to a number of existing approvals including major project approval 08_0129 Orica Ammonium Nitrate Upgrade, determined by the Minister for Planning in 2009, which has subsequently been modified three times. This project approval applies to the Orica Facility (including the Site) located at 15 Greenleaf Road, Kooragang Island, NSW.

Since 2005, the Site has been subject to several voluntary remediation agreements under the CLM Act. As part of the Stage 1 Voluntary Remediation Agreement, Orica undertook remediation of soil beneath the former sludge disposal pit (above the groundwater table) and the soil surrounding the pit. The soil was removed by excavation followed either by off-site disposal or treatment and off-site disposal.

5.5 Approvals interaction

The Kooragang Island Remediation Program proposed for the Site is defined as "environmental protection works", which is permissible with consent upon land zoned SP1 Special Activities. The objective of this zoning is to facilitate development to maximise use of the port facility, particularly special land uses that are not allowed for in other zones as well as ensuring separation from residential areas and other sensitive land uses.

The Kooragang Island Remediation Program seeks approval for a remediation system that will address the actions of the MO including implementing works that will prevent, to the extent practicable, further off-site migration of arsenic. As such, the Kooragang Island Remediation Program is seeking a project specific approval that supplements the existing approval for the Site. As such, the remediation works are to be subject to a separate assessment and approval (SSD 16_7831), whilst continuing to be subject to existing approval 08_0129 as part of the Orica Facility.

5.6 Surrounding Land Use

Crown land on Kooragang Island is owned by the State Property Authority (SPA) and is managed by Port of Newcastle Pty Ltd or Hunter Development Corporation, whilst freehold land is owned by industrial operations. Existing industrial developments on the Island include Port Waratah Coal Service, leased wharf facilities, coal and bulk product loaders, Incitec Pivot Ltd, Cargill, Patricks, East Coast Cement, Kooragang Bulk Facilities, Park Fuels and Tasmania Mines. The Hunter Estuary National Park is located approximately 1.5 km north of the Site.

The land surrounding the Site is used for industrial and port related activities with industrial neighbours directly adjoining the Site to the west and north, while the wider Orica Facility is located to the east and south. The nearest residential premises are located at Stockton, approximately 800 m east of the Orica Facility property boundary. There are also residential properties to the west at Carrington and Mayfield, 1.5 km and 2 km respectively.

5.7 Climate

Meteorology in the area surrounding Kooragang Island is affected by several factors such as terrain and land use. Wind speed and direction are largely affected by topography at the small scale, while factors such as synoptic scale winds (which are modified by sea breezes near the Newcastle coast in the daytime) and complex valley drainage flows that develop during night hours, affecting wind speed and direction.

While climate change related sea level rise and an increased frequency and intensity of storms has the potential to impact low lying coastal areas principally through storm surges, the potential for the proposed remediation works to be affected by sea level rise and flooding is low due to the temporary nature of the construction phase, and the site location, which is approximately 4 km from where the Hunter River meets the sea.



CHAPTER 6 STAKEHOLDER ENGAGEMENT

The Secretary's Environmental Assessment Requirements ■ During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and potentially affected landowners. ■ In particular you must consult with: – Newcastle City Council; – NSW Health; – Environment Protection Authority; – Department of Primary Industries; – Office of Environment and Heritage; – SafeWork NSW; – Port of Newcastle; – Roads and Maritime Services; and – nearby land owners and occupiers that may be affected by the proposal. ■ The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.	Chapter 6
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6.1 Consultation with Stakeholders and Other Authorities

Orica has had an extensive program of consultation with key stakeholders in the development of the Project to meet the objectives of the MO. This has included activities such as face-to-face meetings, correspondence and briefings with a number of local and State government authorities and industrial neighbours.

Regular updates on the progress of the Project have been provided to the NSW EPA through face-to-face meetings and the submission of progress reports and the Remediation Action Plan. Issues raised by the NSW EPA, in addition to the matters raised in the Secretary's Environmental Assessment Requirements, has included

- Provision of information on the management of surface water and erosion and sediment control during the construction activities. Information on the control measures that will be implemented are detailed in Section 9.
- Licensing requirements for the construction activity, with information provided in Section 2.
- Durability of the cut-off wall, which is discussed in Section 8.3 of the RAP (Appendix C).
- Information on the selection of the remediation system, which is discussed in Section 3 and in the RAP (Appendix C).
- Information on the groundwater modelling, which is provided in the RAP (Appendix C).

Orica has met with Newcastle City Council and the Port of Newcastle to provide them with details on the proposed Project. No specific issues were noted by these organisations.



SafeWork NSW was briefed on the proposed Project and noted the importance of the construction safety management plan addressing general construction issues, as well as specific issues associated with excavation activities and potential human health impacts due to the presence of contaminated soil and groundwater. A safety management plan will be prepared and implemented during the construction of the cap and containment system. The management of potential human health impacts is detailed in Chapter 10.

Orica met with NSW Health to provide details on the proposed Project who noted the importance of a communication strategy with the community, adjacent landowners and relevant government agencies. Orica has had a number of face-to-face meetings with adjacent neighbours to discuss the project. Issues raised by them include the management of construction related impacts, in particular soil and water management and air quality. These are addressed in Sections 9 and 12 respectively.

Orica is committed to ensuring ongoing communication with relevant stakeholders and has developed a Communication Plan detailing the activities that will be undertaken to continue to update stakeholders on the key activities being undertaken during the construction and operational phases.

6.2 Consultation with Community and Adjacent Industries

Orica is committed to open and constructive engagement with the communities within which it operates. Information on the arsenic contamination investigations and remediation program has been shared with the community through a range of activities, including:

- Updates to the Orica Kooragang Island Community Reference Group on a regular basis
- Articles in the Orica Community Newsletter, which is distributed to approximately 6,000 residences in the vicinity of the Facility five times per year
- Website updates
- Briefings to the Newcastle Community Consultative Committee on the Environment
- Article on progress in the annual community report, which is distributed to approximately 6,000 residences in the vicinity of the site each year
- Attendance of Orica personnel at a number of community events during the year to provide an opportunity for members of the community to ask questions regarding Orica's operations, including remediation activities

During briefings with the Orica Kooragang Island Community Reference Group the following questions were raised in relation to the proposed remediation system:

- Why cap and containment was selected as the preferred remediation technology, rather than the removal of the material or treatment to recover it. Several of the community members stated that they had concerns regarding the effectiveness of cap and containment remediation systems. Orica discussed the technical reasons why the removal of the material was not viable and the feasibility process that was undertaken to select the cap and containment technology. The successful use of cap and containment systems in other remediation projects was discussed.
- Why it had taken so long to progress the project from the investigation phase to the commitment to install a cap and containment remediation system. An overview of the investigation and remediation activities previously undertaken was provided to the group.

During the implementation of the Project, Orica will continue to provide the community with updates on the progress of the remediation activities through community reference group meetings, articles in community newsletters, information on the site's website and briefings to the Newcastle Community Consultative Committee on the Environment. A Communication Plan has been developed to ensure that the community is updated at key milestones during the construction and operational phases.



CHAPTER 7 ENVIRONMENTAL RISK ANALYSIS

The Secretary's Environmental Assessment Requirements ■ Risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment.	Chapter 7
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As part of the comprehensive Feasibility Assessment of the Kooragang Island Remediation Program (refer to Chapter 3), an Environmental Risk Analysis (ERA) was undertaken, which included consideration of the remediation options to address the MO requirements. In addition and complimentary to this process, a specific risk analysis for the proposed remediation works has been undertaken prior to the request for the SEARs documentation (Scoping Report for the Orica Kooragang Island Remediation Program, submitted July 2016), and has been further developed in the preparation of this EIS. The risk assessment process is used to scope environmental investigations and guide project design.

The ERA enables the EIS to:

- Identify, prioritise and address the environmental issues identified within the Scoping Report for the Orica Kooragang Island Remediation Program. This includes consideration of the significance of the potential environmental impacts and the effectiveness of the proposed management measures in minimising degradation or deterioration of the biophysical, economic or social environment.
- Identify those potential environmental impacts that are not key issues, including those that would be expected to respond well to appropriate mitigation measures and management.
- Identify residual environmental impacts likely to remain after the application of the mitigation measures. Where significant residual impacts remain, this may require greater commitment to management strategies to mitigate the effect or, in some instances, appropriate modifications to the design of the Proposal.

7.1 Identification of Key Issues - SEARs

The Scoping Report for the Orica Kooragang Island Remediation Program identified the issues to be prioritised, which were built upon by the SEARs (issued 18 August) for the remediation project (SSD 16_7831). These issues were identified as:

- Water Quality;
- Soils and Waters;
- Air Quality;
- Waste Management;
- Human Health and Risk;
- Noise and Vibration;
- Traffic and Transport;
- Cumulative Impacts; and
- Biodiversity.

All further potential environmental impacts of the Kooragang Island Remediation Program were identified as having a negligible impact.



7.2 Risk Analysis Methodology

The ERA has been undertaken in accordance with the principles of the *Australian and New Zealand Standard AS/NZS 31000:2009 – Risk Management – Principles and Guidelines*. The analysis involved ranking the risk of each identified potential impact by identifying the consequences of the impact and the likelihood of the impact occurring.

Evaluating Consequences

The first steps involve identification of the consequence levels should a particular impact occur. Definitions of the consequence levels used are provided in Table 2.

Table 2: Risk Analysis - Definition of Consequences

Consequence level	Definition
Catastrophic	■ Would cause long-term and irreversible impacts. ■ Would result in a major prosecution under relevant environmental legislation.
Major	■ Would cause medium-term, potentially irreversible impacts. ■ Would result in a fine or equivalent under relevant environmental legislation.
Moderate	■ Would result in medium-term, reversible impacts.
Minor	■ Would result in short-term, reversible impacts.
Insignificant	■ Would result in minor, negligible impacts.

Evaluating Likelihood

The next step involves identifying the likelihood of an impact through the consideration of the frequency of activities that may cause an impact and the probability of the impact occurring during that activity. The level of likelihood has been classed as:

- Very likely – the event is almost certain to occur in the course of normal or abnormal operating circumstances.
- Likely – the event is likely to occur in the course of normal operations.
- Possible – the event may occur in course of normal operations.
- Unlikely – the event is unlikely to occur in the course of normal or abnormal operating circumstances.
- Very unlikely – the event may occur in exceptional circumstance only.

Risk Assessment Matrix and Rating

The risk rating has then been determined by combining the consequence and likelihood according to the matrix in Table 3.



Table 3: Risk Assessment Matrix

	Likelihood of adverse Impact					
		Very likely	Likely	Possible	Unlikely	Very unlikely
Consequences	Catastrophic	High	High	Medium	Low	Very Low
	Major	High	High	Medium	Low	Very Low
	Moderate	Medium	Medium	Medium	Low	Very Low
	Minor	Low	Low	Low	Low	Very Low
	Insignificant	Very Low	Very Low	Very Low	Very Low	Very Low

Risk rating categories have been determined for each combination of consequence and likelihood as shown in Table 4 below.

Table 4: Risk Rating

Risk category	General description
High	Detailed assessment and planning are necessary to develop appropriate measures to mitigate and manage the potential impacts.
Medium	Potential impacts can be mitigated through the application of relatively standard environmental management measures.
Low	Potential impacts either require no specific management measures or are mitigated adequately through other working controls (such as detailed design requirements, normal working practice, quality and safety controls).
Very Low	Potential impacts are negligible.

Where relevant the potential effectiveness of proposed mitigation measures (as discussed in the relevant chapters of the EIS) has been assessed within the ERA and the degree of effectiveness of the mitigation measures are classed as:

- **Very effective** – the measure would decrease the risk rating score by up to three categories.
- **Effective** – the measure would decrease the risk rating score by up to two categories.
- **Partly effective** – the measure would decrease the risk rating score by one category.
- **Not effective** – the measure would not change the risk rating.



7.3 Environmental Risk Analysis

Using the risk framework from Section 7.2, an ERA was undertaken for the proposed remediation works based on investigations and assessment of the environmental issues during the preparation of the EIS and considering the input from various government agencies and other stakeholders during the consultation process.

The relevant chapters of the EIS include consideration of the potential impacts and benefits and consideration of proposed mitigation and management measures.

The results of the environmental risk analysis are presented in Table 5.



Table 5: Environmental Risk Assessment Results

Aspects	Potential impact example	Overall consequences	Overall Likelihood	Risk Rating	Proposed Mitigation Measure	Effectiveness	Residual Risk Rating
Water	Impact of the installation of the cut-off wall on groundwater characteristics and flow.	Moderate	Possible	Medium	Refer Chapter 8 Contamination Chapter 9 Soil and Water	Partly Effective	Low
Soils and waters	Erosion, sedimentation and contamination during construction. Management of surface water during operation.	Moderate	Possible	Medium	Refer Chapter 9 Soil and Water	Partly Effective	Low
Human Health and Risk	Management of exposure of personnel to arsenic during construction activities. There will be no ongoing operational exposure.	Minor	Unlikely	Low	Refer Chapter 10 Human Health and Risk	Partly Effective	Negligible
Waste	Management of waste generated by the construction.	Minor	Unlikely	Low	Refer Chapter 11 Waste Management	Partly Effective	Negligible
Traffic and Transport	Construction traffic generation.	Minor	Unlikely	Low	Refer Chapter 4 Project Description	Partly Effective	Negligible
Air Quality	Increased traffic on the roads leading to dust and vehicle emissions during construction.	Minor	Unlikely	Low	Refer Chapter 12 Air Quality and Odour	Partly Effective	Negligible
Noise and Vibration	Construction noise and vibration impacts.	Minor	Unlikely	Low	Refer Chapter 13 Noise and Vibration	Partly Effective	Negligible



Aspects	Potential impact example	Overall consequences	Overall Likelihood	Risk Rating	Proposed Mitigation Measure	Effectiveness	Residual Risk Rating
Cumulative	Cumulative impacts in relation to existing operations, surrounding industrial facilities and nearby development	Minor	Unlikely	Low	Refer to Chapter 16 Cumulative Impacts	Partly Effective	Negligible
Flora and fauna	Grass clearing.	Minor	Very Unlikely	Negligible	Refer Chapter 14 Biodiversity	Partly Effective	Negligible
Heritage	Impacts to unidentified indigenous or non-indigenous heritage items.	Minor	Very Unlikely	Negligible	Refer Chapter 15 Heritage: Indigenous and Non-Indigenous	Partly Effective	Negligible



7.4 Environmental Risk Analysis Findings

The ERA has identified that no aspects of the Kooragang Island Remediation Program present a high or medium level of residual risk. There are two aspects of the proposal which present a low level of residual risk:

- Water Quality
- Soil and water

The residual risk rating of 'low' suggests that the residual risk can be managed through the application of environmental management measures. These are detailed within the relevant chapters of the EIS and in a consolidated chapter on the CEMP (Chapter 16).

The remaining environmental risks identified for the proposed remediation works, including those identified within the SEARs, have been assessed as having a negligible level of residual risk. Despite this they will be further addressed within the CEMP and the LTEMP to ensure appropriate environmental management. For example these issues may be managed through detailed design controls and normal working practices.



CHAPTER 8 CONTAMINATION

The Secretary's Environmental Assessment Requirements ■ Including a contaminated land assessment carried out in accordance with the requirements of Management Order (20131407) for the site; ■ a Remedial Action Plan approved by the EPA detailing the works to remediate the site, which includes: – characterisation of the nature and extent of contaminated material and any contaminated groundwater plumes; – details of the proposed remediation process, including treatment methodologies and processes; – justification for the proposed treatment and remediation criteria; – details of proposed remediation management measures including the management of excavated material, stockpiles and wastewater; – a site validation plan; – details of compliance with the Contaminated Land Management Act 1997; – details of the final landform following remediation and the suitability of any fill material; – on-going management of the site following remediation works; and – details of the final use of the site.	Chapter 8
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As previously detailed throughout the EIS, a RAP for the Kooragang Island Remediation Program has been prepared and submitted to the NSW EPA to meet the requirements of the MO. The RAP provides the requirements for the environmental controls to be implemented during the remediation works, as well as the requirements for the long-term environmental controls that will be required to be implemented post remediation, in the form of a Long-term Environmental Management Plan.

The RAP has been independently assessed by an approved reviewer (see Section 8.5.5). The reviewed RAP has been submitted to the NSW EPA as provided in Appendix C.

8.1 Remediation Action Plan (RAP)

The RAP documents a summary of the works completed to allow the development and planning for the proposed remediation approach and outlines a methodology (detailed design) for implementation of the preferred remediation strategy (cap and contain).

More specifically, the scope of the RAP includes:

- Documentation of the remediation approach in accordance with the relevant NSW EPA endorsed guidance documents to ensure the information adequately meets the requirements of Action 1 of the MO;
- Identification of the regulatory and legislative framework for the remediation works as well as the necessary approvals and licences required by regulatory authorities in order to enable the remediation works to proceed;



- Remediation Design including the modelling and concept development components that informed the remediation design;
- Establishing the necessary controls required to complete the remediation work in a safe and environmentally acceptable manner;
- Identification of suitable remediation validation protocols (as required) for the remediation;
- Identification of a framework for preparation of a long-term site environmental management approach, including ongoing monitoring programs required by the MO;
- Documentation of the proposed program of community consultation, prior to, during and post remediation works; and
- Specification of a timeline of milestone goals and targets by which progress towards implementation of the RAP will be measured and reported in writing on a regular basis to the NSW EPA.

Provided in this chapter is a summary of the RAP in relation to the key elements of the proposed remediation strategy and design, validation and proposed final landform and use. Further information in relation to the remediation approach and characteristics and extent of contamination are provided in Chapter 3 of the EIS.

8.2 Remediation Strategy and Design

As discussed in further detail in Chapter 3 of the EIS, the cap and containment remediation option was identified as the preferred option and consists of the installation of a low permeability subsurface wall to minimise the flow of groundwater through the impacted soil in the on-site source area and a surface cap to reduce infiltration. The cap and containment approach provides isolation of arsenic located on the Orica Facility and prevents, to the extent practicable, the further off-site migration of arsenic in groundwater.

The cap and containment system will effectively segregate the residual source of arsenic from the surrounding groundwater system by significantly reducing the flux of groundwater through the identified arsenic contamination. The reduction in the groundwater flux through the source area will also reduce the contaminant mass flux of arsenic migrating off site.

Based on the outcomes of the remediation investigation, including geotechnical, hydrogeology and groundwater modelling, the remediation design was developed to remediate the extent of identified contamination and meet the remediation objectives.

8.3 Validation Plan

Remediation is to be achieved through design and construction of engineered solutions comprising a containment (cut-off) wall to isolate a potential continuing source of arsenic impact to groundwater and an integrated capping system to minimise infiltration of rainwater through the source and surface run-off.

The validation of these measures will be achieved through a combination of two major components:

- Confirmation that the engineering of the remediation design is installed as per the design specification through a series of Construction Quality Control (CQC) and Assurance (CQA) programs during the installation of the system. The CQC program is implemented by the Remediation Contractor and the CQA program is implemented by a suitably qualified scientist or engineer to confirm the CQC has been implemented effectively; and
- Validation of the performance of the remediation design through assessment of hydraulic performance post construction. The post construction hydraulic performance monitoring is to be implemented by a suitably qualified scientist or engineer.

Cut-off Wall CQC and CQA Program

The CQC and CQA requirements to be implemented and the performance specification to be achieved for the cut-off wall are detailed within the Reference Specification (Golder 2016c) and summarised within the RAP.



In general, the CQC requirements include mix testing of the materials to be used for the cut-off wall to confirm the durability of the soil mix. A range of testing will be implemented throughout the installation of the wall, primarily with respect to the slurry material and the cut-off wall materials. The results of the CQC is to be documented within a report prepared by the Remediation Contractor including test results post construction.

The performance requirements of the cut-off wall material will be satisfied if the permeability measured values for at least 85% of test specimens are no more than 1×10^{-9} m/s, no measured value is greater than 5×10^{-9} m/s, and no two measured values between 1×10^{-9} m/s and 5×10^{-9} m/s are from specimens obtained with a 30 m horizontal distance of each other.

The CQA will involve the Validation Consultant performing inspections and reviewing requirements during the cut-off construction program. This will involve technical review of the design and mix testing reports prior to construction; oversight of construction works, audit of CQC testing results, and discretionary independent duplicate testing during the construction phase; and technical review of the construction report prepared by the Remediation Contractor documenting the CQC program.

Capping System CQC and CQA Program

The CQC and CQA requirements to be implemented and the performance specification to be achieved for the capping system are detailed within Reference Specification (Golder 2016c) and summarised within the RAP.

The main elements of the CQC program include preparation of management plans, work method statements, material testing, compaction testing, surveying, notifying for inspection points and works-as-executed (WAE) documentation. The materials to be used for the capping system are to be documented and approved prior to use. The results of the CQC are to be documented within a report prepared by the Remediation Contractor including test results post construction.

The CQA will involve the Validation Consultant performing inspections and reviewing data during the capping system construction program. This will involve approval of materials for use in the capping system, oversight of construction works, audit of CQC testing results, and discretionary independent duplicate testing during the construction phase; and technical review of the construction report prepared by the Remediation Contractor documenting the CQC program.

Hydraulic Validation

Hydraulic performance of the containment system will form a key component of the overall remediation validation assessment. The validation approach is to install three sets of paired and nested well suites (a total of six nested well suites) at strategic locations on either side of the completed cut-off wall, such that the internal and external 'piezometric' water levels can be compared. At each of the six well suite locations, three separate piezometers will be installed to target different hydrogeologic units. Dedicated water level loggers are to be installed in each well to allow collection of water level data and assess how it responds inside and outside the containment cell.

The following presents a series of potential effects on the local hydrogeology that may be observed following installation of the containment cell. These include the effects predicted by the groundwater model, however, it is stressed that validation of system installation is not dependent on observation of *all* of these potential effects. Rather, the validation will consider a holistic assessment of hydraulic effects observed at the monitoring points.

Identified potential effects include:

- The detection of responses to rainfall events that may be recorded in the external wells, but which would be expected to be less prevalent in the data collected from inside the wall. It is noted that the timing of installation of the capping system is a key factor in this assessment as rainfall events prior to cap installation could affect conditions either side of the wall.
- A flattening of the groundwater table(s) inside the cell relative to external conditions;



- An increase in the external hydraulic gradient across the cell (in the direction of groundwater flow); and/or potential increase in gradients around the perimeter of the cell.

It is also noted that barometric pressure inside containment cells has been documented as potentially affecting internal water levels, thereby confounding the comparison with external water levels. To understand these potential effects, an electronic barometric logging device will be deployed in the unsaturated zone (above the water table) beneath the capping system. This will provide real-time monitoring of barometric pressures inside the cell and allow 'normalisation' of the internal water level data, if required.

It is envisaged that the hydraulic verification monitoring will be performed for one year following installation as a minimum, with greater frequency immediately after the initial installation of the system. The overall timeframe for hydraulic verification monitoring will be subject to review at that stage.

8.4 Final Landform

A series of construction drawings, including plan and cross sectional views, have been prepared which detail the final proposed landform (Appendix A of the RAP, which can be found in Appendix C of this EIS). The final landform will have the following design characteristics:

- Minimum 2% (1-in-50) slope for surface water drainage (Drawing 004 in Appendix A of the RAP), sloping from the north-eastern corner of the area to:
 - east-north-east;
 - south-south-west; and
 - south-west.
- 1-in-3 batter slope with a 9 m wide ramp to provide vehicular access to the platform area.
- Surface layer: comprising 400 mm thickness of revegetation soil and grass, and/or road base with spray seal.

8.5 Long-Term Environment Management

8.5.1 Proposed Use of the Remediated Area

The remediated area will be left unused and vegetated with grass and/or utilised as a lay-down area / temporary storage area for small to medium sized plant and equipment required by the Orica Facility. Access to the remediated area will be controlled and maximum weight restrictions will apply.

Post installation of the cap and containment system at the Site, it is proposed to restrict access to the remediated area to prevent damage to the cap and walls of the remediation system. This will be achieved through the installation of a chain wire mesh fence with gates, as required. Access to the area will be restricted to personnel and activities approved by the site management team through the use of security managed locks on the gates and appropriate signage.

8.5.2 Long Term Management Approach

DEC NSW (2006) notes that a Long Term Site Environmental Management Plan (LTSEMP) can be an effective means of ensuring the environment is protected, that users of a site are not exposed to contamination remaining on site and that a site remains suitable for the specified land use when:

- Complete cleanup of contamination affecting an area is not practicable; or
- Contaminants are being capped or contained on site; or
- Remediation is likely to cause a greater adverse impact than would occur if the site were left undisturbed.

The proposed approach for the project is based on isolation and containment of impacted soil and groundwater to prevent interaction of contaminated materials with the surrounding groundwater.



These measures will be designed to render the Site as suitable for a specific land use scenario, namely that outlined above, by reducing various risk profiles to acceptable levels.

Therefore, future activities that could compromise the effectiveness of these measures and potentially alter the risks to human health and the environment need to be identified, managed and controlled such that the site condition can be maintained into the future. Ongoing maintenance of the structures is also a related requirement.

8.5.3 Long-Term Environmental Management Plan (LTEMP)

The MO requires the development of a Long-Term Environment Management Plan (LTEMP) for implementation following completion of the remediation works. The LTEMP is to fulfil the following requirements of the MO:

- Action 2 c). Prepare a LTEMP for any operational phase of the proposed works and provide a copy to the NSW EPA. The LTEMP will incorporate any long-term requirements for operation and maintenance, monitoring and restrictions on site activities in the vicinity of the system or process. The LTEMP should be revised based on systems or process operation and monitoring results on a periodic basis with NSW EPA approval.
- Action 2 d). Operate and maintain the installed system or process in a manner to achieve the remediation objective and in accordance with the LTEMP.
- Action 4). *Update the Arsenic EMP* (An Environmental Management Plan (EMP) has been implemented at the site since 2008 to provide a framework to minimise risk to either human health or the environment from the identified arsenic contamination. This EMP has been regularly revised since its initial implementation).

The LTEMP is to be developed to address the above actions nominated within the MO, specifically to provide a framework to minimise risk to the environment from the identified arsenic contamination post the construction of the containment cell, noting that arsenic contamination is already present outside the proposed cell alignment and on adjacent land. The framework will be based on the following components:

- Describe any restrictions associated with activities or land use on or around the containment cell area.
 - The LTEMP will detail the restrictions associated with using the area, including prevention of excavations within the cell area and maximum weights allowed for equipment that will enter the Site. These restrictions will also be appropriately identified with signage attached to the chain wire fence near the gate(s).
 - Relevant site plans will be updated to mark the cap and containment cell, the fenced area and reference to the location of the current LTEMP.
- The LTEMP will detail the frequency of inspections to ensure that the controls to restrict access to the area are being effectively implemented.
 - The frequency and type of inspection will be developed and finalised in the LTEMP, but is envisaged to be on a bi-annual basis.
 - It will likely require a detailed site inspection focussing on the integrity of the capping system and checking for any signs of deterioration, displacement or erosion of the capping system layers, and/or cracking and desiccation of the near surface materials.
 - It is envisaged that the inspections will be carried out by a suitably qualified engineer or equivalent.
- Groundwater monitoring requirements:
 - The Groundwater Monitoring Plan (GMP, which forms a requirement of the Workplan (Golder, 2014a)) currently being implemented will be revised and novated into the LTEMP to allow the



collection of the required groundwater data to facilitate assessment of the performance of the containment cell.

- The monitoring approach will comprise an hydraulic monitoring component focussed on on-going temporal measurements of groundwater table elevations in paired nests of permanent monitoring piezometers installed either side of the cut-off wall. The approach will consider temporal effects on groundwater levels that may be expected to be expressed in the external monitoring suite, but not in the internal suite. An example of such an effect would be recharge responses associated with rainfall. Similarly, the gradient inside the cut-off wall may be expected to flatten, while the existing regional gradient would continue to be expressed in the external monitoring suite. It is anticipated that such monitoring would be completed on a bi-annual basis.
- Monitoring will also comprise a chemical sampling analytical program, to facilitate comparison of general chemical and geo-chemical concentrations in the vicinity and downgradient of the cut-off wall area over time post-installation. It is anticipated that such monitoring will be undertaken on an annual basis.
- As part of the monitoring requirement, access agreements will need to be maintained with adjacent land owners.
- Provide a program for revision of the LTEMP. The LTEMP is to be developed two months prior to the completion date for the installation of the containment cell.

8.5.4 Long-Term Contingency Approach

The proposed remediation approach comprises two engineered solutions aimed at isolating the inferred ongoing source of groundwater impact and minimising opportunities for contact with contaminated soils.

Should either of the engineered solutions prove ineffective in meeting the remediation objectives, it is unlikely that improvement of the engineered solutions would be practicable. It is considered more likely that alternate engineered designs would need to be tabled for consideration and construction to achieve the remediation objectives.

8.5.5 RAP Review and Approval

The RAP was independently reviewed by Chris Jewell of C.M.Jewell & Associates Pty Ltd. His findings were presented in a report entitled '*Independent Review, 15 Greenleaf Road, Kooragang Island, for Orica IC Assets Pty Ltd* (CMJ, 2016) referenced J1702.2R-rev0 and dated November 2016. A copy of the report is presented in Appendix E.

The Independent Review provided a high level of detailed discussion on the scope and findings of the remediation assessment program, noting that the work had been supported by groundwater modelling by A.D. Laase Hydrologic Consulting.

The review concluded that '*The RAP as a whole contains, and adequately presents and justifies, the information required in respect of a remedial action plan as indicated in Guidelines for Consultants Reporting on Contaminated Sites (EPA, 2011). The RAP and supporting documentation reviewed in this report meet the relevant requirement of Action 1 of the MO*'.



CHAPTER 9 SOIL AND WATER

The Secretary's Environmental Assessment Requirements ■ Including an assessment of the potential soil, groundwater and surface water impacts of the development, including a detailed description of surface and groundwater conditions pre and post remediation works; ■ an assessment of existing and proposed stormwater controls, including a detailed description of the adequacy of sediment basins; ■ details of licensing requirements, groundwater works, dewatering and management of contaminated water; ■ identification of potential conflicts with other water users, including other licensed users and recreational users; ■ a detailed description of the mitigation and management controls that would be put in place to manage erosion and sediment, stormwater, groundwater and acid sulphate soils (if present) during and after remediation works; and ■ details of proposed surface and groundwater monitoring activities and methodologies.	Chapter 9
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Investigations have been undertaken of the former arsenic sludge disposal pit since prior to 2000. These investigations have resulted in a detailed understanding of the nature and extent of arsenic in the soil, groundwater and surface water in the vicinity of the Site. Groundwater monitoring of arsenic has been routinely undertaken since 2004 to provide an understanding of temporal and spatial trends in arsenic (dissolved) concentration in groundwater at and down-gradient of the former sludge disposal pit.

Associated with the ongoing management of the residual arsenic contamination an Environmental Management Plan has been in place since 2008.

The investigation, monitoring and management undertaken with respect to the arsenic contamination has been undertaken in compliance with VRAs, a VMP and the MO issued by the NSW EPA.

9.1 Existing Soil and Water Impacts

Significant work has been undertaken to assess and remediate residual arsenic contamination with a detailed description of the Site land use, surrounding areas, history of use and geology and hydrogeology summarised in the Conceptual Site Model (CSM) (Golder, 2013) for the Site.

These assessments have been further complimented with remediation investigations undertaken during the development of the RAP. The investigation report (Golder, 2016a) was presented in a modular format and presented the results and conclusions of a detailed (Phase 1 and 2) site investigation program completed between March and April 2015.

The investigation included:

- Twenty one (21) soil bores drilled to a depth of 15 m bgl to obtain undisturbed samples. The configuration was specific to the general boundary of the impacted area (see Figure 9.1). Samples were collected in the field, screened with an hand-held Niton XRF meter and selected samples were sent to an accredited laboratory for analyses;
- Seven (7) nested groundwater monitoring wells were installed at locations around the former disposal pit. The wells were installed to depths of up to 35 m bgl. The purpose of the investigations was to understand hydrogeological conditions in the vicinity of the proposed cut-off wall;



Figure 9.1: Site Investigation Locations

A summary of the Site history, pre-remediation soil, groundwater and surface water results (i.e. the outcome of the Phase 1 and 2 investigations) with respect to arsenic contamination are presented in the following sections.

9.1.1 Existing Contamination

The former sludge disposal pit was used for the disposal of solids and liquid arsenic wastes from the Vetrocoke process used at the Ammonia Plant from late 1960s to 1994. Although the primary source of contamination has been removed, residual arsenic has been found in surrounding subsurface soils representing an ongoing source of arsenic to groundwater. Removal of a secondary source of contamination occurred in 2005 with the remediation of contaminated soil beneath the former pit (to the depth of the groundwater table), the bund walls and soil surrounding the pit by excavation, treatment and off-site disposal.

Soil Contamination

Identified arsenic in soil contamination down-gradient of the former sludge disposal pit as a result of historical activities at the Site extends off site from beneath the former pit (now remediated) towards the South Arm of the Hunter River. It is noted that the off-site soil contamination has been caused by adsorption from the groundwater plume, rather than being related to any direct discharges.



Beneath the former pit residual arsenic soil concentrations average 170, 540 and 130 mg/kg in hydrostratigraphic units 1, 2 and 3 respectively. Unit 1 consists of fill and reclaimed sands, Unit 2 estuarine silt and clay and Unit 3 alluvial sand. To provide wider context, a summary of the hydrostratigraphic units is provided in the following table, taken from the RAP (Appendix C).

Table 6: Hydrostratigraphic Units (Golder, 2016b).

Hydrostratigraphic Units	Description	Classification	Typical Hydraulic Conductivity
Unit 1 Fill and reclaimed sand	Various loose fill (including localised slag and ash) and reclaimed sand of coastal origin with shell fragments.	Aquifer, porous medium, unconfined.	3×10^{-5} m/s to 8×10^{-5} m/s
Unit 2 Estuarine silt and clay	Fine-grained estuarine sediments predominantly comprising of silts and clays, black in colour. The lower part becomes gradually coarser (i.e. sandier).	Aquitard, porous medium.	Upper part: likely two orders of magnitude lower than Unit 1 Lower (sandier) part: 10^{-5} m/s
Unit 3 Alluvial sand	Fine- to medium-grained alluvial sand, grey in colour, sub-rounded, occasionally interspersed with bands of clay and minor sandy silt.	Aquifer, porous medium, confined.	8×10^{-5} m/s to 2×10^{-4} m/s
Unit 4 Coarse fluvial sand	Dense medium- to coarse-grained fluvial sands, with rounded gravels and pebbles, pale brown in colour.	Aquifer, porous medium, confined.	Over 10^{-4} m/s
Deeper Sands and Clays	Interbedded strata comprising of: ■ Upper part: yellow brown uniform fine-grained sand (possibly of terrestrial origin), ■ Middle part: grey fine- to medium-grained sand with rounded coal fragments, and ■ Lower part: interspersed black silty clay and sandy clay with minor bands of sand.	Succession of thin aquifer zones and aquitards, porous medium, confined.	N/A
Permian Bedrock	Fine- to medium-grained weathered sandstone, green-blue in colour, dry (predominantly recovered as pulverulent material).	Aquifer, fractured rock medium.	N/A

Arsenic concentrations in the identified contaminated area below and down-gradient of the former pit are of the order of 1,500 mg/kg, with a maximum concentration of 3,570 mg/kg. Arsenic concentrations are generally higher within the sediment in Unit 2, than Unit 1 and Unit 3. Concentrations of arsenic in soil are less than 5 mg/kg at depths below 8 m bgl.

Groundwater Contamination

Dissolved arsenic in groundwater extends downgradient from the former sludge disposal pit off site in a west-northwest direction towards the South Arm of the Hunter River. Concentrations of arsenic in groundwater on site ranged between 15 mg/L and 85 mg/L, with concentrations decreasing since the remediation of the former disposal pit in 2005.



The highest monitored dissolved arsenic concentrations have been recorded between 3 and 7 m bgl. At depths greater than approximately 8 m bgl, dissolved arsenic concentrations are low (<1 mg/L).

This distribution of arsenic in groundwater is complex and dependent on several parameters and features as demonstrated in the CSM. The concentrations vary both laterally and vertically. The following figure is taken from a previous report (URS, 2014) and is presented here as a generalised representation of the inferred distribution and migration pathway at a depth of approximately 3 m bgl.

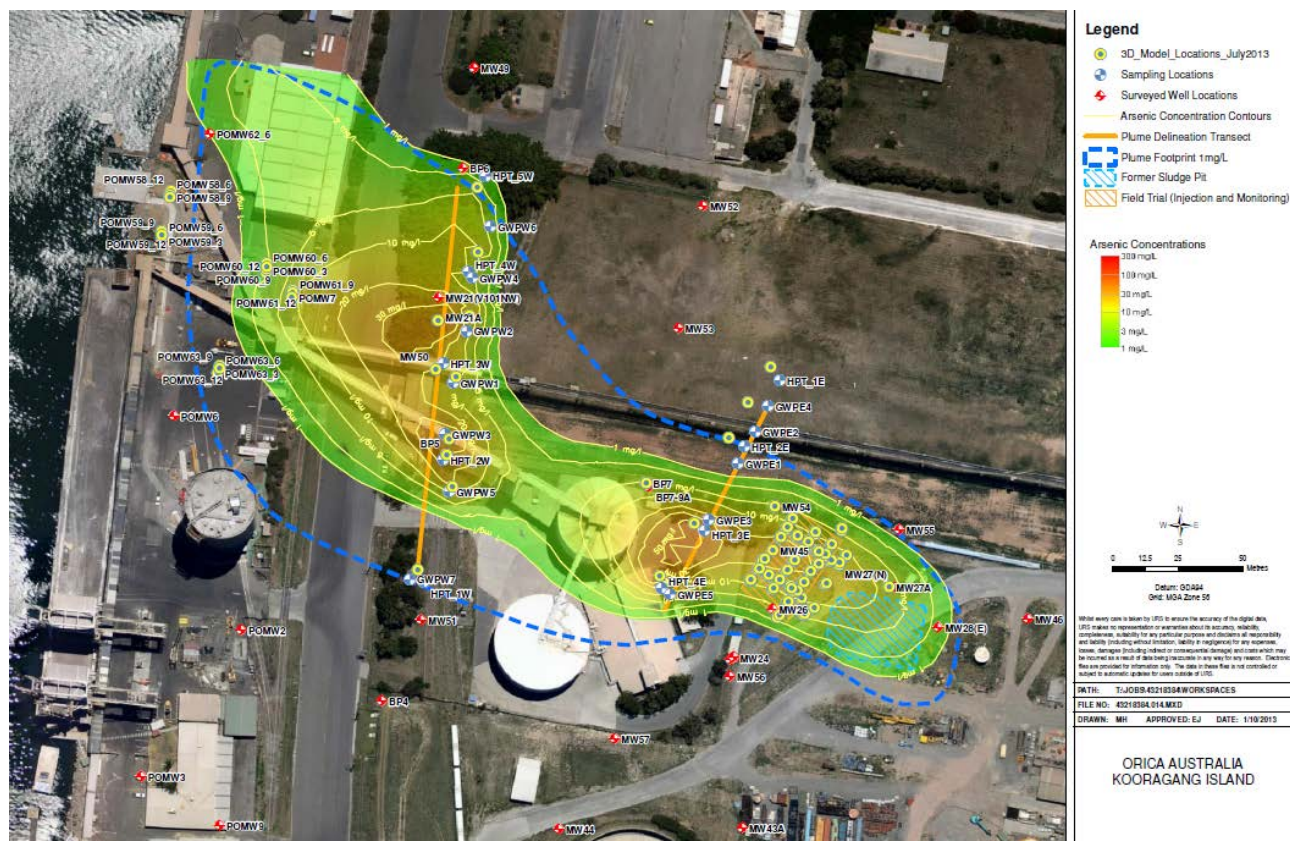


Figure 9.2: Generalised Groundwater Plume (As); from (URS 2014)

The predominant arsenic species in groundwater is As(III) (arsenite) with a minor portion as As(V) (arsenate), which is consistent with the original arsenic source (arsenic trioxide) and the groundwater geochemistry (mildly reducing). Both As(III) and As(V) are inferred to be present predominantly as oxyanions (including their hydrogen substituted forms) in groundwater (Golder, 2013).

Despite a relatively high average groundwater velocity, the migration of arsenic is significantly attenuated within the aquifer. This is supported by the distribution of arsenic in soil and groundwater down-gradient of the former sludge disposal pit (Golder, 2013). The fate and transport of the arsenic has been dominated by dissolved arsenic being leached from the contaminated soils below the former pit and then migrating with groundwater flow. Arsenic has adsorbed to aquifer materials along the flow path until the attenuation capacity of the aquifer is exceeded such that the arsenic plume has migrated more slowly than the groundwater flow. Investigations have confirmed that the predominant process attenuating arsenic in the aquifer is adsorption onto naturally-occurring iron minerals (particularly hydrous ferric (oxy) hydroxides (HFO)) (Golder, 2013). The amount of HFO present in the aquifer was considered to provide substantial arsenic adsorption capacity. Other mechanisms such as adsorption of arsenic to organic matter, sulfides, clays and other minerals are considered not to be the dominant factor in attenuating arsenic within the aquifer, however, they may contribute directly or indirectly to the fate and transport of arsenic, in particular with fine-grained sediments.



Acid Sulfate Soil

Douglas Partners (2011) reviewed the potential for acid sulphate soils in the northern and southern portion of the site and identified:

- The 1:25 000 Acid Sulphate Soil Risk Map for Newcastle indicates that the site is mapped as disturbed terrain. Soil investigations are required to assess the acid sulphate potential.
- pH in water (pH_F) and pH in hydrogen peroxide (pH_{FOX}) screening testings on selected soil samples indicated that pH values after oxidation (pH_{FOX}) greater than 3.5, however, some samples showed a change in pH (i.e. pH_F minus pH_{FOX}) slightly greater than 1.0.

Based on these results, Douglas Partners (2011) concluded that the analysed soils were unlikely to be acid sulphate soils.

Surface Water

There is no surface water in the immediate vicinity of the Site, with the nearest receiving environment the South Arm of the Hunter River approximately 250 m to the west. The Site is not serviced by a stormwater drainage network, instead rainwater that falls on the Site infiltrates the aquifer and flows in a west-north-west direction towards the river.

Groundwater Users

Registered groundwater bores in the vicinity of the remediation area are limited to groundwater bores nominated for monitoring purposes. This is consistent with site knowledge that groundwater is not extracted or used within the vicinity of the Site for any purposes.

Notwithstanding that there are currently no users of groundwater, it is anticipated that the remediation works are unlikely to affect the quantity of groundwater or the groundwater flow direction or velocity that may be available for future users of groundwater.

It is also noted the project does not involve dewatering or other extraction of water.

Flood Management

A Flood Impact Assessment has been completed by BMT WBM for the Project, which is provided in full in Appendix F.

Based on the existing Hunter River flood mapping adopted by Newcastle City Council (Newcastle City Council, 2012b), the Site is located outside the active floodplain and is designated flood free for a 100-year Average Recurrence Interval (ARI) design flood event. In addition Port Stephens Council flood modelling (Port Stephens Council, 2016) identifies the Site is outside the extents for Probable Maximum Flood (PMF). As such, the Site is assessed to remain flood free for all major flood event magnitudes beyond the 100-year ARI, including the PMF and under potential future climate change conditions. Consequently, the Project is compatible with the hydraulic categorisation of the floodplain environment, flood hazard of the land and relevant Council's floodplain risk management plans. The Project would not be affected by flood events up to and including the PMF and is not assessed as resulting in any detrimental increase in the potential flood affectation of adjacent properties, assets or infrastructure.

The Flood Impact Assessment (Appendix F) further identifies that the Project does not require any additional emergency management, evacuation and access or contingency measures above that currently required for the Facility, and would not pose an impact upon existing community emergency management arrangements for flooding at other local or regional localities. Furthermore with the adoption of standard control measures in the CEMP, the Project will result in a negligible impact upon erosion or siltation, destruction of riparian vegetation or reduction of the stability of river banks or watercourses.

9.2 Ongoing Groundwater Monitoring

Bi-annual groundwater monitoring has been undertaken in the vicinity of the former arsenic sludge disposal pit since 2004, with changes in the monitoring network over time as investigations have been undertaken.



To meet the requirements in the MO (Action 3), an Arsenic Groundwater Monitoring Program (GMP) (Golder, 2014b) was prepared. The GMP documents on- and off-site arsenic groundwater monitoring activities to be undertaken throughout the life span of the MO (i.e. up to June 2018). The GMP requires bi-annual monitoring to enable assessment of temporal and spatial trends in arsenic (dissolved) concentration in groundwater at key monitoring locations.

The GMP will be implemented throughout the construction phase of the remediation program. It is noted that on-site wells in the vicinity of the containment cell have been decommissioned to prevent the potential for cross contamination between groundwater units during the construction. As such, the groundwater monitoring will be from the nominated monitoring wells which are located on site up-gradient of the containment cell and at down-gradient off-site wells. It is considered likely that the LTEMP will incorporate the monitoring requirements post-remediation. With the exception of the decommissioned wells, groundwater monitoring will be undertaken in accordance with the frequency, analysis and sampling methodologies detailed within the GMP (Golder, 2014b).

9.3 Potential Impacts

9.3.1 Construction Soil and Water Management

During the construction phase of the proposed works, potential environmental impacts to soil and water could include:

- Erosion and sedimentation of soils during the cut-off wall and capping activities;
- Spillages of contaminated soil outside the Site during vehicle movements;
- Potential acid sulfate soils excavated during construction of the cut-off wall; and
- Contaminated surface water discharging from the Site during rain events.

The CEMP for the Kooragang Island Remediation Program will be completed prior to construction and include mitigation and management measures associated with erosion and sediment control, stormwater, groundwater and potential acid sulphate soils during and after remediation works.

9.3.2 Operational Soil and Water Management

During the operation of the cap and containment system soil and water could potentially be impacted as a result of:

- Failure of the remediation system resulting in arsenic contaminated groundwater migrating outside the containment cell;
- Failure of the cap resulting in the exposure of contaminated soil; and
- Failure of the cap stormwater control measures resulting in surface flow of uncontaminated stormwater.

The design of the cap and containment system has been undertaken to minimise the potential risks to soil and water during the operational phase.

9.4 Management and Mitigation Measures

9.4.1 Construction

The CEMP will detail the measures to be implemented to minimise the potential for soil and water impacts during the construction of the cut-off wall and cap. This will include:

- Management of stockpiles, mixing areas and the excavation to minimise the potential for erosion and sedimentation. This will comprise:
 - dust control activities such as water sprays on work areas and stockpiles or covering of stockpiles with tarpaulins.



- works being established to minimise the potential for sedimentation outside the Site through the use of sediment fencing, barriers or bunds to contain surface water and soil to the construction area.
- covering of the cap area in a timely manner following completion of its construction. The cap will be covered with grass or road base with a spray seal.
- Control of vehicle traffic inside the Site area and inspection of vehicles prior to leaving the construction area to minimise the tracking of contaminated soil outside the work area.

The CEMP will include requirements for the monitoring of compliance with the control measures to minimise the potential for impact on soil and water during construction of the cut-off wall and cap.

9.4.2 Operation

The cap and containment system has been designed to minimise the potential for soil and water impacts during the operational phase.

The remediation system is designed to prevent, to the extent of the technology, the off-site migration of arsenic in groundwater. As detailed in Section 8.3 an extensive validation program will be undertaken during the construction phase to assess the effectiveness of the installation activities. This includes Construction Quality Control by the cut-off wall and cap contractors and Construction Quality Assurance by the validation consultant. The validation program will be reviewed by the Independent Reviewer.

The long-term performance of the cap and containment system will be assessed through a hydraulic validation program which will be documented in the LTEMP. This program will be used to evaluate the performance of the cap and containment system in meeting the MO objectives.

The remediation strategy of cap and containment is to significantly reduce the flux of arsenic contaminated groundwater on the site. As such it is anticipated that over the medium- to long-term the decreasing dissolved arsenic concentration trend will continue. This is based on the diminished potential for further leaching and desorption of arsenic from contaminated soils within the containment cell post construction.

A program of inspection and maintenance will be undertaken to ensure the long-term integrity of the cap and containment system. This will include regular inspections of the cap surface for damage, maintenance of the cap, such as mowing, as required and restrictions on access and use of the cap area. The area will be fenced and approval will be required to access and use the land for any purpose other than identified maintenance activities or monitoring.

Consistent with the current and future users of groundwater, it is anticipated that there would be no or negligible adverse effect on surface water quantity or quality, with no change in the quantity of groundwater discharging to the South Arm of the Hunter River and the predicted medium- to long-term improvement in groundwater quality discharging to the river. On this basis, it is considered that there will be no adverse effect on commercial or recreational use of the South Arm of the Hunter River or on groundwater-dependent ecosystems.

The cap surface water management system has been designed to direct water to two infiltration areas. The infiltration areas have been designed to manage stormwater from a 1 in 10 year storm event. The use of these systems to manage stormwater has been assessed by the hydraulic modelling which has confirmed that this arrangement for the management of stormwater will not affect the performance of the cap and containment system.

9.5 Conclusion

Implementation of measures detailed within the CEMP will ensure that appropriate controls are in place to manage potential risks associated with contaminated soil and groundwater during the construction phase of the Project. It is anticipated that these measures will ensure the environment is not adversely impacted as a result of soil and water management during the construction phase.

The design of the system and controls to manage the area are in place to ensure that the cap and containment system is able to operate effectively and meet the objectives of the MO and the LTEMP.



CHAPTER 10 HUMAN HEALTH RISK

Chapter 10 provides an assessment of the potential risks associated with human health to Site personnel and the surrounding area.

The Secretary's Environmental Assessment Requirements	
■ Including an assessment of the potential risks (on site and off site) associated with the disturbance and long-term containment of contaminated materials; and ■ Details of mitigation and management measures to minimise human health risks and ensure the safety of workers during the development.	Chapter 10

10.1 Existing Site Characteristics

As identified within the MO the Site is declared to be a remediation site and as identified within the EIS, the objective of the Kooragang Island Remediation Program is to prevent, to the extent practicable, further off-site migration of arsenic. Section 9 provides a detailed review of contamination levels at the Site.

Personnel are not directly exposed to arsenic in groundwater or soil as the contamination is located below the ground surface. The arsenic contaminated groundwater is typically located 1 - 2 m below the ground surface while the most elevated soil concentrations are between 3 and 5 m below the ground surface. An Environmental Management Plan (Golder, 2015) is in place to manage exposure of people to potentially contaminated materials. The Environmental Management Plan is provided to adjacent land-owners and land-users on an annual basis.

10.2 Potential Impacts

10.2.1 Construction

The remediation work associated with the construction of the cap and containment system will involve the excavation of arsenic contaminated soil and groundwater as detailed in Chapters 3 and 4 of the EIS.

Potential risks associated with disturbance of contaminated materials during construction include exposure of personnel to arsenic contamination as a result of contact with contaminated soil or groundwater. This exposure could occur from inhalation of airborne materials containing arsenic, ingestion of material due to poor personal hygiene practices and skin absorption due to contact with contaminated materials.

A human health risk assessment considering potential risks to on- and off-site users associated with soil disturbance during the implementation phase was completed and is presented in Appendix G. It found that the disturbance of contaminated material has the potential to result in exposure of workers to arsenic due to contact with contaminated soil, groundwater or arsenic in ambient air.

The arsenic concentrations in soil and groundwater were compared to health based guidelines for the protection of workers. The estimated arsenic concentrations in ambient air were compared to health based guidelines for the protection of the general public given that dust may become airborne beyond the site boundary into an adjacent car park and work area. (The ambient air assessment was informed by an assessment of potential arsenic emissions from the proposed construction program prepared by Pacific Environment (Pacific Environment, 2016), a copy of which is also presented as Appendix H.

Given that the arsenic concentrations in soil, groundwater and ambient air are below relevant health based screening criteria and coupled with the management control measures proposed for the containment of contaminated materials within the site it is concluded that the health risk to workers and the general public is low and acceptable.

Nonetheless, the CEMP will also detail the measures to be undertaken to minimise the potential for exposure of personnel to elevated levels of arsenic contaminated materials.



10.2.2 Operation

During the operational phase of the system there will be limited potential for exposure to contaminated materials due to the presence of the containment cell and the associated controls to prevent excavation in the area.

Personnel implementing the Groundwater Monitoring Plan could be exposed to potentially contaminated groundwater.

10.3 Management and Mitigation Measures

10.3.1 Construction

The CEMP will include a Site Specific Health and Safety Plan (SSHSP) which will detail controls to minimise human health risks associated with the construction of the cut-off wall and cap. The objective of the SSHSP will be the protection of the health and safety of workers on the Site as well as the general safety of occupiers of surrounding areas. The SSHSP will be prepared in accordance with the *Work Health and Safety Act 2011*, the *Work Health and Safety Regulation 2012*, SafeWork NSW requirements and any additional governing regulations.

The document will provide details of the chemical and physical hazards associated with the remediation works and a range of controls. It will include:

- Establishment of equipment, amenities and work area(s);
- Installation of decontamination facilities;
- Establishment of area fencing/bunding and impacted area exclusion zones;
- Details of an induction process for all personnel working on the remediation site;
- Safety data sheets;
- Soil, water and material handling procedures;
- Personal protective equipment requirements (all the safety equipment shall meet all applicable Australian Standards);
- Decontamination procedures for leaving the remediation area prior to breaking for eating, drinking, smoking, using the toilet and before leaving the each day;

Site workers and visitors will be trained on the contents of the SSHSP prior to mobilisation to the works area.

Exclusion Zones

As part of the work health and safety requirements, access within the remediation area shall be controlled. Orica or its nominated subcontractor/ sub consultant will implement varying controls depending on the personnel and whether the proposed work area is in an Exclusion Zone.

Exclusion Zones are remediation areas that either require additional protective measures or may require the adoption of additional health and safety requirements and work practices. Exclusion areas will be assessed on a regular basis as the work areas progress during the construction of the cut-off and cap. The boundary of the exclusion zone will be clearly defined in the field and signs will be installed to advise personnel of the presence of the exclusion zone.

Decontamination Procedures

The SSHSP will outline the procedure for decontamination of personnel leaving the Exclusion Zone(s) prior to breaking for eating, drinking, smoking, use of ablution facilities and before leaving the Site.



All tools, vehicles or equipment which have been in contact with contaminated materials will be decontaminated after leaving the Exclusion Zone(s) as specified in the SSHSP.

10.3.2 Operation

The LTEMP will include measures to ensure that exposure of personnel to arsenic contamination is minimised. Exposure to the potentially contaminated soil and groundwater will be limited through:

- Maintenance activities and inspections to ensure the integrity of the cap;
- Restrictions on access to the area through the installation of a boundary fence around the cap and containment system and controls on activities permissible in the area.
- Health and safety measures specified for any groundwater monitoring at the Site.

10.4 Conclusion

The implementation of the proposed Project is not anticipated to adversely impact on human health and risk with the implementation of the CEMP and the LTEMP.



CHAPTER 11 WASTE MANAGEMENT

Chapter 11 addresses the key issue of waste management associated with the Kooragang Island Remediation Program on the Site.

The Secretary's Environmental Assessment Requirements – including: – accurate estimates of the quantity and classification of the potential liquid and non-liquid waste streams of the development; – a description of storage, treatment (including immobilisation of contaminants), disposal and re-use for all waste generated by the development; and – details of procedures for the assessment and management of contaminated material.	Chapter 11
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11.1 Potential Impacts

11.1.1 Construction

The construction phase of the remediation works will include the installation of a cut-off wall and capping system and a temporary amenities area.

Cut-off Wall and Capping System

During the construction of the cut-off wall there will be a quantity of spoil generated, estimated to be between 10 and 30% of the volume of the material extracted to install the wall. This surplus spoil material will be placed within the cut-off wall system. This minimises the potential for off-site waste disposal of contaminated soils. A capacity to emplace approximately 1500 m³ of surplus spoil material is allowed for in the landform design.

The quantity of spoil generated has been estimated based on the blend of soil, bentonite and imported clay material determined in mix testing to achieve the required permeability. Any surplus materials which cannot be contained, or otherwise re-used, on the Site and for which off-site disposal is deemed appropriate will be classified and managed in accordance with the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014). It is envisaged that contaminated spoil will be retained on site and surplus soil containing low concentrations of arsenic disposed off-site. This material will be transported to an appropriately licensed landfill using a licensed transport company in accordance with the requirements of the *Protection of the Environment Operations (Waste) Regulation 2005*.

Construction activities will also generate general waste such as packaging, timber and plastics.

Temporary Amenity Area

The temporary amenity area will include bathroom facilities, crib room and office space. Waste generation from activities in these areas is anticipated to include food waste and packaging, general office waste, bathroom facility waste and used PPE.

11.1.2 Operations

During the operational phase there will only be minor quantities of waste generated from maintenance of any grassed areas and sampling of groundwater.



11.2 Management and Mitigation Measures

11.2.1 Construction

The proposed remediation approach is substantially based on site capping and containment of impacted soils and materials. Spoil generated during the wall construction process will also be placed within the cut-off wall system. The potential for substantial volumes of solid waste to be generated is relatively low. Off-site disposal of such waste (if generated as a surplus of spoil for example) would be the most likely option. Any such surplus materials which cannot be contained, or otherwise re-used, on site and for which off-site disposal is deemed appropriate will be classified and managed in accordance with the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014).

Waste from temporary bathroom facilities will be collected by a licensed waste disposal company and taken off site for processing at a licensed treatment plant.

General waste from the construction area and temporary amenities will be managed using existing arrangements at the Facility and disposed of using appropriately licensed companies.

The CEMP will outline procedures for the assessment and management of the waste materials, including requirements for testing and classification of the waste in accordance with NSW EPA requirements.

11.2.2 Operation

Operational wastes will be managed in accordance with existing waste disposal arrangements at the Facility. Wastes will be assessed and disposed of in accordance with the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014).

11.3 Conclusion

The systems in place to minimise the quantity of waste that requires disposal and the processes to assess and manage waste using appropriately licensed companies will minimise any impacts associated with Project waste management.



CHAPTER 12 AIR QUALITY AND ODOUR

Chapter 12 addresses the key issue of air quality and odour associated with the Kooragang Island Remediation Program.

The Secretary's Environmental Assessment Requirements ■ including a quantitative assessment of the air quality and odour impacts of the development on surrounding receivers, in accordance with relevant Environmental Protection Authority guidelines; ■ cumulative impacts of other developments on and off-site; and ■ details of the proposed management and monitoring measures.	Chapter 12
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12.1 Existing Environment

The Site is currently a grassed, unutilised area of the Facility. Therefore the Site generates negligible impacts upon air quality or odour.

12.2 Potential Impacts

12.2.1 Construction

During the construction phase potential air quality impacts of the Kooragang Island Remediation Program to surrounding off-site receivers could occur as a result of dust emissions associated with the construction of the cut-off wall and cap system, vehicular traffic within the construction area or fuel combustion from vehicles and equipment associated with the Project.

During the excavation of soil it is unlikely that there would be significant odour generated, with little odour detected from the soils during the installation of a number of monitoring wells within the Site area. If there is any odour it is expected to be only localised to the area of the stockpiled soil.

Construction works are to be undertaken with appropriate environmental safeguards and management measures (refer to Section 12.3) so dust emissions from wind erosion and vehicle emissions are expected to be negligible.

Notwithstanding, an independent assessment of local air quality (on- and off- site) during the construction phase was undertaken by Pacific Environment Limited (PE) (PE, 2017). A copy of the report is presented in **Appendix H**. Local sensitive receptors are shown on Figure 13.1. The study involved:

- A review of the Project and site conditions with respect to potential air emissions sources;
- Preparation of a particulate matter emission inventory for key operations that involve arsenic-contaminated material;
- Dispersion modelling of arsenic emissions with comparison against regulatory impact assessment criteria; and
- Provision of relevant conclusions and recommended air quality management measures.

The key report findings indicated that based on the analyses undertaken, it was considered that the potential for the Project to result in adverse air quality impacts is low. Noting this, it was recommended that construction air quality management be addressed via the preparation of a project-specific CEMP. Suggestions for air quality management requirements were also outlined.

As explained in Section 10.2.1, the outcome of the air modelling programme also informed a site specific Human Health Risk Assessment (Golder, 2017). The HHRA, which also included consideration of arsenic



concentrations in soil and groundwater, concluded that risks during the construction phase were low and could be appropriately managed by implementation of the CEMP and LTEMP.

12.2.2 Operation

During operation the cap and containment system will have a negligible impact upon air quality and odour, as all contaminated material will remain undisturbed within the cap and containment system. The top of the cap will be covered either with grass or road base with a spray seal limiting dust from the area.

12.3 Management and Mitigation Measures

The CEMP will include measures to mitigate and manage air emissions and dust as a result of construction activities of the remediation works. This includes a suite of controls to be implemented within the Site including:

- Minimisation of open excavation areas;
- Expeditious reinstatement of excavations and exposed surfaces;
- Covering of all loads being transported off site;
- Minimisation of the number of stockpiles and implementation of dust minimisation controls for stockpiled materials;
- Minimisation of dust generation from haulage areas including use of water sprays or other appropriate techniques;
- The landform will be revegetated with grass and/or road base with spray seal to minimise the potential for dust generation upon completion of the remediation activities; and
- Maintenance on equipment to minimise exhaust emissions.

12.4 Conclusion

The implementation of control measures to manage the dust emissions during the construction of the cut-off wall and cap are anticipated to minimise the potential for adverse impacts on air quality as a result of the Project.



CHAPTER 13 NOISE AND VIBRATION

Chapter 13 addresses the key issue of noise and vibration associated with the Kooragang Island Remediation Program.

The noise assessment includes existing environment, impact assessment (based on estimated emissions) and mitigation measures.

The Secretary's Environmental Assessment Requirements	Chapter 13
■ including: an assessment of all noise and vibration impacts on surrounding sensitive receivers; and ■ details of the proposed noise and vibration management and monitoring measures.	

13.1 Existing Environment

Orica undertakes annual monitoring of the existing noise environment at sensitive receiver residential locations in Stockton, approximately 1 km from the Site. This monitoring has established the existing background noise levels at the nearest sensitive residential receivers, with levels of 41 – 56 dB(A) during an assessment undertaken in 2009. Monitoring undertaken in July/August 2016 has confirmed that there has not been any significant variation in the noise levels at these reference locations.

13.2 Potential Impacts

13.2.1 Construction

Construction noise management levels are provided in the *NSW Interim Construction Noise Guideline* (ICNG) (DECCW, 2009). Construction noise management levels for residential receivers are presented in Table 7. The management levels represent the level at which, when exceeded, management measures are required.

Table 7: Construction Noise Management Levels at Residences

Time of Day	Management Level LAeq,15min
Recommended Standard Hours: Monday to Friday 7.00 am to 6.00 pm	Noise affected RBL + 10 dB(A)
Saturday 8.00 am to 1.00 pm No work on Sundays or Public Holidays	Highly noise affected 75 dB(A)
Outside recommended standard hours	Noise affected RBL + 5 dBA

RBL – Rating Background Noise Level

LAeq - Equivalent Continuous Level

In addition to noise criteria at residential locations, relevant construction noise management levels for non-residential receivers are presented in Table 8 for reference.



Table 8: Non-residential land use construction noise management levels

Land Use	Noise Management Level
Industrial	LAeq,15min 75 dB(A) (external)

Potential noise sources at the Site during the construction activities are anticipated to include a long armed excavator, crane and grader, trucks and light vehicles delivering materials and equipment and a generator for power supply.

In assessing the potential impact of construction noise as a result of the Project on the nearest sensitive residential receivers (see Figure 13.1) the methodology and results of the noise and vibration assessment (Assessment) that has previously been completed for the Facility (Atkins Acoustics & Associates, 2009) were considered. This assessment was completed for construction activities associated with the expansion of the Facility and included consideration of noise from large-scale mobile equipment such as excavators and cranes.



Figure 13.1: Sensitive Receptors – Noise and Air Quality



In the Assessment noise from construction activities was modelled with the Environmental Noise Model and assumed a cumulative source sound power level of 120dB(A). The results of this noise modelling is provided in Table 9.

Table 9: Predicted construction noise levels at Stockton

Assessment Location	Predicted Noise Levels dB(A)
P1 – Fullerton Street (North)	31
P2 - 186 Fullerton Street	44
P3 – 239 Dunbar Street	41
P4 – 284 Fullerton Street	43

While the results of the noise modelling were for construction of the Orica Facility upgrade, given the scale of this project it is considered these predicted noise levels would be above the predicted construction noise levels of the Kooragang Island Remediation Program. However, to be conservative, these numbers are utilised for the purpose of assessing the noise contribution of the Project.

The Assessment also considered traffic noise. However, when comparing the number of traffic movements associated with construction of the proposed remediation works and the existing traffic volumes of the surrounding area (existing daily traffic volume at Stockton Bridge as 20,233), it is considered that traffic movements as a result of the Kooragang Island Remediation Program would not result in any noticeable change to the traffic noise at sensitive receiver locations.

Conservatively utilising the lowest existing background noise levels of 41 dB(A) at the reference locations (Section 13.1), the construction noise criteria for management measures for the remediation works would be 51 dB(A) during standard construction hours. All modelled construction noise contributions are lower than this construction noise criteria.

13.2.2 Operation

Once constructed the cap and containment system will have a negligible impact upon noise and vibration during operation due to the limited activity at the Site.

13.3 Management and Mitigation Measures

The Kooragang Island Remediation Program will result in noise generation from typical construction activities associated with construction of the cap and containment system (as outlined in Chapter 4) that will be ongoing for approximately five months. Based upon the construction activities to be undertaken and the distance to sensitive receivers, the impact of vibration of the remediation activities is considered to be negligible.

Activities that could result in noise levels above the construction noise criteria for the Project will be undertaken during standard construction hours, being:

Table 10: Construction hours for activities that are not audible at residences outside the Site

Day	Time
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday and Public Holiday	Nil

13.4 Conclusion

Based on the calculations of the Assessment, the predicted noise levels in Table 9 demonstrate that noise from the construction activities at the sensitive receiver locations are well below the construction noise



criteria and thus the Kooragang Island Remediation Program would have a low impact upon noise and vibration at sensitive receiver locations.



CHAPTER 14 BIODIVERSITY

The Secretary's Environmental Assessment Requirements ■ Including an assessment of biodiversity impacts arising from the proposed remediation works, including details of potential impacts upon groundwater dependant ecosystems, in accordance with the Framework for Biodiversity Assessment or relevant Office of Environment and Heritage guidelines.	Chapter 14
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14.1 Existing Environment

14.1.1 Flora

As previously identified within Chapter 5 of the EIS, the Site is located on reclaimed land in a highly modified industrial area as shown in Figure 5.1. Approximately 1.5 km to the north (upstream) of the Site is the Hunter Estuary National Park. The park incorporates the former Kooragang Nature Reserve, which covers an area in excess of 2,923 ha, and sections of which are a Ramsar site (pertaining to the conservation and sustainable utilisation of wetlands). The Site is located within the Northern Sydney Basin Bioregion.

The Site is identified as having a very low level of native vegetation. As documented within the Environmental Assessment (EA) for the upgrade to the Orica Facility (08_0129), the vegetation that is located on the Site (and the wider Orica Facility) is primarily comprised of grasses and weeds such as common couch (*Cynodon dactylon*) and Paspalum (*Paspalum dilatatum*) (Kinhill, 1997). No known groundwater-dependent ecosystems are located on the Site or surrounding area.

14.1.2 Fauna Habitat

Searches of threatened species databases (*NSW Threatened Species Conservation Act 1995* (TSC Act) and *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)) list threatened fauna species that have been recorded in the general area including:

- Australasian Bittern (*Botaurus poeciloptilus*);
- Green and Golden Bell Frog (*Litoria aurea*);
- Eastern Bent-wing Bat (*Miniopterus shreibersii*); and
- Grey-headed Flying Fox (*Pteropus poliocephalus*).

There is limited habitat for these species on the Site due to the lack of water bodies and the lack of trees for roosting. There is no aquatic habitat on the Site that would support a population of the Australasian Bittern or Green and Golden Bell Frog. The habitat for the Eastern Bent-wing Bat and Grey-headed Flying Fox is limited to foraging habitat as there are no potential roost sites, however it is considered unlikely that these species would utilise the heavily developed Orica Facility for regular foraging.

14.1.3 Aquatic Flora and Fauna

The Hunter River estuary functions as a shipping harbour, port and recreation area. It receives industrial discharges (including from the Orica Facility), periodic urban stormwater runoff and flood volumes of water from the Hunter Valley following heavy rains. The Project is proposing to address the objective of the MO to "Implement works that will prevent, to the extent required by Action 1c [of the Management Order], the further offsite migration of arsenic in groundwater".

14.1.4 Biodiversity Assessment

The *Framework for Biodiversity Assessment* (OEH, 2014) provides a consistent methodology to assess and quantify all biodiversity values to establish whether the Project will require a biodiversity offset to address unavoidable impacts. In accordance with the Framework for Biodiversity Assessment methodology, the Site



has a value score of well below 17 and as a result further impact assessment of biodiversity is not required for the Kooragang Island Remediation Program.

14.2 Conclusion

As the Site is located in a highly modified environment the construction of the cap and containment remediation system is anticipated to have a negligible impact upon biodiversity.



CHAPTER 15 HERITAGE: INDIGENOUS AND NON-INDIGENOUS

Chapter 15 provides an assessment of indigenous and non-indigenous issues associated with the Kooragang Island Remediation Program.

15.1 Indigenous Heritage

Kooragang Island was artificially created by amalgamating several smaller islands with dredged material and industrial waste. The island consists of tidal flats, overlain with dredge-spoil, with a limited local relief of less than 3 m. Soils at Kooragang Island have been extensively disturbed due to past activities including the reclamation scheme, which involved the use of sediment dredged from the Hunter River channels. In addition to land reclamation, the Facility itself comprises a highly industrial area with the presence of the existing ammonium nitrate facility. This indicates that the Site has been highly disturbed, and the likelihood of either surface or sub-surface archaeological materials remaining in context is considered to be very unlikely. The remediation site has previously been assessed for Indigenous heritage values as part of the approved Orica Ammonium Nitrate Upgrade project (08_0129), which found negligible potential impacts to heritage value (Kinhill, 1997). In accordance with the previous methodology, a desk based assessment has been undertaken.

A search for heritage items listed in the Aboriginal Heritage Information Management System (AHIMS) was conducted on 15 August 2016 for the Site using a 200 m buffer.

The results of the search indicate that no Aboriginal sites or places are recorded in or within 200 m of the Site. Previous assessments of the Orica Facility and the Site completed for the approved Orica Ammonium Nitrate Upgrade project (08_0129) resulted in similar findings identifying that only two Aboriginal sites have been recorded on Kooragang Island, including a shell midden on what was formerly Moschetto Island (#38-4-0050) and a shell midden on the northern approach to the Tourle Street Bridge (#38-4-0041) (Kinhill, 1997).

15.1.1 Potential Impacts

The AHIMS search results show that there are no existing Aboriginal sites occurring in close proximity to the remediation site. The Site consists of a highly industrialised area with the locations for the proposed plants being greatly disturbed, currently comprised of graded gravel / grass areas.

Kooragang Island has been identified as having cultural heritage significance to the Aboriginal community, based on the likelihood that the area was used by Aboriginal people (Williams et al 2000: 16-18). Nevertheless, no specific cultural values have been identified on the Site and the Site is considered as having a low archaeological potential due to the history of land reclamation activities on Kooragang Island and the industrial nature of the area to be impacted by the proposed works. This assessment does not imply that the Site is devoid of all value; rather it suggests that the cultural heritage values are not significant when considered in the wider context of Aboriginal sites in the Lower Hunter region. As such, heritage issues are not considered to be a constraint to the proposed works. However, measures will be incorporated to manage potential Aboriginal artefacts which may be uncovered during construction works.

15.1.2 Management and Mitigation Measures

The remediation site is very unlikely to contain items of heritage significance that would constrain the proposed remediation works. The CEMP will include the following requirement in relation to heritage considerations:

Any Aboriginal objects that are uncovered during the remediation works will be left undamaged and in situ where possible. Construction works shall cease and an assessment will be conducted by a qualified archaeologist in consultation with Aboriginal stakeholders and OEH for direction as to its preservation, historical recording and / or removal if such items are uncovered.

15.1.3 Conclusion

Given the nature of the Site it is considered that the Aboriginal Heritage significance is low and that it is unlikely that any significant impacts would occur as a result of the Project.



15.2 Non-Indigenous Heritage

Searches for non-indigenous heritage items listed in the NSW Heritage Register, the Port of Newcastle Heritage and Conservation register 2014 and the Newcastle LEP 2012 were conducted on 15 August 2016 for the remediation site. The results of the searches for non-indigenous heritage items indicate:

- There are no heritage items or areas listed under the NSW Heritage Register on or within the vicinity of the Site.
- There are no heritage items, heritage areas or streetscapes listed in the Newcastle LEP 2012 on or within the vicinity of the Site.
- There are no heritage items or areas listed under the Port of Newcastle Heritage and Conservation register 2014 on or within the vicinity of the Site.
- The closest heritage item is a Palm Tree identified as locally significant within the Newcastle LEP 2012 and the Port of Newcastle Heritage and Conservation register 2014. This is located approximately 1 km south of the remediation site.

As identified in Chapter 5, Kooragang Island and the remediation site have been extensively disturbed due to past activities including reclamation and are located within a highly industrial area. As such, the potential for archaeological value is extremely unlikely.

15.2.1 Potential Impacts

The Project will not have a direct or indirect impact upon historic or non-indigenous heritage including listed heritage items and conservation areas.

15.2.2 Management and Mitigation Measures

While the potential impacts of the Project upon heritage are considered to be negligible, the following contingency is proposed to be included in the CEMP:

Should non-indigenous cultural material be identified during any works, construction and/or operation will cease in the vicinity of the find and an appropriate representative at OEH will be contacted.

15.2.3 Conclusion

Given the nature of the Site it is considered that the non-indigenous heritage significance is low and that it is unlikely that any significant impacts would occur as a result of the Project.



CHAPTER 16 CUMULATIVE IMPACTS AND CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

The Secretary's Environmental Assessment Requirements

- Including an assessment of the cumulative impacts of the proposal in relation to existing on-site operations, surrounding industrial facilities and other nearby approved and proposed development.
- A consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS.

Chapter 16

16.1 Cumulative Impacts

The Kooragang Island Remediation Program is located within an existing industrial area with considerable distance to residential or further sensitive receivers. Potential cumulative impacts of the remediation works have been considered in relation to the key biophysical, social and economic issues assessed within the EIS. This includes consideration of cumulative impacts of remediation works at the Orica Facility.

The remediation works seek to permit Orica to address the objectives of the MO issued by the NSW EPA. As detailed within Chapter 3, the cap and containment system has been identified as the preferred remediation option due in part to its low potential for impact (including cumulative impact) upon the Site and surrounding environment. Potential impacts predominantly relate to construction activities and therefore are temporary only and manageable through standard measures (identified within the CEMP).

16.2 Draft Environmental Management and Monitoring Measures

Despite the respective assessment of key issues identifying the Kooragang Island Remediation Program as having a low impact upon the Site and surrounding area (including sensitive receivers), mitigation measures proposed in the respective chapters are consolidated within Table 11. These measures are designed to ameliorate potential impacts associated with individual risks and minimise the potential for overall cumulative impacts. These are further detailed within the CEMP for the remediation works in addition to the LTEMP for the Orica Facility.

Table 11: Draft Compilation of Mitigation Measures

Environmental Issue	Mitigation and consolidation
Soil and Water	In the event of discovery of Potential Acid Sulphate Soils (PASS), procedures would be developed to mitigate potential impacts on the environment. These procedures would be documented in the CEMP. ■ Management of stockpiles, mixing areas and the excavation to minimise the potential for erosion and sedimentation. This will comprise: ■ dust control activities such as water sprays on work areas and stockpiles or covering of stockpiles with tarpaulins. ■ works being established to minimise the potential for sedimentation outside the Site through the use of sediment fencing, barriers or bunds to contain surface water and soil to the construction area. ■ covering of the cap area in a timely manner following completion of its construction. The cap will be covered with grass or road base with a spray seal.



Environmental Issue	Mitigation and consolidation
	■ Control of vehicle traffic inside the Site area and inspection of vehicles prior to leaving the construction area to minimise the tracking of contaminated soil outside the work area. The CEMP will include requirements for the monitoring of compliance with the control measures to minimise the potential for impact on soil and water during construction of the cut-off wall and cap.
Human Health Risk	A SSHSP will be developed by Orica prior to commencement of the Kooragang Island Remediation Program. The objective of the SSHSP will be the protection of the health and safety of workers on the Site as well as the general safety of occupiers of surrounding areas on and off Site. Site workers and visitors will be trained on the contents of the SSHSP prior to mobilisation to the works area.
Waste Management	Surplus materials which cannot be contained, or otherwise re-used, on site and for which off-site disposal is deemed appropriate will be classified and managed in accordance with the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014). Waste from temporary bathroom facilities will be collected by a licensed waste disposal company and taken off site for processing at a licensed treatment plant. General waste from the construction area and temporary amenities will be managed using existing arrangements at the Facility and disposed of using appropriately licensed companies. The CEMP will outline procedures for the assessment and management of the waste materials, including requirements for testing and classification of the waste in accordance with NSW EPA requirements. Operational wastes will be managed in accordance with existing waste disposal arrangements at the Facility. Wastes will be assessed and disposed of in accordance with the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014).
Air Quality and Odour	The CEMP will include measures to mitigate and manage air emissions and dust as a result of construction activities of the remediation works. This includes a suite of controls to be implemented within the Site including: ■ Minimisation of open excavation areas; ■ Expeditious reinstatement of excavations and exposed surfaces; ■ Covering of all loads being transported off site; ■ Minimisation of the number of stockpiles and implementation of dust minimisation controls for stockpiled materials; ■ Minimisation of dust generation from haulage areas including use of water sprays or other appropriate techniques; ■ The landform will be revegetated with grass and/or road base with spray seal to minimise the potential for dust generation upon completion of the remediation activities; and



Environmental Issue	Mitigation and consolidation
	■ Maintenance on equipment to minimise exhaust emissions.
Noise and Vibration	The CEMP will detail measures for the management of construction noise which will include operating time restrictions on the undertaking of activities that are audible at the nearest sensitive receiver.
Biodiversity	Given the highly disturbed nature of the Site no specific mitigation measures are proposed. Measures to address air quality, soil and water will ensure that the impact of the Project on surrounding land is minimised.
Heritage Issues	Should indigenous or non-indigenous cultural material be identified during any works, construction and/or operation will cease in the vicinity of the find and the appropriate representative at OEH will be contacted.
Stakeholder	Stakeholder engagement activities will continue to be implemented during the project assessment, construction and operational phases, including: ■ Dedicated telephone number for people to obtain information on the Project or make a complaint regarding construction activities ■ Updates of the Orica website and in community newsletters ■ Briefings to relevant stakeholders such as adjacent neighbours and the community reference group.



CHAPTER 17 JUSTIFICATION AND CONCLUSIONS

This chapter contributes and reiterates the justification of the Kooragang Island Remediation Program in addition to providing the conclusion to the EIS.

The Secretary's Environmental Assessment Requirements ■ Justification for the proposed development;	Chapter 17
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17.1 Justification

The Kooragang Island Remediation Program seeks to gain approval to permit Orica to address the objectives of Management Order (MO) (Order Number 20131407; Declaration Number 21089; Area Number 3183) under Section 14 of the CLM Act (Appendix B).

The Kooragang Island Remediation Program is to install a cap and containment system on the Site. The installation of a cap and containment system will provide isolation of the arsenic (contained in soil and groundwater) located on the Orica site and prevent, to the extent practicable, the further off-site migration of arsenic in groundwater. The containment system's low permeability subsurface cut-off wall will minimise the flow of groundwater through the impacted soil in the on-site source area and the surface cap will significantly reduce infiltration of rainwater into the containment cell.

A comprehensive evaluation and ranking process of potential remediation technologies was undertaken, which resulted in the selection of cap and containment as the preferred remediation technology. Extensive assessment of the preferred remediation technology has been completed for the project, which is detailed throughout the EIS in addition to the RAP provided in Appendix C.

As identified within the respective chapters of the EIS, the proposed remediation works in relation to environmental key and non-key issues are identified as low impact, with the works continuing to meet all relevant legislative and policy requirements of their respective issues. Potential impacts predominantly relate to construction activities and therefore are temporary only and manageable through mitigation measures (identified within the CEMP).

Cap and containment provides a durable remediation option with this type of remediation technology developed and successfully implemented at many sites in New South Wales, including in the Newcastle area and on Kooragang Island. Ongoing maintenance and monitoring will be undertaken to ensure the ongoing effectiveness of the system in meeting the remediation objective and will be documented in a Long-Term Environmental Management Plan and a Groundwater Monitoring Program.



17.2 Conclusion

The Kooragang Island Remediation Program has been assessed within this EIS in accordance with the State Significant Development process pursuant to Part 4 of the EP&A Act. The potential impacts of the Project have been identified and assessed as part of this EIS addressing the SEARs for the development (SSD 16_8731). The assessment has concluded that no significant environmental impacts have been identified as a result of the proposed remediation activities and that any potential affects can be satisfactorily mitigated and managed through measures identified within this document. The Kooragang Island Remediation Program is also consistent with the existing and future land use of the Site and relevant Government legislation, policies and strategies.

The Kooragang Island Remediation Program will provide significant benefit in terms of facilitating the requirements and objectives of the MO issued by the NSW EPA. The EIS considers the Project is in the public interest and should be recommended for approval.

IMPORTANT INFORMATION ABOUT THIS REPORT

Your attention is drawn to the document titled - "Important Information Relating to this Report", which is included in **Appendix I** of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.



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State Environmental Planning Policy (Three Ports) 2013



State Environmental Planning Policy No 71—Coastal Protection

State Environmental Planning Policy (State and Regional Development) 2011

Work Health and Safety Act 2011

Work Health and Safety Regulation 2012



APPENDIX A

Secretary's Environmental Assessment Requirements (SSD 16_7831)

Ms Sherree Woodroffe
Orica Australia Pty Ltd
PO Box 80
MAYFIELD NSW 2304

Dear Ms Woodroffe

**State Significant Development – Secretary’s Environmental Assessment Requirements
Orica Arsenic Remediation Project – 15 Greenleaf Road, Kooragang (SSD 7831)**

Please find attached the Secretary’s Environmental Assessment Requirements (SEARs) for the proposed remediation of contaminated land for Orica Australia Pty Ltd at 15 Greenleaf Road, Kooragang in the Newcastle local government area.

The SEARs have been prepared in consultation with the relevant government agencies (see **Attachment 2**), and are based on the information you have provided to date. Unfortunately, Newcastle City Council was unable to respond in time, and therefore you are required to consult with them directly in relation to further requirements for the Environmental Impact Statement (EIS). Please note that the Department may alter the SEARs at any time. You must consult further with the Department if you do not lodge a development application and EIS for the development within two years of the date of issue of these SEARs.

I wish to emphasise the importance of effective and genuine community consultation and the need for the proposal to proactively respond to the community's concerns. Accordingly, you must undertake a comprehensive, detailed and genuine community consultation and engagement process during the preparation of the EIS. This process must ensure that the community is informed of the development and engaged with issues of concern to them. Sufficient information must be provided to the community to enable a good understanding of the development and any potential impacts.

Your development may require separate approval under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). If an EPBC Act approval is required, please advise the Department accordingly, as the Commonwealth assessment process may be integrated into the NSW assessment process, and supplementary SEARs may need to be issued.

Please contact the Department at least two weeks before you intend lodge the EIS and any associated documentation for the development. This will enable the Department to determine the:

- applicable fee (under Division 1AA, Part 15 of the Environmental Planning and Assessment Regulation 2000); and
- consultation and public exhibition arrangements, including copies and format requirements of the EIS.

If you have any enquiries about these SEARs, please contact Patrick Copas on the above details.

Yours sincerely



Chris Ritchie
Director
Industry Assessments
as delegate of the Secretary

18/8/16.

Secretary's Environmental Assessment Requirements

Section 78A(8A) of the *Environmental Planning and Assessment Act* Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*

Application Number	SSD 7831
Development	The project involves the construction of a cap and containment remediation system to enclose arsenic contaminated soil with a concentration of greater than 40mg/kg, located within a small section in the north-western portion of the site.
Location	15 Greenleaf Road, Kooragang NSW 2304
Applicant	Orica Australia Pty Ltd
Date of Issue	August 2016
General Requirements	The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in clauses 6 and 7 of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i>. In addition, the EIS must include: • a detailed description of the development, including: – existing operations carried out on the site and how the site operates lawfully under the <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act) including any reliance on existing use rights and/or planning approvals and how these will be consolidated; – need for the proposed development; – justification for the proposed development; – likely staging of the development; – likely interactions between the development and existing, approved and proposed operations in the vicinity of the site; – plans of any proposed building works; and – contributions required to offset the proposal. • demonstrate that the site is suitable for the proposed use in accordance with <i>State Environmental Planning Policy No 55 – Remediation of Land</i>; • consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments; • consideration of issues discussed in Attachment 2 (public authority responses to key issues); • a risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment; • detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: – a description of the existing environment, <u>using sufficient baseline data</u>; – an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; – a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and • a consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS. The EIS must also be accompanied by a report from a qualified quantity surveyor providing: • a detailed calculation of the capital investment value (as defined in clause 3 of the <i>Environmental Planning and Assessment Regulation 2000</i>) of the proposal, including details of all assumptions and components from which the CIV calculation is derived;

	• a close estimate of the jobs that will be created by the development during the construction and operational phases of the development; and • certification that the information provided is accurate at the date of preparation.
Key issues	The EIS must address the following specific matters: • Contamination – including: – a contaminated land assessment carried out in accordance with the requirements of Management Order (20131407) for the site; – a Remedial Action Plan approved by the EPA detailing the works to remediate the site, which includes: ○ characterisation of the nature and extent of contaminated material and any contaminated groundwater plumes; ○ details of the proposed remediation process, including treatment methodologies and processes; ○ justification for the proposed treatment and remediation criteria; ○ details of proposed remediation management measures including the management of excavated material, stockpiles and wastewater; ○ a site validation plan; and ○ details of compliance with the <i>Contaminated Land Management Act 1997</i>. – details of the final landform following remediation and the suitability of any fill material; – on-going management of the site following remediation works; and – details of the final use of the site. • Soil & Water – including: – an assessment of the potential soil, groundwater and surface water impacts of the development, including a detailed description of surface and groundwater conditions pre and post remediation works; – an assessment of existing and proposed stormwater controls, including a detailed description of the adequacy of sediment basins; – details of licensing requirements, groundwater works, dewatering and management of contaminated water; – identification of potential conflicts with other water users, including other licensed users and recreational users; – a detailed description of the mitigation and management controls that would be put in place to manage erosion and sediment, stormwater, groundwater and acid sulphate soils (if present) during and after remediation works; and – details of proposed surface and groundwater monitoring activities and methodologies. • Human Health and Risk – including: – an assessment of the potential risks (on site and off site) associated with the disturbance and long-term containment of contaminated material; and – details of mitigation and management measures to minimise human health risks and ensure the safety of workers during the development. • Waste Management – including: – accurate estimates of the quantity and classification of the potential liquid and non-liquid waste streams of the development; – a description of storage, treatment (including immobilisation of contaminants), disposal and re-use for all waste generated by the development; and – details of procedures for the assessment and management of contaminated material. • Traffic and Transport – including accurate predictions of the traffic generated by all phases of the proposal. • Air Quality and Odour – including: – a quantitative assessment of the air quality and odour impacts of the development on surrounding receivers, in accordance with relevant Environmental Protection Authority guidelines;

	– cumulative impacts of other developments on and off-site; and – details of the proposed management and monitoring measures. • Noise and Vibration – including: – an assessment of all noise and vibration impacts on surrounding sensitive receivers; and – details of the proposed noise and vibration management and monitoring measures. • Cumulative Impacts – including an assessment of the cumulative impacts of the proposal in relation to existing on-site operations, surrounding industrial facilities and other nearby approved and proposed development. • Biodiversity – including an assessment of biodiversity impacts arising from the proposed remediation works, including details of potential impacts upon groundwater dependant ecosystems, in accordance with the <i>Framework for Biodiversity Assessment</i> or relevant Office of Environment and Heritage guidelines.
Plans and Documents	The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the <i>Environmental Planning and Assessment Regulation 2000</i> . These documents should be included as part of the EIS rather than as separate documents.
Consultation	During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and potentially affected landowners. In particular you must consult with: • Newcastle City Council; • NSW Health; • Environment Protection Authority; • Department of Primary Industries; • Office of Environment and Heritage; • SafeWork NSW; • Port of Newcastle; • Roads and Maritime Services; and • nearby land owners and occupiers that may be affected by the proposal. The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.
Further consultation after 2 years	If you do not lodge an EIS for the development within 2 years of the issue date of these SEAR's, you must consult with the Secretary in relation to the requirements for lodgement.
References	The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this development.

ATTACHMENT 1

Technical and Policy Guidelines

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:

<http://www.planning.nsw.gov.au>

<http://www.bookshop.nsw.gov.au>

<http://www.publications.gov.au>

Policies, Guidelines & Plans

Plans and Documents

The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Environmental Planning and Assessment Regulation 2000. Provide these as part of the EIS rather than as separate documents.

In addition, the EIS must include the following:

1. An existing site survey plan drawn at an appropriate scale illustrating:
 - the location of the land, boundary measurements, area (sq. m) and north point;
 - the existing levels of the land in relation to buildings and roads;
 - location and height of existing structures on the site;
 - location and height of adjacent buildings and private open space; and
 - all levels to be to Australian Height Datum (AHD).
2. A locality/context plan drawn at an appropriate scale should be submitted indicating:
 - watercourses including nearby rivers and creeks, and dams;
 - significant local features such as heritage items;
 - the location and uses of nearby buildings, shopping and employment areas, hospitals and schools; and
 - traffic and road patterns, pedestrian routes and public transport nodes.
3. An indication of the location of the site with respect to the relevant Land Zoning Map within the *Shoalhaven Local Environment Plan 2014*.
4. Drawings at an appropriate scale illustrating:
 - detailed plans, sections and elevations of the existing building, which clearly show all proposed internal and external alterations and additions.

Documents to be submitted

Documents to submit include:

- 1 electronic copy of all the documents and plans for review prior to exhibition; and
- other copies as determined by the Department once the development application is lodged.

Technical and Policy Guidelines

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:

<http://www.planning.nsw.gov.au>

<http://www.bookshop.nsw.gov.au>

<http://www.publications.gov.au>

Policies, Guidelines & Plans

Aspect	Policy /Methodology
Soil and Water	
<i>Contamination and Soil</i>	Guidelines for Consultants Reporting on Contaminated Sites (EPA, 2011)
	Guidelines for the NSW Site Auditor Scheme – 2nd Edition (DEC, 2006)
	Sampling Design Guidelines (EPA, 1995)
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC & NHMRC)
	National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC)
	Draft Guidelines for the Assessment & Management of Groundwater Contamination (DECC)
	State Environmental Planning Policy No. 55 – Remediation of Land
	Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land (DOP)
	Acid Sulfate Soils Manual (Stone et al. 1998)
	National Water Quality Management Strategy: Water quality management - an outline of the policies (ANZECC/ARMCANZ)
<i>Surface Water</i>	NSW Guidelines for Controlled Activities on Waterfront Land (NOW, 2012)
	National Water Quality Management Strategy: Policies and principles - a reference document (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Implementation guidelines (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)
	Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)
	NSW State Rivers and Estuaries Policy(1993)
	State Water Management Outcomes Plan
	NSW Government Water Quality and River Flow Environmental Objectives (DECC)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)
	Managing Urban Stormwater: Soils & Construction (Landcom)
	Managing Urban Stormwater: Treatment Techniques (DECC)
	Managing Urban Stormwater: Source Control (DECC)
	Technical Guidelines: Bunding & Spill Management (DECC)
	NSW Floodplain Development Manual 2005
<i>Groundwater</i>	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	Australian Groundwater Modelling Guidelines (NWC, 2012)
	NSW State Groundwater Policy Framework Document (DLWC)
	NSW State Groundwater Quality Protection Policy (DLWC)
	NSW State Groundwater Dependent Ecosystems Policy (2002)

Hazards	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines (DUAP) Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis
Waste	Waste Avoidance and Resource Recovery Strategy 2010-2021 (EPA) The National Waste Policy: Less Waste More Resources 2009 Waste Classification Guidelines (DECC) Environmental guidelines: Composting and Related Organics Processing Facilities (DEC) Environmental guidelines: Use and Disposal of Biosolid Products (NSW EPA) Composts, soil conditioners and mulches (Standards Australia, AS 4454)
Transport	Guide to Traffic Generating Development (RTA) Road Design Guide (RTA)
Air Quality	Protection of the Environment Operations (Clean Air) Regulation 2010 Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC) Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)
Odour	Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW (DEC) Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW (DEC)
Noise	NSW Industrial Noise Policy (DECC) NSW Road Noise Policy (EPA, 2011) Environmental Criteria for Road Traffic Noise (NSW EPA) Interim Construction Noise Guideline (2009)

ATTACHMENT 2

Public Authority Responses to Request for Key Issues



DOC16/380526, File No. EF13/3405

Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Mr Patrick Copas

patrick.copas@planning.nsw.gov.au

Dear Mr Copas

SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

ORICA KOORAGANG – ARSENIC REMEDIATION PROJECT (SSD_7831)

I refer to your email to the Environment Protection Authority (EPA) received on 26 July 2016 requesting the EPA input for the preparation of Secretary's Environmental Assessment Requirements (SEARs) in respect of the above proposal.

The site is impacted by arsenic in soil and groundwater, and the EPA has declared the site as significantly contaminated land under the *Contaminated Land Management Act 1997* due to the offsite migration of arsenic impacted groundwater. Management of the contamination is currently regulated by the EPA by way of a Management Order. As required under the Management Order, a number of remediation options have been considered by the proponent. The final selected remediation option is based on the on-site isolation and containment of residual arsenic impacted soils, and is intended to prevent the further offsite migration of arsenic impacts in groundwater.

The EPA understands that the proposal involves the installation of a cap and containment remediation system to enclose arsenic contaminated soil with a concentration of greater than 40mg/kg, located the north-western portion of the site. The project will involve the installation of a low permeability cut-off wall to a depth of approximately 12 metres below ground level, as well as a low permeability cap.

The EPA has considered the details of the proposal as provided in the application and attached information and has identified the information it requires to be addressed in the Environmental Impact Statement (EIS) to make a reliable appraisal of the impacts of the proposal. The main issues of interest to the EPA are:

- contaminated site requirements;
- impacts on water quality and site water management;
- impacts on air quality;
- potential noise impacts due to construction; and
- waste management and disposal.

Attachment A presents a more detailed explanation of EPA's main issues regarding the proposed development. Please note that the issuing of SEARs is a statutory requirement for EPA and should not be construed as support or endorsement of the proposed development.

Attachment B provides links to numerous references materials that may assist the proponent to prepare an adequate EIS.

The proponent should be aware that any commitments made in the EIS may be formalised into EPA's suggested approval conditions for the proposal and the Environment Protection Licence. Accordingly, pollution control measures should not be proposed if they are impractical, unrealistic, or beyond the financial viability of the development.

The EPA requests that the applicant provide **one printed copy and one electronic copy** of the EIS and any supporting or background reports when lodging the application with the EPA. These documents should be lodged with the EPA's Regional Manager – Hunter at PO Box 488G, Newcastle NSW 2300.

If you require any further information regarding this matter please contact Hamish Rutherford on (02) 4908 6824.

Yours sincerely

 12/8/2016.

REBECCA SCRIVENER
Acting Head Regional Operations Unit - Hunter
Environment Protection Authority

Encl.

Contact officer: HAMISH RUTHERFORD
(02) 4908 6824

ATTACHMENT A

ENVIRONMENT PROTECTION AUTHORITY- REQUEST FOR ENVIRONMENTAL ASSESSMENT REQUIREMENTS FOR A STATE SIGNIFICANT DEVELOPMENT

PROPOSED ARSENIC REMEDIATION PROJECT, ORICA KOORAGANG (SSD_7831)

GENERAL INFORMATION

The following information must be provided in the Environmental Impact Statement (EIS) to enable EPA to accurately assess the environmental implications of the proposed activity. The EIS must adequately describe the development proposal and the existing environment including air, noise, waters, soils, chemicals and waste.

THE PROPOSAL

The objectives of the proposal should be clearly stated and refer to:

- The size and type of the operation,
- The nature of the processes and the products, by-products and wastes produced;
- The use or disposal of products or wastes;
- The anticipated level of performance in meeting required environmental standards and cleaner production principles;
- The staging and timing of the proposal; and
- The proposal's relationship to any other industry or facility.

THE PREMISES

The EIS will need to fully identify all of the processes and activities intended for the site and during the life of the project. This will include details of:

- a site plan prepared by a registered surveyor clearly showing the boundaries of any proposed premises that will be subject to an Environment Protection Licence (EPL) and the proposed locations of any discharge points covered by an EPL;
- ownership and/or land use details of any premises and land likely to be affected by the proposed development including lot and DP numbers;
- maps and/or aerial photographs, showing:
 - The location of the proposed facility and details of the surrounding environment;
 - The proposed layout of the site;
 - All equipment proposed for use at the site;
 - Appropriate landuse zoning;
 - Topography, vegetation, location of utilities and services;
 - The location of residences and properties that may be impacted by the operation;
 - The location of any environmentally sensitive areas such as conservation areas, wetlands, creeks or streams, watercourses and stormwater systems;
 - Surface water management systems;
 - Chemicals, including fuel, used on the site and proposed methods for their transportation, storage, use and emergency management;
 - Waste generation and disposal;
 - Methods to mitigate any expected environmental impacts of the development;

CONTAMINATED LAND MANAGEMENT

The remediation project must comply with the existing Management Order (#20131407) issued under the *Contaminated Land Management Act 1997*. The proposed works are also to be carried out in accordance with the *Remediation Action Plan – Orica Kooragang Island: Arsenic Management Order* prepared by Golder Associates (8 July, 2008), subject to endorsement by the EPA.

The EIS should include an assessment of the contaminated site, as well as details on how the site contamination will be remediated and/or managed so that further offsite migration of arsenic in groundwater originating from the site is prevented. This should include details on the proposed mechanisms to capture the long-term management and awareness of the arsenic-impacted soils that are proposed to remain on site beneath the capping.

The assessment can be based on existing data available to the proponent, however, should further environmental data be collected, investigation works are to be conducted in accordance with the guidelines made or approved under section 105 of the *Contaminated Land Management Act 1997* including:

- *Guidelines for Consultants Reporting on Contaminated Sites* (EPA, 2011),
- *Guidelines for the NSW Site Auditor Scheme - 2nd edition* (DEC, 2006),
- *Sampling Design Guidelines* (EPA, 1995), and
- *National Environment Protection (Assessment of Site Contamination) Measure 1999* (April 2013).

Independent review of the proposal and verification of the works program by a suitably qualified and technically competent third-party reviewer should be a requirement for the works. The reviewer will be required to verify the adequacy and appropriateness of the proposed remedial strategy, and the effectiveness of the remedial works in preventing the migration of contamination from the site.

WATER MANAGEMENT

The EIS must provide sufficient information to demonstrate that the proposed development can be operated whilst complying with the *Protection of the Environment Operations Act 1997*, in particular, the protection of water quality during construction and operation of the facility.

The methodology, data and assumptions used to design any pollution control works and assess the potential impact of the proposal on water quality (ground and surface waters), must be fully documented and justified.

The EIS must include an adequacy assessment of stormwater controls. This assessment must determine sediment basins are adequately sized based on relevant guidelines and that discharges to waters from any sediment basins or other treatment systems comply with the requirements of the *Protection of the Environment Operations Act 1997*.

The EIS must identify any fuel or chemical storage areas to be established on the site and describe the measures proposed to minimise the potential for leakage or the migration of pollutants into the soil/waters or from the site.

The EIS should also describe the sewage treatment and effluent management processes used on site including the proposed numbers of occupancy using the premises.

NOISE AND VIBRATION IMPACTS

The EIS must include a noise assessment of the existing environment, potential impacts and proposed noise amelioration measures. The EPA's Interim Construction Noise Guideline deals with the assessment of noise from construction activities and advises on best practice approaches to

minimise noise impacts. It is specifically aimed at managing noise from construction works regulated by the EPA.

AIR QUALITY

The EIS must include an Air Quality Impact Assessment (AQIA). The AQIA must identify and describe in detail all possible sources of air pollution and activities/processes with the potential to cause air pollutants including odours and fugitive dust emissions beyond the boundary of any premises proposed to be licenced by an EPL. This should cover both the construction and operational phases of the development. The AQIA should include cumulative impacts associated with existing developments and any developments having been granted development consent but which have not commenced.

The EIS should demonstrate that the facility will operate within EPA's objectives which are to minimise adverse effects on the amenity of local residents and sensitive land uses and to limit the effects of emissions on local, regional and inter-regional air quality.

The EIS must describe in detail the measures proposed to mitigate the impacts and quantify the extent to which the mitigation measures are likely to be effective in achieving the relevant environmental outcomes.

The AQIA must be prepared in accordance with the EPA's *"Approved Methods and Guidance for the Modelling & Assessment of Air Pollutants in NSW"*. The AQIA must describe the methodology used and any assumptions made to predict the impacts. Air pollutant emission rates, ambient air quality data and meteorological data used in the assessment must be clearly stated and justified.

DANGEROUS GOODS and CHEMICAL TRANSPORT, STORAGE and HANDLING

The EIS must outline all details regarding the transport, handling, storage and use of dangerous goods, chemicals and products, including fuel, both on site and with ancillary activities and describe the measures proposed to minimise the potential for leakage or the migration of pollutants into the air, land or waters from the site.

MONITORING PROGRAMS

The EIS should include a detailed assessment of any noise, air quality, water quality or waste monitoring required during the on-going operation of the facility to ensure that the development achieves a satisfactory level of environmental performance and to demonstrate that any activity licenced by an EPL is carried out in an environmental satisfactory manner. The evaluation should include a detailed description of the monitoring locations, sample analysis methods and the level of reporting proposed.

WASTE FACILITIES

The EIS should include:

1. Details of the layout of any proposed waste facility, the treatment process and the environmental controls at the facility.
2. Details of the quantity and type of liquid and/or non-liquid waste(s) generated, handled, processed or disposed of at the premises. Waste must be classified according to EPA's *Waste Classification Guidelines 2008*.
3. Details of liquid waste and non-liquid waste management at the facility, including:

- the transportation, assessment and handling of waste arriving at or generated at the site;
 - any stockpiling of wastes or recovered materials at the site;
 - any waste processing related to the facility, including reuse, recycling, reprocessing or treatment both on- and off-site;
 - the method for disposing of all wastes or recovered materials at the facility;
 - the emissions arising from the handling, storage, processing and reprocessing of waste at the facility;
 - the proposed controls for managing the environmental impacts of these activities.
4. Details of procedures for the assessment, handling, storage, transport and disposal of all **hazardous waste** used, stored, processed or disposed of at the site, in addition to the requirements for liquid and non-liquid wastes.
 5. Details of the quantity, type and specifications for all **output products** proposed to be produced from the facility. The description should include the physical, chemical and biological characteristics (including contaminant concentrations) of those output products as well as relevant accredited standards against which the products would comply. In documenting or describing the composition of output products and/or wastes generated from the proposed facility reference should be made to the relevant EPA *resource recovery exemption* (<http://www.epa.nsw.gov.au/waste/RRecoveryExemptions.htm>) or the *Waste Classification Guidelines 2008* (<http://www.epa.nsw.gov.au/waste/envguidlms/index.htm>).
 6. Details of intended (or potential) end uses for output products from the facility and the relevant product standards which would be used to assess those products against.
 7. Details of the type and quantity of any chemical substances (including hydrocarbon (oils and fuels, explosives etc.) to be used or stored and describe arrangements for their safe use and storage.

GENERAL WASTE

The EIS should:

1. Include a detailed plan for in-situ classification of waste material, including the sampling locations and sampling regime that will be employed to classify the waste, particularly with regards to the identification of contamination hotspots.
2. Identify, characterise and classify all waste that will be generated onsite through excavation, demolition or construction activities, including proposed quantities of the waste.
Note: All waste must be classified in accordance with EPA's *Waste Classification Guidelines*.
3. Identify, characterise and classify all waste that is proposed to be disposed of to an offsite location, including proposed quantities of the waste and the disposal locations for the waste. This includes waste that is intended for re-use or recycling.
Note: All waste must be classified in accordance with EPA's *Classification Guidelines*.
4. Include a commitment to retaining all sampling and classification results for the life of the project to demonstrate compliance with EPA's *Waste Classification Guidelines*.
5. Provide details of how waste will be handled and managed onsite to minimise pollution, including:
 - a) Stockpile location and management

- Labelling of stockpiles for identification, ensuring that all waste is clearly identified and stockpiled separately from other types of material (especially the separation of any contaminated and non-contaminated waste).
- Proposed height limits for all waste to reduce the potential for dust and odour.
- Procedures for minimising the movement of waste around the site and double handling.
- Measures to minimise leaching from stockpiles into the surrounding environment, such as sediment fencing, geofabric liners etc.

b) Erosion, sediment and leachate control including measures to be implemented to minimise erosion, leachate and sediment mobilisation at the site during works. The EA should show the location of each measure to be implemented. The Proponent should consider measures such as:

- Sediment traps
- Diversion banks
- Sediment fences
- Bunds (earth, hay, mulch)
- Geofabric liners
- Other control measures as appropriate

The Proponent should also provide details of:

- how leachate from stockpiled waste material will be kept separate from stormwater runoff;
- treatment of leachate through a wastewater treatment plant (if applicable); and
- any proposed transport and disposal of leachate off-site.

6. Provide details of how the waste will be handled and managed during transport to a lawful facility. If the waste possesses hazardous characteristics, the Proponent must provide details of how the waste will be treated or immobilised to render it suitable for transport and disposal.
7. Include details of all procedures and protocols to be implemented to ensure that any waste leaving the site is transported and disposed of lawfully and does not pose a risk to human health or the environment.
8. Include a statement demonstrating that the Proponent is aware of EPA's requirements with respect to notification and tracking of waste.
9. Include a statement demonstrating that the Proponent is aware of the relevant legislative requirements for disposal of the waste, including any relevant Resource Recovery Exemptions, as gazetted by EPA from time to time.
10. Outline contingency plans for any event that affects operations at the site that may result in environmental harm, including: excessive stockpiling of waste, volume of leachate generated exceeds the storage capacity available on-site etc.

EPA STATUTORY REQUIREMENTS

The EIS should confirm that the proposed activity is listed in Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act) and will therefore require an Environment Protection Licence from EPA.

Please note that this response does not cover biodiversity or Aboriginal cultural heritage issues, which are the responsibility of the Office of Environment and Heritage.

Attachment B – Guidance Material

Title	Web address
<u>Relevant Legislation</u>	
<i>Contaminated Land Management Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+140+1997+cd+0+N
<i>Environmentally Hazardous Chemicals Act 1985</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+14+1985+cd+0+N
<i>Environmental Planning and Assessment Act 1979</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
<i>Protection of the Environment Operations Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
<i>Water Management Act 2000</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
<u>Licensing</u>	
Guide to Licensing	http://www.epa.nsw.gov.au/resources/licensing/160307-licensing-guide.pdf
<u>Air Issues</u>	
Air Quality	
Approved methods for modelling and assessment of air pollutants in NSW (2005)	http://www.environment.nsw.gov.au/resources/air/ammodelling05361.pdf
POEO (Clean Air) Regulation 2010	http://www.legislation.nsw.gov.au/maintop/view/inforce/subordleg+428+2010+cd+0+N
<u>Noise and Vibration</u>	
Interim Construction Noise Guideline (DECC, 2009)	http://www.epa.nsw.gov.au/resources/noise/09265cng.pdf
Assessing Vibration: a technical guideline (DEC, 2006)	http://www.epa.nsw.gov.au/resources/noise/vibrationguide0643.pdf
Industrial Noise Policy	http://www.epa.nsw.gov.au/resources/noise/ind_noise.pdf
Industrial Noise Policy Application Notes	http://www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm
NSW Road Traffic Noise Policy (DECCW, 2011)	http://www.epa.nsw.gov.au/resources/noise/2011236nswroadnoisepolicy.pdf
<u>Waste, Chemicals and Hazardous Materials and Radiation</u>	
Waste	
Environmental Guidelines: Solid Waste Landfills (EPA, 2016)	http://www.epa.nsw.gov.au/resources/waste/solid-waste-landfill-guidelines-160259.pdf
Waste Classification Guidelines	http://www.epa.nsw.gov.au/wasteregulation/classify-guidelines.htm
Resource recovery exemption	http://www.epa.nsw.gov.au/wasteregulation/recovery-exemptions.htm
Chemicals subject to Chemical Control Orders	

Title	Web address
Chemical Control Orders (regulated through the EHC Act)	http://www.epa.nsw.gov.au/pesticides/ccos.htm#five
National Protocol - Approval/Licensing of Trials of Technologies for the Treatment/Disposal of Schedule X Wastes - July 1994	Available in libraries
National Protocol for Approval/Licensing of Commercial Scale Facilities for the Treatment/Disposal of Schedule X Wastes - July 1994	Available in libraries
<u>Water and Soils</u>	
Acid sulphate soils	
Acid Sulfate Soils Planning Maps	http://canri.nsw.gov.au/download/
Acid Sulfate Soils Manual (Stone et al. 1998)	Manual available for purchase from: http://www.landcom.com.au/whats-new/the-blue-book.aspx Chapters 1 and 2 are on DP&I's Guidelines Register at: Chapter 1 Acid Sulfate Soils Planning Guidelines: http://www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Planning%20Guidelines.pdf Chapter 2 Acid Sulfate Soils Assessment Guidelines: http://www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Assessment%20Guidelines.pdf
Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004)	http://www.derm.qld.gov.au/land/ass/pdfs/lmg.pdf This replaces Chapter 4 of the Acid Sulfate Soils Manual above.
Soils – general	
Soil and Landscape Issues in Environmental Impact Assessment (DLWC 2000)	http://www.dnr.nsw.gov.au/care/soil/soil_pubs/pdfs/tech_rep_34_new.pdf
Managing urban stormwater: soils and construction, vol. 1 (Landcom 2004) and vol. 2 (A. Installation of services; B Waste landfills; C. Unsealed roads; D. Main Roads; E. Mines and quarries) (DECC 2008)	Vol 1 - Available for purchase at http://www.landcom.com.au/whats-new/publications-reports/the-blue-book.aspx Vol 2 - http://www.environment.nsw.gov.au/stormwater/publications.htm
Landslide risk management guidelines	http://www.australiangeomechanics.org/resources/downloads/
Site Investigations for Urban Salinity (DLWC, 2002)	http://www.environment.nsw.gov.au/resources/salinity/booklet3siteinvestigationsforurbansalinity.pdf
Local Government Salinity Initiative Booklets	http://www.environment.nsw.gov.au/salinity/solutions/urban.htm
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf

Title	Web address
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf



Department of Primary Industries

OUT16/30040

Ms Emma Barnet
Industry Assessments
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Emma.barnet@planning.nsw.gov.au

Dear Ms Barnet

**Orica Remediation Project, Kooragang Island (SSD 7831)
Request for Secretary's Environmental Assessment Requirements (SEARs)**

I refer to your email dated 26 July 2016 to the Department of Primary Industries (DPI) in respect to the above matter. Comment has been sought from relevant divisions of DPI and Department of Industry - Lands. Any further referrals to DPI can be sent by email to landuse.enquiries@dpi.nsw.gov.au.

The department has reviewed the request for SEARs and recommends the Environmental Impact Statement (EIS) be required to include:

- Annual volumes of surface water and groundwater proposed to be taken by the activity (including groundwater dewatering, through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.
- Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project).
- The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.
- A detailed and consolidated site water balance.
- Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.
- Full technical details and data of all surface and groundwater modelling.
- Proposed surface and groundwater monitoring activities and methodologies.
- Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.
- Consideration of relevant policies and guidelines.

- A statement of where each element of the SEARs is addressed in the EIS (i.e. in the form of a table).

Yours sincerely

A handwritten signature in black ink that reads "Rebekah Gomez-Fort." The signature is written in a cursive, flowing style.

Rebekah Gomez-Fort
A/Director, Planning Policy & Assessment Advice
12 August 2016



Office of Environment & Heritage

DOC16/371893-1
SSD 7831

Mr Patrick Copas
Student Planner, Industry Assessments
Department of Planning and Environment
patrick.copas@planning.nsw.gov.au

Dear Mr Copas

RE: INPUT INTO SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS FOR ORICA REMEDIATION PROJECT, KOORAGANG ISLAND (SSD 7831)

I refer to your email dated 26 July 2016 inviting the Office of Environment and Heritage (OEH) to provide input into the Secretary's Environmental Assessment Requirements (SEARs) for the proposed Orica Remediation Project (operated by Orica Australia Pty Ltd) State Significant Development (SSD 7831) located on Kooragang Island (Lot 2 and 3 in Deposited Plan 234286), Newcastle. This project is located within the Newcastle local government area.

OEH understands that Orica Australia Pty Ltd (the applicant) proposal will involve the installation of a cap and containment remediation system to enclose arsenic contaminated soil with a concentration of greater than 40mg/kg, located within a small section in the north-western portion of the site. The project will involve the installation of a low permeability cut-off wall to a depth of approximately 12 metres below ground level, as well as a low permeability cap. OEH acknowledges that the proposal is a State Significant Development as it is development for the purpose of remediation of land that is classified as Category 1 remediation works in accordance with a Management Order issued under the *Contaminated Lands Management Act 1997*. Consequently, it meets the criteria outlined within Schedule 1, clause 24(1) of *State Environmental Planning Policy (State and Regional Development) 2011*. The Minister for Planning is the consent authority.

OEH has reviewed the application (and supporting documentation) and has prepared Standard SEARs which are presented in **Attachment A**. Additional flooding comments are provided in **Attachment B**.

The Framework for Biodiversity Assessment was released on 1 October 2014. This project is to be assessed under this policy and must be conducted by a person accredited in accordance with section 142B(1)(c) of the *Threatened Species Conservation Act 1995* (TSC Act), including the provision of a Biodiversity Assessment Report. Given that the Framework for Biodiversity Assessment is a relatively new state wide policy, the consultant is welcome to contact OEH with any questions they may have regarding the methodology.

The proponent will need to ensure that the biodiversity assessment is fully consistent with requirements of the Framework for Biodiversity Assessment. Guidance documents to assist with this process are

provided in **Attachment C**. Please note that a Biodiversity Assessment Report is still a requirement of the FBA even if the site is disturbed.

If you have any further questions in relation to this matter, please contact Steve Lewer, Regional Biodiversity Conservation Officer, on 4927 3158.

Yours sincerely

A handwritten signature in blue ink, appearing to be 'S. Lewer', written in a cursive style.

8 AUG 2016

STEVE LEWER

Acting Senior Team Leader Planning, Hunter Central Coast Region
Regional Operations

Enclosure: Attachments A, B & C

Attachment A – Standard Environmental Assessment Requirements

Biodiversity
1. Biodiversity impacts related to the proposed development are to be assessed and documented in accordance with the <u>Framework for Biodiversity Assessment</u> , unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the <i>Threatened Species Conservation Act 1995</i> .
Aboriginal cultural heritage
2. The EIS must identify and describe Aboriginal cultural heritage values that exist across the whole area that will be affected by the development and document these in the EIS. This may include the need for surface survey and test excavation. The identification of cultural heritage values should be guided by the <i>Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW</i> (DECCW, 2011) and consultation with OEH regional officers.
3. Where Aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken and documented in accordance with the <i>Aboriginal cultural heritage consultation requirements for proponents 2010</i> (DECCW). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the EIS.
4. Impacts on Aboriginal cultural heritage values are to be assessed and documented in the EIS. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.
Historic heritage
5. The EIS must provide a heritage assessment including but not limited to an assessment of impacts to <i>State and local heritage</i> including conservation areas, natural heritage areas, places of Aboriginal heritage value, buildings, works, relics, gardens, landscapes, views, trees should be assessed. Where impacts to State or locally significant heritage items are identified, the assessment shall: a. outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the NSW Heritage Manual (1996), b. be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria), c. include a statement of heritage impact for all heritage items (including significance assessment), d. consider impacts including, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant), and e. where potential archaeological impacts have been identified develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations (terrestrial and maritime as relevant) and include the results of these test excavations.

Water and soils

6. The EIS must map the following features relevant to water and soils including:
 - a. Acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map).
 - b. Rivers, streams, wetlands, estuaries (as described in Appendix 2 of the Framework for Biodiversity Assessment).
 - c. Groundwater.
 - d. Groundwater dependent ecosystems.
 - e. Proposed intake and discharge locations.
7. The EIS must describe background conditions for any water resource likely to be affected by the development, including:
 - a. Existing surface and groundwater.
 - b. Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations.
 - c. Water Quality Objectives (as endorsed by the NSW Government www.environment.nsw.gov.au/ieo/index.htm) including groundwater as appropriate that represent the community's uses and values for the receiving waters.
 - d. Indicators and trigger values/criteria for the environmental values identified at (c) in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.
8. The EIS must assess the impacts of the development on water quality, including:
 - a. The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the development protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.
 - b. Identification of proposed monitoring of water quality.
9. The EIS must assess the impact of the development on hydrology, including:
 - a. Water balance including quantity, quality and source.
 - b. Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas.
 - c. Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems.
 - d. Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches).
 - e. Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water.
 - f. Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.
 - g. Identification of proposed monitoring of hydrological attributes.

Flooding and coastal erosion

10. The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:
 - a. Flood prone land
 - b. Flood planning area, the area below the flood planning level.
 - c. Hydraulic categorisation (floodways and flood storage areas).
11. The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 1 in 10 year, 1 in 100 year flood levels and the probable maximum flood, or an equivalent extreme event.
12. The EIS must model the effect of the proposed development (including fill) on the flood behaviour under the following scenarios:
 - a. Current flood behaviour for a range of design events as identified in 8) above. The 1 in 200 and 1 in 500 year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.
13. Modelling in the EIS must consider and document:
 - a. The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood.
 - b. Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories.
 - c. Relevant provisions of the NSW Floodplain Development Manual 2005.
14. The EIS must assess the impacts on the proposed development on flood behaviour, including:
 - a. Whether there will be detrimental increases in the potential flood affection of other properties, assets and infrastructure.
 - b. Consistency with Council floodplain risk management plans.
 - c. Compatibility with the flood hazard of the land.
 - d. Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land.
 - e. Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.
 - f. Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.
 - g. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council.
 - h. Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the SES and Council.
 - i. Emergency management, evacuation and access, and contingency measures for the development considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES.
 - j. Any impacts the development may have on the social and economic costs to the community as consequence of flooding.

Attachment B – Project Specific Requirements / Comments

Flooding:

OEH (Water, Floodplains and Coast Unit, Hunter) have some concerns related to water management (including post construction) and erosion and sediment during construction. As such OEH requests the following additional information:

1. The proposed construction plans, Project number 1418917 Drawings 2, 3 and 4 by Golder Associates show existing and proposed levels on site for the area where the proposed capping is to occur. These drawings show increases of level of up to 1.2 metres together with batter slopes which may direct flows towards the adjoining properties and/or impede the natural flow of water from these properties. The EIS should provide adequate stormwater/flood modelling information to demonstrate that there are no adverse effects on flood levels and stormwater flows beyond the property boundaries.
2. Proposed methodology for the construction of the 12 metre deep cut off wall will require excavation of considerable volumes of spoil in order to achieve stable batters at the required depth. The majority of the spoil is proposed to be reused in the bentonite mix and to refill the void however during construction volumes of unconsolidated spoil will be present on site. Standard erosion and sediment control procedures as required by the Blue Book are unlikely to be adequate to ensure that contaminants are not mobilised from the spoil pile during wet weather. The EIS must provide details of containment of contaminated runoff and any water generated by dewatering during the construction process. Risk assessment must include all stages of the construction process. Limitations on stock pile size and area of exposed excavation at any one time may be required to mitigate risks.

Attachment C – Guidance material

Title	Web address
Relevant Legislation	
<i>Coastal Protection Act 1979</i>	www.legislation.nsw.gov.au/maintop/view/inforce/act+13+1979+cd+0+N
<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>	www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
<i>Environmental Planning and Assessment Act 1979</i>	www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
<i>Fisheries Management Act 1994</i>	www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
<i>Marine Parks Act 1997</i>	www.legislation.nsw.gov.au/maintop/view/inforce/act+64+1997+cd+0+N
<i>National Parks and Wildlife Act 1974</i>	www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
<i>Protection of the Environment Operations Act 1997</i>	www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
<i>Threatened Species Conservation Act 1995</i>	www.legislation.nsw.gov.au/maintop/view/inforce/act+101+1995+cd+0+N
<i>Water Management Act 2000</i>	www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
<i>Wilderness Act 1987</i>	www.legislation.nsw.gov.au/viewtop/inforce/act+196+1987+FIRST+0+N
Biodiversity	
NSW Biodiversity Offsets Policy for Major Projects (OEH, 2013)	www.environment.nsw.gov.au/resources/biodiversity/140672biopoly.pdf
Framework for Biodiversity Assessment (OEH, 2013)	www.environment.nsw.gov.au/resources/biodiversity/140675fbapdf
Fisheries NSW policies and guidelines	www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation
List of national parks	www.environment.nsw.gov.au/NationalParks/parksearchatoz.aspx
Revocation, re-categorisation and road adjustment policy (OEH, 2012)	www.environment.nsw.gov.au/policies/RevocationOfLandPolicy.htm
Guidelines for developments adjoining land and water managed by OEH (DECCW, 2010)	www.environment.nsw.gov.au/resources/protectedareas/10509devadjdeccw.pdf
Heritage	
The Burra Charter (The Australia ICOMOS charter for places of cultural significance)	http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf
Statements of Heritage Impact 2002 (HO & DUAP)	www.environment.nsw.gov.au/resources/heritagebranch/heritage/hmstatementsofhi.pdf
NSW Heritage Manual (DUAP) 1996	www.environment.nsw.gov.au/Heritage/publications/index.htm#G-I

Aboriginal Cultural Heritage	
Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)	www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	www.environment.nsw.gov.au/resources/cultureheritage/10783FinalArchCoP.pdf
Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)	www.environment.nsw.gov.au/resources/cultureheritage/20110263ACHguide.pdf
Aboriginal Site Recording Form	www.environment.nsw.gov.au/resources/parks/SiteCardMainV1_1.pdf
Aboriginal Site Impact Recording Form	www.environment.nsw.gov.au/resources/cultureheritage/120558asirf.pdf
Aboriginal Heritage Information Management System (AHIMS) Registrar	www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm
Care Agreement Application form	www.environment.nsw.gov.au/resources/cultureheritage/20110914TransferObject.pdf
Water and Soils	
Acid sulphate soils	
Acid Sulfate Soils Planning Maps via 'The NSW Natural Resource Atlas'	www.nratlas.nsw.gov.au/
Acid Sulfate Soils Manual (Stone et al. 1998)	www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Planning%20Guidelines.pdf
Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004)	http://www.advancedenvironmentalmanagement.com/Reports/Savannah/Appendix%2015.pdf This replaces Chapter 4 of the Acid Sulfate Soils Manual above.
Flooding and Coastal Erosion	
Reforms to coastal erosion management	www.environment.nsw.gov.au/coasts/coastalerosionmgmt.htm
Floodplain development manual	www.environment.nsw.gov.au/floodplains/manual.htm
Guidelines for Preparing Coastal Zone Management Plans	Guidelines for Preparing Coastal Zone Management Plans www.environment.nsw.gov.au/resources/coasts/130224CZMPGuide.pdf
NSW Climate Impact Profile	NSW Climate Impact Profile
Climate Change Impacts and Risk Management	Climate Change Impacts and Risk Management: A Guide for Business and Government, AGIC Guidelines for Climate Change Adaptation
Water	
Water Quality Objectives	www.environment.nsw.gov.au/ieo/index.htm
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	www.environment.gov.au/water/publications/quality/australian-and-new-zealand-guidelines-fresh-marine-water-quality-volume-1
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf

From: [Rebecca Johnston](#)
To: [Patrick Copas](#)
Subject: RE: Request for Key Issues and Assessment Requirements - Orica Remediation Project, Kooragang Island (SSD-7831)
Date: Tuesday, 9 August 2016 11:08:03 AM
Attachments: [image002.png](#)
[image004.png](#)
[oledata.mso](#)
[image003.jpg](#)

Dear Patrick

Thank you for the opportunity to provide input into the SEARs for the proposal outlined in your email of 26th July 2016. The Scoping Report has been reviewed and the following comments are provided to assist the Department in the preparation of the SEARs.

It is noted that Section 1.3 (pp 2) and Table 1 (e)(pp 3) of the Scoping Report prepared by Orica incorrectly identifies the zoning of the land being *zoned Special Activities under the State Environmental Planning Policy (Major Projects) Amendment 2009*. Elsewhere in the document, the correct zoning is referenced, being SP1 Special Activities under the *State Environmental Planning Policy (Three Ports) 2013*.

Port of Newcastle (PON) is the adjoining land owner of Lot 7, DP 262783, being Heron Road, and is a significant land holder and operator of port activities on Kooragang Island. Please note that Heron Road and Greenleaf Road are not public roads, and PON is not the roads authority under the terms of Roads Act 1993. These are private parcels of land of which PON acts as the manager and owner.

PON and Orica work closely together and Orica have provided regular communication regarding the status of this project. Ongoing communication by Orica with regards to this project is expected, and requested to continue. Consultation with PON tenants on adjoining or nearby land, should also be undertaken as part of the preparation of the EIS. PON can provide contact details of such tenants, if required.

The following should be addressed through the EIS:

- During construction short-term monitoring should be undertaken of adjacent groundwater monitoring wells to ensure works are not exacerbating existing arsenic levels, or mobilising dormant contamination;
- Process for consultation with PON with regards to the development of the Long-term Environmental Management Plan and Groundwater Monitoring Program, especially for the location of any additional monitoring wells/sites required on PON land, ongoing access arrangements and provision of data.
- The impacts from the generation of additional construction traffic should be considered in light of other port activities, in particular the distribution of cargo from K2 and K3 Berths via truck to local storage facilities.
- Should a construction laydown area be required on any PON land including Heron Road, the consent of the land owners will be required for such a use as well as a licence from PON.

If you have any questions regarding the above please let me know.

regards

Rebecca Johnston

Planning Officer

6 Newcomen Street (PO Box 790) Newcastle NSW 2300 Australia

Tel: 02 4908 8219

Mob: 0437 057 557

Email: Rebecca.Johnston@portofnewcastle.com.au

Website: www.portofnewcastle.com.au

Please consider the environment before printing this email.



APPENDIX B

Management Order (Order Number 20131407; Declaration Number 21089; Area Number 3183)

Environment Protection Authority

Management order

(Section 14 of the Contaminated Land Management Act 1997)

Order Number 20131407; Declaration Number 21089; Area Number 3183

Service: By Registered post

Orica IC Assets Pty Ltd (010 767 263)

Attention:

The Proper Officer

Level 3, 1 Nicholson Street

East Melbourne

Victoria 3002

Background

- A. Orica IC Assets Pty Ltd (ACN 010 767 263) (Orica) previously known as Incitec Ltd operated an ammonium nitrate facility at Lot 3 DP 234288 known as 15 Greenleaf Road, Kooragang Island NSW (the site). The site commenced production of ammonium nitrate for the purpose of fertiliser manufacture in 1969 and has operated under a number of related entities including Orica Australia Pty Ltd (from 2003), Industrial Chemicals Limited (from 2002) and Incitec Ltd.
- B. The site is currently owned by Orica IC Assets Pty Ltd (ACN 010 767 263).
- C. Ammonia is produced on the site by reforming natural gas to produce hydrogen which is then combined with nitrogen (from air) to produce ammonia.
- D. From approximately 1969 until 1994 a solution containing arsenic was used to scrub carbon dioxide from the process gas stream prior to the production of ammonia. During this period spent arsenic waste was disposed of into an arsenic disposal pit in the north-west of the site.
- E. Groundwater is contaminated with arsenic at concentrations significantly exceeding the trigger values for the protection of aquatic ecosystems in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australia and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ 2000). Concentrations of arsenic are reported in *Kooragang Island Groundwater Monitoring Results – Ammonia and Arsenic* prepared by Orica Australia Pty Ltd dated 25 February 2008. Concentrations of arsenic in the Hunter River were reported below low reliability marine trigger values in *Investigation of Arsenic Levels in the Hunter River at Kooragang Berths 2 and 3* prepared for Orica Australia Pty Ltd dated 2 July 2013.
- F. Arsenic has migrated off the site in groundwater and may continue to migrate. The contaminated groundwater has impacted on the quality of waters and has contaminated other landholdings.
- G. On 16 November 2005 the Environment Protection Authority (EPA) declared the site as a remediation site ([Notice No. 21089](#)) under the *Contaminated Land Management Act 1997* (the Act) then in force.
- H. On 5 December 2005 the EPA agreed to a Voluntary Remediation Proposal ([Notice No 26061](#)) by Orica under the Act then in force. The principal features of the proposal included the implementation of source remediation activities, assessment of groundwater remediation options and a desktop study and bench scale trials of Permeable Passive Reactive Barrier (PPRB) material and techniques. The proposal was completed on 8 December 2006.
- I. Source remediation activities undertaken at the site in 2005 included the removal of arsenic contaminated soil and sludge from the former sludge disposal pit to the depth of

- the groundwater table, chemical stabilisation of removed material as required and offsite disposal of the treated waste at a licensed landfill.
- J. On 8 December 2006 the EPA agreed to a second Voluntary Remediation Proposal ([Notice No 26093](#)) by Orica under the Act then in force. The principal features of the proposal included the preparation of an environmental management plan, monitoring of the migration of arsenic in groundwater, validation of a conceptual site model and implementation of a pilot trial to assess the practicability of arsenic immobilisation/adsorption.
- K. On 19 November 2008 the EPA agreed to a third Voluntary Remediation Proposal ([Notice No 26109](#)) by Orica under the Act. The proposal involved further work to develop two short listed options for remediation of the site, which were in-situ treatment of groundwater and extraction/ex-situ treatment of groundwater. The principal features of the proposal were the assessment and design of a hydraulic containment and groundwater treatment system to reduce the transport of arsenic in groundwater and assessment of in-situ treatment options.
- L. On 1 July 2009 the *Contaminated Land Management Amendment Act 2008* commenced and substituted new provisions for the management of contaminated land that are currently in force. The declaration of the site as a remediation site in 2005 is deemed to be a declaration of the site as significantly contaminated land under the current Act. Further, the second and third voluntary remediation proposals that had not been completed on 1 July 2009 were each taken to be an approved Voluntary Management Proposal (VMP) for the purposes of the current Act. These two proposals were both completed on 13 December 2010.
- M. A report titled *Feasibility study for ex-situ arsenic treatment* dated 28 December 2009 was prepared on behalf of Orica. A report prepared on behalf of Orica titled *Treatability Study for In-situ Arsenic Removal from Groundwater* dated 23 December 2009 recommended field trials of in-situ treatment.
- N. On 13 December 2010 the EPA approved a fourth VMP ([Notice No 20101723](#)) under the Act. The VMP involved a field trial of in-situ geochemical fixation of arsenic in groundwater.
- O. A report titled *Final Performance Monitoring Report, Field Trial for In-situ Geochemical Fixation of Arsenic; Kooragang Island* dated 30 April 2013 was prepared on behalf of Orica.
- P. A report titled *Arsenic Groundwater Remediation – Feasibility Assessment* dated 30 August 2013 (Orica 2013) was prepared by Orica to re-assess the feasibility of five short-listed options for the remediation of arsenic in groundwater at the site. The assessment included a bench-scale laboratory treatability testing program to assess the performance of zero-valent iron to treat arsenic in groundwater.
- Q. As agreed with the NSW EPA, Orica engaged an independent expert to undertake a review of the process undertaken by Orica and its consultants to assess options for managing arsenic in groundwater. The findings of the report are provided in *Orica Kooragang Island Groundwater Remediation Feasibility Assessment, Independent Review of Assessment Process* prepared by GHD dated March 2014.
- R. The objective of this order is to implement remedial action that will prevent the further offsite migration of the arsenic in groundwater.
- S. EPA has advised Orica of the EPA expectation that the remedial method will be a staged active intervention. Three remedial methods that have been discussed in relation to this order are a Permeable Passive Reactive Barrier (the EPA preferred approach), a barrier wall and capping to contain contaminated groundwater, and pump and treatment of groundwater (approaches suggested by Orica). The EPA has advised Orica that a provision for capital expenditure should be made for the remedial actions in the order.
- T. In order to meet this objective, this order requires that Orica provide a Workplan to the EPA by 31 October 2014 that identifies the remedial method that will be implemented to remediate the arsenic in groundwater.

- U. Under the Act, the EPA may issue a management order to one or more appropriate persons. The EPA may choose a person who is responsible for the significant contamination of the land as an appropriate person. Orica is responsible for the significant contamination of the land because it carried on activities on the land that utilised arsenic and it caused the contamination by its operation of the ammonium nitrate facility which leaked arsenic into the soil and groundwater. I determine Orica is the appropriate person to be the subject of this order.
- V. Prior to the making of this order, the EPA considered all submissions made as to whether an order should be issued.

Land to which this order applies

This order applies to the site as identified on the [declaration of remediation site number 21089](#) made on 16 November 2005 as listed in the following table (**the Land**):

Description	Address
Lot 3 DP 234288	15 Greenleaf Road, Kooragang Island NSW

Nature of the significant contamination and the nature of any harm

The EPA declared the contamination of the Land to be significant enough to warrant regulation. The EPA continues to believe that the Land is contaminated and that the contamination is significant enough to warrant regulation. In particular:

- Groundwater is contaminated with arsenic at concentrations significantly exceeding the ANZECC/ARMCANZ 2000 guidelines for the protection of aquatic ecosystems;
- Arsenic contaminated groundwater has migrated off the site and may continue to migrate. The contaminated groundwater impacts upon the quality of the waters and is contaminating adjacent land; and
- There are potential human and biota exposure pathways to the contaminants.

Action required by this order

Under section 14(1) of the Act, I, Erwin Benker, direct Orica Australia Pty Ltd (ACN 004 117 828) to do each of the following in relation to the Land:

1. Implement works that will prevent, to the extent required by Action 1c, the further offsite migration of arsenic in groundwater. In planning the works, all necessary steps are to be taken to ensure the remedial work is implemented and commissioned by 31 December 2017.

- a) Prepare and submit a plan (workplan) to the EPA which clearly identifies the remedial method that will be implemented at the site and describes activities to:
- i. Undertake investigations and trials of remediation works to develop the design, construction and performance specifications of a remediation system or process to meet the remedial outcome described in '1.' above. These investigations and trials may include aquifer pump tests and groundwater modelling.
 - ii. As necessary, undertake treatability trials to confirm the design, construction and performance specifications to meet required treatment criteria, and/or management of waste streams. These works may include bench scale and pilot scale testing of component parts of the works, and of any waste management.
 - iii. Undertake investigations to support the development of performance specifications and remediation endpoints of the proposed works.
 - iv. If necessary, undertake a field trial of the proposed remedial works based on the outcomes of tasks (i) and (ii) above.
- b) Identify performance criteria for the identified remedial method and submit the performance criteria to the EPA;

- c) Upon the agreement of the workplan and performance criteria by the EPA, implement the approved workplan and submit the required deliverables in accordance with the schedule in the approved workplan.
- d) As appropriate, formally request landowner consent for access to relevant off site areas required for proposed works. This may include in-principle agreement with finalisation of the agreement after detailed design of the proposed works is complete.
- e) Prepare and submit to the EPA for approval a Remediation Action Plan (RAP) which is in accordance with the remedial method identified in the approved workplan and which documents the remediation strategy, system design, implementation approach, identification of regulatory licences, approvals and remediation end points.

2. Implement the proposed remediation works

- a) Apply for necessary approvals from the relevant consent authorities for the proposed works. This may include approval from Newcastle City Council, NSW Office of Water and NSW EPA.
- b) Implement the proposed works in accordance with the design specifications and requirements detailed in the approved RAP.
- c) Prepare a Long Term Environmental Management Plan (LTEMP) for any operational phase of the proposed works and provide a copy to the EPA. The LTEMP will incorporate any long-term requirements for operation and maintenance, monitoring and restrictions on site activities in the vicinity of the system or process. The LTEMP should be revised based on system or process operation and monitoring results on a periodic basis with EPA approval.
- d) Operate and maintain the installed system or process in a manner to achieve the remediation objective and in accordance with the LTEMP.
- e) Prepare and submit to the EPA a validation report, on completion of the works, demonstrating that the proposed remediation infrastructure has been installed to the design specification.

3. Groundwater monitoring

Develop a Groundwater Monitoring Program ('GMP') for arsenic contamination, submit the GMP to the EPA and implement the GMP upon receipt of EPA approval. The GMP will fit within the framework of the Long Term Environment Management Plan (LTEMP) described in item 2(c). The GMP shall include as a minimum:

- a) Sampling of accessible sentinel groundwater monitoring wells onsite and offsite on a bi-annual basis for arsenic.
- b) Analysis of all groundwater samples for arsenic.
- c) Results of sampling to be provided to the EPA within eight weeks of completion of the sampling.
- d) Preparation of an annual summary report of the bi-annual sampling, including commentary on any trends observed, implication of those trends on the proposed remedial works and comparison of the results to ANZECC/ARMCANZ trigger values or other criteria agreed by the EPA. The report is to be submitted to the EPA within twelve weeks of completion of the second bi-annual sampling round.
- e) Review the GMP in light of sampling completed every two years, and advise the EPA of any recommended changes to the GMP.

The GMP may be revised as required, with EPA approval.

4. Update of Arsenic Environmental Management Plan

The existing Arsenic Environmental Management Plan must be updated prior to the commencement of operation of the remediation system to address risks to affected land users, landowners and stakeholders and should include the following as a minimum:

- a) Names and contact details of persons to be contacted including Orica personnel and emergency authorities in the event of any offsite incident;
- b) Names and contact details of persons to be contacted in the event of any emergency onsite or offsite; and
- c) Procedures to be implemented in the event of arsenic contamination encountered in soil or groundwater offsite.

5. Update Communication Strategy

Prepare and provide to the EPA a communication strategy to ensure key stakeholders are kept informed on the progress of the remedial work under this Management Order. The Communications Strategy must include:

- a) Identification of key stakeholders, including the Orica Kooragang Island Community Reference Group (CRG), industrial neighbours, Newcastle City Council (NCC) and neighbouring communities.
- b) Utilisation of a range of different communication measures to maximise access to information; and,
- c) Scheduled communication activities to update stakeholders of progress at regular intervals.

6. All submissions to the EPA must be:

- posted to: Manager Contaminated Sites
PO Box A290, Sydney South, NSW 1232, and
- emailed to: niall.johnston@epa.nsw.gov.au

7. Carry out directions consistent with EPA Guidelines

Carry out the actions in this order consistent with any relevant guidelines made or approved by the EPA under s 105 of the Act.

8. Public access to information

Make available for inspection by any person, free of charge, any report on the actions taken under the management order, and provide a copy of such a report to any person for a reasonable fee.

9. Timing of the submission of reports required by this Order

The reports required by this order must be submitted to the EPA in accordance with the following table as may be varied from time to time by the EPA in writing.

Item	Report	Submission Date to EPA
1a	Prepare and submit Workplan that identifies the remedial method for EPA approval	31 October 2014
1b	Prepare and submit	21 November 2014

	performance criteria	
1e	Prepare and submit RAP	30 June 2016
2c	Prepare LTEMP	Two months prior to planned completion date for the installation of the proposed system or process.
2e	Prepare and submit to the EPA a validation report	30 June 2018
3	Develop Groundwater Monitoring Plan (GMP) for EPA approval	31 August 2014
3c	Results of bi-annual sampling	Within eight weeks of the completion of sampling
3d	Summary report of the bi-annual groundwater sampling results including commentary	Annually (within twelve weeks of the final sampling event for each year) in accordance with the GMP.
4	Updated Arsenic EMP	Two months prior to the commencement of operation of the proposed system or process.
5	Updated Communications Strategy	31 December 2014

10. Timing of actions required by this Order

The actions required by this order must be completed in accordance with the following table as may be varied from time to time by the EPA in writing.

All necessary steps are to be taken to ensure the remedial work is implemented and commissioned by 31 December 2017.

Item	Action	Submission Date to EPA
1c	Implementation of the workplan	To commence within eight weeks of EPA approval of the Workplan in accordance with the Workplan schedule.
1d	Formally request in-principle landowner consent for long-term access for construction, operation and maintenance of system.	30 December 2014
2a	Lodge the necessary supporting documentation to apply for approval from relevant consent authorities	31 October 2016
2b	Undertake proposed works in accordance with design specifications and requirements in the RAP	Within 12 months of receiving regulatory approvals and landowner consent for the work
2d	Operate and maintain the	In accordance with the

	installed system or process in a manner to achieve the remediation objective and in accordance with the LTEMP	LTEMP, with periodic review of operation and monitoring.
3a, 3b	Undertake groundwater monitoring in accordance with the GMP	Every six months
5	Implement activities in the communications strategy	In accordance with the communications strategy schedule

[Signed]

ERWIN BENKER
Acting Manager Contaminated Sites
Environment Protection Authority
 (by delegation)

Date: 28 July 2014

NOTE:

Cost Recovery

Section 34 of the CLM Act allows the EPA to recover its costs in connection with the issue of, monitoring actions of and seeking compliance with a remediation order.

Information recorded by the EPA

Section 58 of the CLM Act 1997 requires the EPA to maintain a public record. A copy of this management order will be included in the public record.

Information recorded by councils

Section 59 of the Act requires the EPA to give a copy of this order to the relevant local council. The council is then required to note on its planning certificate issued pursuant to s 149(2) of the *Environmental Planning and Assessment Act 1979* that the land is currently subject to a management order. The EPA is required to notify council as soon as practicable when the order is no longer in force and the notation on the s 149(2) certificate can be removed.

Relationship to other regulatory instrument

This order does not affect the provisions of any relevant environmental planning instruments which may control the land on which the land is located or provisions of any other environmental protection legislation administered by the EPA.

Guidelines made or approved under section 105 of the CLM Act.

All the directions in this order must be carried out consistent with guidelines made or approved under section 105 of the CLM Act. See <http://www.environment.nsw.gov.au/clm/guidelines.htm>.

Appeals against this decision

You can appeal to the Land and Environment Court against this order. The deadline for lodging the appeal is 21 days after you were given notice of this order.

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