Major Project Approval MP 09_0147 – Remediation of Former Orica Villawood Site

Section 4.55(1A)
Modification Application
Response to request
for additional information

Submitted to
NSW Department of Planning,
Industry and Environment
on behalf of Orica Australia Pty Ltd

November 2020

Suite 2, Upper Ground Floor, 437 Kent Street Sydney NSW 2000 P 61 2 9267 4267
E info@dblproperty.com W www.dblproperty.com ABN 99 090 880 649

DOCUMENT INFORMATION

Client	Project Name	Document Number	Document Title	Revision Status
Orica Australia Pty Ltd	Orica Villawood Remediation Project	1485/905/09	Section 4.55(1A) Modification Application	Final

Document prepared by DBL Property Pty Limited

ABN 99 090 880 649

Prepared by:

Jeffrey Lord
Director

Disclaimer

This report has been prepared at the request of the Orica Australia Pty Ltd and its Agents for the specific purposes to which it refers. We disclaim any responsibility to any third party who may use any portion of this report for any other purpose without the prior written approval of DBL Property.

DBL Property has not completed anything in the nature of an audit or valuation and is not providing an opinion on the accuracy of information and estimates forming the basis of the information contained in this report. Some of the information contained within the report has been provided by parties other than DBL Property.

The statements, opinions and estimates included in this report are given in good faith and in the belief that they are not false, misleading or incomplete. We present these estimates and assumptions as a basis for the reader's interpretation and do not present them as a certified valuation nor as results that will be actually achieved.

The report remains valid for a period of 90 days due to the changing nature of the real estate market and planning controls. The terms of this engagement are such that DBL Property has no obligation to update this report because of events occurring subsequent to the date of this report.

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INTRODUCTION

This report has been prepared by DBL Property on behalf of Orica Australia Pty Ltd (Orica) pursuant to section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to modify Major Project Approval MP 09_0147 (Approval), known as the Orica Villawood Remediation Project (Project). This report has been prepared to respond to a request from the NSW Department of Planning, Industry and Environment (DPIE) for additional information in relation to Modification No. 3 to the Approval.

The Approval applies to land identified as 2 Christina Road, Villawood (Lot 1 DP 634604) (Site).

Broadly, the proposed modifications seek to update and improve the ongoing environmental site management approach under the approved Project by:

- amending the conditions of the Approval to require ongoing compliance with long-term environmental management plan; and
- subdividing the Property into two lots to support ongoing contamination management in the context of allowing for the ongoing use and potential divestment of a major portion of the Site.

The proposed modifications are aimed at meeting ongoing environmental site management in the context of allowing for the ongoing use and potential divestment of a major portion of the Site, and have been previously discussed with the DPIE officers. Further detail is now set out in this report.

The proposed modifications have been either requested by Mr Chris Jewell, NSW Environment Protection Authority (EPA) Accredited Site Auditor (Auditor), or are proposed by Orica in order to:

- establish ongoing remediation management protocols for the Site; and
- ensure that Orica maintains responsibility for groundwater monitoring and the contingency actions to address risks in the long-term environmental management plans discussed below.

The proposed modifications do not alter the approved remediation works at the Site, which have been completed in accordance with the Approval, including the Remedial Action Plan prepared by AECOM Australia Pty Ltd or any amendments approved by the Site Auditor (RAP) that was approved by the Auditor.

At the completion of decommissioning and reinstatement works, Condition 6 of Schedule 4 of the Approval requires that a validation report prepared in accordance the RAP (Validation Report). The Validation Report was approved by the Auditor and indicated that long-term management of the Site under an Environmental Management Plan would be necessary.

At the completion of the remediation works, Condition 7 of Schedule 4 of the Approval requires that a Site Audit Statement(s) be issued to the EPA and the Director-General (now Secretary of DPIE).

To satisfy the above conditions and the Validation Report, a Site Audit Statement (Section B2) (SAS B2) and accompanying Site Audit Report (SAR) has been issued including review of the long-term management plan in the form of the:

- Long-Term Environmental Management Plan (LTEMP); and
- Groundwater Management Plan (GMP).

The Auditor has agreed that these two long-term management plan documents can form the ongoing management structure for the Site. Their separation into two documents allows the appropriate allocation of responsibility for in-ground management measures and groundwater monitoring and management between the two proposed lots on the Site (allowing Orica to maintain responsibility for the existing groundwater contamination associated with the Site via continued ownership of proposed Lot 1).

Copies of the LTEMP and GMP are attached to the SAS B2, which is attached at Appendix B.

The SAS B2 and SAR were provided to the EPA and Secretary of DPIE by the Auditor in order to satisfy Condition 7 of Schedule 4 of the Approval and is considered by the Auditor to be an extended requirement under Condition 6 of Schedule the Approval.

BACKGROUND

Site

The Approval applies to land identified as 2 Christina Road, Villawood (Lot 1 DP 634604). The Site is shown in the image below.

Site Location (source: Six Maps 2020)

Remediation works

The Project involved remediation of the soil at the site and risk assessment of the groundwater. The main contaminants for which site specific remediation goals or groundwater trigger values were developed are monochlorobenzene (MCB), ethylene dichloride (EDC), trichloloroethene (TCE), tetrachloroethene (PCE), 1,2-dichloroethane (1,2-DCA), vinyl chloride, dichlorodiphenyltrichloroethane (DDT), an organochlorine pesticide, and its degradation products dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE), hexachlorobenzene (HCB), total petroleum hydrocarbons (TPHs) including benzene, toluene, ethyl benzene and xylene and polycyclic aromatic hydrocarbons (PAHs), including benzo(a)pyrene.

The volumes requiring remediation under the Management Order issued by the EPA under the *Contaminated Land Management Act 1997*, were approximately:

- 13,000 m^3 of in situ soil;
- 10,000 m^3 of soil excavated from the western part of the property in 2003 and 2004; and
- 2,000 m^3 of contaminated material brought from the former Orica Chester Hill facility in 2008.

Excavation and treatment of contaminated soil was completed at the end of 2015. The soil remediation work has effectively removed a substantial source of groundwater contamination from the soil, though some contribution from the separate-phase contaminants in groundwater would be expected to continue.

Approval

The Approval was issued on 18 May 2012 under the former section 75J of the EP&A Act and has been modified under the former section 75W of the EP&A Act as follows:

- Modification 1 – was issued on 3 April 2013, which allowed for the construction of water treatment ponds.
- Modification 2 – was issued on 27 October 2015, which modified the Approval to include additional conditions around asbestos management and a long-term environmental management plan.

On 28 June 2019, the Project was declared to be State significant development (SSD) for the purposes of the EP&A Act. Accordingly, the Approval is now subject to the SSD modification pathway under section 4.55 of the EP&A Act.

Consultation

In preparing Modification No. 3 to the Approval, Orica has extensively consulted with the EPA, who have:

- reviewed and provided comments on draft versions of this report; and
- issued a letter to Orica dated 10 November 2020 (EPA Letter), which is attached at Appendix C.

The EPA Letter confirms that the EPA does not object to Orica lodging this Modification No. 3 of the Approval.

PROPOSED MODIFICATIONS

This application seeks to update and improve the ongoing environmental site management approach under the approved Project in the context of allowing for the ongoing use and potential divestment of a major portion of the Site.

The proposed modifications to the existing Approval are set out below.

1. **Modify Condition 10 of Schedule 4 of the Approval to provide an enforcement mechanism for the LTEMP and GMP**

This modification is proposed at the request of the Auditor.

The Auditor has issued the SAS B2, which reviews the appropriateness of the LTEMP and GMP, both dated 23 April 2020. The LTEMP and GMP are required by the Auditor to have a legal enforcement mechanism to ensure ongoing compliance with each plan, such as a condition of a development consent and/or a public positive covenant on the land title.

By virtue of Modification 2, Schedule 4 of the Approval was amended to insert a new Condition 10 as follows:

> ***Long-Term Environmental Management Plan***
>
> *10. The Proponent shall prepare a long-term Environmental Management Plan (EMP) for the approval of the Site Auditor. The EMP is to document how the site is to be managed into the future and, amongst other provisions, is to include:*
>
> *a) a detailed site survey which defines the extent of potential asbestos impacted soil on the site;*
> *b) a description of the measures to be implemented to ensure the ongoing availability of the EMP for current and future owners and occupiers of the Site; and*
> *c) provisions which prevent future disturbance of site soils or any intrusive activities except under a specific Construction Environmental Management Plan (CEMP) which is also to be approved by a Site Auditor.*
>
> *The EMP shall be prepared by a suitably qualified and experienced person in consultation with the EPA within once month of the completion of the remediation works, or as otherwise agreed with the Secretary.*
>
> *A copy of the approved EMP shall be submitted to the Secretary, the EPA and Council in conjunction with the notice of completion required under Clause 17 of State Environmental Planning Policy No 55-Remediation of Land.*

The Auditor has requested that this condition be modified to include an enforcement requirement and has proposed alternate wording. It is therefore proposed that Condition 10 of Schedule 4 of the Approval is modified by deleting the existing text and inserting the following text (shown in red and italics):

> *The Proponent shall prepare a Long-Term Environmental Management Plan (LTEMP) and a Groundwater Monitoring Plan (GMP) ('the Plans'), to the satisfaction of the Site Auditor.*

The Plans shall be prepared by a suitably qualified and experienced person in consultation with the EPA. The Site Auditor shall review the appropriateness and suitability of the Plans in relation to this condition. The Plans shall be prepared in accordance with the requirements outlined in Section 3.4.6 of the NSW EPA Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition), October 2017.

The Plans shall include:

a) a description of the nature and location of contamination remaining on Site;
b) the objectives of the LTEMP and GMP which are that the environment and receptors off-site are protected, users of the Site are not exposed to contamination and off-site areas impacted by contamination from the Site remain suitable for their existing use and any use that could occur under exempt and complying development;
c) procedures for residual contamination management;
d) responsibilities for the LTEMP and GMP implementation; and
e) an implementation schedule for each action in the LTEMP and GMP.

The Site shall be maintained and all activities on the Site conducted in accordance with the Site Auditor approved LTEMP, for the duration of the site occupation and operation, as required by the Site Audit Statement.

The Site Auditor approved GMP shall apply to the landowner of Proposed Lot 1 on the Site and the obligations of the GMP will be the responsibility of that landowner into the future, as required by the Site Audit Statement. Contingency actions to address risks to human health or environment from the groundwater contamination in relation to the existing and approved use of the Site will also be required to be undertaken by the landowner of Proposed Lot 1.

A copy of the LTEMP and GMP approved by the Site Auditor shall be submitted to the Secretary, the EPA and Council in conjunction with the associated Site Audit Statement and Site Audit Report.

The landowner of Proposed Lot 1 will make the most recent version of the LTEMP and GMP, as approved by the Site Auditor, available to the public free of charge, unless the owner identifies commercial-in-confidence or private/personal information (including information relating to a third party) within those documents. In these cases, the landowner will remove such information from the documents to make the documents suitable for public release.

This application seeks that Condition 10 of Schedule 4 of the Approval is modified in accordance with the above comments.

2. Subdivision of the Site to create a parcel of land for long-term retention by Orica

This application seeks development consent for minor subdivision of the Site.

The intent of the proposed subdivision is to allow for Orica to maintain a presence in the vicinity of the Site in the form of ongoing land ownership, whilst allowing for the ongoing use and potential divestment of a major portion of the Site. This ownership will commit Orica to an ongoing obligation to manage groundwater monitoring associated with the Site.

The proposed subdivision is shown in Appendix D and involves the creation of a single 1500m2 lot. The small lot has been created in a manner that complies with the *Bankstown Local Environmental Plan 2015* (BLEP 2015).

The subdivision is then proposed to be accompanied by proposed easements and public positive covenant (PPC) obligations to guide ongoing contamination management as follows:

Proposed Lot 1:

- The proposed small lot (1500m2 to meet the BLEP 2015 requirements) will be retained in Orica ownership.
- Proposed Lot 1 will carry with it an obligation to require ongoing groundwater monitoring and contingency actions arising from any risks identified in relation to the groundwater contamination per the GMP in the form of a PPC under section 88E of the *Conveyancing Act 1919* (NSW) (Conveyancing Act) in favour of the EPA (GG). The wording of the PPC, along with other terms to be imposed under section 88B of the Conveyancing Act are attached at Appendix D. The final wording of these instruments will be agreed with the EPA for their execution.
- Proposed Lot 1 will also have the benefit of an easement (CC) over Proposed Lot 2 to access, install and maintain groundwater monitoring wells by Orica and carry out testing of the wells as required.

Proposed Lot 2:

- The whole of Proposed Lot 2 will be burdened with an easement (CC) in favour of Proposed Lot 1 to access, install and maintain groundwater monitoring and extraction wells by Orica and carrying out testing of the wells and any contingency actions as required.
- In addition to the overall easement to access, install and maintain groundwater wells (CC), Proposed Lot 2 will also be specifically burdened with an easement in favour of Proposed Lot 1 (EE) relating to a 5 metre wide strip along the Christina Road frontage requiring it to remain clear of major improvements.

Both lots are also proposed to be burdened with an easement (DD) for access in favour of the EPA to allow EPA to enter both sites.

On this basis, the subdivision of the Site will allow for environmental management obligations to be applied to the two lots as follows:

- the LTEMP will apply to the Site (including Proposed Lot 1 and Proposed Lot 2), per Condition 10 of Schedule 4 of the Approval as modified in accordance with this application; and
- the GMP will apply to Proposed Lot 1 and remain an obligation of Orica for on-site and off-site groundwater monitoring and addressing any contingency actions required to address risks in relation to the groundwater contamination and the existing and approved use of the land, per Condition 10 of Schedule 4 of the Approval as modified in accordance with this application and under the PPC.

This approach has been designed to minimise the regulatory burden on future owners of Proposed Lot 2 while:

- providing ongoing public disclosure;

- enforcing the LTEMP and GMP on the relevant occupiers via conditions of the Approval (as modified in accordance with this application) and titling requirements;
- giving access for Orica and EPA to Proposed Lot 2 after any future sale and/or development of that lot; and
- ensuring the 'polluter pays' principle applies.

The draft plan of subdivision showing the proposed two lot subdivision of the Site and the draft dealings (under sections 88B and 88E of the Conveyancing Act) are attached at Appendix D.

This application seeks that development consent is provided for subdivision of the Site in accordance with the above comments.

3. New condition of the Approval to require a PPC to be registered on the Proposed Lot 1 in favour of the EPA

To supplement the proposed imposition of a PPC under section 88E of the Conveyancing Act on Proposed Lot 1 in favour of the EPA, this application proposes that a new condition is inserted in the Approval to require its imposition. This approach will therefore provide certainty that the PPC is registered on the Proposed Lot 1 in conjunction with the subdivision of the Site.

Insertion of a new condition similar to the following text (shown in red and italics) is proposed:

> *The two lot subdivision of the Site to create a new parcel of land (Lot 1) is to be subject to a public positive covenant under section 88E of the Conveyancing Act 1919 (NSW) in favour of the EPA, prior to subdivision of the Site, and will require ongoing groundwater management by the owner of Lot 1, and contingency actions to address any risks from the residual groundwater contamination in relation to the existing and approved use of the land, in accordance with the GMP approved by the Site Auditor.*

This application seeks that a new condition of the Approval is inserted in accordance with the above comments.

SUBSTANTIALLY THE SAME DEVELOPMENT

Section 4.55(1A) of the EP&A Act states that a consent authority may modify a development consent if:

> *it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all).*

The development, as proposed to be modified, is substantially the same development as that originally approved in that it:

- will not alter the remediation works, which have been completed;
- will not alter the use of the Site;
- will allow for the ongoing environmental management in relation to the Site; and
- will be of no environmental impact.

CLAUSE 115(1) REQUIREMENTS

In accordance with clause 115(1) of the *Environmental Planning and Assessment Regulation 2000* (NSW), we confirm the following in respect of this modification application:

Clause 115(1)...	Requirement	Comment
(a)	The name and address of the applicant.	Orica Australia Pty Ltd C/O DBL Property UGF, 437 Kent Street Sydney 2000
(b)	A description of the development to be carried out under the consent (as previously modified).	Remediation of Former Orica Villawood Site
(c)	The address, and formal particulars of title, of the land on which the development is to be carried out.	Address: 2 Christina Road, Villawood NSW 2163 Legal description: Lot 1 DP 634604
(d)	A description of the proposed modification to the development consent.	See section of this report titled 'Proposed Modifications' above.
(e)	A statement that indicates either: (i) that the modification is merely intended to correct a minor error, misdescription or miscalculation; or (ii) that the modification is intended to have some other effect, as specified in the statement.	The proposed modifications are sought to satisfy the Auditor request for an enforcement update to existing Condition 10 of Schedule 4 of the Approval, create a single lot to be retained by Orica and to ensure Orica's ongoing commitment to groundwater monitoring and management. Clause 115(e)(i) is not applicable.
(f)	A description of the expected impacts of the modification.	See section of this report titled 'Environmental Assessment' below.
(g)	An undertaking to the effect that the development (as to be modified) will remain substantially the same as the development that was originally approved.	As discussed in this report, the development (as to be modified) will remain substantially the same as the development that was originally approved.
(g1)	In the case of an application that is accompanied by a biodiversity development assessment report, the reasonable steps taken to obtain the like-for-like biodiversity credits required to be retired under the report to offset the residual impacts on biodiversity values if different biodiversity credits are proposed to be used as offsets in accordance with the variation rules under the *Biodiversity Conservation Act 2016.*	Not applicable.
(h)	If the applicant is not the owner of the land, a statement signed by the owner of the land to the effect that the owner consents to the making of the application.	A consent letter from Orica Limited is attached at Appendix A.
(i)	A statement as to whether the application is being made to the Court (under section 4.55) or to the consent authority (under section 4.56)	This application is being made under section 4.55(1A) of the EP&A and does not relate to a development consent granted by the Court.

ENVIRONMENTAL ASSESSMENT

Section 4.55(1A)(a) of the EP&A Act states that a consent authority may modify a development consent if "*it is satisfied that the proposed modification is of minimal environmental impact*".

Under section 4.55(3) the consent authority must also take into consideration the relevant matters to the application referred to in section 4.15(1) of the EP&A Act and the reasons given by the consent authority for the grant of the original consent.

The following assessment considers the relevant matters under section 4.15(1) and demonstrates that the development, as proposed to be modified, will be of minimal environmental impact.

Consistency with environmental planning instrument

The Site is located in the City of Canterbury Bankstown Local Government Area and within Zone IN1 General Industrial under the BLEP 2015.

The relevant provisions of Zone IN1 General Industrial are outlined below:

> *1 Objectives of zone*
>
> *• To provide a wide range of industrial and warehouse land uses.*
> *• To encourage employment opportunities.*
> *• To minimise any adverse effect of industry on other land uses.*
> *• To support and protect industrial land for industrial uses.*
>
> *2 Permitted without consent*
> *Nil*
>
> *3 Permitted with consent*
> *Agricultural produce industries; Building identification signs; Business identification signs; Depots; Food and drink premises; Freight transport facilities; Garden centres; General industries; Hardware and building supplies; Hospitals; Industrial training facilities; Kiosks; Landscaping material supplies; Light industries; Markets; Medical centres; Neighbourhood shops; Oyster aquaculture; Places of public worship; Plant nurseries; Roads; Tank-based aquaculture; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4*
>
> *4 Prohibited*
> *Agriculture; Air transport facilities; Airstrips; Amusement centres; Biosolids treatment facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Centre-based child care facilities; Charter and tourism boating facilities; Commercial premises; Eco-tourist facilities; Entertainment facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Function centres; Health services facilities; Heavy industrial storage establishments; Home occupations (sex services); Industries; Jetties; Marinas; Mooring pens; Moorings; Open cut mining; Pond-based aquaculture; Port facilities; Residential accommodation; Respite day care centres; Restricted premises; Rural industries; Schools; Sewage treatment plants; Signage; Tourist and visitor accommodation; Water recreation structures; Water recycling facilities; Wharf or boating facilities; Wholesale supplies*

Clause 2.6(1) of the BLEP 2015 states that:

> *Land to which this Plan applies may be subdivided, but only with development consent.*

Accordingly, this modification application seeks the necessary development consent for the proposed subdivision of the Site.

In relation to subdivision of the Site, additional requirements under the BLEP 2015 are set out in the table below.

Clause	Requirement under the BLEP 2015	Comment
4.1(3)	The size of any lot resulting from a subdivision of land to which this clause applies is not to be less than the minimum size shown on the Lot Size Map in relation to that land.	In Zone IN1 General Industrial, the minimum lot size for subdivision is 1,500m2. The proposed modifications comply with this requirement as the size of the subdivided lots is as follows: • Proposed Lot 1: 1,500m2 • Proposed Lot 2: 12.45 Ha
4.1C(1)	Despite clause 4.1(3), development consent must not be granted to the subdivision of land in Zone IN1 General Industrial unless the width of each lot to be created is at least 24 metres wide at the front building line.	The proposed modifications comply with this requirement as the width of each subdivided lot at the front building line is as follows: • Proposed Lot 1: 24 m • Proposed Lot 2: Greater than 24 m

In preparing this application, the proposed subdivision has been discussed with Canterbury Bankstown Council and various alternatives considered. We confirm that Council did not favour a small lot configuration that extended along the Christina Road frontage as it would limit access for any future site access for Proposed Lot 2.

Accordingly, the subdivision has been developed to meet the requirements of BLEP 2015 requirements.

Likely environmental impacts

The proposed modifications do not make any material changes to the current Approval and simply seek to update and improve the ongoing environmental site management approach under the approved Project in accordance with the SAS B2 and SAR.

Orica will retain ownership of Proposed Lot 1 and meet any ongoing obligations under the LTEMP and GMP as required under the Approval (as modified) and any PPCs imposed on that lot.

Accordingly, the proposed modifications will be of minimal environmental impact, if any at all.

CONCLUSION

The Approval permitted the remediation of the Site and the proposed modifications seek to update and improve the ongoing environmental site management approach under the approved Project.

The proposed modifications comprise:

- a minor modification to condition 10 of Schedule 4 of the Approval to better manage and legally enforce ongoing site management at the request of the Auditor;
- subdivision of the Site, in the form of a two lot subdivision for a single small lot to be retained by Orica; and
- a new condition of the Approval requiring a PPC on Proposed Lot 1 to ensure the owner of that lot (Orica) must comply with groundwater monitoring obligations under the GMP.

The proposed modifications represent a relatively minor change to the approved development and will be of minimal environmental impact, if any at all.

In accordance with section 4.55(1A) of the EP&A Act, the Approval may be modified as:

- the proposed modification is of no environmental impact; and
- is substantially the same development as development for which the Approval was granted.

We look forward to the prompt assessment of this application.

APPENDIX A – Owners Consent Letter

Orica Ltd
ACN 004 145 868
1 Nicholson Street East Melbourne
PO Box 4311 Melbourne
Victoria 3001 Australia
Tel 61 3 9665 7111
Direct Tel: + 61 3 9665 7210
email: kevin.sonnemann@orica.com
http://www.orica.com

25 July 2019

Mr Chris Ritchie
Director
Industry Assessments
Department of Planning & Environment
320 Pitt Street
Sydney, 2000

Dear Chris

Owners Consent – Orica Limited – Modification to Major Project Approval MP 09_0147, Villawood Remediation Project – addition of EMP Enforcement Condition

As the owners of the above-mentioned land we hereby give consent to the lodgement of the Modification to Major Project Approval MP 09_0147.

Should you have any queries please do not hesitate to contact the undersigned.

Yours faithfully,

Kevin Sonnemann | Head - Property
Orica Ltd | www.orica.com
1 Nicholson Street, East Melbourne VIC 3002 Australia
☎ +61 3 9665 7210 | ✆ +61 419 161 744 | ✉ kevin.sonnemann@orica.com

APPENDIX B – SAS B2 with LTEMP and GMP

NSW Site Auditor Scheme

Site Audit Statement

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the *Contaminated Land Management Act 1997* on 12 October 2017. For information about completing this form, go to Part IV.

Part I: Site audit identification

Site audit statement no. SA280/5

This site audit is a:

☑ statutory audit

☐ ~~non-statutory audit~~

within the meaning of the *Contaminated Land Management Act 1997*.

Site auditor details

(As accredited under the *Contaminated Land Management Act 1997*)

Name	Christopher Jewell	
Company	C. M. Jewell & Associates Pty Ltd	
Address	1/13 Kalinda Road	
	BULLABURRA	Postcode 2784
Phone	02 4759 3251	
Email	chris@cm-jewell.com.au	

Site details

Address:	2 Christina Road	
	VILLAWOOD NSW	Postcode: 2163

Property description

Lot 1 in DP634604 in the Parish of Liberty Plains, County of Cumberland

Local government area: City of Canterbury Bankstown Council

Area of site: 12.6 hectares

Current zoning: IN1 General Industrial

Regulation and notification

To the best of my knowledge:

☑ **the site is** the subject of a declaration, order, agreement, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985,* as follows:

- ☑ Declaration no. 21071 issued on 13 April 2005 under section 21 of the *Contaminated Land Management Act 1997*
- ~~☐ Notice no.~~
- ☑ Order no. 23019 issued on 2 November 2005 under section 23 of the *Contaminated Land Management Act 1997*
- ~~☐ Agreement no.~~
- ~~☐ Proposal no.~~

~~☐ **the site is not** the subject of a declaration, order, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985.*~~

To the best of my knowledge:

☑ the site **has** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*

~~☐ the site **has not** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997.*~~

Site audit commissioned by

Name:	Mr James Stening	
Company:	Orica Australia Pty Ltd	
Address:	16-20 Beauchamp Road	
	MATRAVILLE NSW	Postcode: 2036
Phone:	02 9352 2213	Email: james.stening@orica.com

Contact details for contact person (if different from above)

Name:	Mr Kevin Sonnemann
Phone:	03 9665 7210
Email:	kevin.sonnemann@orica.com

Nature of statutory requirements (not applicable for non-statutory audits)

☑ Requirements under the *Contaminated Land Management Act* 1997 (e.g. management order; please specify, including date of issue)

Management Order no. 23019 issued 2 November 2005 under section 23 of the *Contaminated Land Management Act 1997*

~~☐ Requirements imposed by an environmental planning instrument (please specify, including date of issue)~~

☑ Development consent requirements under the *Environmental Planning and Assessment Act 1979* (please specify consent authority and date of issue)

Project Approval no. MP 09_0147 issued pursuant to section 75J of the *Environmental Planning and Assessment Act 1979* by NSW Department of Planning and Infrastructure on 18 May 2012, as modified Mod-1 3 April 2013 and Mod-2 27 October 2015

☐ ~~Requirements under other legislation (please specify, including date of issue)~~

_____

_____

Purpose of site audit

☐ ~~**A1** To determine land use suitability~~

~~Intended uses of the land:~~ _____

~~OR~~

☐ ~~**A2** To determine land use suitability subject to compliance with either an active or passive environmental management plan~~

~~Intended uses of the land:~~ _____

~~OR~~

(Tick all that apply)

☑ **B1** To determine the nature and extent of contamination

☑ **B2** To determine the appropriateness of:

☐ ~~an investigation plan~~

☐ ~~a remediation plan~~

☑ a management plan

☐ ~~**B3** To determine the appropriateness of a **site testing plan** to determine if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*~~

☐ ~~**B4** To determine the compliance with an approved:~~

☐ ~~**voluntary management proposal** or~~

☐ ~~**management order** under the *Contaminated Land Management Act 1997*~~

☑ **B5** To determine if the land can be made suitable for a particular use (or uses) if the site is remediated or managed in accordance with a specified plan.

Intended uses of the land: Commercial and industrial use

Information sources for site audit

Consultancies which conducted the site investigations and/or remediation:

JBS&G Australia Pty Ltd

Environmental Risk Sciences Pty Ltd

Golder Associates Pty Ltd

URS Australia Pty Ltd

AECOM Australia Pty Ltd

Orica Australia Pty Ltd

CH2M HILL Australia Pty Ltd

Titles of reports reviewed:

Groundwater Management Plan, Lot 1 DP1258519, 2 Christina Road, Villawood, prepared by JBS&G Australia Pty Ltd (ref. 56506/124961 (Rev 2)), dated 23 April 2020

Long-Term Environmental Management Plan, Lots 1 and 2 DP1258519, 2 Christina Road, Villawood, prepared by JBS&G Australia Pty Ltd (ref. 56506/124960 (Rev1)), dated 23 April 2020

2020 Risk Based Criteria: Groundwater, Orica Villawood, prepared by Environmental Risk Sciences Pty Ltd (ref. OA/20/VR002-revB), dated 20 April 2020

Round 11 Groundwater Monitoring Event - February 2019, Orica Villawood, prepared by Golder Associates Pty Ltd (ref. 18114104-001-R-rev0), dated 1 May 2019

Remediation Validation Report, Lot 1 DP634604, 2 Christina Road, Villawood, NSW, prepared by JBS&G Australia Pty Ltd (ref. 41762/100530 RevC), dated 22 March 2016

Orica Villawood Round 8 Groundwater Monitoring Event – January 2016, prepared by Golder Associates Pty Ltd (ref. 107623183-007-Rev0_Villawood_GME), dated 27 April 2016

Additional Soil Gas and Indoor Air Sampling at Orica Villawood, prepared by URS Australia Pty Ltd (ref. 43218438), dated 2 November 2015

Validation Sampling and Analysis Plan, 2 Christina Road, Villawood, NSW, prepared by JBS&G Australia Pty Ltd (ref. 41672/58284 Rev1), dated 3 March 2015

DNAPL Source Zone Excavation Work Plan, Orica Villawood – Former Effluent Treatment Plant, prepared by URS Australia Pty Ltd (ref. 43514066/RPT01/D), dated 2 March 2015

Addendum to the Orica Villawood Remedial Action Plan (Asbestos in Soils) – 2 Christina Road, Villawood, NSW, prepared by AECOM Australia Pty Ltd, dated 11 February 2015

SSF Soil Assessment, Villawood Remediation, prepared by Orica Australia Pty Ltd, dated 7 November 2014

Supplementary Soil and Groundwater Investigation Report, Western Boundary of Pharmaceuticals Site, Christina Road, Villawood, NSW, prepared by CH2M HILL Australia Pty Ltd (ref. 423107.01.01), dated April 2012

Remedial Action Plan, 2 Christina Rd, Villawood NSW, prepared by AECOM Australia Pty Ltd (ref. S4149701), dated 17 March 2011

Human Health and Environmental Risk Assessment, Orica Villawood, prepared by URS Australia Pty Ltd (ref. 43217484), dated 9 February 2011

Under Building Investigation, Pharmaceuticals Site Villawood, prepared by CH2M HILL Australia Pty Ltd (ref. 359640.T1.02), dated July 2007

Validation Report, Pharmaceuticals Site, Christina Road, Villawood, prepared by CH2M HILL Australia Pty Ltd (ref. 3596940.T1.01), dated July 2007

Other information reviewed, including previous site audit reports and statements relating to the site:

Regional geological and topographic mapping

Regional hydrogeological data

Site Audit Report - 2 Christina Road, Villawood, Section 2D Audit, prepared by C. M. Jewell & Associates Pty Ltd (ref. J1196.2R-rev0), dated September 2006 and accompanying Site Audit Statement SA280

Site Audit Report - 2 Christina Road, Villawood, prepared by C. M. Jewell & Associates Pty Ltd (ref. J1196.14R-rev0), dated March 2012 and accompanying Site Audit Statement SA280/2

Draft Site Audit Report - Pharmaceuticals Site, 2 Christina Road, Villawood, prepared by C. M. Jewell & Associates Pty Ltd (ref. J1196.16R-rev0), dated October 2012 and accompanying Draft Site Audit Statement SA280/3

Site Audit Report - Remediation and Validation, 2 Christina Road, Villawood, prepared by C. M. Jewell & Associates Pty Ltd (ref. J1196.24R-rev0), dated 7 August 2019 and accompanying Site Audit Statement SA280/4

Site audit report details

Title:	Risk Assessment, Groundwater Management Plan and Long-Term Environmental Management Plan, 2 Christina Road, Villawood	
Report no.	J1196.31R-rev0	Date: 13 August 2020

Part II: Auditor's findings

Please complete either Section A1, Section A2 or Section B, not more than one section. (Strike out the irrelevant sections.)

- Use **Section A1** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **without the implementation** of an environmental management plan.
- Use **Section A2** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **with the implementation** of an active or passive environmental management plan.
- Use **Section B** where the audit is to determine:
  - (B1) the nature and extent of contamination, and/or
  - (B2) the appropriateness of an investigation, remediation or management plan[1], and/or
  - (B3) the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or
  - (B4) whether the terms of the approved voluntary management proposal or management order have been complied with, and/or
  - (B5) whether the site can be made suitable for a specified land use (or uses) if the site is remediated or managed in accordance with the implementation of a specified plan.

[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

Section A1

I certify that, in my opinion:

The **site is suitable** for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

- ☐ Residential, including substantial vegetable garden and poultry
- ☐ Residential, including substantial vegetable garden, excluding poultry
- ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☐ Day care centre, preschool, primary school
- ☐ Residential with minimal opportunity for soil access, including units
- ☐ Secondary school
- ☐ Park, recreational open space, playing field
- ☐ Commercial/industrial
- ☐ Other (please specify): _____

OR

- ☐ I certify that, in my opinion, the **site is not suitable** for any use due to the risk of harm from contamination.

Overall comments:

_____

_____

_____

_____

_____

_____

Section A2

I certify that, in my opinion:

Subject to compliance with the **attached** environmental management plan[2] (EMP), the site is suitable for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

☐ Residential, including substantial vegetable garden and poultry

☐ Residential, including substantial vegetable garden, excluding poultry

☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry

☐ Day care centre, preschool, primary school

☐ Residential with minimal opportunity for soil access, including units

☐ Secondary school

☐ Park, recreational open space, playing field

☐ Commercial/industrial

☐ Other (please specify): _____

EMP details

Title: _____

Author: _____

Date: _____ No. of pages: _____

EMP summary

This EMP (attached) is required to be implemented to address residual contamination on the site.

The EMP: (Tick appropriate box and strike out the other option.)

☐ requires operation and/or maintenance of **active** control systems[3]

☐ requires maintenance of **passive** control systems only[3].

Purpose of the EMP:

_____

_____

_____

_____

[2] Refer to Part IV for an explanation of an environmental management plan.
[3] Refer to Part IV for definitions of active and passive control systems.

~~Description of the nature of the residual contamination:~~

~~Summary of the actions required by the EMP:~~

~~How the EMP can reasonably be made to be legally enforceable:~~

~~How there will be appropriate public notification:~~

~~Overall comments:~~

Section B

Purpose of the plan[4] which is the subject of this audit:

To ensure that the contaminants remaining in site soils, and contaminated site groundwater, are appropriately managed to protect the health of future site users, occupiers, visitors and contractors, and that these contaminants are not transported from the site; and to:

- monitor and confirm contaminant concentrations associated with the identified groundwater plumes in on-site and off-site locations;
- assess possible changes to contaminant concentrations at the site in areas downgradient of remediation areas following the proposed excavation works. This may occur following a high rainfall event at the completion of the excavation works;
- facilitate contingency planning in the event that the groundwater plumes are found to migrate faster than predicted;
- monitor groundwater levels and quality on and off site to enable ongoing assessment of risk to workers, and to confirm the findings of groundwater modelling previously conducted for the site;
- monitor groundwater quality on and off site to enable ongoing assessment of risk to surrounding sensitive environmental receptors (aquatic ecosystems in Brynes Creek concrete channel); and
- address groundwater-related obligations under Part 3 of the *Contaminated Land Management Act 1997* or other regulatory obligations imposed by the EPA.

I certify that, in my opinion:

(B1)

☑ The nature and extent of the contamination **has** been appropriately determined

~~☐ The nature and extent of the contamination **has not** been appropriately determined~~

AND/~~OR~~ (B2)

☑ The investigation, remediation or management plan **is** appropriate for the purpose stated above

~~☐ The investigation, remediation or management plan **is not** appropriate for the purpose stated above~~

~~AND/OR (B3)~~

~~☐ The site testing plan:~~

~~☐ **is** appropriate to determine~~

~~☐ **is not** appropriate to determine~~

~~if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*~~

~~AND/OR (B4)~~

[4] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

~~AND/OR (B4)~~

~~☐ The terms of the approved voluntary management proposal* or management order** (strike out as appropriate):~~

~~☐ **have** been complied with~~

~~☐ **have not** been complied with.~~

~~*voluntary management proposal no. _____~~

~~**management order no. _____~~

AND/OR (B5)

☑ The site **can be made suitable** for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

~~☐ Residential, including substantial vegetable garden and poultry~~

~~☐ Residential, including substantial vegetable garden, excluding poultry~~

~~☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~

~~☐ Day care centre, preschool, primary school~~

~~☐ Residential with minimal opportunity for soil access, including units~~

~~☐ Secondary school~~

~~☐ Park, recreational open space, playing field~~

☑ Commercial/industrial

~~☐ Other (please specify): _____~~

IF the site is ~~remediated/~~managed* in accordance with the following plan (**attached**):

*Strike out as appropriate

Plan title:	Long-Term Environmental Management Plan, Lots 1 and 2 DP1258519, 2 Christina Road, Villawood (ref. 56506/124960 Rev1)	
Plan author:	JBS&G Australia Pty Ltd	
Plan date:	23 April 2020	No. of pages: 100

Plan title:	Groundwater Management Plan, Lot 1 DP1258519, 2 Christina Road, Villawood (ref. 56506/124961 Rev2)	
Plan author:	JBS&G Australia Pty Ltd	
Plan date:	23 April 2020	No. of pages: 27

SUBJECT to compliance with the following condition(s):

Any revision of the Long-Term Environmental Management Plan or Groundwater Management Plan must be reviewed and approved by a site auditor.

~~Overall comments:~~

Part III: Auditor's declaration

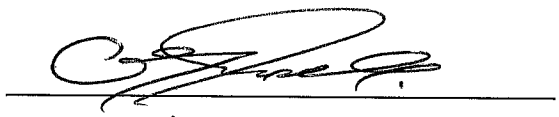
I am accredited as a site auditor by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997.*

Accreditation no. 9810

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997,* and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed 

Date 14 August 2020

Part IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remediation plan or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use or uses of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A1 or Section A2 or Section B of Part II, **not** more than one section.

Section A1

In Section A1 the auditor may conclude that the land is *suitable* for a specified use or uses OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further investigation or remediation or management of the site was needed to render the site fit for the specified use(s). **Conditions must not be** imposed on a Section A1 site audit statement. Auditors may include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

Section A2

In Section A2 the auditor may conclude that the land is *suitable* for a specified use(s) subject to a condition for implementation of an environmental management plan (EMP).

Environmental management plan

Within the context of contaminated sites management, an EMP (sometimes also called a 'site management plan') means a plan which addresses the integration of environmental mitigation and monitoring measures for soil, groundwater and/or hazardous ground gases throughout an existing or proposed land use. An EMP succinctly describes the nature and location of contamination remaining on site and states what the objectives of the plan are, how contaminants will be managed, who will be responsible for the plan's implementation and over what time frame actions specified in the plan will take place.

By certifying that the site is suitable subject to implementation of an EMP, an auditor declares that, at the time of completion of the site audit, there was sufficient information satisfying guidelines made or approved under the *Contaminated Land Management Act 1997* (CLM Act) to determine that implementation of the EMP was feasible and would enable the specified use(s) of the site and no further investigation or remediation of the site was needed to render the site fit for the specified use(s).

Implementation of an EMP is required to ensure the site remains suitable for the specified use(s). The plan should be legally enforceable: for example, a requirement of a notice under the CLM Act or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of *the Environmental Planning and Assessment Act 1979*.

Active or passive control systems

Auditors must specify whether the EMP requires operation and/or maintenance of active control systems or requires maintenance of passive control systems only. Active management systems usually incorporate mechanical components and/or require monitoring and, because of this, regular maintenance and inspection are necessary. Most active management systems are applied at sites where if the systems are not implemented an unacceptable risk may occur. Passive management systems usually require minimal management and maintenance and do not usually incorporate mechanical components.

Auditor's comments

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

Section B

In Section B the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or whether the terms of an approved voluntary management proposal or management order made under the CLM Act have been complied with, and/or whether the site can be made suitable for a specified land use or uses if the site is remediated or managed in accordance with the implementation of a specified plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement. The condition must not specify an individual auditor, only that further audits are required.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

Part III

In **Part III** the auditor certifies their standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to

- the **NSW Environment Protection Authority**:

  nswauditors@epa.nsw.gov.au or as specified by the EPA

  AND

- the **local council** for the land which is the subject of the audit.

Orica Australia Pty Ltd

Groundwater Management Plan

Lot 1 DP1258519
2 Christina Road, Villawood, NSW

23 April 2020

56506/124961 (Rev 2)

JBS&G

www.jbsg.com.au

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Abbreviations

Term	Definition
ACM	Asbestos Containing Material (e.g. fibre cement sheet)
AECOM	AECOM Pty Ltd
AHD	Australian Height Datum
Bgl	Below ground level
Bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, xylene
CEMP	Construction Environmental Management Plan
CFM	Chloroform
CH2MHill	CH2MHill Pty Ltd
CLM Act 1997	*Contaminated Land Management Act 1997 (NSW)*
CMJ&A	CM Jewell & Associates Pty Ltd
COC	Contaminants of concern
COPC	Contaminants of potential concern
DCA	1,2-dichloroethane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DDX	(DDD + DDE + DDT)
DEC	Department of Environment and Conservation
DNAPL	Dense non aqueous phase liquid
DO	Dissolved oxygen
DQI	Data quality indicator
DQO	Data quality objective
EPA	Environment Protection Authority
EC	Electrical conductivity
EDC	1,2-dichloroethane
GMP	Groundwater Monitoring Program
Ha	Hectare
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
HHERA	Human health and ecological risk assessment
ICIANZ	Imperial Chemical Industries of Australia and New Zealand Limited
ISZ	Impacted Soil Zone as defined in JBS&G (2015a)
JBS&G	JBS&G Australia Pty Ltd
JSRA	Job Safety Risk Assessment
LDPE	Low density polyethylene
LOR	Limit of reporting
LTEMP	Long-Term Environmental Management Plan
MCB	Chlorobenzene
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NOW	NSW Office of Water
NSW	New South Wales
NUDLC	National Uniform Drillers Licensing Committee
OCP	Organochlorine pesticide
OEH	Office of Environment and Heritage
Orica	Orica Australia Pty Ltd
PAH	Polycyclic aromatic hydrocarbon
PCE	Tetrachloroethylene
PPE	Personal protective equipment
QA/QC	Quality assurance/quality control
RAP	Remediation Action Plan
RBGC	Risk Based Groundwater Criteria (developed in the HHERA (URS, 2011))
RBSC	Risk-Based Soil Criteria (developed in the HHERA (URS, 2011))

Term	Definition
RPD	Relative percent difference
SWMS	Safe Work Method Statement
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
TWL	Trade waste line
URS	URS Australia Pty Ltd
USEPA	United States Environment Protection Agency
VC	Vinyl chloride
VENM	Virgin Excavated Natural Material
VHC	Volatile halogenated compounds
VIC	Victoria
VOC	Volatile Organic Compound
WHS Act	*Work Health and Safety Act 2011 (NSW)*
WSA	Western Storage Area

1. Introduction

Orica Australia Pty Ltd (Orica) engaged JBS&G Australia Pty Ltd (JBS&G) to prepare a Groundwater Management Plan (GMP) for 2 Christina Road, Villawood, NSW (the 'site') (**Figure 1**). The site was initially part of a larger chemical manufacturing facility owned by the Commonwealth of Australia and used for the manufacturing of munitions, including trinitrotoluene (TNT), in 1941. The site was subsequently purchased by Taubmans in 1946, who manufactured a range of chemicals including chlorobenzene and DDT until the southern portion of the facility was purchased by ICIANZ Limited (ICIANZ) in 1953. ICIANZ (which later became Orica Australia Pty Ltd) continued to manufacture a wide range of agricultural and pharmaceutical chemicals until the site was closed in 2000. The site has been vacant since closure in 2000, with remediation of the 'Pharmaceutical Site' portion occurring in 2003/2004 and the 'Crop Care' portion in 2013-2015.

Previous site activities resulted in site soil contamination with volatile halogenated compounds (VHCs), OCPs, polycyclic aromatic hydrocarbons (PAHs), inorganic mercury and asbestos that a Human Health and Environmental Risk Assessment (HHERA) (URS, 2011) considered requiring remediation. Groundwater on site and down gradient of the site was found to be impacted by site-related contaminants including VOCs and OCPs, but was considered to not require remediation by the HHERA (URS, 2011) subject to ongoing management.

In 2005 the NSW Environment Protection Authority (NSW EPA) declared the site a remediation site under the *Contaminated Land Management Act 1997* (*CLM Act 1997*) and issued a Remediation Order (No. 23019, Area 3200).

Soil remediation works were validated by JBS&G (2015a) to have been completed in accordance with the Remedial Action Plan (RAP) (AECOM, 2011). Integral parts of the remediation were excavation and onsite treatment of soils impacted by chemical COC. Cover of material identified to contain asbestos was also completed.

Site regulation.

1.1 Objectives

The RAP (AECOM, 2011) required that a groundwater monitoring program is developed and implemented with the objectives to:

- "*Monitor and confirm contaminant concentrations associated with the identified groundwater plumes in on-site and off-site locations;*
- *Assess possible changes to contaminant concentrations at the Site in areas downgradient of Remediation Areas following the proposed excavation works. This may occur following a high rainfall event at the completion of the excavation works; and*
- *Facilitate contingency planning in the event that the groundwater plumes are found to migrate faster than predicted."*

Additional specific objectives of this GMP are to:

- Monitor groundwater levels and quality on and off site to enable ongoing assessment of risk to workers, and to confirm the findings of groundwater modelling previously conducted for the site;
- Monitor groundwater quality on and off site to enable ongoing assessment of risk to surrounding sensitive environmental receptors (aquatic ecosystems in Byrnes Creek concrete channel); and
- Address groundwater-related obligations under Part 3 of the *Contaminated Land Management Act* 1997 or other regulatory obligations imposed by the EPA.

1.2 Responsibility

Orica shall be responsible for implementing this GMP an any revisions until the NSW EPA agrees in writing that no further monitoring is required.

2. Description of Contamination

Contaminants that may be present in groundwater at the site include those that have either originated directly, as products or waste products, from manufacturing processes carried out on the site or indirectly as degradation products of chemicals formed in those processes. The RAP (AECOM, 2011) identified five groundwater plumes. The contaminants that are relevant to this GMP are listed in **Table 6** and their properties are described in **Appendix A**. Their most recent nature and extent in groundwater were mapped by Golder (2015, 2019a) and are presented on **Figure 1**. AECOM described the plumes as follows:

- **Plume 1**: Inferred Primary source is the former DDT formulation plant and adjacent benzene/chlorobenzene (MCB) storage area. Dense non-aqueous phase liquid (DNAPL) (as a secondary source) has been historically identified at some monitoring locations. Key contaminants include MCB, DDX, benzene, toluene and trichloroethene (TCE).
- **Plume 2**: Inferred source is the former IHPT process building, tank farm and EDC recovery plant, effluent stripping plant and associated trade waste lines (TWLs). Key contaminants include DDX and 1,2-dichloroethene (DCA) with minor benzene, toluene and TCE.
- **Plume 3**: Inferred source is the former Effluent Treatment Plant and associated TWLs. DNAPL has been historically identified at some monitoring locations. Key contaminants include DDX, MCB, DCA, TCE, benzene and toluene.
- **Plume 4**: Inferred source has not been fully defined. Key contaminants include DDX, DCA and TCE.
- **Plume 5**: Inferred source is impacted soils associated with TWLs. Key contaminants include DDX, MCB and DCA.

In 2019 (Golder, 2019b) an assessment of the presence of per- and poly-fluoroalkyl substances (PFAS) in groundwater was completed. The assessment concluded that "*whilst PFAS are present in groundwater, the concentrations recorded do not currently point to significant risks to human health of the environment*".

The HHERA (URS, 2011) concluded that groundwater did not present a significant risk to human health or the environment at the site or in off-site areas. The RAP (AECOM, 2011) further concluded that the soil remediation works would provide an additional benefit of removing impacted soils which had the most potential to impact the shallow groundwater system. However, the HHERA (URS, 2011) identified and developed human health risk-based groundwater criteria (RBGC) for contaminants in groundwater with the intention that they be used as trigger levels for a proposed long-term groundwater monitoring program.

A detailed summary of the nature and extent of soil and groundwater contamination is provided in the RAP (AECOM, 2011). The February 2019 Groundwater Monitoring Event (Golder, 2019a) presents previous analytical results and references previous groundwater assessments at the site. Key previous groundwater assessments at the site are summarised in **Table 1**.

Table 1: Key Previous Groundwater Monitoring and Assessments

Author	Key Groundwater Assessments
A.D. Laase Hydrologic Consulting	Laase Hydrologic Consulting (2007). Groundwater Flow and Contaminant Transport Modelling. 10 July 2007
AECOM Australia Pty Ltd	Round 1 (March 2010) and Round 2 (July 2010) Groundwater Monitoring Events
Golder Associates Pty Ltd	Groundwater Monitoring Program – Orica Villawood dated 21 December 2012
Golder Associates Pty Ltd	Round 3 (January 2011), Round 4 (December 2011), Round 5 (January/February 2013), Round 6 (January 2014), Round 7 (January 2015), Round 8 (January 2016), Round 9 (January 2017,) Round 10 (January 2018), Round 11 (February 2019) Groundwater Monitoring Events

3. Monitoring Program

The GMP includes groundwater gauging, sampling and chemical analysis of samples collected from nominated on-site and off-site monitoring wells on an annual basis until the GMP endpoint has been reached as detailed in the following sections. The GMP endpoint is described in Decision 8 in **Table 4** in **Section 3.4.5**, and shall be considered by a suitably experienced hydrogeologist for review and approval by a Site Auditor.

The RAP (AECOM, 2011) indicated a monitoring period of approximately 5-10 years depending on the findings of the monitoring program. Any decision concerning cessation of monitoring must be made in consultation with the NSW EPA. Monitoring must continue until NSW EPA agrees in writing that no further monitoring is required.

The following table (**Table 2**) presents monitoring locations for gauging, sampling and chemical analysis. **Figure 1** shows the locations of the wells. The locations may be revised based on the outcomes of the previous monitoring events and on accessibility of wells (e.g., due to development), but this would constitute a change to the GMP and would have to be managed in accordance with **Section 4**.

Table 2: Groundwater Monitoring Schedule

Monitoring Location	Easting	Northing	Lot DP	Groundwater Plume	Analytes	Monitoring Rationale
MW400	314262	6249288	Lot 1 DP634604	Plume 1	VHC, BTEX	Former source area.
MW401	314239	6249161	Lot 1 DP634604	Plume 1	VHC, OCP	Former source area.
MW402	314122	6249256	Lot 1 DP634604	Plume 2	VHC, OCP	Former source area.
MW23R	313785	6249276	Lot 1 DP634604	Plume 3	BTEX, VHC, OCP	Delineation of plume boundary. Downgradient of ISZ 4a Fluid Recovery System.
MW24R	313781	6249246	Lot 1 DP634604	Plume 3	BTEX, VHC, OCP	Delineation of plume boundary. Downgradient of ISZ 4a Fluid Recovery System.
MW27	313830	6249211	Lot 1 DP634604	Plumes 1 & 2	BTEX, VHC, OCP	Delineation of western perimeter of plumes.
MW403	313812	6249261	Lot 1 DP634604	Plume 3	BTEX, VHC, OCP	Source area. Well connected to sub-grade drainage layer (sump) as DNAPL removal contingency.
MW38	313946	6249354	Lot 1 DP634604	Plume 4	VHC	Source area (MW48 replacement)
MW77	313865	6249319	Lot 1 DP634604	Plume 4	VHC	Outside southern limit of plume.
BP108 (2, 6, 10 m)	313879	6249073	Lot 201 DP714834	Plumes 1 & 2	VHC, Ultra-trace OCP	Beyond south-western perimeter of plumes.
BP107 (2, 6, 10, 14 m)	314109	6248950	Lot 162 DP529288	Plumes 1 & 2	VHC	Beyond southern limit of plumes.
OS03A/B	314042	6249153	Lot 34 DP828860	Plumes 1 & 2	VHC, Ultra-trace OCP	Within plumes.
OS04A	313969	6249154	SP31700	Plumes 1 & 2	VHC	Within plumes.
OS07A/B	313605	6249086	Road Reserve	Plume 3	BTEX, VHC, Ultra-trace OCP	North-western perimeter of plume.
OS08	314175	6249098	Lot 1 DP597303	Plume 1	VHC, Ultra-trace OCP	Within plume near southern boundary.
OS10A	313924	6249138	SP31700	Plumes 1 & 2	VHC	Within plumes.
MW303	313697	6249182	Road Reserve	Plume 3	BTEX, VHC, Ultra-trace OCP	Beyond southern perimeter of plume.

BTEX – benzene, toluene, ethyl benzene, xylenes
OCP – organochlorine pesticides

VHC – volatile halogenated compounds
Monitoring location coordinates presented in Golder (2019a). Coordinates for MW303 estimated only.

3.1 Sampling Methods

Standing water levels and phase-separated liquid interfaces at each monitoring well are to be measured using an electronic water level / interface probe. When practicable, all standing water levels should be measured in a mobilisation event to allow interpretation of groundwater flow direction and gradient. Monitoring locations at which phase separated liquids/ non-aqueous phase liquids are identified shall not be sampled for dissolved-phase contaminants.

The condition of each monitoring well should be inspected and any damage recorded prior to measurement.

Monitoring locations shall be sampled using a low-flow groundwater sampling method. This may either use a micropurge technique using a dedicated bladder pump or a surface-mounted peristaltic pump with dedicated small-diameter Low-Density Polyethylene (LDPE) tubing and single-use silicon tubing at the pump. The end of the LDPE tubing or bladder pump inlet will correspond with the mid-point of the screened section of the well or piezometer, or an alternative level specified on hydrogeological grounds.

Groundwater monitoring and extraction wells shall be purged prior to collection of groundwater samples to ensure collection of a sample representative of groundwater at the location. The purge and sampling rate shall be such that the water level within the well does not decrease by more than approximately 10 cm; if the minimum practicable pumping rate results in a greater decrease in water level then this shall be noted on the field records. Groundwater parameters[1] shall be measured using a calibrated probe(s) / meter ex situ in a flow cell during purging. Purging is to continue until representative groundwater has entered the sampling device. This will be determined by measurement of stable[2] water parameters (primarily pH, EC and redox).

A physical description of the sample[3] will be recorded on the field data sheets during purging.

Groundwater is to be sampled directly from the sample tubing and transferred into the laboratory provided and pre-preserved bottles appropriate for the analysis. Once filled, all sample containers will be immediately tightly capped and placed in a secure chilled esky. Samples must be stored and transported to the laboratory under Chain of Custody protocols.

3.1.1 General Field Procedures

Samples shall be labelled with a unique identifier that includes the monitoring location name, sample depth for piezometers and date.

Quality Assurance / Quality Control (QA/QC) samples shall be labelled with a unique identifier that does not reveal the corresponding primary sample (for duplicates).

Site conditions, weather, date and time of sampling, sampler names, gauging and purging records, equipment calibration, and sample register shall be recorded by the sampler.

All non-dedicated sampling and measurement equipment is to be decontaminated before and after each use according to the following procedure:

- Wash with Decon 90 or similar decontaminant / water solution and rinse.
- Wash with potable water.

[1] pH, electrical conductivity (EC), dissolved oxygen (DO), redox potential and temperature
[2] DO +/- 10%; temperature +/- 2° C; redox potential +/- 10%; EC +/- 3%; pH +/- 0.05; and uniform turbidity.
[3] colour, odour, turbidity, films/sheens, phase separated liquids/ non-aqueous phase liquids

Dedicated or single use disposable equipment such as LDPE tubing and nitrile gloves does not require decontamination and shall be disposed of appropriately following use.

Groundwater samples are to be kept secure and in eskies cooled with frozen blocks during the field program and subsequent transportation to the laboratory. Storage and transport of the samples is to be under Chain of Custody documentation.

Equipment used to perform measurements (i.e. the water quality meter/probes) shall be calibrated to manufacturer's specifications by the supplier prior to use and at least daily by the sampler on subsequent days. Calibration checks and adjustments shall be performed as required during field operations.

3.2 Analytical Schedule

All samples should be analysed at a laboratory certified by National Association of Testing Authorities (NATA) for the required analyses. The analytes for samples from each location are provided in **Table 2**, while the analytical methods, limits of reporting and holding time for each groundwater analyte are outlined in **Table 3**.

Table 3: Analytical Requirements

Analyte		Limit of Reporting (depending on the analyte)	Preservation and Holding Time	Method
VHC	Volatile Halogenated Compounds (must include all those listed as RBGC)	1-10 ug/L	Glass vial with Teflon lined lid; nil headspace; preserved to pH<2 with HCl, H_2SO_4 or $NaHSO_4$; store at <4^{0}C; analysis within 14 days	USEPA 8260 or equivalent
BTEX	Benzene, Toluene, Ethyl Benzene, Xylenes	1-10 ug/L	Glass vial with Teflon lined lid; nil headspace; preserved to pH<2 with HCl, H_2SO_4 or $NaHSO_4$; store at <4^{0}C; analysis within 14 days	USEPA 8260 or equivalent
OCP	Organochlorine pesticides (must include all those listed as RBGC)	0.5 ug/L	Glass container with Teflon lined lid; unpreserved; store at <4^{0}C; extraction within 7 days and analysis within 40 days	USEPA 8270 USEPA 8081 (or equivalents)
OCP (Ultra-trace)		0.01 ug/L		

3.3 Well Maintenance

If monitoring wells become damaged and/or require replacement, a suitably experienced hydrogeologist shall design the new wells to meet the monitoring objective.

The wells will be constructed in general accordance with relevant NSW EPA endorsed guidance such as *Minimum Construction Requirements for Water Bores in Australia* (NUDLC, 2012), and *Publication 669 Groundwater Sampling Guidelines* (VIC EPA, 2000).

3.4 Data Quality Objectives

The data quality objectives (DQOs) have been developed for the GMP in the following sections.

3.4.1 State the Problem

The RAP (AECOM, 2011) identifies five groundwater plumes (Plume 1 to 5), with the most recent groundwater data provided by Golder (2019a).

The HHERA (URS, 2011) concluded that groundwater did not present a significant risk to human health or the environment at the site or in off-site areas. However, the RAP (AECOM, 2011) also concluded that ongoing groundwater monitoring is required following soil remediation works at the site for a long-term duration.

It is an assumption of the risk assessment that the plumes are stable and will not expand into previously impacted areas.

It is necessary to confirm that this assumption (based on observations, groundwater modelling and on professional judgement concerning the nature of the retardation and attenuation process) remains valid.

3.4.2 Identify the Decisions

The following decisions are required to be made during implementation of the GMP:

1. Are there any unacceptable risks to on-site or off-site users under a commercial/industrial land use scenario associated with site-related contaminants in groundwater?
2. Is the conceptual hydrogeological model developed in the RAP (AECOM, 2011) for the site still valid?
3. Are the findings of groundwater modelling previously conducted for the site as described in the RAP (AECOM, 2011) still valid?
4. Have groundwater conditions underlying the site and off site within Plumes changed significantly in spatial extent or maximum concentrations?
5. Was the GMP implemented in accordance with these DQO requirements?
6. Are changes to the GMP necessary?
7. Are contingency actions required to be considered?

3.4.3 Identify Inputs to the Decision

The inputs to the decisions are:

- The previous groundwater monitoring results;
- Physical observations, including groundwater gauging results, the presence of non-aqueous phase liquids, and visual and olfactory contamination indicators;
- Groundwater analytical data from samples collected from monitoring locations;
- Appropriate use of groundwater Trigger Values, sampling and analytical methods;
- Confirmation that the Data Quality Indicators (DQIs) have been achieved; and
- Changes to site conditions (e.g. construction or development).

3.4.4 Define the Study Boundaries

The extent of the GMP is confined to groundwater underlying the site, and off-site plumes as shown on **Figure 3**. The extent may change based on results of previous groundwater monitoring.

3.4.5 Develop a Decision Rule

Groundwater analytical data will be compared against the RBGC adopted as Trigger Values in **Table 6**. The decision rules adopted to answer the decision identified in **Section 3.4.2** are summarised in **Table 4**.

Table 4: Decisions

Decision Required to be Made	Decision Rule
1. Are there any unacceptable risks to on-site or off-site users under a commercial/industrial land use scenario associated with site-related contaminants in groundwater?	Groundwater analytical data will be compared against the RBGC adopted as Trigger Values in **Table 6**. If the RBGC are exceeded, the decision is Yes. Otherwise, the decision is No.
2. Has the validity of the conceptual hydrogeological model developed in the RAP (AECOM, 2011) changed?	Is there a plume-wide change in groundwater elevations that would indicate a significant change in recharge, groundwater velocity or flow direction that would measurably affect Plume behaviour? If the answer is yes, the decision is Yes. Otherwise, the decision is No.
3. Has the validity of the findings of groundwater modelling previously conducted for the site as described in the RAP (AECOM, 2011) changed?	Are monitoring results similar to model predictions at long time steps (e.g. every 5 years)? If the answer is yes, the decision is Yes. Otherwise, the decision is No.
4. Has groundwater contamination underlying the site and off site within Plumes increased significantly in spatial extent or concentrations?	Does a graphical assessment of historical concentrations trends indicate an increasing trend and is a statistically significant trend shown by the Mann-Kendall method (or equivalent)? Has the historical maximum concentration been exceeded? Is non-aqueous phase liquid present or changed in nature at a location where it has historically not been identified? If the answer is yes to any of the above, the decision is Yes. Otherwise, the decision is No.
5. Was the GMP not implemented in accordance with these DQO requirements?	Were DQIs not achieved? If the answer is yes, the decision is Yes. Otherwise, the decision is No.
6. Do changes to the GMP require consideration?	If the answer to any of the above is 'Yes', then Yes. If not, then No.
7. Do contingency actions require consideration?	If the answer to any of the above is 'Yes', then Yes. If not, then No.

3.4.6 Specify Limits of Decision Error

Specific limits for this project have been adopted with consideration to appropriate guidance from the NSW EPA, NEPC (2013), DEC (2006).

There are two types of decision error identified in AS4482.1-2005 '*Guide to the investigation and sampling of sites with potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds*'. These include:

a. Deciding that the site is acceptable when it actually is not; and

b. Deciding that the site is not acceptable when it is.

Limits are required to be set on each type of error presented here. AS4482.1-2005 nominates 5% probability of (a) and 20% probability of (b). It is noted that the application of this relationship assumes a uniform distribution of impact over the site area. This is not the case at the site.

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined Data Quality Indicators (DQIs) for completeness, comparability, representativeness, precision and accuracy. The acceptable limit on decision error is 90% compliance with DQIs.

The DQIs established for the project are discussed below in relation to precision, accuracy, representativeness, comparability, completeness and sensitivity, and are summarised in **Table 5**.

- **Precision** – measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples for COPC. For asbestos precision is assessed by whether the identification results for duplicate samples were in agreement with the original sample.
- **Accuracy** – measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards. Note it is only applied to contaminants of concern.
- **Representativeness** – expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** – expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples, and ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting (LOR), in producing reliable data in relation to the adopted site criteria.

Table 5: Data Quality Indicators

Data Quality Indicators	Frequency	Data Quality Criteria
Precision		
Blind duplicates (intra laboratory)	1 / 20 samples, at least 1 per event	<50% RPD
Blind duplicates (inter laboratory)	1 / 20 samples, at least 1 per event	<50% RPD
Laboratory duplicates	Laboratory standard	Laboratory standard
Accuracy		
Surrogate spikes	All organic samples	70-130%
Laboratory control samples	1 per lab batch	70-130%
Matrix spikes	1 per lab batch	70-130%
Representativeness		
Sampling appropriate for media and analytes	-	-
Samples extracted and analysed within holding times.	-	Organics (14 days; 7 days for OCPs)
Trip spike (BTEX only)	1 per sampling event	70-130% recovery
Trip blank	1 per sampling event	<LOR
Rinsate blank	1 per sampling event	<LOR
Laboratory (method) blank	1 per lab batch	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All samples
Standard analytical methods used for all analyses	All Samples	All samples
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples
Limits of reporting (LOR) appropriate and consistent	All Samples	LOR <= RBGC
Completeness		
Sample description and COCs completed and appropriate	All Samples	All samples
Appropriate documentation	All Samples	All samples
Satisfactory frequency and result for QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Analytical methods and LOR appropriate for media and consistent	All Samples	LOR <= RBGC

3.4.7 Optimise the Design for Obtaining Data

This will be achieved by following this GMP.

3.5 Assessment Criteria

Groundwater Trigger Values (Groundwater Risk Based Criteria (RBC)) have been developed for a number of exposure scenarios that may occur on the site and in the off-site areas where groundwater contamination derived from the site is present (EnRiskS 2020). These RBC were developed for exposure settings that may occur on- and off-site following remediation of soil contamination and were derived using current (2020) toxicity reference values for the chemicals of potential concern. The EnRiskS (2020) update of the RBC was prepared to ensure that all current and future uses in off-site areas were addressed by the risk assessment. The assessment reviewed the zoning for the downgradient off-site area (IN1 General Industrial under the *Bankstown Local Environmental Plan (2015))* and assessed all permissible uses. In addition, RBGC were also developed for the case that basements were constructed in downgradient areas.

The EnRiskS (2020) criteria replace the RBC previously developed in the HHERA (URS 2011). The Groundwater RBC are in **Table 6**.

Table 6: Groundwater Trigger Values

Contaminant Name	Abbreviation	*Groundwater Trigger Value (RBC) (mg/L)*				
		Scenario 1: Commercial / industrial building - warehouse (slab)	Scenario 2: Commercial / industrial building - offices (slab)	Scenario 3: Commercial / industrial buildings with basement level car park	Scenario 4: Excavations in areas where groundwater is shallow (<1.5 m bgl)	Scenario 5: Excavations in areas where groundwater is deeper (>1.5 m bgl)
Hexachlorobenzene	HCB	-	-	-	0.4 (NL)	-
1,2-dichloroethane	DCA or EDC	620	170	180	200	98000 (NL)
Vinyl chloride	VC	40	10	100	80	53000 (NL)
Chloroform	CFM	2100	600	1400	60	27000 (NL)
Trichloroethene	TCE	30	8	40	10	8300 (NL)
Tetrachloroethene	PCE	2600 (NL)	730 (NL)	4200 (NL)	100	78000 (NL)
1,1,2-trichloroethane	-	1800	520	330	13	6200 (NL)
Chlorobenzene	MCB	18000 (NL)	5200 (NL)	12000 (NL)	390	220000 (NL)
Benzene	B	80	20	80	22	11000 (NL)
Toluene	T	100000 (NL)	28000 (NL)	120000 (NL)	2300 (NL)	2200000 (NL)
a-hexachlorocyclohexane	a-HCH (a-BHC)	-	-	-	230 (NL)	-
b-hexachlorocyclohexane	b-HCH (b-BHC)	-	-	-	0.6 (NL)	-
d-hexachlorocyclohexane	d-HCH (d-BHC)	-	-	-	85 (NL)	-
g-hexachlorocyclohexane	g-HCH (g-BHC or lindane)	-	-	-	85 (NL)	-
Dieldrin	-	-	-	-	1.7 (NL)	-
Dichlorophenyl ethanes and ethenes	DDX (DDT + DDE + DDD)	-	-	-	2 (NL)	-

Note: The Trigger Values are the RBGC developed by EnRiskS (2020) for COPC identified in on- and off-site groundwater and are protective for long-term workers and intrusive workers. They are intended to be used to screen analytical results to trigger additional risk assessment or contingency measures.

- No RBC derived as CoPC not volatile and only the vapour inhalation pathway is potentially complete

(NL) derived RBC exceeds the solubility limit for the pure chemical, hence it is unlikely that the chemicals will be present in groundwater at a concentration that would ever pose an unacceptable risk

** Additive risks should be addressed in the application of these criteria particularly for all the CHCs. Where these RBC are applied, the ratio of concentration to RBC needs to be calculated for each CHC. The sum total of all ratios needs to be less than or equal to 1 for additive risks to be acceptable.

3.6 Reporting

A report should be prepared for each groundwater monitoring event. The report should be prepared in accordance with relevant requirements in NEPC (2013) and NSW EPA guidance, and include the following:

- Details of groundwater monitoring program methodology and scope of works;
- Condition of each monitoring well in the GMP;
- Results of groundwater monitoring including standing water levels, presence and thickness of non-aqueous phase liquids, field parameters and laboratory analyses, including NATA certified laboratory reports and Chain of Custody records;
- Assessment on the suitability of the data quality for intended use;
- Interpretation of the data, including changes in the groundwater flow regime, comparison of groundwater data to trigger values and historical groundwater concentrations, and an

analysis of concentration trends and the spatial distribution of contamination in groundwater;

- Conclusions and recommendations, including recommendations for further monitoring and consideration of contingency measures.

3.7 Contingency Measures

In the event COPC concentrations in groundwater exceed the RBGC, the spatial extent of the plumes is extending at a significantly faster rate than predicted or DNAPL is identified, the following contingency actions will be considered by Orica:

- Conduct confirmatory sampling and analysis;
- Conduct a specific risk assessment or amend the HHERA (URS, 2011);
- If an unacceptable risk is identified then consider contingency measures, which may include administrative or engineering controls, to manage the risk;
- Revise the GMP, which may include increased sampling frequency and additional locations;
- Revise the LTEMP as necessary in accordance with Section 6.

In the case that contingency actions are implemented, a Site Auditor must be engaged to review the works and to issue a Site Audit Statement following their completion.

It is important to note that:

- Groundwater flow at the site occurs slowly and overall plume conditions are expected to change slowly (i.e. over a time period of several years and decades, not months), and

- No technologies capable of remediating matrix-diffused contamination under the constraints imposed by geological conditions and the infrastructure present in the impacted off-site areas are currently available.

ISZ 4a Fluid Recovery System

Due to the ongoing identification of dense non-aqueous phase liquid (DNAPL) and elevated COPC concentrations at some on-site locations within Plume 3, a fluid capture and recovery contingency system was installed in accordance with URS (2015) as a contingency measure as part of soil remediation works. This system's location is shown on Figure 2 of the LTEMP and broadly comprises:

- A 300 mm thick aggregate layer at approximately 6 metres below ground surface which drains groundwater via collection pipes to a sump; and

- A 100 mm diameter uPVC extraction well (MW403, Figure 3) with machine slotted screen of nominal 0.4 mm slots in the sump.

This system should be monitored by Orica in accordance with the GMP. If a recoverable amount of DNAPL is present, the DNAPL should be removed by Orica to the extent practicable and disposed of in accordance with regulatory requirements.

3.8 Change Management

It may, from time to time, be necessary to revise this GMP to give effect to EPA requirements or reflect changes to groundwater conditions, changes in knowledge, change in policy or guidelines, changes on site and/or changes off site. Such changes may include, but are clearly not restricted to:

- Loss of access to monitoring wells due to damage (including internal damage due to silting, incrustation or equipment malfunction, and accidental external damage by plant or other means; and/or

- Construction of new buildings or other infrastructure requiring relocation of a well; and/or

- Denial of access by a landowner or occupier.

The preferred order of response to such loss of access would be:

1. Recondition or repair the existing monitoring well

2. Drill a replacement well adjacent to the location of the original well and properly decommission the original well, as per the requirements of NUDLC (2012)

3. Locate, and negotiate access to, an alternative site for the lost well that fulfils the same monitoring functions as the original well i.e. at a similar position within or in relation to the same plume(s) and screened at a similar depth in the same formation.

For wells located on Lot 1 or Lot 2 DP1258519, replacement wells would be placed at the closest accessible location to the original location that meets functional requirements.

For wells located outside these Lots and between Christina Road and the railway line, replacement wells would be placed in the closest accessible location to the original location that meets functional requirements or else in the road reserve on the southern side of Christina Road.

For wells located outside these Lots and south of the railway line (currently the sentinel wells BP107 and BP108 only), replacement wells would be placed in the closest accessible location that positions the well an appropriate distance beyond the toe of the relevant plume, so that the sentinel function continues to be served.

Changes to the GMP should be managed in accordance with **Section 4**.

4. Revision to the GMP

It may, from time to time, be necessary to revise this GMP to reflect changes to legislation, changes to conditions on/off site such as those identified above and/or improvements in technologies or knowledge, including revision of toxicity reference values.

Revision of the GMP should be undertaken by an appropriately qualified and experienced environmental professional. It is recommended that the revised document be reviewed by a NSW Contaminated Site Auditor accredited under the *CLM Act 1997*. Copies of the revised GMP should be distributed to the current Site Owners and NSW EPA.

5. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

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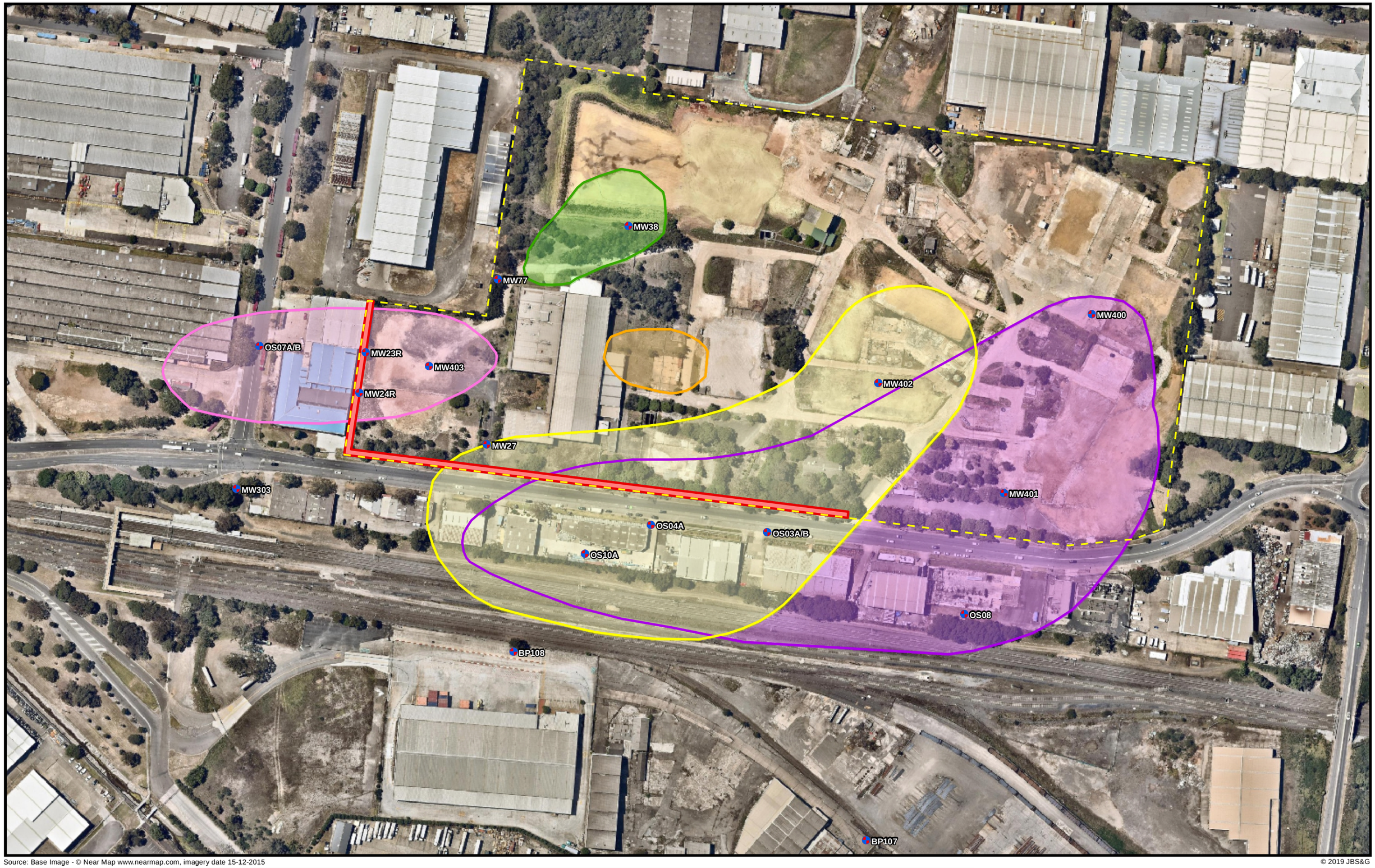
Figures



Source: Base Image - © Near Map www.nearmap.com, imagery date 15-12-2015

0 20 40 80 m

Scale:1:2,250

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
B	Original Issue - R02	RF	04-11-2019

Legend:

- Approximate Site Boundary
- Approximate Boundary - lOT 1 & 2 dp1258519
- Approximate Monitoring Well Locations 2020

Approximate Plume Extents - Golder 2009

- Plume 1
- Plume 2
- Plume 3
- Plume 4
- Plume 5

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Figure 1: Groundwater Monitoring Locations 2020 and Generalised Plumes

Client: Orica Australia Pty Ltd

Project: Groundwater Monitoring Plan 2020

Job No: 56506 File Name: 56506_01

Appendix A Chemical Properties of Chemicals of Potential Concern

Table A1: Chemical Properties of Chemicals of Potential Concern

Contaminant Name	Abbreviation	Properties					
		Form	Colour	Odour	Solubility	Volatility	Toxicity to Humans
Lindane [a-HCH (a-BHC), b-HCH (b-BHC), d-HCH (d-BHC) and g-HCH (g-BHC)]	-	Solid (crystalline)	Colourless to white	Slight musty odour	Practically water insoluble	Volatile	Possible Carcinogen
Benzene	-	Liquid	Clear, colourless	Petroleum-like odour	Insoluble and lighter than water (floats in water)	Volatile	Known Carcinogen
DDX (DDT + DDE + DDD)	-	Solid (crystalline)	White	Odourless	Insoluble in water	Not volatile, persistent	Possible Carcinogen
Hexachlorobenzene	HCB	Solid (crystalline)	Colourless to white	No description provided	Insoluble in water and heavier than water (sinks in water)	Semi-volatile	Probable Carcinogen
1,1,2-trichloroethane		Liquid	Clear, light coloured	Sweet chloroform-like odour	Insoluble in water and slightly heavier than water (sinks in water)	Volatile	Not known to be Carcinogenic
1,2-dichloroethane	DCA or EDC	Oily Liquid	Clear, colourless	Sweet chloroform-like odour	Insoluble in water and heavier than water (sinks in water)	Volatile	Possible Carcinogen
Vinyl chloride	VC	Gas	colourless	Mild, sweet odour	Slightly soluble in water	Volatile	Known Carcinogen
Chloroform	CFM	Liquid	colourless	Ether-like odour	Insoluble in water	Volatile	Probable Carcinogen
Trichloroethene	TCE	Liquid	Colourless	Sweet, chloroform-like odour	Slightly soluble in water	Volatile	Probable Carcinogen
Tetrachloroethene	PCE	Liquid	Colourless	Ether-like odour	Low solubility in water, heavier than water (sinks in water)	Volatile	Probable Carcinogen
Chlorobenzene	MCB	Liquid	Colourless to clear yellow	Sweet almond-like odour	Practically insoluble in water and heavier than water (sinks in water). Vapours heavier than air	Volatile	Not known to be Carcinogenic

Contaminant Name	Abbreviation	Properties					
Toluene	-	Liquid	Clear, colourless	Sweet, pungent, benzene-like odour	Insoluble in water and lighter than water (floats on water)	Volatile	Not known to be Carcinogenic
Dieldrin	-	Solid (flakes)	White to light brown	Mild, chemical odour	Insoluble in water	Semi-volatile	Probable Carcinogen

Sourced from the PubChem database, maintained by the U.S. Department of Health & Human Services (https://www.ncbi.nlm.nih.gov/pcsubstance)

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Orica Australia Pty Ltd

Long-Term Environmental Management Plan

Lots 1 and 2 DP1258519
2 Christina Road, Villawood, NSW

23 April 2020

56506/124960 (Rev 1)

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Abbreviations

A list of the common abbreviations used throughout this report is provided below.

Term	Definition
ACM	Asbestos Containing Material (e.g. fibre cement sheet)
AECOM	AECOM Pty Ltd
AHD	Australian Height Datum
BHC	Benzene hexachloride
bgl	Below ground level
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene and xylenes
B(a)P	Benzo(a)pyrene
CEMP	Construction Environmental Management Plan
CFM	Chloroform
CH2MHill	CH2MHill Pty Ltd
CLM Act 1997	*Contaminated Land Management Act 1997 (NSW)*
CMJ&A	CM Jewell & Associates Pty Ltd
COC	Contaminants of concern
COPC	Contaminants of potential concern
CTC	Carbon tetrachloride
DCA	1,2-dichloroethane (also EDC)
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyl-trichloroethane
DDX	DDD + DDE + DDT
DNAPL	Dense non aqueous phase liquid
DO	Dissolved oxygen
DQIs	Data Quality Indicators
DQOs	Data Quality Objectives
EC	Electrical conductivity
EPA	NSW Environment Protection Authority
ETP	Effluent Treatment Plant
GMP	Groundwater Management Plan
ha	Hectare
H_2SO_4	Sulphuric acid
HHERA	Human Health and Environmental Risk Assessment (URS, 2011)
HCl	Hydrochloric acid
HCB	Hexachlorobenzene
HCH	Hexachlorocyclohexane
ICIANZ	Imperial Chemical Industries of Australia and New Zealand Limited
ISZ	Impacted Soil Zone as defined in JBS&G (2015a)
JBS&G	JBS&G Australia Pty Ltd
JSRA	Job Safety Risk Assessment
LDPE	Low-density polyethylene
LOR	Limit of Reporting
LTEMP	Long-Term Environmental Management Plan
MCB	Chlorobenzene
$NaHSO_4$	Sodium bisulphate
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
NOW	NSW Office of Water
NSW	New South Wales
OCP	Organochlorine pesticide
OEH	Office of Environment and Heritage
Orica	Orica Australia Pty Ltd
PAH	Polycyclic aromatic hydrocarbon
PCE	Tetrachloroethene

Term	Definition
PPE	Personal protective equipment
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan (AECOM, 2011)
RBGC	Risk Based Groundwater Criteria (developed in the HHERA (URS, 2011))
RBSC	Risk-Based Soil Criteria (developed in the HHERA (URS, 2011))
RBSWC	Risk Based Site Wide Criteria (developed in the HHERA (URS, 2011))
RPD	Relative Percentage Difference
SAR	Site Audit Report
SAS	Site Audit Statement
SWMS	Safe Work Method Statement
TCE	Trichloroethene
TNT	Trinitrotoluene
TPH	Total Petroleum Hydrocarbons
TWL	Trade waste line
URS	URS Australia Pty Ltd
USEPA	United States Environmental Protection Agency
VC	Vinyl chloride
VENM	Virgin Excavated Natural Material
VHC	Volatile Halogenated Compound
VOC	Volatile Organic Compound
WHS Act	*Work Health and Safety Act 2011 (NSW)*
WSA	Western Storage Area

Executive Summary

The property located at 2 Christina Road, Villawood, NSW (Lots 1 and 2 DP 1258519) was historically part of a larger group of chemical manufacturing facilities that generated products including munitions and chemicals (agricultural and pharmaceutical grade) until operations ceased in 2000. **Figure 1** shows the location of the property.

Remediation of soil contamination (by materials including volatile organic compounds (VOC), organochlorine pesticides (OCP), polycyclic aromatic hydrocarbons (PAH), inorganic mercury and asbestos) related to the former manufacturing operations was completed in 2015. However, not all contamination was removed. A Long Term Environmental Management Plan (LTEMP) must be implemented at the site in order to manage the remaining contaminants.

This document is the LTEMP.

The following sections provide a summary of the requirements of the LTEMP. Detailed information, procedures, monitoring programs and management measures are included in the body of the document.

Long Term Environmental Management Plan (LTEMP)

The objectives of the LTEMP are to ensure that the contaminants remaining in site soils, and contaminated site groundwater, are appropriately managed to protect the health of future site users, occupiers, visitors and contractors, and that these contaminants are not transported from the site.

The LTEMP will apply indefinitely and at all times during operations at the site. The LTEMP applies to any works within the site, but is particularly important for activities which include any intrusive work, including:

- Demolition and removal of any ground cover, pavements or buildings;
- Underground utility installation, maintenance or removal; and
- Excavations - whether dug, cut, piled, trenched or bored.

However, for any significant intrusive works or major construction activities, an activity-specific management plan (such as a Construction Environmental Management Plan - CEMP) must be prepared prior to starting work.

Extent of Remaining Impacted Material

Contaminated materials remaining following the remediation and validation works include:

- Materials identified to potentially contain asbestos, located in the following areas:
  - under a 300 mm Virgin Excavated Natural Material (VENM) cover layer and geofabric marker layer within the Western Storage Area (WSA) (**Figure 2**);
  - under a 100 mm VENM cover layer within former ISZ soil remediation areas (**Figure 2**);
  - under a cover layer (grass, mulch, pavement) across the remainder of the site;
- Materials underlying the former Pharmaceuticals Building footprint that did not require remediation provided that they remain covered by concrete pavement (the building floor); and
- Groundwater underlying the site and areas down gradient from the site.

Other materials that remain on site include:

- Bricks that have been placed within ISZ1b (grid reference V8 – X6, **Figure 2**) at an approximate depth of 3 to 4 m. Some of the bricks are coated with lead-based paint and may require management if disturbed;

- Mixed-media materials containing natural zeolite, granular activated carbon and sand, which are present within fill below the VENM and geofabric cover at the WSA;
- A stockpile of crushed concrete (grid reference P30 – T28, **Figure 2**), which was inspected in 2015 and was not considered to be contaminated; and
- Former Trade Waste Lines and associated infrastructure which remain in place. It is unlikely, but possible, that waste chemicals are present in the lines. **Appendix C** shows where this former infrastructure is located.

LTEMP Provisions

The key provisions of this LTEMP are that:

- Any person undertaking intrusive works at the site must be inducted into the LTEMP;
- A copy of this LTEMP must be supplied to all persons conducting intrusive works on the site;
- The integrity of the cover layers must be maintained as outlined in this LTEMP;
- Inspections must be undertaken to ensure that the cover layer is intact and that no asbestos is visible; and
- The health, safety and environmental requirements set out in this LTEMP must be followed.

Responsibilities

Responsibilities are defined in detail in **Section 3.2** of the LTEMP. Site Owners, Orica and persons with management or control of a workplace at the site have specific responsibilities for the provision and implementation of the LTEMP.

Management Strategy

Intrusive Works

Where any intrusive work is required, the following management measures will apply:

- Prior to any work, the person responsible for the management of the LTEMP (LTEMP manager) must give approval for the work;
- Anyone undertaking intrusive work at the site must be inducted into the LTEMP and the Asbestos Management Plan (AMP) (**Appendix G**); and
- Any repairs or changes to cover layers must be reported to, and recorded by the LTEMP manager.

Requirements for Specific Tasks

Working with Asbestos Containing Materials (ACM)

- All intrusive work must be undertaken in accordance with the Asbestos Management Plan (**Appendix G**).
- At the completion of the work, the cover layer (where present) shall be re-instated. An inspection of the ground surface of the work area must be carried out to check if asbestos is present. Any asbestos that is seen must be appropriately managed.

Working with Material Containing Chemicals of Concern (COPC)

In addition to the requirements for intrusive work, the following measures will apply for those working with soil materials that are potentially contaminated:

- If the soil materials are (or are expected to be) odorous, appropriate odour controls will be required to prevent odour impact at the workplace boundary; and
- If indicators of gross contamination are seen or smelt during works, then provisions in the Unexpected Finds Protocol must be followed.

Exposing the Material under the Pharmaceuticals Building

- Soils remaining beneath the Pharmaceuticals Building were found to be suitable for commercial/industrial use provided that the building and concrete slab remain as cover.
- If the cover is removed or damaged then further assessment of potential risks is required. That assessment should be carried out by a suitably experienced environmental consultant.
- Any material excavated in the area of the Pharmaceuticals Building must be reinstated underneath the building or concrete slab.

Encountering Trade Waste Lines and Associated Infrastructure

In addition to the requirements for intrusive work, the following measures will apply if Trade Waste Lines (TWLs) are, or are expected to be, encountered during site works (**Appendix C** shows where former TWL infrastructure is located):

- Visual inspection of the TWL should be carried out to see if liquids are present;
- If liquids are observed and are suspected of being contaminated, then the Unexpected Finds Protocol must be followed. Otherwise, standard worker health and safety, and environmental, procedures should be followed;
- Release of liquids from the TWL to the environment must be prevented; and
- The ends of TWL sections, if encountered should be capped or plugged with cement grout or other suitable material to stop liquids flowing in or out.

Encountering Groundwater

- Due to the depth of groundwater (typically exceeding 2 metres), exposure of site users to groundwater is unlikely. However, groundwater may be encountered in deep excavations.
- For deep excavations, an activity-specific management plan, such as a CEMP, must be developed and implemented.
- Groundwater should not be extracted at the site for any purpose other than groundwater monitoring. An activity-specific management plan (e.g. a CEMP) will guide any activities such as construction dewatering when groundwater extraction cannot be avoided.
- The management plan must include procedures to:
  - Minimise direct contact of workers with groundwater;
  - Monitor and ensure that there is a safe atmosphere for workers; and
  - Prevent release of contaminated groundwater or liquids to the environment.

On-Site Soil Management

- Material excavated from below the cover during site works should be stockpiled separately from cover layer material. Stockpiles must be placed on a sealed surface or on plastic sheeting to prevent cross-contamination of unsealed surfaces.
- Stockpiles must be secured and covered if odorous or remaining for more than 24 hours.
- Appropriate dust, sediment and erosion controls must be implemented and maintained for the duration of soil management works, consistent with relevant guidelines/standards.
- For example, exposed soils in excavations and stockpiles should be covered or kept moist to prevent dust. Care should be taken to not over-wet materials such that excess runoff is generated.
- For substantial site works, appropriate dust controls and monitoring at the work site boundary should be applied.
- Any material excavated from below the cover should be assumed to contain asbestos and, unless shown that asbestos is not present, must be re-used below the cover layer. Cover

layer material cross-contaminated with soil from below the cover layer must also be re-used below the cover layer.

Cover Management

- The site cover layers must be maintained to prevent exposure to underlying asbestos contamination.
- The surface of the cover layer must be maintained such that erosion and sediment transport is prevented.
- If the cover layer requires replacement, equivalent materials, a concrete slab or permanent pavement with imported compacted sub-base materials and a marker layer would be suitable.
- Any changes to the cover layer, or relocation of the geotextile marker layer, should be noted in the LTEMP. This should include revised as-built drawings to identify any changes to the composition in the cover or marker layers.

Breach of Cover Layers

In the event that the cover layer is unintentionally breached, the following procedure must be followed:

- Stop the activity or process that breached the cover layer;
- Assess the hazards associated with the exposure of the underlying material and implement appropriate controls to address the hazards (e.g., temporary cover);
- Repair the cover layer to ensure the underlying material is isolated beneath the cover;
- Securely stockpile any remaining material to prevent unauthorised access;
- Complete an investigation into what led to the breached cover layer and implement controls to prevent a reoccurrence;
- Complete an environmental incident/corrective action report; and
- Review and revise the LTEMP to prevent a reoccurrence.

Groundwater Ongoing Management

Orica will implement a Groundwater Management Plan (GMP) (JBS&G 2020) at the site and in adjacent areas. The management plan broadly comprises periodic sampling using a network of monitoring wells located on and off site. Locations of the monitoring wells are provided in **Figure 3** and these wells must be maintained. In the case that a well is destroyed it will require replacement. The samples obtained are analysed for groundwater contaminants and site-specific trigger levels are used to assess whether additional risk assessment or contingency actions are required.

Waste management

Waste material (solid or liquid) excavated, extracted or recovered should be classified and managed in accordance with relevant EPA guidelines and current legislation and regulations.

Environmental Inspections

Inspections must be conducted by a person responsible for the workplace or a nominated suitably experienced and competent person. Inspections are to occur as detailed in **Table 4.1** of the LTEMP.

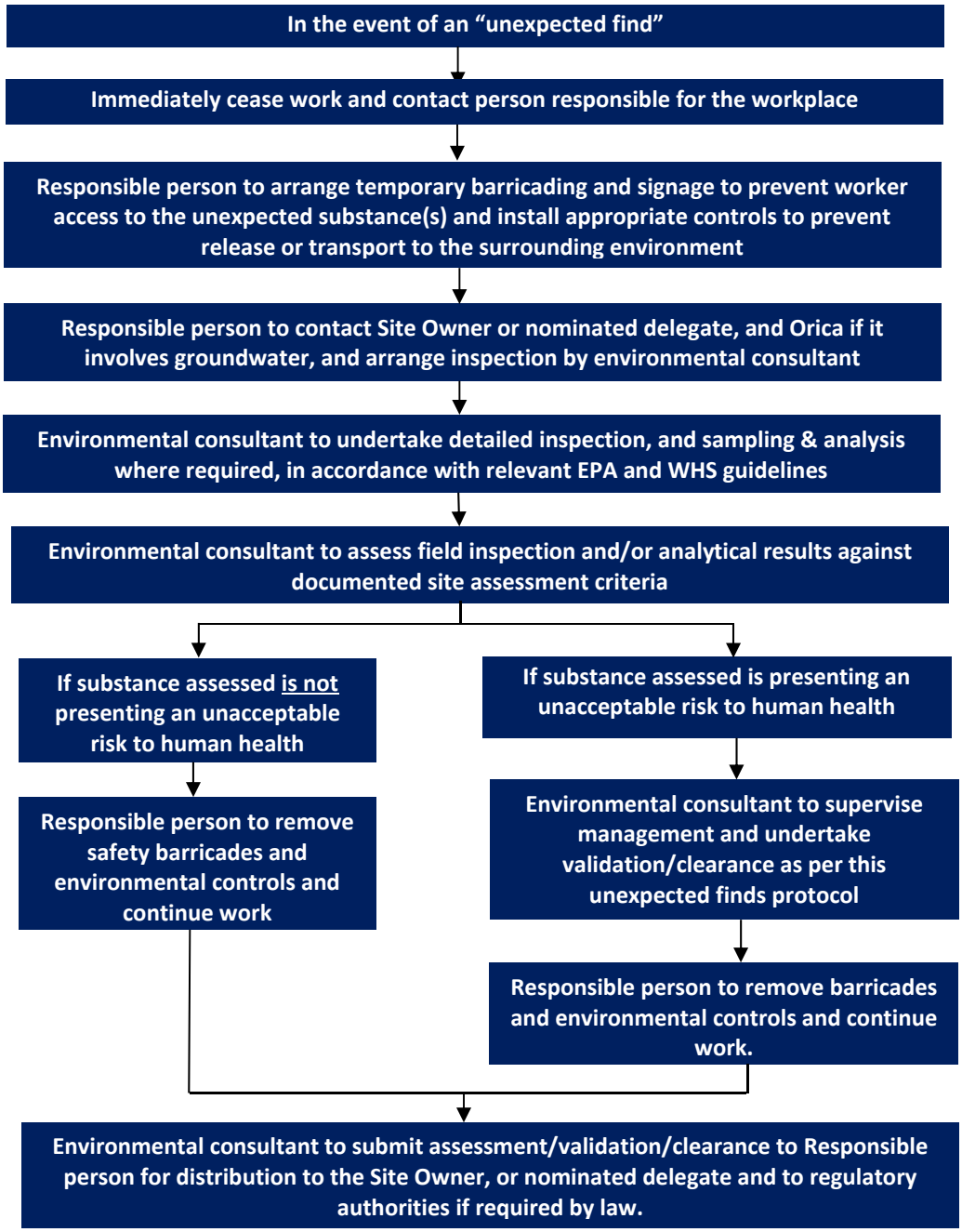
Table 1.1: Environmental Inspections

Inspection Time	Inspection Frequency
Following a breach of a cover layer, or a ground surface altering event	Following incident
Following break / repair of a cover layer	Upon completion
Routine inspection of cover layer across site	Annually, or as required (e.g. following any intrusive site works, or significant rainfall event)
Routine inspection of site surface for visible asbestos. It is essential that this inspection is completed by someone trained in identifying asbestos materials, preferably an appropriately qualified, trained and experienced environmental scientist / hygienist / competent person.	Annually for covered areas; quarterly for uncovered areas, or after any event that may result in disturbance or exposure of uncovered fill materials (e.g. following any intrusive site works, or significant rainfall event)

All records of inspections must be retained for a minimum period of five years.

Unexpected Find Protocol

In the event that possibly contaminated materials (e.g. white crystalline material, oil staining, oily liquids or sheens) or unidentified liquids are seen or smelt in soils, pits or TWL infrastructure, the following procedure must be followed:



After any Unexpected Find, the LTEMP must be reviewed and revised to reflect the new information and any changes that have been made to ensure ongoing site suitability and management.

Asbestos Identification Unexpected Find

If asbestos is identified at the ground surface or during intrusive works, the following steps must be followed:

- Stop the activity or process that resulted in the unexpected find;
- Implement the specific requirements for working with asbestos impacted materials; and
- Update the Asbestos Register in accordance with the Asbestos Management Plan (**Appendix G**)

1. Introduction

1.1 Background

Orica Australia Pty Ltd (Orica) engaged JBS&G Australia Pty Ltd (JBS&G) to prepare a Long-Term Environmental Management Plan (LTEMP) for Lots 1 and 2 in Deposited Plan (DP) 1258519 located at 2 Christina Road, Villawood, NSW (the 'site') (**Figure 1**). The purpose of the LTEMP is to manage contaminated soils that remain present on the site and contaminated groundwater present beneath the site and in down gradient off-site areas. The principal contaminants of concern (COC) are asbestos, volatile organic compounds (VOCs) and organochlorine pesticides (OCPs).

The site was initially part of a larger chemical manufacturing facility owned by the Commonwealth of Australia and used for the manufacturing of munitions, including trinitrotoluene (TNT), in 1941. The site was subsequently purchased by Taubmans in 1946, who manufactured a range of chemicals including chlorobenzene and DDT until the southern portion of the facility was purchased by ICIANZ Limited (ICIANZ) in 1953. ICIANZ (which later became Orica Australia Pty Ltd) continued to manufacture a wide range of agricultural and pharmaceutical chemicals until the site was closed in 2000. The site has been vacant since closure in 2000, with remediation of the 'Pharmaceutical Site' portion occurring in 2003/2004 and the 'Crop Care' portion in 2013-2015.

Previous site activities resulted in site soil contamination with VOCs, OCPs, polycyclic aromatic hydrocarbons (PAHs), inorganic mercury and asbestos that a Human Health and Environmental Risk Assessment (HHERA) (URS, 2011) considered requiring remediation. Groundwater on site and down gradient of the site was found to be impacted by site-related contaminants including VOCs and OCPs, but was considered to not require remediation by the HHERA (URS, 2011) subject to ongoing management.

In 2005 the NSW Environment Protection Authority (NSW EPA) declared the site a remediation site under the *Contaminated Land Management Act 1997* (*CLM Act 1997*) and issued a Remediation Order (No. 23019, Area 3200).

Soil remediation works were validated by JBS&G (2015a) to have been completed in accordance with the Remedial Action Plan (RAP) (AECOM, 2011). Integral parts of the remediation were excavation and onsite treatment of soils impacted by chemical COC. Cover of material identified to contain asbestos was also completed.

A LTEMP is required by the RAP (AECOM, 2011), RAP Addendum (AECOM, 2015) and validation report (JBS&G, 2015a) to ensure that contaminants remaining in site soils, and contaminated groundwater, are appropriately managed to ensure continued protection of human health for future site and off-site users, occupiers, visitors and contractors.

1.2 Objectives

The objectives of the LTEMP are to ensure that the contaminants remaining in site soils, and contaminated site groundwater, are appropriately managed to protect the health of future site users, occupiers, visitors and contractors, and that these contaminants are not transported from the site.

This LTEMP is not intended to apply to major excavations or construction activities or existing buildings. An activity-specific management plan, such as a Construction Environmental Management Plan (CEMP), should be prepared and implemented during major works.

1.3 Responsibilities

The **Site Owner** shall be responsible for implementation this LTEMP and any revisions. The responsibility of the site owner and others is further described in **Section 3.2**.

2. Summary of Site Conditions

2.1 Site Details

The site is located at 2 Christina Road, Villawood, NSW. The location of the site is shown in **Figure 1**. The site details are summarised in **Table 2.1** and described in more detail in the following sections.

Table 2.1: Summary Site Details

Lot/DP	Lots 1 and 2 DP 1258519
Address	2 Christina Road, Villawood, NSW
Site Area	12.6 hectares (ha)
Geographical Coordinates	Easting – 335249.18, Northing – 1505924.97
Local Government Authority	Bankstown City Council
Current Zoning	Commercial/Industrial

2.2 Site Description

The site is a large partially developed portion of land. The following key features describe the site at the time of inspection by JBS&G (2015b):

- The northwest of the site comprises the Western Storage Area (WSA) which is relatively flat and raised to a higher elevation than the surrounding land. The WSA comprises a cover of 300 mm of Virgin Excavated Natural Material (VENM) and geofabric marker layer overlying materials which have been identified to, or potentially contain, asbestos.
- The central and eastern portions of the site are flat with variable cover of vegetation, formed gravel roads, site fill materials, concrete hardstand and some built structures. VENM backfill covers former ISZ 1a/8 and ISZ 1b excavation.
- The southern central portion of the site is flat with variable cover of vegetation, bitumen pavement, built structures such as demountable buildings and site fill materials.
- The western portion of the site is flat with variable cover of vegetation, formed gravel roads, and site fill materials. The Pharmaceuticals Building is present in this portion of the site.

The layout of the site is shown on **Figure 2**. Former soil remediation areas (ISZ 1a/8, ISZ 1b, ISZ 5, ISZ 7, ISZ 9) from which impacted soils were excavated, the WSA and an additional area (ISZ 4a) that required remediation as a contingency measure due to the presence of Dense Non Aqueous Phase Liquid (DNAPL) in nearby groundwater monitoring wells, as described by URS (2015), are presented in **Figure 2**.

2.3 Extent of Impacted Material Remaining on Site

Materials impacted by chemical COC that the RAP (AECOM, 2011) identified as representing a potential risk to human health and the environment and consequently requiring remediation have been treated in accordance with the RAP (AECOM, 2011). Known impacted materials remaining on the site include:

- Fill/soil materials identified to contain, or potentially contain, asbestos that are under a VENM cover and marker layer within the WSA (**Figure 2**);
- Fill/soil materials identified to contain, or potentially contain, asbestos that are under a VENM cover layer within former ISZ soil remediation areas (**Figure 2**);
- Fill/soil materials potentially containing asbestos that are under a cover layer (grass, mulch, pavement) at areas outside the WSA and former ISZ soil remediation areas;
- Materials underlying the Pharmaceuticals Building footprint containing chemical COC that did not require remediation to make the site suitable for commercial/industrial use provided they remain covered by concrete pavement (the building floor); and

- Groundwater containing organic contaminants of potential concern COPC (Plume 1 to Plume 5) underlying the site (see **Figure 3**).

Given the complexity of the site and the limitations of any site investigation, there is the potential that materials containing COC that were not identified during the site investigations and remediation works remain.

The location of covered areas, including the WSA, former ISZ soil remediation areas and the Pharmaceuticals Building, are shown in **Figure 2**.

2.4 Extent of Impacted Material Remaining off Site

The HHERA (URS, 2011) concluded that COPC in groundwater did not present a significant risk to human health or the environment in off-site areas. However, identified site-related COPCs remaining off the site include groundwater containing dissolved-phase organic COPC within three plumes (Plume 1 to Plume 3) (see **Figure 3**).

2.5 Summary of Identified Contamination Issues

2.5.1 Chemical Contaminants in Soil

Remediation and validation of chemical contaminants in soil has been completed in accordance with the RAP (RAP) (AECOM, 2011), and as documented in JBS&G (2015a), to ensure that the site is suitable for ongoing commercial / industrial use.

The remediation was based on Remediation Goals set out in the RAP (AECOM, 2011) that were adopted from Risk Based Site Wide Criteria (RBSWC) for COPC in soils developed in the HHERA (URS, 2011). The Remediation Goals accommodated the scenario that contaminated soil containing all COPC identified at any depth may be brought to the surface during potential site development and allow for the excavation, validation and movement of materials across the site. The soil COPC are listed in

Table 2.2 and included OCPs, PAHs, VOCs, and mercury. The properties of the COPC listed in **Table 2.2** that are relevant to this LTEMP are described in **Appendix H**.

The HHERA (URS, 2011) also identified and developed Risk-Based Soil Criteria (RBSC) for individual areas of the site under scenarios where personnel only have access to that area (as opposed to the entire site) or not all COPC are present in that area. The RAP Addendum (AECOM, 2015) identified asbestos as an additional soil COC (**Section 2.5.2**).

Soils underlying the Pharmaceuticals Building footprint contain chemical COC at concentrations that URS (2011) determined do not present a risk provided that the concrete slab remains as a cover. Soils in other areas of the site that did not require remediation contain concentrations of chemical COPCs that the HHERA (URS, 2011) concluded do not present a risk to human health or the environment. Chemical COPCs in soil have the potential to cause aesthetic or odour issues.

Table 2.2: Soil COPC and RBSWC

Contaminant Name	Abbreviation	RBSWC^ (mg/kg)
Major Risk Contribution		
1,2,3-trichloropropane	-	0.5
1,4-dichlorobenzene	-	15
a-hexachlorocyclohexane	a-HCH (a-BHC)	30
b-hexachlorocyclohexane	b-HCH (b-BHC)	15
Benzene	-	5
DDX (DDT + DDE + DDD)	-	2000
Endosulfan II	-	100
g-hexachlorocyclohexane	g-HCH (g-BHC or lindane)	15
Hexachlorobenzene	HCB	5
Minor Risk Contribution		
1,2-dichloroethane	DCA or EDC	700
Vinyl chloride	VC	10
Chloroform	CFM	80
Carbon tetrachloride	CTC	10
Trichloroethene	TCE	400
Tetrachloroethene	PCE	5
Chlorobenzene	MCB	2500
Toluene	-	200
Ethylbenzene	-	200
Xylenes	-	800
Carcinogenic polycyclic aromatic hydrocarbons, as benzo(a)pyrene equivalents	Carcinogenic PAHs, as B(a)P equivalents^^	10
Bis(2-chloroethyl)ether	-	1
d-hexachlorocyclohexane	d-HCH (d-BHC)	1.2
Dieldrin	-	15
Inorganic mercury (total)	Hg	75

^ RBSWC were derived by URS (2011) under the scenario that contaminated soil containing all COPC identified at any depth may be brought to the surface during potential site development and to allow the excavation, validation and movement of materials across the site. URS (2011) should be referred to for alternate RBSC that may be applicable if access is limited to a portion of the site or not all COPC are present.
^^ As defined by Table 1A(1) in NEPC (2013).

2.5.2 Asbestos

Asbestos is defined in NEPC (2013) and Safe Work Australia (2020).

During remediation and validation works at the site asbestos containing materials (ACM) and friable asbestos were identified in fill materials.

Asbestos remains in materials underlying the cover layer in the WSA and at a minimum in remediation areas ISZ 1a/8 and ISZ 5.

A detailed inspection of the ground surface in accessible areas, that was undertaken during the period October - December 2015 (JBS&G, 2015b), did not visually identify ACM at the ground surface at that time.

There is potential for asbestos that was not identified in previous investigations, remediation and the remediation validation (JBS&G, 2015a), or the detailed visual inspection of the site surface (JBS&G, 2015b) to be present below the ground surface at the site. Intrusive works below the ground surface or changes to the site surface may uncover asbestos. The health effects of asbestos are detailed in enHealth (2005).

A description of the cover layers is provided in **Section 2.8**. Management measures for these materials, in the event that disturbance of the ground is required, are provided in **Section 4.1**. Management measures for these materials, in the event that it becomes necessary for the cover layers to be breached, are provided in **Section 4.8**.

2.5.3 Groundwater

Groundwater is present underlying the site and downgradient off-site areas. COPC present in groundwater at the site include those that have either originated directly, as products or waste products, from manufacturing processes carried out on the site or indirectly as degradation products of chemicals formed in those processes. DNAPL has historically been identified at a number of locations on the site. In addition, concentrations exceeding 1% of the contaminant's pure phase solubility have also been identified implying the potential presence of DNAPL in upgradient (on site) locations. The HHERA (URS, 2011) concluded that COPC in groundwater did not present a significant risk to human health or the environment at the site (where no source zones are present) or in off-site areas.

In 2019 (Golder, 2019b) an assessment of the presence of per- and poly-fluoroalkyl substances (PFAS) in groundwater was completed. The assessment concluded that "*whilst PFAS are present in groundwater, the concentrations recorded do not currently point to significant risks to human health of the environment*".

The RAP (AECOM, 2011) identified five groundwater plumes. Their most recent extent was mapped by Golder (2019a) (**Figure 3**). AECOM described the plumes as follows:

- **Plume 1**: Inferred Primary source is the former DDT formulation plant and adjacent benzene/chlorobenzene (MCB) storage area. DNAPL (a secondary source) has been historically identified at some monitoring locations on the site. Key contaminants include MCB, DDX, benzene, toluene and trichloroethene (TCE).
- **Plume 2**: Inferred source is the former IHPT process building, tank farm and EDC recovery plant, effluent stripping plant and associated TWLs. Key contaminants include DDX and 1,2-dichloroethane (DCA) with minor benzene, toluene and TCE.
- **Plume 3**: Inferred source is the former Effluent Treatment Plant (ETP) and associated TWLs. DNAPL has been historically identified at some monitoring locations on the site. Key contaminants include DDX, MCB, DCA, TCE, benzene and toluene.
- **Plume 4**: Inferred source has not been fully defined. Key contaminants include DDX, DCA and TCE.
- **Plume 5**: Inferred source is impacted soils associated with TWLs. Key contaminants include DDX, MCB and DCA.

While the HHERA (URS, 2011) concluded that groundwater did not present a significant risk to human health or the environment at the site or in off-site areas, human health risk-based groundwater criteria (RBGC) were developed for contaminants in groundwater with the intention that they be used as trigger levels for the long-term groundwater monitoring program. The RBGC were derived for COPC identified in off-site groundwater and are protective of human health, in particular of exposures by long-term workers within existing (slab-on-grade construction) buildings and intrusive workers. The RBGC were amended in 2018 and 2020 (EnRiskS 2018 and EnRiskS 2020).

The most significant exposure pathway to human receptors on- and off- site that was considered by URS (2011) to be potentially complete was inhalation of volatile chemicals as vapours that had migrated (from the top of the groundwater table) through the overlying soils and into buildings, outdoor excavations and air. The HHERA (URS, 2011) considered that direct contact with groundwater during normal day-to-day work on the site and in off-site areas would not be expected to occur, and there would also be limited potential for direct contact to occur during intrusive works associated with the maintenance of underground utilities. This is because groundwater is at least 2 m below ground level beneath the site and off-site areas, is not considered to have a likely beneficial use in this area, and is not extracted or used in the area (URS, 2011). There is potential for exposure of intrusive workers to chemical COPC in groundwater during deep excavation works.

The EnRiskS (2020) update of the RBGC was prepared to ensure that all current and future uses in off-site areas were addressed by the risk assessment. The assessment reviewed the zoning for the downgradient off-site area (IN1 General Industrial under the *Bankstown Local Environmental Plan (2015))* and assessed all permissible uses. In addition, RBGC were also developed for the case that basements were constructed in downgradient areas.

Potential groundwater contaminants and RBGC are presented in **Table 2.3**. The properties of these materials are described in **Appendix H**.

Table 2.3: Groundwater Trigger Values

Contaminant Name	Abbreviation	*Groundwater Trigger Value (RBC) (mg/L)*				
		Scenario 1: Commercial / industrial building - warehouse (slab)	Scenario 2: Commercial / industrial building - offices (slab)	Scenario 3: Commercial / industrial buildings with basement level car park	Scenario 4: Excavations in areas where groundwater is shallow (<1.5 m bgl)	Scenario 5: Excavations in areas where groundwater is deeper (>1.5 m bgl)
Hexachlorobenzene	HCB	-	-	-	0.4 (NL)	-
1,2-dichloroethane	DCA or EDC	620	170	180	200	98000 (NL)
Vinyl chloride	VC	40	10	100	80	53000 (NL)
Chloroform	CFM	2100	600	1400	60	27000 (NL)
Trichloroethene	TCE	30	8	40	10	8300 (NL)
Tetrachloroethene	PCE	2600 (NL)	730 (NL)	4200 (NL)	100	78000 (NL)
1,1,2-trichloroethane	-	1800	520	330	13	6200 (NL)
Chlorobenzene	MCB	18000 (NL)	5200 (NL)	12000 (NL)	390	220000 (NL)
Benzene	B	80	20	80	22	11000 (NL)
Toluene	T	100000 (NL)	28000 (NL)	120000 (NL)	2300 (NL)	2200000 (NL)
a-hexachlorocyclohexane	a-HCH (a-BHC)	-	-	-	230 (NL)	-
b-hexachlorocyclohexane	b-HCH (b-BHC)	-	-	-	0.6 (NL)	-
d-hexachlorocyclohexane	d-HCH (d-BHC)	-	-	-	85 (NL)	-
g-hexachlorocyclohexane	g-HCH (g-BHC or lindane)	-	-	-	85 (NL)	-
Dieldrin	-	-	-	-	1.7 (NL)	-
Dichlorophenyl ethanes and ethenes	DDX (DDT + DDE + DDD)	-	-	-	2 (NL)	-

Note: The Trigger Values are the RBGC developed by EnRiskS (2020) for COPC identified in on- and off-site groundwater and are protective for long-term workers and intrusive workers. They are intended to be used to screen analytical results to trigger additional risk assessment or contingency measures.

- No RBC derived as CoPC not volatile and only the vapour inhalation pathway is potentially complete.
(NL) derived RBC exceeds the solubility limit for the pure chemical, hence it is unlikely that the chemicals will be present in groundwater at a concentration that would ever pose an unacceptable risk.

** Additive risks should be addressed in the application of these criteria particularly for all the CHCs. Where these RBC are applied, the ratio of concentration to RBC needs to be calculated for each CHC. The sum total of all ratios needs to be less than or equal to 1 for additive risks to be acceptable.

2.5.4 Soil Vapour / Ambient Air

The HHERA (URS, 2011) concluded that inhalation exposure in off-site areas represents a low and essentially negligible risk, and did not represent an unacceptable risk onsite except in ISZ5, which has since been remediated to ensure the site is suitable for commercial/industrial use.

In order to support the conclusions of the HHERA (URS, 2011), a program of ambient air and soil vapour sampling was undertaken at the site between 2007 and 2012, as documented by URS

(2015b). URS showed that concentrations of COPC in soil gas and ambient air, on site and in off-site areas overlying the groundwater plumes, are steady or decreasing. URS (2015b) concluded that these data supported the conclusions of the HHERA (URS, 2011), and that further sampling was not required.

2.6 Other Materials of Note

2.6.1 Bricks

Bricks that were characterised as environmentally suitable for retention on site (JBS&G, 2015a) have been placed within ISZ1b (grid reference V8 – X6, **Figure 2**) at an approximate depth of 3 to 4 m below current ground surface. Some of the bricks are coated with lead-based paint and consequently may require management if disturbed.

2.6.2 Granular Activated Carbon/Zeolite/Sand

Mixed-media materials containing natural zeolite, granular activated carbon and sand which have been characterised as being environmentally suitable for retention on site (JBS&G, 2015a), are present within fill materials underlying the cover at the WSA.

2.6.3 Crushed Concrete

A stockpile of crushed concrete is present at grid reference P30 – T28 (**Figure 2**). The stockpile was inspected and no visual or olfactory indicators of contamination, including visible asbestos, were identified at that time, as documented in JBS&G (2015b).

2.6.4 Former Trade Waste Lines and Infrastructure

Former Trade Waste Lines (TWLs) and associated infrastructure remain under the ground surface at the site. It is unlikely, but possible, that waste chemicals are present in the lines. **Appendix C** provides an indication of the location of former TWL infrastructure.

2.7 Implications of Residual Contamination

The key implications of residual contamination include:

- The primary issue associated with the asbestos remaining at the site is managing the risk of inhalation of respirable fibres if the materials were to be disturbed.
- A secondary issue with the presence of the asbestos remaining at the site is disposal of waste spoil that may contain asbestos in the event that excavation of materials is required.
- The primary issue associated with the chemical COCs remaining covered beneath the Pharmaceuticals Building, or chemical COPCs not identified during investigations or remediation, is managing the risk of direct contact.
- A secondary issue with the presence of the chemical COPC remaining at the site is disposal of waste spoil that may contain chemical COPC and aesthetic issues in the event that excavation of materials is required.
- An issue with bricks retained at depth at grid reference V8 – X6 is disposal and managing the risk of direct contact or leaching if those bricks coated with lead-based paint are exposed.
- The primary issue associated with the chemical COCs at concentrations exceeding RBGC in groundwater underlying the site is managing the risk of direct contact and inhalation of vapours if groundwater is encountered during deep intrusive works.
- A secondary issue associated with the chemical COCs in groundwater underlying the site is disposal of waste groundwater if encountered during deep intrusive works.

2.8 Site Cover Layers

A description of the cover layers was provided by JBS&G (2015a). The purpose of the cover layers is to provide physical separation between site users and underlying soil identified as impacted, or potentially impacted, with asbestos and/or other contaminants. The cover layers at the site comprise:

- WSA – A geofabric marker layer overlying asbestos-impacted materials and, above the marker, a barrier layer generally more than 0.3 m thick comprised of VENM, as shown on **Figure 2** and the survey plan provided in **Appendix B**. The placement of the marker and barrier layers is detailed in the validation report (JBS&G, 2015a).
- ISZs – A barrier layer comprising VENM of nominal minimum thickness of 0.1 m and with an extent shown in **Figure 2** and the survey plan provided (for ISZ 1a/8 and ISZ 1b) in **Appendix B**. ISZ 7 was also backfilled with VENM.
- Pharmaceuticals Building – existing concrete pavement and building.

Various areas of existing pavement (asphalt and concrete slabs), grass and mulch are also present, as described by JBS&G (2015b).

3. Implementation of the LTEMP

3.1 Application of the LTEMP

This LTEMP is to be applied at all times during works at the site and will apply indefinitely for future site operations.

This LTEMP will come into force on the date of issue of the Site Audit Statement (SAS) for soil remediation works.

The requirements of this LTEMP are intended to apply to any activities within the site, but are particularly important for those activities which could involve disturbance of cover layers or exposure of contaminants in soil beneath cover layers or uncovered ground surface (i.e. any intrusive works); or exposure to groundwater (i.e. deep intrusive works). Such activities may include, but not be limited to, the following:

- Demolition and removal of any ground cover, pavements or buildings;
- Underground utility installation, maintenance or removal; or
- Excavations (e.g. dug, cut, piled or bored).

Some components of the LTEMP apply to off-site groundwater monitoring and management.

3.2 Roles and Responsibilities under the LTEMP

3.2.1 Site Owner

A copy of this LTEMP must be provided to all persons acquiring ownership of all or part of the site (Site Owners).

A Site Owner must provide a copy of this LTEMP to any successor in Title on or prior to transfer of ownership.

A Site Owner must ensure that a copy of this LTEMP is provided to all lessees and persons with management or control of a workplace at the site.

A Site Owner must act with reasonable care to maintain the integrity of current or future environmental monitoring locations and allow site access for future environmental monitoring under this LTEMP or the GMP.

As required by the Environmental Deed, a Site Owner must notify Orica of changes in site use or activities that may significantly change or interfere with environmental monitoring under this LTEMP or the GMP.

3.2.2 Persons with management or control of a workplace at the site

It is the responsibility of a person with management or control of a workplace at the site, or their nominated delegate, to ensure that an appropriate responsible person is nominated and made responsible for the implementation of the provisions of the LTEMP. This person must be made aware of, and must understand, all the provisions of this LTEMP, and must be identified in Schedule 1 (**Appendix D**) of this LTEMP, which must be updated as required.

The responsible person must ensure that the provisions of this LTEMP are implemented.

3.2.3 Orica

Orica has the following responsibilities:

- Implement the Groundwater Management Plan (GMP) in accordance with **Section 4.9**;
- Maintain on-site and off-site monitoring wells that are required for the GMP;

- Provide GMP monitoring results to the Site Owners;
- Notify the Site Owners of changes in groundwater conditions at the site that may affect suitability of the site for commercial/industrial use;
- Development and implementation of contingency measures in response to changes in groundwater conditions at the site that may affect suitability of the site for commercial/industrial use; and
- Address obligations under Part 3 of the *Contaminated Land Management Act* 1997 or other regulatory obligations imposed by the EPA.

3.3 Applicability of Relevant Legislation

The site will be a workplace or workplaces and, therefore, all the relevant provisions of the *Work Health and Safety Act 2011 (NSW)* (WHS Act) and the *Work Health and Safety Regulation 2017 (NSW)* (WHS Regulation) will apply to the site.

Since asbestos is present at the site, it is required that an Asbestos Management Plan be prepared and an asbestos register be maintained for the workplace to comply with the requirements of the WHS Regulation.

Other Legislation and Regulations are potentially applicable to the site. The Site Owner and persons with management or control of a workplace at the site are required to satisfy themselves that all permits and licences required by such legislation and regulations have been obtained and their conditions satisfied. Potentially applicable legislation includes:

- *Contaminated Land Management Act 1997* (CLM Act 1997).
- *Environmental Planning and Assessment Act 1979* (EP&A Act 1979).
- *Protection of the Environment Operations Act 1997* (POEO Act 1997).

together with associated legislative instruments and approved guidelines.

3.4 Summary of Provisions of this LTEMP

The provisions of this LTEMP are summarised as follows:

- Site personnel or contractors required to conduct intrusive works at the site must be inducted into the LTEMP and must be aware of their responsibilities with regard to health and safety and protection of the environment;
- A copy of this LTEMP is to be supplied to all persons conducting intrusive works on the site;
- The integrity of the cover layers must be maintained by application of the procedures outlined in this LTEMP;
- Site surface conditions must be inspected (as detailed in **Section 4.1**) to ensure integrity of covers and that no visible asbestos is present; and
- The health and safety and environmental requirements specific to the contamination issues on the site as outlined in this LTEMP must be complied with (refer to **Section 5**).

An activity-specific management plan, such as a CEMP, is required to be developed for any significant intrusive activity and any major construction activities.

4. Management Strategy

4.1 Requirements for Intrusive Works

Where any intrusive works are required, the following management measures will apply:

- Prior to any intrusive work commencing, approval for the works must be sought from the person responsible for the management of the LTEMP (**Section 3**);
- Site personnel or contractors required to conduct intrusive works at the site must be inducted into the LTEMP and the Asbestos Management Plan (AMP) (**Appendix G**), and must be aware of their responsibilities with regard to health and safety and protection of the environment;
- Any repairs to cover layers shall be recorded as outlined in **Section 4.10** and changes should be detailed in an updated **Appendix A**, if required.

4.2 Specific Requirements for Those Working with Asbestos Impacted Material

ACM and friable asbestos are present in soil underlying cover layers and are present or potentially present underlying the ground surface at other areas across the site. Work involving any breaches of the cover layer or ground surface at uncovered areas (i.e. intrusive works) will be undertaken as detailed in the AMP (**Appendix G**).

At the completion of the works the cover layer (if formerly present) shall be re-instated in accordance with the requirements of this LTEMP. Inspection of the work area for asbestos at the ground surface, with appropriate management of asbestos if visually identified, in accordance with requirements in NEPC (2013) and enHealth (2005) should be conducted. The changes should be detailed in an updated **Appendix E** and the Asbestos Register updated.

4.3 Specific Requirements for Those Working with Soil Materials Containing Chemical COPC

Remediation works were validated to have been conducted in accordance with the RAP (AECOM, 2011) to ensure site suitability for commercial/industrial use. However, COPC in soils are known to remain at the site at concentrations that do not represent a risk to workers or the environment. Soils containing chemical COPC may also be odorous. The following management measures will apply for those working with soil materials containing chemical COPC:

- Requirements for intrusive works (**Section 4.1**) shall be followed;
- If the soil materials are, or are suspected to be odorous, appropriate odour controls (including of the excavation and excavated materials) shall be required to prevent odour impact at the workplace boundary; and
- If gross contamination is suspected based on visual or olfactory indicators during works, then provisions in the Unexpected Finds Protocol (**Section 4.11**) shall be followed.

4.4 Specific Requirements if Trade Waste Lines and Associated Infrastructure Are Encountered

Trade Waste Lines (TWLs) and associated infrastructure remain under the ground surface at the site. It is unlikely, but possible, that waste chemicals are present in the lines. **Appendix C** provides an indication of former TWL infrastructure. If TWLs or associated infrastructure are, or are expected to be, encountered during site works, then the following management measures will apply:

- Requirements for intrusive works (**Section 4.1**) shall be followed;
- Visual inspection of the TWL section encountered should be conducted for the potential presence of liquids;

- If liquids are observed to be present they should be assumed to be contaminated (refer Unexpected Finds Protocol - **Appendix E**) until proven otherwise;
- Prevent release of contaminated liquids to the environment; and
- Ends of TWL sections, if encountered, at the extent of the work area should be capped or plugged with cement grout or other suitable material to prevent or minimise future egress or ingress of liquids or materials.

4.5 Specific Requirements for the Pharmaceuticals Building

Soils remaining beneath the Pharmaceuticals Building were found by URS (2011) to be suitable for commercial/industrial use provided that the building and concrete slab remain as cover.

If the cover is removed or cover integrity is altered then further assessment of potential risks to site users and the environment by a suitable experienced environmental consultant is required.

Any soil/fill excavated during works in this area must be reinstated underneath the building or concrete slab.

4.6 Specific Requirements if Groundwater is Encountered

Contaminants present in groundwater within Plume areas have been assessed to not present a significant risk to human health or the environment at the site or in off-site areas unless groundwater is encountered in excavations. Due to the depth of groundwater (typically exceeding 2 metres) and aquifer properties, exposure of site users to groundwater is considered by URS (2011) to be unlikely.

Groundwater should not be extracted at the site for any purpose other than groundwater monitoring. This does not apply to construction dewatering or remediation provided an activity-specific management plan (e.g. a CEMP) is prepared.

Groundwater may be encountered by workers during deep intrusive works. For such works, an activity-specific management plan, such as a CEMP, is recommended to be developed and implemented. This should include standard worker health and safety, and environmental, procedures.

If groundwater potentially containing COPCs at concentrations exceeding RBGC is likely to be encountered then supplementary worker health and safety, and environmental, procedures are recommended to ensure a safe work environment to:

- Minimise direct contact of groundwater with workers;
- Show and ensure there is a safe atmosphere for workers; and
- Prevent release of contaminated groundwater or liquids to the environment.

Characterisation (e.g. by sampling and analysis at an appropriately accredited laboratory) of the groundwater may be undertaken to assist in determination of the required supplementary procedures.

4.7 On-Site Soil Management

Any soil/fill excavated during on-site works, such as maintenance of underground services, should be securely stockpiled separately from cover layer material.

Stockpiles must be placed on a sealed surface or on plastic sheeting to prevent cross-contamination of unsealed surfaces.

Stockpiles must be placed in a secure location on site and covered if they are to remain for more than 24 hours.

Appropriate dust, sediment and erosion controls must be implemented and maintained for the duration of soil management works, consistent with Landcom (2004) *Managing Urban Stormwater: Soils and Construction* guide and other relevant guidelines/standards.

Any material excavated from below cover layers should be assumed to contain asbestos and, unless shown otherwise, must be re-used below the cover layer. Cover layer material cross-contaminated with soil from below the cover layer must be re-used below the cover layer.

Excavations or stockpiles of odorous materials shall be covered or managed to prevent odour impacts at the boundary of the workplace.

Exposed soils in the walls and floors of excavations and stockpiles of spoil should be covered or kept moist to prevent the generation of dust from these sources. Care should be taken to not over-wet excavations and/or stockpiles such that excess runoff is generated.

For substantial site works, appropriate dust controls and monitoring at the work site boundary should be applied.

4.8 Cover Management

The site cover layers, as described in **Section 2.8,** must be maintained in order to prevent future site users, occupiers, visitors and contractors being exposed to the asbestos contamination.

The cover surface shall be maintained such that erosion and sediment transport is prevented.

If the soil cover layer at the WSA and ISZs requires replacement, equivalent materials or a concrete slab or permanent pavement with imported compacted sub-base materials and marker layer would be suitable.

Any changes or substitution of the soil barrier layer or relocation of the geotextile marker layer should be noted in revisions of the LTEMP, which should include revised as-built drawings to identify any changes to the composition in the barrier or marker layers. The changes should be incorporated into **Appendix A** of this LTEMP.

Periodic inspections of cover layers and ground surface are required in accordance with **Section 4.12**.

Breach of Cover Layers

The following procedure will be followed in the event that the cover layers are unintentionally breached, such that the underlying contaminated soil is exposed:

- Stop the activity or process that has exposed the impacted material;
- Assess the hazards associated with the exposure of the impacted material and implement appropriate procedures to address the hazards (e.g., temporary cover);
- Repair the cover layers such that the impacted material is once again isolated beneath the cover;
- Collect and secure any impacted material that may remain exposed and stockpile securely so that it is protected from casual access;
- Review the activity or process that led to the exposure of the impacted material and revise procedures or actions accordingly to prevent a reoccurrence;
- Complete an environmental incident/corrective action report; and
- Review and revise the LTEMP to reflect any changes that have to be made to prevent a reoccurrence.

4.9 Groundwater – Ongoing Management

Orica shall implement the Groundwater Management Plan (GMP) (JBS&G 2020) to meet requirements in the RAP (AECOM, 2011) to:

- "*Monitor and confirm contaminant concentrations associated with the identified groundwater plumes in onsite and off-site locations;*
- *Assess possible changes to contaminant concentrations at the Site in areas downgradient of Remediation Areas following the proposed excavation works. This may occur following a high rainfall event at the completion of the excavation works; and*
- *Facilitate contingency planning in the event that the groundwater plumes are found to migrate faster than predicted."*

The GMP broadly comprises periodic sampling using a network of monitoring wells located on and off site within the identified groundwater plumes and inferred historical source areas. The samples obtained are analysed for groundwater COPC. The RBGC derived by EnRiskS (2020) are intended to be used as trigger levels to assess whether additional risk assessment or contingency actions are required.

Additional procedures for implementation when groundwater is encountered are detailed in **Section 4.6**.

ISZ 4a Fluid Recovery System

Due to the historical identification of dense non-aqueous phase liquid (DNAPL) and elevated COPC concentrations at some on-site locations within Plume 3, a fluid capture and recovery contingency system was installed in accordance with URS (2015) as a contingency measure as part of soil remediation works. This system's location is shown on **Figure 2** and broadly comprises:

- A 300 mm thick aggregate layer at approximately 6 metres below ground surface which drains groundwater via collection pipes to a sump; and
- A 100 mm diameter uPVC extraction well (MW403, **Figure 3**) with machine slotted screen of nominal 0.4 mm slots in the sump.

This system is monitored by Orica in accordance with the GMP.

4.10 Waste Management

Waste material (solid or liquid) excavated, extracted or recovered should be classified and disposed of off-site in accordance with EPA guidelines (NSW EPA, 2014) or guidelines that may be in force at that time. Waste must be managed in accordance with the provisions of the *Protection of the Environment (Waste) Regulation 2014* or successor instruments.

Some COPC, including OCPs and hexachlorobenzene, are classified as scheduled chemicals. As such, waste materials containing these compounds must be managed in accordance with the NSW EPA *Scheduled Chemical Wastes Chemical Control Order 2004*.

4.11 Unexpected Finds Protocol

The procedure in **Appendix E** should be followed if an unexpected find is encountered.

4.11.1 Identification of Asbestos

Asbestos is present underlying cover at the WSA and ISZ areas, and, although asbestos was not visually identified at the ground surface at the time of inspection by JBS&G (2015b), it is potentially present within fill materials outside these areas.

The following procedure will be followed in the event of identification of asbestos at the ground surface or during intrusive works:

- Stop the activity or process that resulted in the unexpected find;
- Implement specific requirements for those working with asbestos impacted material detailed in **Section 4.2**;
- Update the Asbestos Register in accordance with the Asbestos Management Plan (**Appendix G**); and
- Review and revise the LTEMP to reflect any changes that have to be made to ensure ongoing site suitability.

4.11.2 Identification of Possible Chemical Contamination

Remediation works were validated to have been conducted in accordance with the RAP (AECOM, 2011) to ensure site suitability for commercial/industrial use. However, there is potential that chemical contamination not previously identified by investigations and remediation work is present in soils, groundwater or liquids in TWL infrastructure.

The following procedure will be followed in the event of visual (e.g. white crystalline material, oil staining, oily liquids or sheens) or olfactory (e.g. solvent odour) indicators of site-related contaminants, or if DNAPL or unidentified liquids in soils, pits or TWL infrastructure are encountered:

- Stop the activity or process that resulted in the unexpected find;
- Assess the hazards associated with the exposure of the impacted material and implement appropriate procedures to address the hazards. These shall include supplementary worker health, safety and environment procedures to ensure a safe work environment (i.e. minimise direct contact of impacted material with workers, show and ensure there is a safe atmosphere for workers) and prevent release of contaminated materials to the environment. These procedures may include controls such as temporary cover or containment, additional personnel protective equipment and air monitoring;
- Collect and secure any impacted soil or liquid that may remain exposed and stockpile/store securely so that it is protected from casual access;
- Implement decontamination procedures to prevent contamination being transported via workers, tools, equipment and clothes from the work area;
- Review the activity or process that led to the unexpected find and revise procedures or actions accordingly to prevent a reoccurrence;
- Complete an environmental incident/corrective action report; and
- Review and revise the LTEMP to reflect any changes that have to be made to ensure ongoing site suitability.

Characterisation (e.g. by sampling and analysis at an appropriately accredited laboratory) of the soil or groundwater may be undertaken to assist in determination of the required supplementary procedures.

4.12 Environmental Inspections

Inspections shall be conducted by a person responsible for the workplace or a nominated suitably experienced and competent person. Inspections shall be made at the following times throughout the occupation of the site (**Table 4.1**).

Table 4.1: Environmental Inspections

Inspection Time	Inspection Frequency
Following an accidental breach/penetration of a cover layer, or an event that may significantly alter ground surface condition	Following incident

Inspection Time	Inspection Frequency
Following break / repair of a cover layer	Upon completion
Routine inspection of cover layer across site	Annually, or as required (e.g. following any intrusive site works, or significant rainfall event)
Routine inspection of site surface for visible asbestos. It is recommended this inspection is completed by someone trained in identifying asbestos materials, preferably an appropriately qualified, trained and experienced environmental scientist / hygienist / competent person.	Annually for covered areas; quarterly for uncovered areas, or after any event that may result in disturbance or exposure of uncovered fill materials (e.g. following any intrusive site works, or significant rainfall event)

Records of the inspection shall be retained for a minimum period of five years.

5. Health and Safety Management

It is the responsibility of persons with management or control of workplaces at the site to ensure that comprehensive health and safety programs that comply with the requirements of the WHS Regulation and are appropriate for the activities undertaken at the site are implemented. Given the presence of contaminants including asbestos and chemical COPC at the site, additional protocols and procedures that address the specific hazards posed by the identified COPC must be included in the overall health and safety plans that are implemented.

6. Revision of the LTEMP

It may, from time to time, be necessary to revise this LTEMP to reflect changes to legislation, changes to conditions on site and/or improvements in technologies or knowledge.

In particular, it is recognised that this LTEMP will require revision immediately following development of the site to incorporate changes to site conditions due to the development activities and address aspects of the development that could not be foreseen when this initial version was prepared.

Revision of the LTEMP should be undertaken by an appropriately qualified and experienced environmental professional. It is recommended that the revised document be reviewed by a NSW Contaminated Site Auditor accredited under the *CLM Act 1997*. Copies of the revised LTEMP should be distributed to the current Site Owners and occupiers and all other persons nominated on the distribution lists in Schedule 1 (**Appendix F**) for on-going implementation.

7. Schedules

The following schedules are attached to (**Appendix F**) and form part of this LTEMP:

- Schedule 1A: Site Owners
- Schedule 1B: Persons with Management or Control of Workplace
- Schedule 1C: Inducted Persons
- Schedule 2: Implementation Schedules

Additions to the Schedules shall not be regarded as constituting revisions or amendments to the LTEMP.

8. References

AECOM (2011) *Remedial Action Plan, 2 Christina Rd, Villawood, NSW*. AECOM Australia Pty Ltd, Ref S4149701, 17 March 2011

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ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia

AS (2005) *AS4482.1-2005 - Guide to the investigation and sampling of sites with potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds*. Australian Standards

Bankstown (2015) *Bankstown Local Environmental Plan 2015.* https://www.legislation.nsw.gov.au/#/view/EPI/2015/140/whole Accessed 23 April 2020

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DEC, NSW (2006) *Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd Edition)*, NSW DEC

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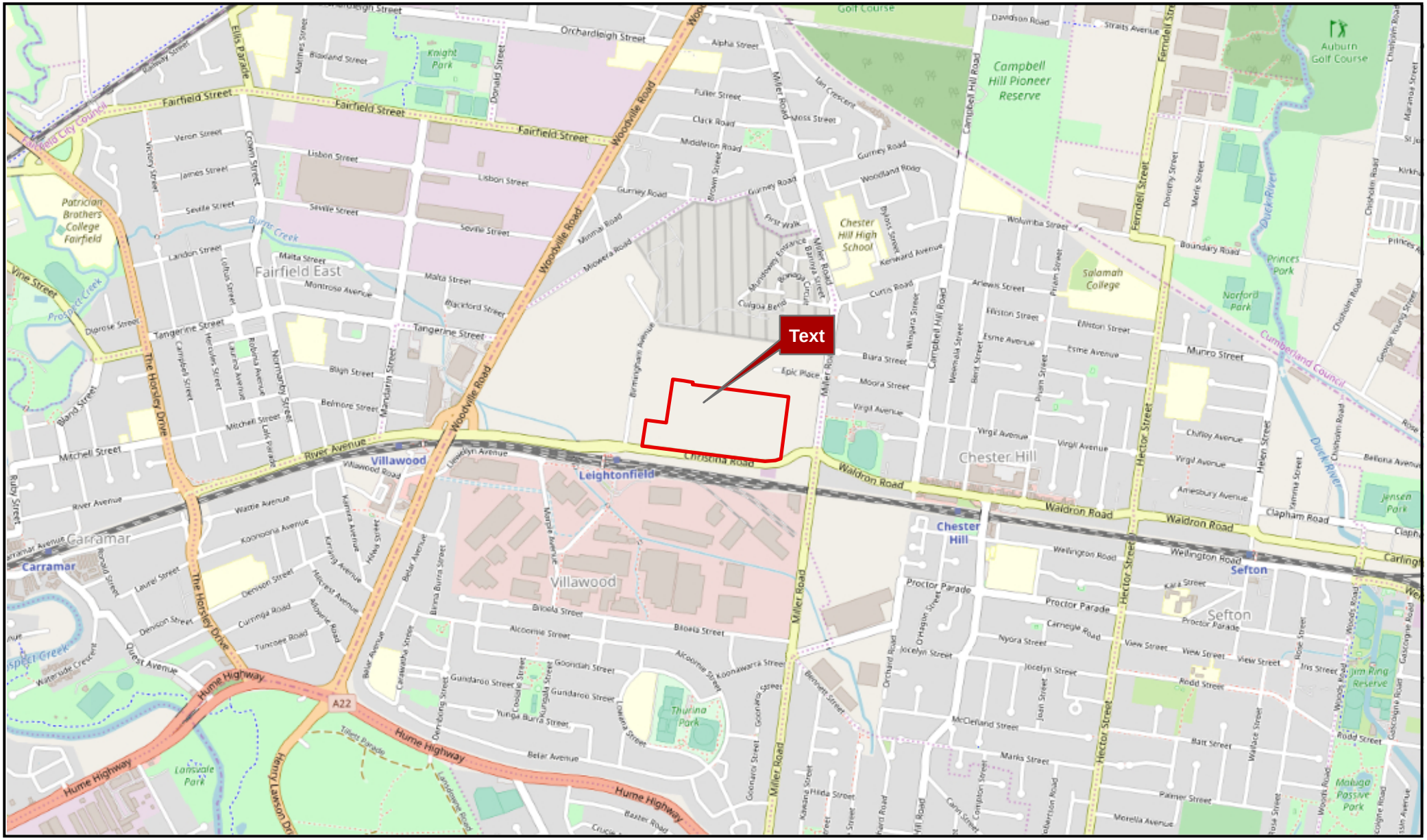
9. Limitations

This document should not be amended in any way without prior approval by JBS&G.

If this document is revised, it will become a new document.

Compliance with this LTEMP is a condition of a site audit statement that determines the suitability of the site for current and future uses. When the LTEMP is revised or replaced, the revised or replacement LTEMP must be reviewed and approved by a Site Auditor accredited under the *CLM Act 1997*.

Appendix A Figures



Source: Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA

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Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
B	Original Issue - R02	RF	04-11-2019

Legend:

Approximate Site Boundary

JBS&G **Figure 1: Site Location**

Client: Orica Australia Pty Ltd

Project: Lot 1 & 2 DP1258519 - LTEMP

Job No: 56506 File Name: 56506_01

Source: Base Image - © Near Map www.nearmap.com, imagery date 5-12-2015

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Scale:1:1,750

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
B	Original Issue - R02	RF	04-11-2019

Legend:

- Approximate Site Boundary
- Western Storage Area
- ISZ Excavation Areas
- Western Storage Area - Coordinates
- ISZ Excavation Areas - Coordinates

JBS&G **Figure 2: Site Layout**

Client: Orica Australia Pty Ltd

Project: Lot 1 & 2 DP1258519 - LTEMP

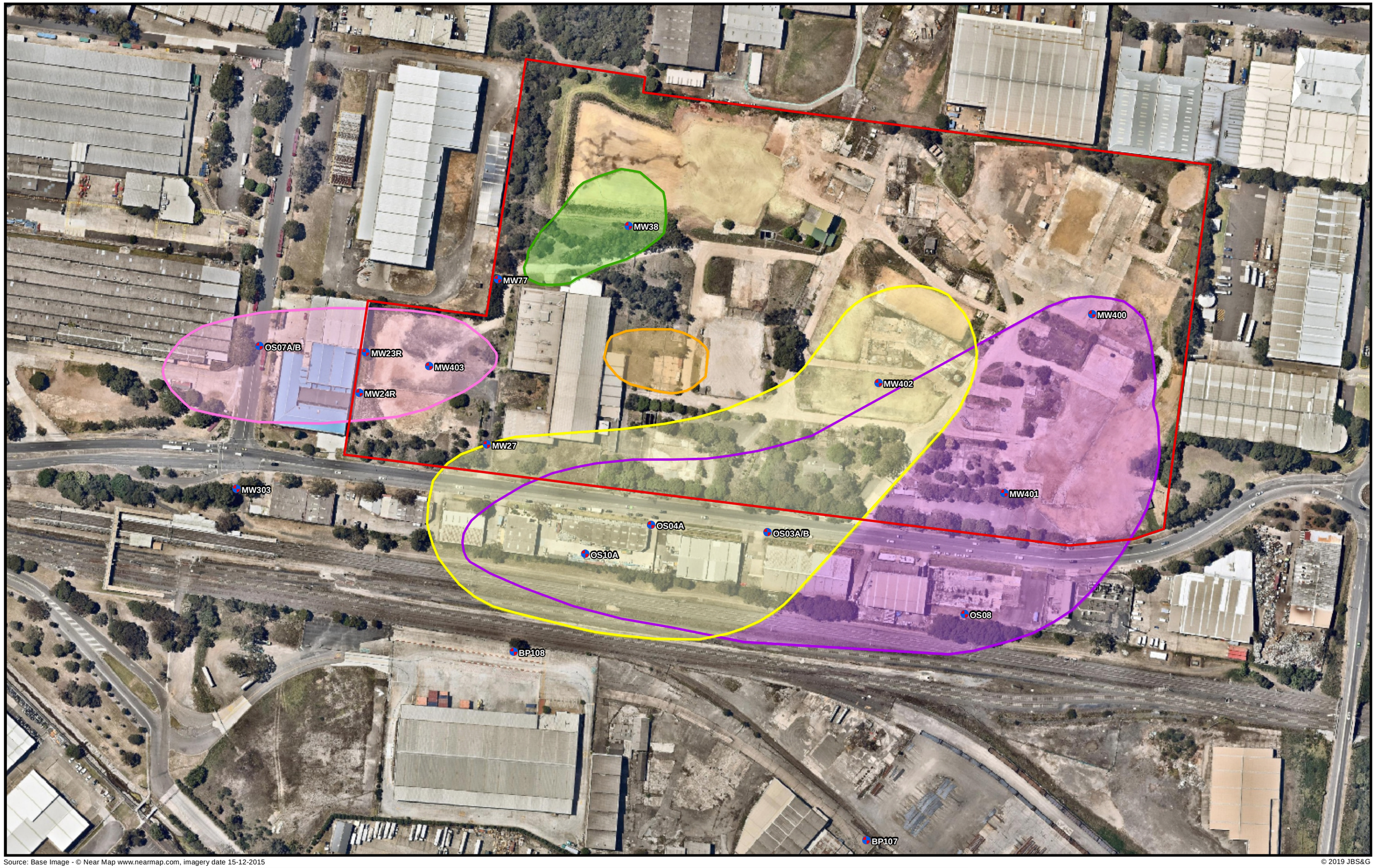
Job No: 56506 File Name: 56506_02

Table: Coordinates of ISZ Area and Western Storage Area in Figure 2
Project Number: 51144
Project Name: LTEMP - Lots 1 and 2 DP1258519, 2 Christina Road Villawood

ID	Area	Easting	Northing
1	ISZ 5	313994.3	6249435.9
2	ISZ 5	314006.5	6249434.3
3	ISZ 5	314005.5	6249425.4
4	ISZ 5	313993.6	6249430.8
5	ISZ 5	314041.0	6249387.9
6	ISZ 5	314049.5	6249387.9
7	ISZ 5	314049.3	6249381.0
8	ISZ 5	314041.0	6249379.8
9	ISZ 5	314041.0	6249387.9
10	ISZ 9	314226.2	6249404.5
11	ISZ 9	314233.4	6249402.9
12	ISZ 9	314237.6	6249399.0
13	ISZ 9	314238.5	6249393.1
14	ISZ 9	314228.4	6249373.7
15	ISZ 9	314228.4	6249373.7
16	ISZ 9	314228.3	6249373.7
17	ISZ 9	314228.3	6249373.7
18	ISZ 9	314223.6	6249372.4
19	ISZ 9	314217.7	6249373.9
20	ISZ 9	314213.3	6249378.1
21	ISZ 9	314212.4	6249383.9
22	ISZ 9	314220.2	6249399.9
23	ISZ 9	314213.1	6249400.8
24	ISZ 9	314214.2	6249409.1
25	ISZ 9	314226.7	6249407.5
26	ISZ 7	314331.1	6249389.7
27	ISZ 7	314329.4	6249376.1
28	ISZ 7	314321.7	6249368.6
29	ISZ 7	314314.5	6249365.4
30	ISZ 7	314307.5	6249367.3
31	ISZ 7	314304.1	6249376.6
32	ISZ 7	314307.4	6249385.7
33	ISZ 7	314315.4	6249392.8
34	ISZ 7	314323.6	6249393.4
35	ISZ 7	314331.1	6249389.7
36	ISZ 4a	313840.5	6249262.7
37	ISZ 4a	313832.4	6249254.8
38	ISZ 4a	313821.5	6249255.2
39	ISZ 4a	313790.5	6249242.3
40	ISZ 4a	313795.8	6249275.2
41	ISZ 4a	313825.0	6249261.4
42	ISZ 4a	313830.3	6249261.6
43	ISZ 4a	313833.8	6249263.8
44	ISZ 4a	313836.2	6249275.8
45	ISZ 4a	313841.6	6249275.2
46	ISZ 4a	313840.5	6249262.7
47	ISZ 1a/8	314282.3	6249333.5
48	ISZ 1a/8	314313.9	6249319.9
49	ISZ 1a/8	314301.9	6249289.7
50	ISZ 1a/8	314299.4	6249271.4
51	ISZ 1a/8	314298.3	6249269.6
52	ISZ 1a/8	314261.9	6249285.0
53	ISZ 1a/8	314272.1	6249306.2
54	ISZ 1a/8	314272.0	6249310.1
55	ISZ 1a/8	314282.3	6249333.5
56	ISZ 1a/8	314280.0	6249258.6
57	ISZ 1a/8	314290.4	6249257.4
58	ISZ 1a/8	314306.5	6249246.4
59	ISZ 1a/8	314308.6	6249257.4
60	ISZ 1a/8	314315.5	6249256.2
61	ISZ 1a/8	314310.3	6249221.6
62	ISZ 1a/8	314303.6	6249212.3
63	ISZ 1a/8	314293.0	6249205.5
64	ISZ 1a/8	314288.3	6249205.2
65	ISZ 1a/8	314281.9	6249200.6
66	ISZ 1a/8	314281.2	6249196.4
67	ISZ 1a/8	314288.7	6249191.5

Table: Coordinates of ISZ Area and Western Storage Area in Figure 2
Project Number: 51144
Project Name: LTEMP - Lots 1 and 2 DP1258519, 2 Christina Road Villawood

ID	Area	Easting	Northing
68	ISZ 1a/8	314302.1	6249193.1
69	ISZ 1a/8	314300.8	6249185.0
70	ISZ 1a/8	314281.9	6249179.5
71	ISZ 1a/8	314281.8	6249176.2
72	ISZ 1a/8	314285.3	6249167.7
73	ISZ 1a/8	314285.3	6249162.9
74	ISZ 1a/8	314278.7	6249163.1
75	ISZ 1a/8	314276.6	6249153.0
76	ISZ 1a/8	314261.0	6249153.3
77	ISZ 1a/8	314260.9	6249150.8
78	ISZ 1a/8	314247.2	6249151.6
79	ISZ 1a/8	314249.0	6249156.3
80	ISZ 1a/8	314247.1	6249168.9
81	ISZ 1a/8	314223.6	6249171.8
82	ISZ 1a/8	314224.2	6249191.0
83	ISZ 1a/8	314213.4	6249193.2
84	ISZ 1a/8	314211.9	6249197.2
85	ISZ 1a/8	314215.9	6249212.8
86	ISZ 1a/8	314221.1	6249213.7
87	ISZ 1a/8	314226.5	6249215.4
88	ISZ 1a/8	314227.0	6249223.2
89	ISZ 1a/8	314237.0	6249242.3
90	ISZ 1a/8	314241.2	6249253.1
91	ISZ 1a/8	314263.7	6249244.6
92	ISZ 1a/8	314270.6	6249237.4
93	ISZ 1a/8	314280.0	6249258.6
94	ISZ 1a/8	314293.2	6249181.0
95	ISZ 1a/8	314305.8	6249182.8
96	ISZ 1a/8	314302.8	6249159.4
97	ISZ 1a/8	314297.5	6249159.2
98	ISZ 1a/8	314293.2	6249181.0
A	Western Storage Area	314036.3	6249356.3
B	Western Storage Area	314033.3	6249354.0
C	Western Storage Area	314025.6	6249356.1
D	Western Storage Area	314011.4	6249357.8
E	Western Storage Area	314009.1	6249355.4
F	Western Storage Area	314003.9	6249356.6
G	Western Storage Area	313988.8	6249363.3
H	Western Storage Area	313977.5	6249360.6
I	Western Storage Area	313911.6	6249368.2
J	Western Storage Area	313922.8	6249435.9
K	Western Storage Area	313982.8	6249415.9
L	Western Storage Area	313989.0	6249415.9
M	Western Storage Area	313994.5	6249423.8
N	Western Storage Area	314032.2	6249417.5
O	Western Storage Area	314035.4	6249406.8
P	Western Storage Area	314050.0	6249399.4
Q	Western Storage Area	314053.2	6249395.7
R	Western Storage Area	314054.3	6249381.3
S	Western Storage Area	314047.9	6249374.5
T	Western Storage Area	314039.9	6249366.2
U	Western Storage Area	314036.3	6249356.3



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Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
A	Original Issue - R02	RF	04-11-2019

Legend:

- Approximate Site Boundary
- Approximate Monitoring Well Locations 2020

Approximate Plume Extents - Golder 2009

- Plume 1
- Plume 2
- Plume 3
- Plume 4
- Plume 5

JBS&G

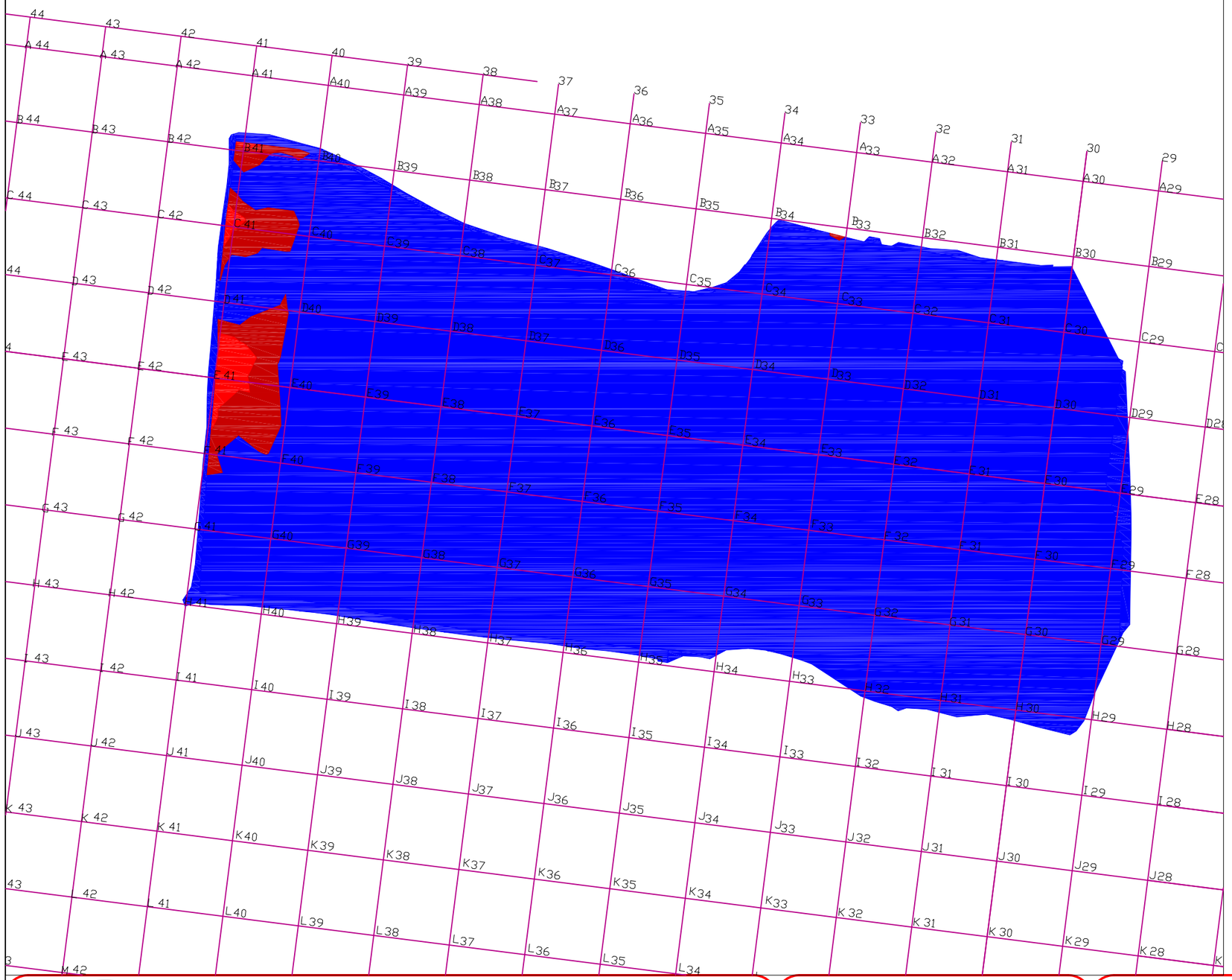
Figure 3: Groundwater Monitoring Locations 2020 and Generalised Plumes

Client: Orica Australia Pty Ltd

Project: Lot 1 & 2 DP1258519 - LTEMP

Job No: 56506 File Name: 56506_03

Appendix B Survey plans showing site cover



(=AMG)
MGA

TN

APPROX. 1°

Lower		Upper		Colour
0	to	0.05	m	
0.05	to	0.1	m	
0.1	to	0.15	m	
0.15	to	0.2	m	
0.2	to	0.25	m	
0.25	to	0.3	m	
0.3	to	100	m	

NOTE: DEPTHS SHOWN ARE FROM TOP OF CAPPING (SURVEYED 03/12/15) TO FINAL WSA SURVEY (SURVEYED 02/10/15)

TOTAL SURVEYING SOLUTIONS

SUITE 5 / 21 ELIZABETH STREET, CAMDEN NSW 2570

Ph. (02) 4655 4035 Fax. (02) 46 55 7094 Email: tss@totalsurveying.com.au

DRAWING:	DEPTH RANGES OF CAPPING ON WSA AREA	JOB No.: 13020	LGA: BANKSTOWN
		PLAN No.: 13020_WSACAP1	DATUM: MGA/AHD
CLIENT: ENVIRO-PACIFIC		DATE: 07/12/15	SCALE: 1:700
PROJECT: ORICA SITE REMEDIATION		DRAWN: AC	CONT. INT.: NA
ADDRESS: VILLAWOOD		CHK: CD	SHEET: 1 OF 1

VOLUMES
ISZ1a = 6476.41m³ CUT
INCLUDING CARPARK AND SUBSTATION
ISZ1b = 2556.29m³ CUT

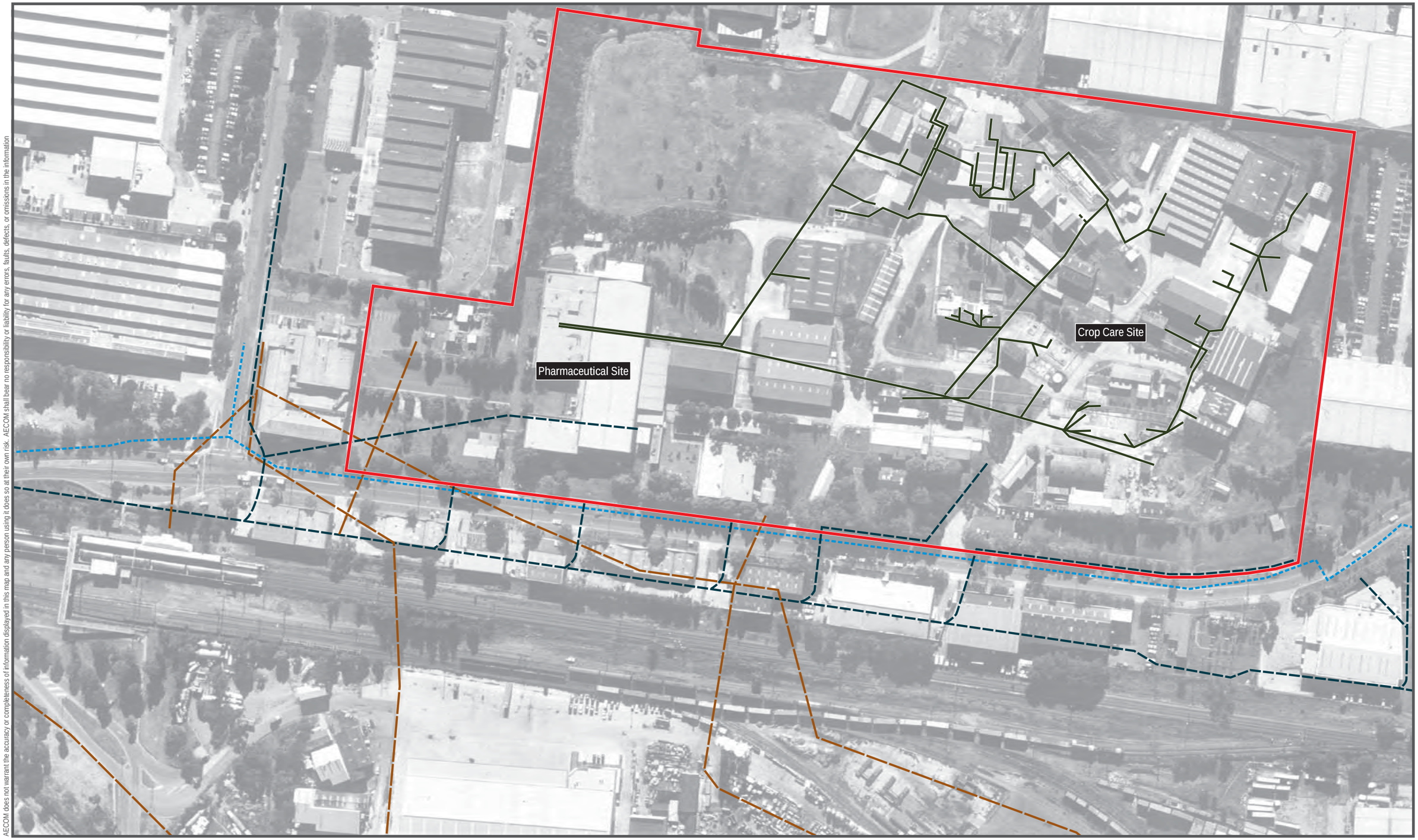
Lower_value		Upper_value	Colour
-5	to	-4.666 m	
-4.666	to	-4.333 m	
-4.333	to	-4 m	
-4	to	-3.666 m	
-3.666	to	-3.333 m	
-3.333	to	-3 m	
-3	to	-2.666 m	
-2.666	to	-2.333 m	
-2.333	to	-2 m	
-2	to	-1.666 m	
-1.666	to	-1.333 m	
-1.333	to	-1 m	
-1	to	-0.666 m	
-0.666	to	-0.333 m	
-0.333	to	0.0 m	
0.0	to	0.1 m	

NOTE: TEST PIT LOCATIONS ARE INTERPOLATED FROM DOCUMENT BY AECOM. PLAN "FIGURE 7. ISZ1A, 1B AND 8"

TOTAL SURVEYING SOLUTIONS
SUITE 5 / 21 ELIZABETH STREET, CAMDEN NSW 2570
Ph. (02) 4655 4035 Fax. (02) 46 55 7094 Email: tss@totalsurveying.com.au

DRAWING: ISZ1a, b AND CARPARK DEPTH RANGES AND VOLUME	JOB No.: 13020	LGA: FAIRFIELD	REVISION No.	REVISION DATE:	COMMENT:
	PLAN No.:13020_220716ISZ1a	DATUM: AHD/MGA			
CLIENT: ENVIRO-PACIFIC	DATE: 22/07/2015	SCALE: 1:250			
PROJECT: ORICA SITE REMEDIATION	DRAWN: AC	CONT. INT.: NA			
ADDRESS: VILLAWOOD	CHK: CD	SHEET 1			

Appendix C Former Trade Waste Line Locations (AECOM, 2011)



PROJECT ID: S4149701
CREATED BY: TO
LAST MODIFIED: TO 14 04 2010

AECOM
www.aecom.com

0 80m

LEGEND

- Site boundary
- Approximate stormwater alignment
- Water - potable
- Contaminated Trade Waste
- Sewer - current/closed

Site Layout and Historic/Existing Drains and Trade Waste Lines

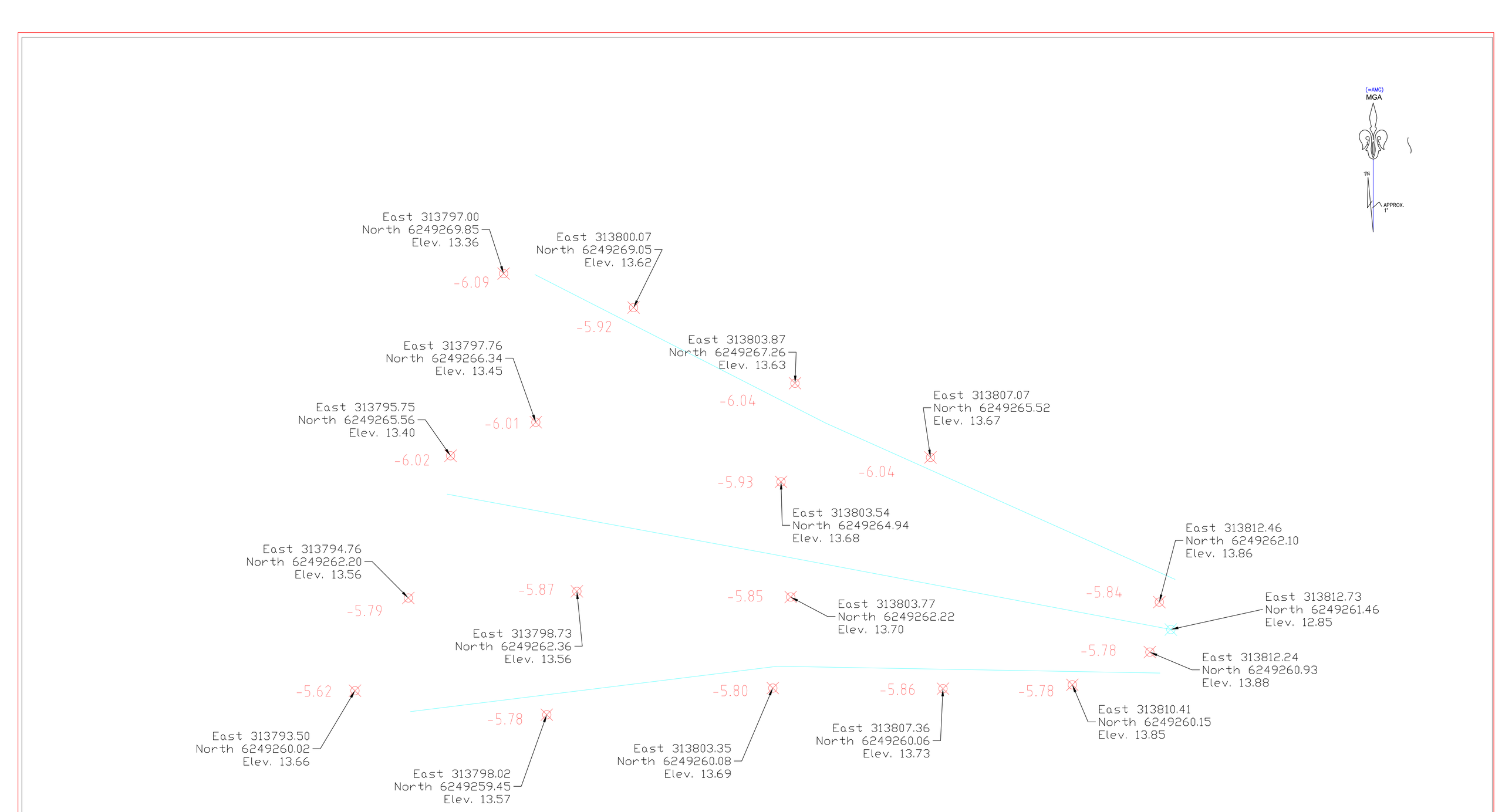
Orica Australia Pty Ltd
Remedial Action Plan
2 Christina Road
Villawood NSW 2163

Figure
3

Map Document: G:\Projects\S4\S41400_S41499\S41497 Orica Villawood RAP\S4149701 RAP\S4149701 F3 Rev A

A3 Size

Appendix D ISZ 4a Contingency DNAPL Recovery System (URS, 2015)



TOTAL SURVEYING SOLUTIONS
SUITE 5 / 21 ELIZABETH STREET, CAMDEN NSW 2570
Ph. (02) 4655 4035 Fax. (02) 46 55 7094 Email: tss@totalsurveying.com.au

DRAWING: PLAN SHOWING DEPTH OF REMEDIATION PIT FROM EXISTING SURFACE LEVEL	JOB No.: 13020	LGA: ASUUMED	REVISION No.	REVISION DATE:	COMMENT:
	PLAN No.: 13020_JH_1	DATUM: AHD			
CLIENT: ENVIRO PACIFIC	DATE: 13/08/15	SCALE: NTS			
PROJECT: VILLAWOOD	DRAWN: JH	CONT. INT.: N/A			
ADDRESS: VILLAWOOD	CHK: CD	SHEET 1 OF 1			

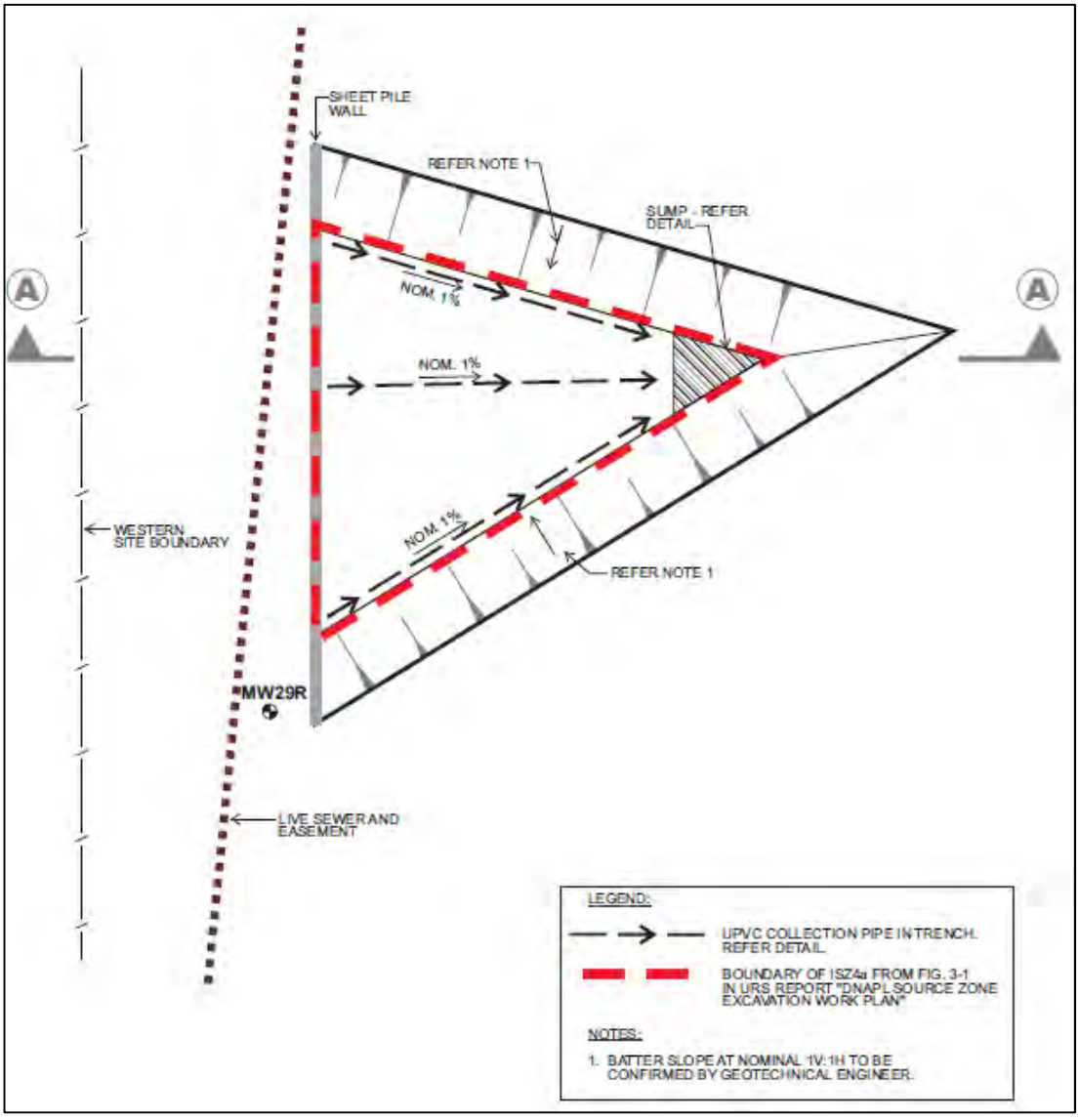
—— INDICATES TRENCH IN PIT

5 SUBSURFACE DRAINAGE INSTALLATION

Following the review of the draft Work Plan, the Environmental Auditor (Mr Chris Jewell) requested that a drainage layer be installed at the base of the excavation, including the installation of drains and standpipes to facilitate monitoring and potential contingency measures if DNAPL is encountered in the drainage layer after backfilling.

The conceptual drainage design is illustrated in **Figure 5-1**. It should be noted that the excavation is likely to be terminated on fractured rock (i.e., the extent practicable as permitted with an excavator bucket). As such the surface of the base of the excavation is likely to be irregular. Notwithstanding this, to the extent practicable the base of the excavation should be sloped from west to east at a grade of 1%. UPVC collection pipes are to be installed in trenches in the base of the excavation along the northern and southern boundaries as well as along the central axis. The collection pipes are to drain into a sump located at the eastern end of the excavation.

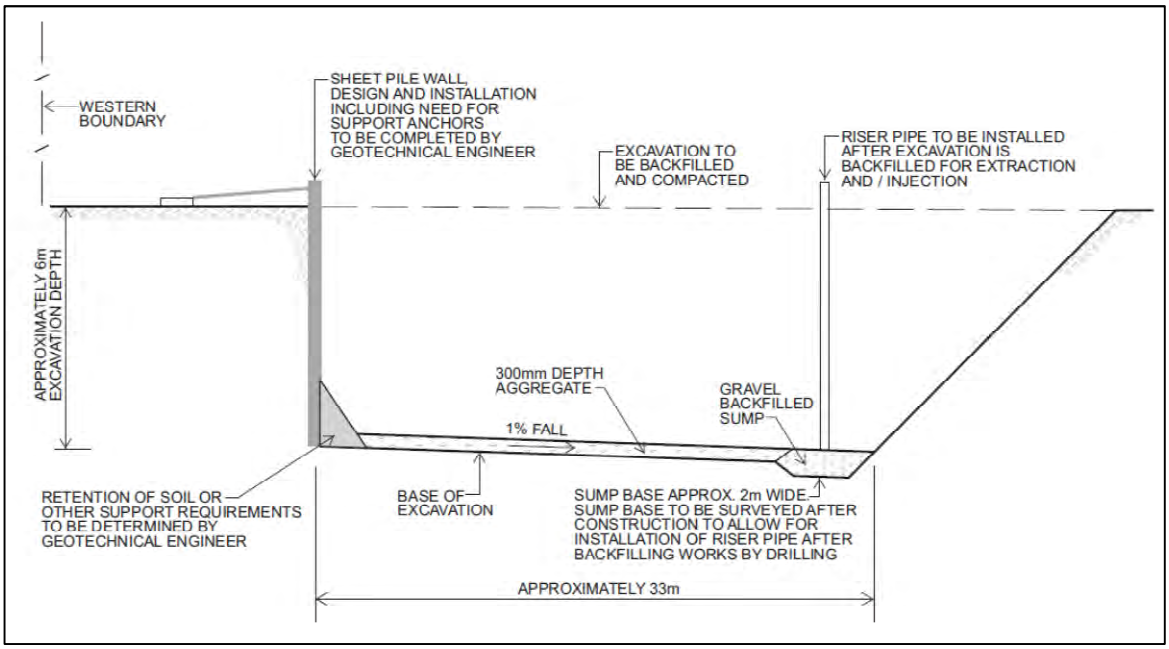
Figure 5-1 Conceptual Drainage Design



The northern and southern batters have nominally assumed to have a slope of 1:1 (vertical:horizontal), but will need to be confirmed by a geotechnical engineer. The western boundary will have a sheet pile wall installed with anchors (if required) and/or other shoring requirements to be determined by a geotechnical engineer.

As shown in **Figure 5-2**, after installation of the collection pipes, an aggregate layer a minimum of 300 mm thick is to be placed at the base of the excavation. The sump base is to be approximately 2 m wide and is to be surveyed after construction to allow of the installation of a riser pipe after backfilling works by drilling.

Figure 5-2 Conceptual Drainage Design – Section A-A'



As shown in **Figure 5-3** , the collection pipes are to be laid in a trench nominally 200 mm deep and 400 mm wide at the base of excavation where it is feasible to excavate further into the rock. If this is not feasible the collection pipes are to be placed at the base of the excavation and covered with a minimum of 300 mm of aggregate. The collection pipes are to be comprised of 150 mm diameter UPVC with 20 mm diameters holes drilled at 150 mm spacing at third points around circumference. The aggregate is to be comprised of nominal 50 mm diameter material and should be free of fines (<1%). The large diameter of the aggregate will minimise the capillary entry pressure and be conducive for DNAPL to drain into the pose spaces from adjoining fractures. The aggregate layer is to be covered with a geofabric prior to backfilling the excavation.

As shown in **Figure 5-4**, the sump at the eastern end of the exaction is to be excavated approximately 200 mm into the base of the excavation and nominally have a depth of 500 mm of aggregate

After backfilled a 100 mm diameter UPVC riser is to be installed into the sump by drilling. The section of the riser pipe penetration the sump is to be comprised of machine slotted screen with nominal 0.4 mm slots.

Figure 5-3 Conceptual Drainage Design – Trench and Pipe Details

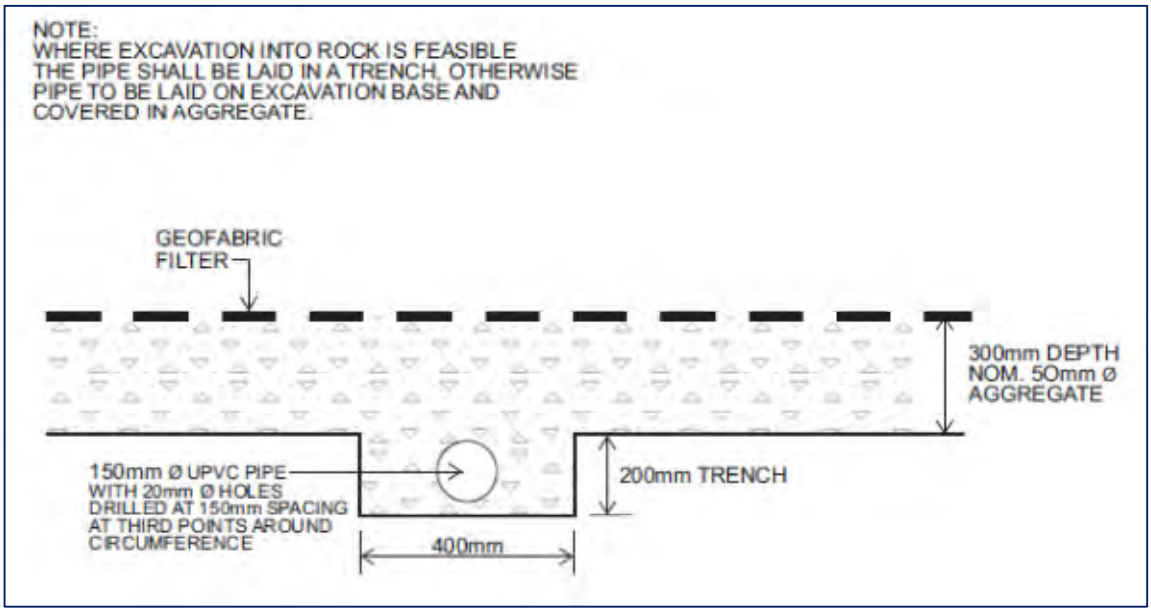
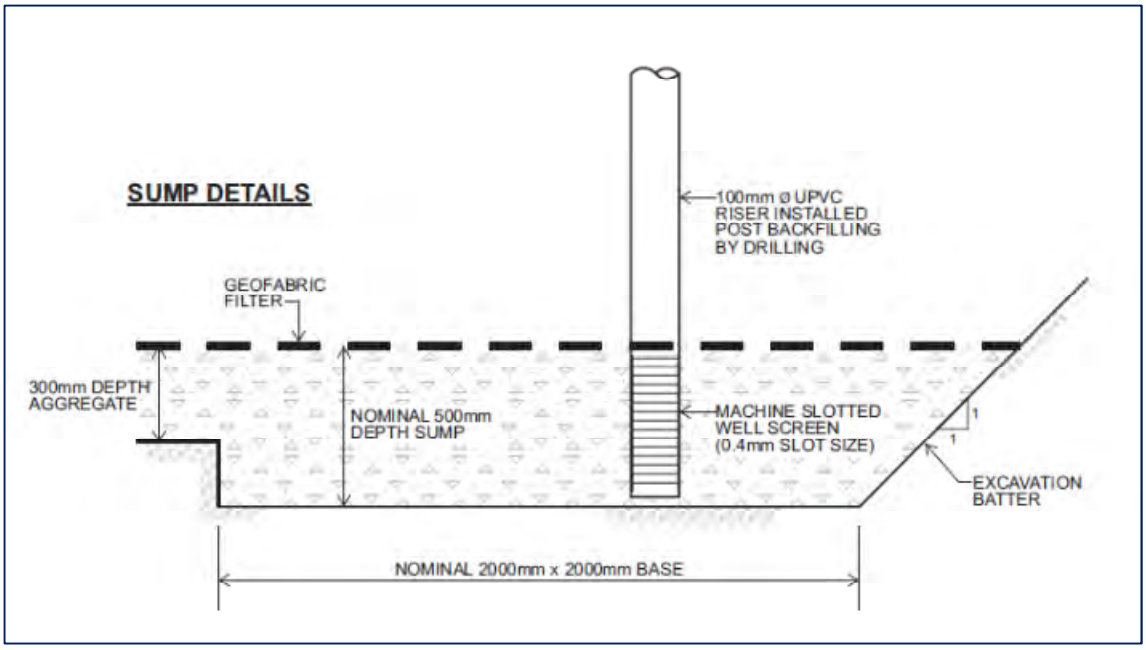
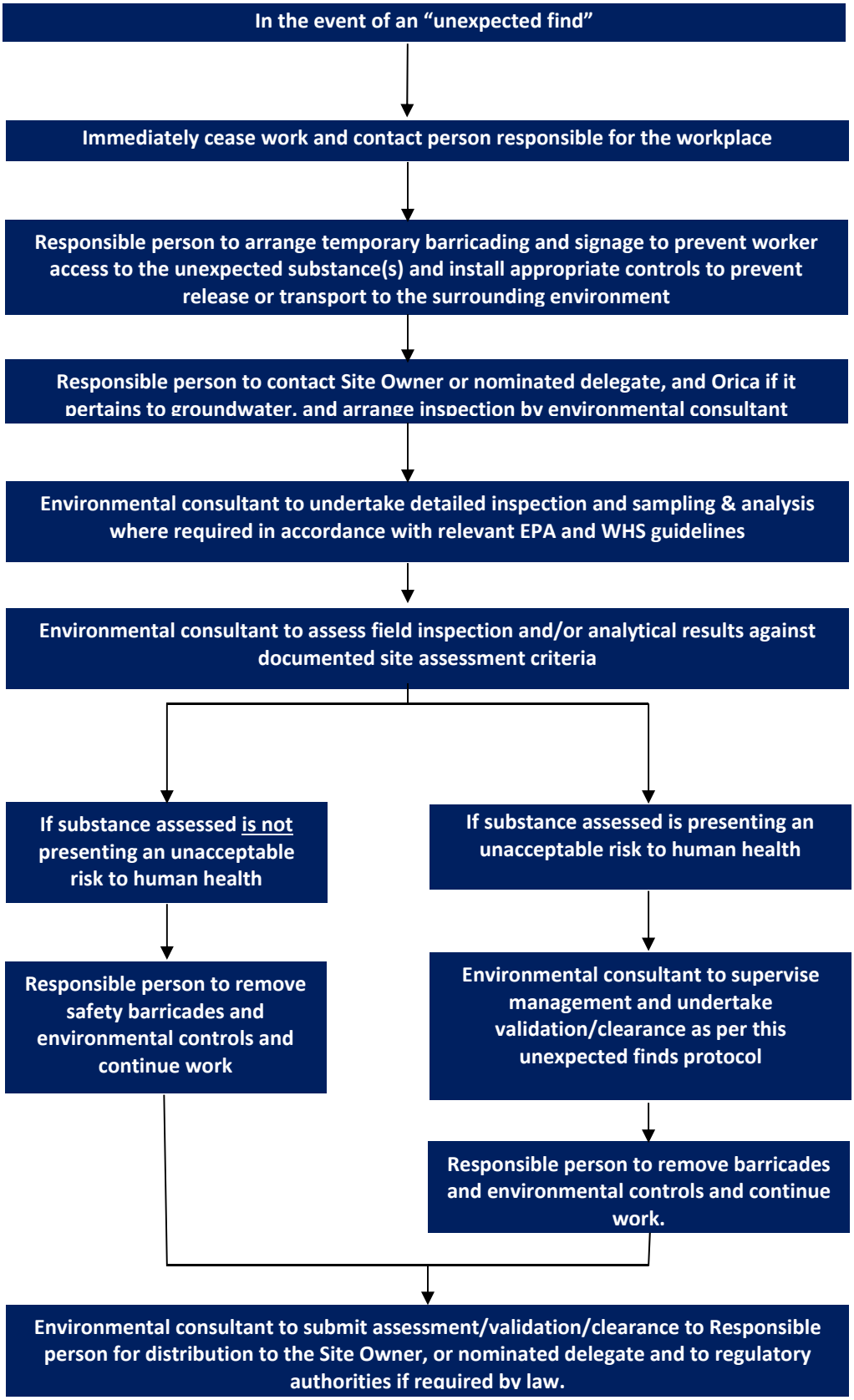


Figure 5-4 Conceptual Drainage Design – Sump Details



Appendix E Unexpected Finds Protocol



Appendix F Schedules

SCHEDULE 1A

Site Owners

Site	Owner	Contact Details	Date of Acquisition
Lots 1and 2 DP 1258519			

SCHEDULE 1B

Persons with Management or Control of Workplace

Site	Workplace Description	Person	Contact Details	Date
Lots 1 and 2 DP 1258519				

SCHEDULE 1C

Inducted Persons

Name	Position	Date of Induction	Signature	Name and Position of Inductor	Comments

Notes:

1. The person responsible for the workplace must ensure that the LTEMP and any revisions are distributed to the Site Owner, all occupiers of the site and all personnel undertaking intrusive works at the site.
2. Additional copies of this sheet may be made and inserted into the document as required.

SCHEDULE 2

Implementation Schedules

LTEMP Lots 1 and 2 DP 1258519				
Action: Intrusive Works	**Reference**	**Yes**	**No**	**Comments**
Works approved by person responsible for the workplace?	Sections 3.2.2 and 4.1			
Have all workers been inducted to the LTEMP?	Section 4.1			
Copy of LTEMP supplied to all workers?	Section 4.1			
Has an activity-specific management plan been developed to manage WHS and environmental risks?	Sections 3.4 and 4			
Specific requirements with respect to working with asbestos adopted?	Section 4.2			
Specific requirements with respect to working with chemical COPC adopted (as required)?	Section 4.3			
Specific requirements if Trade Waste Lines encountered adopted (as required)?	Section 4.4			
Specific requirements for work beneath the Pharmaceuticals Building adopted (as required)?	Section 4.5			
Specific requirements if COPC in groundwater is encountered adopted (as required)?	Section 4.6			
Have soil management controls been implemented as required?	Section 4.7			
Has the cover been breached? If so, have disturbed material been replaced and cover reinstated appropriately?	Section 4.8			
Waste material disposed offsite in accordance with relevant EPA guidelines and legislation?	Section 4.10			
Works area inspected following reinstatement of cover layer?	Section 4.12			
Do works require that the LTEMP is revised/updated?	Section 6			

LTEMP Lots 1 and 2 DP 1258519			
Action: Emergency response in the event cover layers are breached unintentionally (Section 4.8)	**Yes**	**No**	**Comments**
Assess incident and potential hazards and implement appropriate procedures to address the hazards.	NA	NA	
Have all workers involved in the repair been inducted to the LTEMP?			
Copy of LTEMP supplied to all workers?			
Has an activity-specific management plan been developed to manage WHS and environmental risks?			
Repair inspected by a suitable experienced person and found to be acceptable?			
Does incident require that the LTEMP is revised/updated to prevent occurrence?			

LTEMP Lots 1 and 2 DP 1258519				
Task: Environmental Inspection – Cover Layers (Section 4.12)				
Area	Cover Intact (Y/N)	Description of Defect	Corrective Action	Date Corrective Action Completed

LTEMP Lots 1 and 2 DP 1258519				
Task: Environmental Inspection – Ground Surface (Section 4.12)				
Area	Asbestos Visually Identified (Y/N)	Description of Asbestos Containing Material	Corrective Action	Date Corrective Action Completed

Appendix G Asbestos Management Plan

Asbestos Management Plan

Lots 1 and 2 DP1258519
2 Christina Road, Villawood, NSW

14 December 2019

51144/ 103,298 (Rev 1)

JBS&G

www.jbsg.com.au

Table of Contents

Figures

Tables (In Text)

Appendices

Abbreviations

A list of the common abbreviations used throughout this report is provided below.

Term	Definition
ACM	Asbestos Containing Material (e.g. fibre cement sheet)
AECOM	AECOM Pty Ltd
AF	Asbestos fines
CEMP	Construction Environmental Management Plan
CFM	Chloroform
COC	Contaminants of concern
COPC	Contaminants of potential concern
EPA	NSW Environment Protection Authority
FA	Fibrous asbestos
ha	Hectare
ICIANZ	Imperial Chemical Industries of Australia and New Zealand Limited
ISZ	Impacted Soil Zone as defined in JBS&G (2015a)
JBS&G	JBS&G Australia Pty Ltd
JSRA	Job Safety Risk Assessment
LTEMP	Long-Term Environmental Management Plan
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NSW	New South Wales
Orica	Orica Australia Pty Ltd
PPE	Personal protective equipment
RAP	Remedial Action Plan (AECOM, 2011)
SWMS	Safe Work Method Statement
VENM	Virgin Excavated Natural Material
WHS Act	*Work Health and Safety Act 2011 (NSW)*
WSA	Western Storage Area

1. Introduction

Orica Australia Pty Ltd (Orica) engaged JBS&G Australia Pty Ltd (JBS&G) to prepare an Asbestos Management Plan (AMP) for Lots 1 and 2 DP1258519 located at 2 Christina Road, Villawood, NSW (the 'site') (**Figure 1**). The purpose of the AMP is to identify and manage asbestos hazards that remain present on the site during ongoing site use in accordance with relevant legislative and regulatory requirements.

The site was initially part of a larger chemical manufacturing facility owned by the Commonwealth of Australia and used for the manufacturing of munitions, including trinitrotoluene, in 1941. The site was subsequently purchased by Taubmans in 1946, who manufactured a range of chemicals including chlorobenzene and DDT until the southern portion of the facility was purchased by ICIANZ Limited (ICIANZ) in 1953. ICIANZ (which later became Orica Australia Pty Ltd) continued to manufacture a wide range of agricultural and pharmaceutical chemicals until the site was closed in 2000. The site has been vacant since closure in 2000, with remediation of the 'Pharmaceutical Site' portion occurring in 2003/2004 and the 'Crop Care' portion in 2013-2015.

Remediation of chemical contaminants in soils was validated by JBS&G (2015a) to have been completed in accordance with the Remedial Action Plan (RAP) (AECOM, 2011). Integral parts of the remediation were excavation and onsite treatment of soils impacted by chemical contaminants. During previous investigations, remediation works and validation, asbestos was identified in fill materials remaining at the site under cover (placed as part of remediation works) and remediated areas, and is potentially present in other areas at the site.

An inspection of the surface of the entire site carried out by JBS&G (2016) did not identify any asbestos-containing materials on the surface of the site (minor surface asbestos contamination had previously been removed).

An AMP is required to provide procedures for addressing risks associated with asbestos exposure to ensure the protection of the health of site workers, future site workers and the neighbouring community, should disturbance of asbestos impacted materials occur in future.

This AMP is intended to be read in conjunction with, and be cross-referenced by, the Long-term Environment Management Plan (LTEMP) (JBS&G, 2019) for the site. The LTEMP is required by the RAP (AECOM, 2011), RAP Addendum (AECOM, 2015) and validation report (JBS&G, 2015a) to ensure that contaminants remaining in site soils, and contaminated groundwater, are appropriately managed to ensure continued protection of human health for future site and off-site users, occupiers, visitors and contractors.

This AMP is not intended to apply to major excavations or construction activities or existing buildings. An activity-specific management plan, such as a Construction Environmental Management Plan (CEMP), should be prepared and implemented during major works.

2. Summary of Site Conditions

2.1 Site Details

The site is located at 2 Christina Road, Villawood, NSW. The location of the site is shown in **Figure 1**. The site details are summarised in **Table 2.1** and described in more detail in the following sections.

Table 2.1: Summary Site Details

Lot/DP	Lots 1 and 2 DP1258519
Address	2 Christina Road, Villawood, NSW
Site Area	12.6 hectares (ha)
Geographical Coordinates	Easting – 335249.18, Northing – 1505924.97
Local Government Authority	Bankstown City Council
Current Zoning	Commercial/Industrial

2.2 Site Description

The site is a large partially developed portion of land. The following key features describe the site at the time of inspection by JBS&G (2015b):

- The northwest of the site comprises the Western Storage Area (WSA) which is relatively flat and raised to a higher elevation than the surrounding land. The WSA comprises a cover of 300 mm of Virgin Excavated Natural Material (VENM) and geofabric marker layer overlying materials which have been identified to, or potentially contain, asbestos.
- The central and eastern portions of the site are flat with variable cover of vegetation, formed gravel roads, site fill materials, concrete hardstand and some built structures. VENM backfill covers former ISZ 1a/8 and ISZ 1b excavation.
- The southern central portion of the site is flat with variable cover of vegetation, bitumen pavement, built structures such as demountable buildings and site fill materials.
- The western portion of the site is flat with variable cover of vegetation, formed gravel roads, and site fill materials. The Pharmaceuticals Building is present in this portion of the site.

The layout of the site is shown on **Figure 2**. Former soil remediation areas (ISZ 1a/8, ISZ 1b, ISZ 5, ISZ 7, ISZ 9) from which impacted soils were excavated, the WSA and an additional area (ISZ 4a) that required remediation as a contingency measure due to the presence of Dense Non Aqueous Phase Liquid (DNAPL) in nearby groundwater monitoring wells, as described by URS (2015), are presented in **Figure 2**.

2.3 Asbestos at the Site

2.3.1 Asbestos Definitions

Friable asbestos is defined by Safe Work Australia in the Codes of Practice (Safe Work Australia, 2020/2018) as being "*…material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contains asbestos*". This includes asbestos fibre impacted soils and asbestos fines as identified by laboratory analysis. The materials defined in the NEPC (2013) as fibrous asbestos (FA) and asbestos fines (AF) are friable asbestos.

Non-friable asbestos material is defined by Safe Work Australia (2020/2018) as being *"…material containing asbestos that is not friable asbestos, including material containing asbestos fibres reinforced with a bonding compound*." This includes bonded asbestos fragments found in soils, subject to laboratory analysis for respirable fibres. The materials defined in the NEPC (2013) as bonded asbestos are non-friable asbestos.

Asbestos containing material (ACM) means any material or thing that, as part of its design, contains asbestos. Given the nature and current condition of this site this legal definition should be extended to include materials that, in their current condition, contain asbestos.

2.3.2 Asbestos Issues

Mechanical disturbance of ACM fragments and disturbance of soils containing asbestos may result in the release of fibres and, therefore, such activities should be managed to prevent any fibres becoming airborne. The health effects of asbestos are detailed in *Management of Asbestos in the Non-Occupational Environment* (enHealth, 2005).

The primary issue associated with the asbestos contamination remaining below the ground surface is inhalation of respirable fibres if the materials were to be disturbed and abraded or otherwise mobilised into the air.

A secondary issue with asbestos contamination is disposal of excess spoil that may be impacted with asbestos.

2.3.3 Asbestos Remaining at the Site

During remediation and validation works at the site asbestos containing materials (ACM) and friable asbestos was identified in fill materials. Asbestos impacted materials remaining on the site include:

- Fill/soil materials that are under a cover and marker layer within the WSA are identified to contain, or potentially contain, non-friable and/or friable asbestos (**Figure 2**);
- Fill/soil materials that are under a cover layer or adjacent to former ISZ 1a/8 and ISZ 5 soil remediation areas are identified to contain, or potentially contain, non-friable and/or friable asbestos (**Figure 2**); and
- Fill/soil materials that are under a cover layer (grass, mulch, pavement) or ground surface at areas outside the WSA and former ISZ soil remediation areas potentially contain non-friable and/or friable asbestos.

A description of the cover layers is provided in **Section 2.4**. The location of covered areas, including the WSA, former ISZ soil remediation areas and the Pharmaceuticals Building, are shown in **Figure 2**. Details of the exact location of identified asbestos at the site are provided in the Asbestos Register (**Appendix B**).

A detailed inspection of the ground surface at accessible areas undertaken during the period October - December 2015 (JBS&G, 2015b) did not visually identify ACM at the ground surface at the time of final inspection.

There is potential for asbestos that was not identified in previous investigations, remediation and the remediation validation (JBS&G, 2015a) or detailed visual inspection of the site surface (JBS&G, 2015b) to be present below the ground surface at the site. Intrusive works below the cover or ground surface or changes to the site surface may uncover asbestos.

2.4 Site Cover Layers

A description of the cover layers was provided by JBS&G (2015a). The purpose of the cover layers is to provide physical separation between site users and underlying soil identified to be impacted, or potentially impacted, with asbestos (and/or other contaminants). The cover layers at the site comprise:

- WSA – A geofabric marker layer overlying asbestos impacted materials and a barrier layer of a thickness generally exceeding 0.3 m as shown in **Figure 2**. A survey plan is provided in Appendix B of the LTEMP (JBS&G, 2019). The placement of the marker and barrier layers is detailed in the validation report (JBS&G, 2015a).

- ISZs – A barrier layer of nominal minimum thickness of 0.1 m with an extent shown in **Figure 2**. A survey plan is provided in Appendix B of the LTEMP (JBS&G, 2019).
- Pharmaceuticals Building – existing concrete pavement and building.

Various areas of existing pavement (asphalt and concrete slabs), grass and mulch are also present, as described by JBS&G (2015b).

3. Application of AMP and Responsibilities

3.1 Application of this AMP

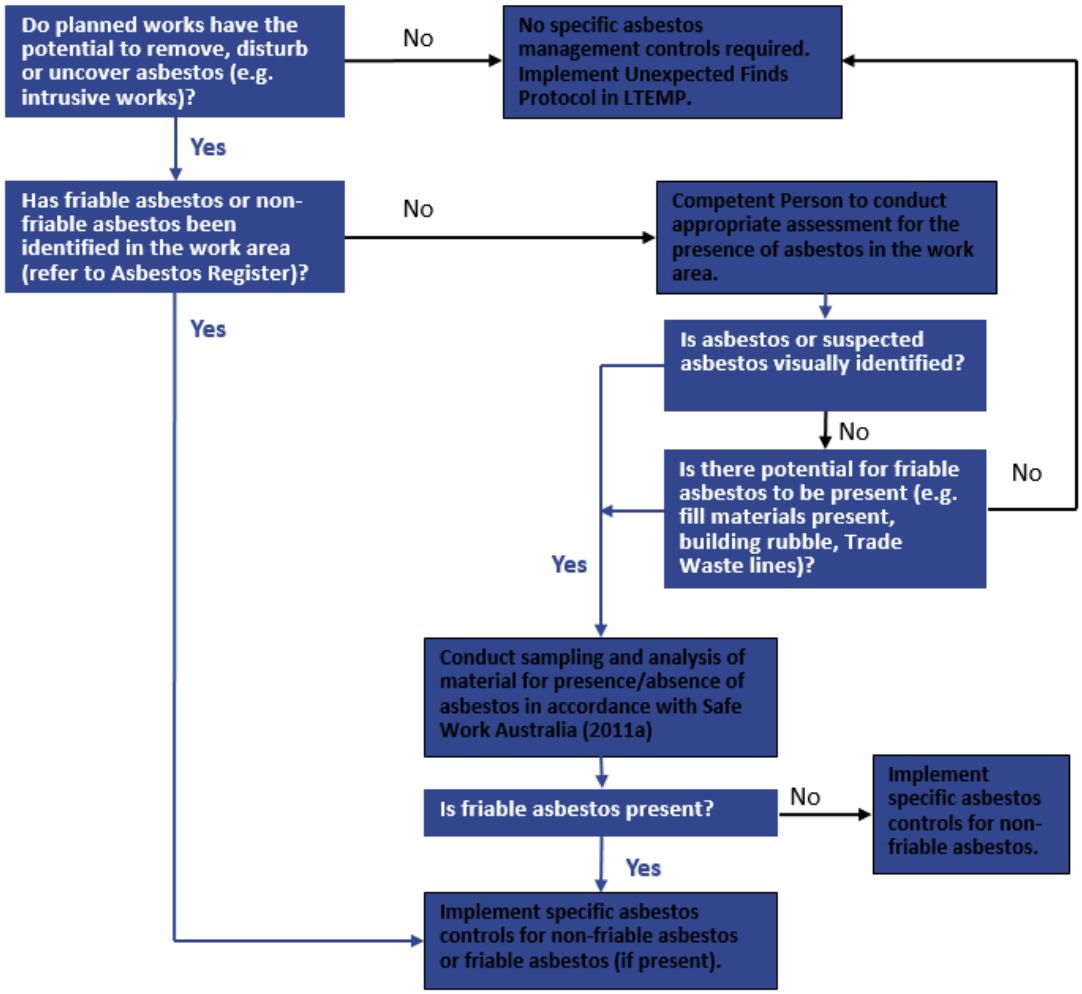
The site will be a workplace or workplaces and, therefore, all the relevant provisions of the *Work Health and Safety Act 2011 (NSW)* (WHS Act) and the *Work Health and Safety Regulation 2017 (NSW)* (WHS Regulation) will apply to the site.

Non-friable and friable asbestos have been identified in fill/soil underlying WSA cover layers and former ISZ 5 and ISZ 1a/8 remediation areas, and are potentially present underlying the ground surface at other areas at the site (see **Section 2.3.3.** On this basis, it is required that an AMP be prepared and an asbestos register be maintained for the workplace to comply with the WHS Regulation.

A precautionary approach should be undertaken in accordance with Safe Work Australia (2020/2018) whereby material needs to be considered to contain asbestos unless proven otherwise if there is uncertainty as to whether it contains asbestos.

The general approach is to implement management measures described in **Section 4** and procedures in **Section 5**.

This AMP is intended to be applied to all works at the site that will, or potentially will, remove, disturb or uncover asbestos (i.e. any intrusive works such as excavation or utility installation underlying cover layers or underlying the ground surface at other areas). Therefore, the following decision framework shall be applied to asbestos management procedures and controls in this AMP.



3.2 Roles and Responsibilities under the AMP

3.2.1 Site Owner

A copy of this AMP must be provided to all persons acquiring ownership of all or part of the site (Site Owners).

A Site Owner must provide a copy of this AMP to any successor in Title.

A Site Owner must ensure that a copy of this AMP is provided to all lessors and persons with management or control of a workplace at the site.

The Site Owner may act as a Person conducting a business or undertaking (**Section 3.2.3**).

3.2.2 Persons with management or control of a workplace at the site

For the purposes of this AMP, the person with management or control of a workplace at the site shall act as a Person conducting a business or undertaking (**Section 3.2.3**).

3.2.3 PCBU

In accordance with the provisions of the Work Health and Safety Regulation 2017, a Person conducting a business or undertaking (PCBU) (or Principal Contractor) shall be appointed for the proposed intrusive works. Alternatively, the Site Owner or Persons with management or control of a workplace at the site may adopt the role of a PCBU for the purposes of the intrusive works.

Responsibilities of the PCBU include, but are not limited to the following. The PCBU must:

- Be responsible for the proposed intrusive work at all times until the work is completed;
- Ensure that all persons involved with proposed intrusive work have undertaken appropriate occupational health and safety training;
- Keep records of induction training for site workers and any site specific training;
- Ensure that any subcontractors provide safe work method statements for the activities for which they are engaged;
- Monitor any subcontractors to ensure that they are complying with the safe work method statements; and
- Maintain a hazardous substances register for all hazardous substances used or present on site.

The PCBU is responsible for co-ordinating health and safety activities for the project. Other responsibilities of the PCBU include:

- Compliance with occupational health and safety and environmental legislation, regulations, standards, codes and the site-specific rules relating to safety contained in this AMP;
- Ensuring that sufficient funds are available to procure the necessary health and safety equipment such as personal protective equipment (PPE);
- Managing accident and emergency procedures;
- Managing workplace injury management and rehabilitation.
- The PCBU has the authority to provide for the auditing of compliance with the provisions of this AMP, suspension or modification of work practices, and administration of disciplinary actions for individuals whose conduct does not meet the requirements set forth herein.

3.3 Licensed Asbestos Assessor

A Licensed Asbestos Assessor (LAA) shall be engaged to assess any suspected friable asbestos containing materials when required and supervise friable asbestos removal works. The LAA shall also complete airborne asbestos monitoring for the duration friable asbestos removal works until such time that a clearance certificate has been provided for the work area.

The LAA shall:

- Complete static asbestos air monitoring for the duration of the friable asbestos works until such time that the final clearance inspection has been issued. All daily results of air monitoring activities are to be displayed or be readily available for the information of site workers.
- Provide advice, if required, in relation to suspected ACM and the management of asbestos issues associated with the works.
- Be available, if required, for consultation with regards to the conditions and requirements of this AMP.
- Complete a final excavation inspection and clearance inspection following the completion of friable asbestos removal works and undertake any relevant validation/clearance sampling to enable a ground surface clearance certificate to be issued for the site to confirm the ground surface is clear of friable asbestos.

3.4 Competent Person

If friable asbestos has not been identified to be present in a work area, a Competent Person as defined in Safe Work Australia (2018) *Code of Practice - How to Safely Remove Asbestos* may be engaged to assess the area for the presence of asbestos. The Competent Person may also complete airborne asbestos monitoring for the duration of non-friable asbestos removal works as required by this AMP.

An Asbestos Consultant may act as a Competent Person provided they meet the definition in Safe Work Australia (2018).

The Competent Person may:

- Assess a work area for the presence of asbestos if friable asbestos has not been identified.
- Complete static asbestos air monitoring at the non-friable asbestos works boundaries as required by this AMP until such time that the final clearance inspection has been successfully completed. All daily results of air monitoring activities are to be displayed or be readily available for the information of site workers.
- Provide on-site advice, if required, in relation to suspected ACM and the management of asbestos issues associated with the works.
- Be available, if required, for consultation with regards to the conditions and requirements of this AMP.
- Complete a final clearance inspection of the work area following non-friable asbestos removal works to verify the absence of visually identifiable ACM.

3.5 Removal Contractor

<u>Class A Licensed Asbestos Removal Contractor</u>

A Class A (friable) licensed asbestos removal contractor shall be used to remove friable asbestos impacted materials from the site (if required) and also to supervise site workers involved with the excavation and management of materials containing friable asbestos until such time that the site

ground surface clearance certificate (**Section 5.4.2**) has been provided by the LAA. The licensed asbestos removal contractor will be the primary person responsible and in charge for works on site involving ACM or friable asbestos during asbestos removal works.

The responsibilities of the Class A Licensee include:

- Submit an application to undertake friable asbestos removal to Safe Work NSW (formerly WorkSafe NSW) no later than 5 business days prior to the proposed commencement date.
- Prepare a site specific Asbestos Removal Control Plan prior to any friable asbestos impacted materials being removed from the site.
- Ensure compliance with relevant legislation and the conditions of this AMP.
- Handling and management of friable or non-friable asbestos or asbestos contaminated material at the site in accordance with relevant legislation and Codes of Practice.
- Ensure appropriate environmental and safety controls outlined in this AMP are maintained for the duration of the works.
- Assisting site sub-contractors, where required, in complying with relevant legislation and the procedures outlined in this AMP.

Class B Licensed Asbestos Removal Contractor

A Class B (non-friable only) licensed asbestos removal contractor shall be used to complete non-friable asbestos removal works if greater than 10 m^2 of non-friable asbestos is proposed to be removed/managed across the entire site area. The Class B licensed contractor can only undertake non-friable asbestos related works and cannot perform any works relating to friable asbestos. A Class A (friable) licensed asbestos removal contractor may also complete non-friable asbestos removal works.

In the event that a Class B licensed asbestos removal contractor is engaged to complete non-friable asbestos related works, their responsibilities shall include:

- If greater than 10 m^2 of non-friable asbestos is proposed to be removed/managed across the entire site area, submit an application to undertake non-friable asbestos removal to Work Cover Authority of NSW (Safe Work NSW) no later than 5 business days prior to the proposed commencement date.
- Prepare a site specific Asbestos Removal Control Plan prior to any asbestos impacted materials being removed from the site.
- Ensuring compliance with relevant legislation and the conditions of this AMP.
- Handling and management of non-friable asbestos or non-friable asbestos contaminated material at the site in accordance with relevant legislation and Codes of Practice.
- Ensure appropriate environmental and safety controls outlined in this AMP are maintained for the duration of the works.
- Assisting site sub-contractors, where required, in complying with relevant legislation and the procedures outlined in this AMP.

3.6 Asbestos Register

As referenced in Safe Work Australia (2020/2018), a PCBU must ensure an Asbestos Register is prepared and kept at the workplace. The asbestos register must be maintained, to ensure the information in the register is up-to-date. A copy of the Asbestos Register is provided in **Appendix B**.

The Asbestos Register is a document that lists all identified (or assumed) asbestos in a workplace. The asbestos register must:

- Record any asbestos or ACM that has been identified or is likely to be present at the workplace from time to time. This would include:
  - the date on which the asbestos or ACM was identified;
  - the location, type and condition of the asbestos; or
- State that no asbestos or ACM is identified at the workplace if the person knows that no asbestos or ACM is identified or is likely to be present from time to time at the workplace.

A comprehensive Asbestos Register may also include:

- Details of any asbestos assumed to be in the workplace;
- Results of any analysis that confirms a material at the workplace is or is not asbestos;
- Dates when the identification was carried out; and
- Details of inaccessible areas.

Photographs or drawings may also be attached to the asbestos register to visually show the location of the asbestos or ACM in the workplace.

The Asbestos Register will be kept at the site, and all site works or personnel will have access to the Asbestos Register at any time through the PCBU.

4. Health, Safety and Environment Management

4.1 General

The general management approach of this AMP is summarised as follows:

- Site personnel or contractors required to conduct intrusive works at the site must be inducted into the AMP and must be aware of their responsibilities with regard to health and safety and protection of the environment;
- A copy of this AMP is to be supplied to all persons conducting asbestos works on the site; and
- The health and safety and environmental requirements specific to the contamination issues on the site as outlined in this AMP must be complied with.

An activity-specific management plan, such as a CEMP, is recommended to be developed for any major intrusive or construction activities.

4.2 Safe Work Method Statements

Safe work method statements that must be prepared by the PCBU or by sub-contractors completing intrusive works, are to be prepared and approved by the PCBU and Site Owner prior to those activities commencing.

Safe Work Method Statements must:

- Describe how work is to be carried out;
- Identify the safety risks;
- Describe the control measures that must be applied to the work;
- Describe the equipment used in the work;
- Describe any standards or codes applicable to the work; and
- Training and qualifications required of persons undertaking the work.

4.3 Site Access Control

The PCBU shall ensure that the area in which works are taking place is designated a construction (asbestos removal) works area and that the area is secured in a manner that access can be controlled. This will ensure that only workers appropriately inducted into the site management protocols are present during the works. The boundaries of the work area may be varied by the PCBU or Removal Contractor, LAA or Competent Person.

Entrance to each nominated work area should be via a dedicated entry point which will contain the following features in addition to site security measures as required for a construction site as per relevant health and safety provisions:

- Readily identifiable and delineated site access / egress point. Where possible this location shall be visibly identifiable by temporary site fencing / barricading or similar;
- Decontamination unit for all site personnel to remove PPE and dispose of contaminated articles and will also include a hand wash and boot wash facility. The decontamination unit will be located in close proximity of the designated site access / egress point;
- Asbestos warning signage including “No Entry Without Required PPE” and a contact number for members of the public to direct any queries / complaints; and
- Emergency contact details.

Any authorised person accessing the work area should do so in accordance with health and safety requirements as indicated in this AMP. The implementation of the health, safety and environmental requirements should be administered by the PCBU.

The work area should only be accessed once the site personnel have been inducted, have signed in, and have donned the required PPE (**Section 4.6**). Upon exiting the site, personnel must remove and dispose of/clean the PPE in the provided decontamination area.

4.4 Training and Certification

The PCBU must not allow any person to carry out project works unless he/she is satisfied that the person has undergone suitable WHS induction training as defined by the WHS Regulation 2017, including but not limited to:

- General occupational health and safety training for construction work;
- Work activity based health and safety training (job specific training); and
- Site-specific health and safety induction training.

For each person carrying out project works, for a period of three years, the PCBU must keep a record of the following:

- A copy of relevant statements of WHS induction training, or a statement indicating that the PCBU is satisfied that the relevant WHS induction training has been undertaken; and
- A brief description of the site-specific training undertaken by the person.

4.5 Site Safety Induction

It is the responsibility of the PCBU to ensure that all persons carrying out construction work on site are given site-specific work health and safety training. The induction shall be undertaken by the PCBU. The induction shall be undertaken as per a standard presentation which will address the following topics as per the requirements of this AMP:

- Identification of any site specific hazards and risk control measures in relation to the asbestos impacted nature of the site;
- Regulatory requirements or codes of practice relevant to identified site specific hazards as restricted to asbestos impact;
- Directions on what to do if suspected asbestos containing material or asbestos contaminated material is encountered;
- Site orientation at least including location of asbestos decontamination areas at site access / egress points; and
- Site specific safety rules in relation to asbestos.

The PCBU is responsible for establishing site specific safety rules. The rules must be displayed in an easily observable location (nominally in the site office) so as to ensure that all site workers, including any sub-contractors, have ready access.

At the completion of the Induction Presentation, each 'inducted person' shall be required to acknowledge that they have understood the requirements for the site works and health, safety and environmental obligations by completion of a Site Induction Form.

4.6 Personal Protective Equipment

During asbestos removal works, Personal Protective Equipment (PPE) will need to be used, in combination with other effective control measures to prevent the generation and inhalation of airborne fibres. The selection and use of PPE should be based on a risk assessment. The risk

assessment should consider other controls such as soil and dust management (**Section 4.8**), cover management (**Section 4.9**) and monitoring (**Section 5.3**).

The following additional items of PPE are required in addition to the standard construction site PPE outlined by the PCBU for the site, and applies for any ground workers within a friable asbestos removal work area, as defined by the Removal Contractor, Competent Person or LAA:

- Disposable 'tyvek' coverall suits must be worn;
- Disposable or non-disposable gloves. Where non-disposable gloves are worn, these must be cleaned within the decontamination unit in accordance with Safe Work Australia (2018);
- P2 class respirator or higher – non disposable respirators must be cleaned in the decontamination unit and maintained in accordance with Safe Work Australia (2018); and
- Laceless steel capped rubber soled work shoes or gumboots.

Plant operators must close cabin doors and windows and set air conditioning to re circulate when operating within a friable asbestos work area.

The abovementioned PPE requirements are recommended for non-friable asbestos removal works.

If friable asbestos is not present, then the PPE requirements can potentially be modified/reduced as assessed by a LAA or Competent Person, provided the PPE are made available to workers.

4.7 Management of Subcontractors

Contractors and subcontractors working on-site will be required to adopt the provisions of this AMP and will be advised of potential safety and environmental issues on site during site-specific induction training. This induction will include the work health and safety responsibilities, requirements and controls for all subcontractors working on site. All subcontractor activities will be monitored by the PCBU, the Removal Contractor, LAA and Competent Person to ensure compliance with the requirements of this AMP.

Contractors and subcontractors whose work will be performed on-site, or who otherwise could be exposed to health and safety hazards, will be advised of known hazards through distribution of site information contained in this AMP. They shall be solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations.

Subcontractors must sign an acceptance form prior to commencing work on site.

Contractors and subcontractors are solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations.

Subcontractors may only modify, and then only to improve, the conditions specified in this AMP with approval from the PCBU or delegated person.

4.8 Soil and Dust Management

Soil and dust, including for stockpiles and excavations, shall be managed in accordance with provisions in the LTEMP (JBS&G, 2019).

4.9 Cover Management

The site cover layers, as described in LTEMP (JBS&G, 2019), must be maintained in order to prevent future site users, occupiers, visitors and contractors being exposed to the asbestos contamination.

The cover surface shall be maintained in accordance with provisions in the LTEMP (JBS&G, 2019).

4.10 Waste Management

Waste shall be managed in accordance with provisions in the LTEMP (JBS&G, 2019).

5. Asbestos Management Procedures

5.1 General Approach

The following management approach will apply:

- Prior to any work commencing, approval for the works must be sought from the PCBU.
- The asbestos management decision framework in **Section 3.1** shall be followed.
- The PCBU or Competent Person shall determine whether the works constitute work that will, or potentially will, remove, disturb or uncover asbestos (e.g. any intrusive works such as excavation or utility installation below cover layers or below the ground surface in other areas). Reference to identified asbestos described in **Section 2.3.3** and the Asbestos Register (**Appendix B**) is required.
- Site personnel or contractors at the site must be inducted into the LTEMP (JBS&G, 2019) and this AMP, and must be aware of their responsibilities with regard to health and safety and protection of the environment.

5.2 Specific Requirements for working with friable asbestos

Works that will, or potentially will, disturb or uncover friable asbestos must follow procedures for friable asbestos removal works described in the *Code of Practice - How to Safely Remove Asbestos* Safe Work Australia (2018). These broadly include the following procedures.

Prior to Works

- Workers and visitors to the work area will be made aware of the presence of asbestos and only authorised people shall enter the work area, which must be surrounded by a perimeter barrier to restrict entry that is clearly marked with asbestos removal caution signs, as per AS1319[1].
- Submit an application to undertake friable asbestos removal to Safe Work NSW no later than 5 business days prior to the proposed commencement date.
- Prepare a site specific Asbestos Removal Control Plan prior to any friable asbestos impacted materials being removed from the site.

During Works

- Removal works shall be undertaken by a Class A Licensed Asbestos Removal Contractor.
- Static air monitoring surrounding each friable asbestos impacted area and with consideration to neighbouring receptors shall be undertaken in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC: 3003(2005)]* for the duration of the work by an independent LAA as described in **Section 5.3**.
- An exclusion zone shall be established around the perimeter of the asbestos work area. The dimensions of the exclusion zone shall be dictated by the LAA or Removal Contractor.
- All personnel working within the asbestos work area shall wear PPE described in **Section 4.6**. PPE shall be decontaminated or disposed of prior to leaving the work area.
- Personal protective equipment used during the works shall be disposed of as asbestos waste.

[1] *Safety signs for the occupational environment AS 1319-1994*, Standards Australia dated 1994 (AS1319)

- Excavator operator cabins shall be kept closed during excavation works with air conditioners set to recycle.
- Spoil generated from intrusive works must be treated as asbestos impacted materials and handled accordingly. Any excess spoils must be disposed off site to a suitably licensed waste facility and in accordance with (**Section 4.10**).
- Any obvious pieces of asbestos containing materials shall be picked up and placed into a labelled asbestos waste bag.
- Soil and dust management procedures described in **Section 4.8** must be followed. This includes that any stockpiled excavated material shall be kept within the work area and kept damp, and stockpiles must be covered if left for more than 24 hours.
- Appropriate leak proof transport vehicles must be used to transport materials off-site.
- Transport vehicles shall be covered prior to leaving site and any material removed from wheels to prevent tracking outside the site.

Post Works

- At the completion of the works the cover layer (if formerly present) shall be re-instated in accordance with **Section 4.9**.
- An asbestos clearance inspection of the work area, including any excavation floor and wall surface that are not proposed to be covered, should be conducted by the LAA in accordance with **Section 5.4.2**. Any changes to site conditions should be detailed in an updated Asbestos Register (**Appendix B**).
- Upon completion of the clearance inspection by the LAA, a clearance report for the resultant / reinstated area surface shall be prepared confirming the absence of asbestos.

5.3 Specific Requirements for working with non-friable asbestos

Works that will, or potentially will, disturb or uncover non-friable asbestos must follow procedures for non-friable asbestos removal works described in the *Code of Practice - How to Safely Remove Asbestos* Safe Work Australia (2018). These broadly include the following procedures.

Prior to Works

- Workers and visitors to the work area will be made aware of the presence of asbestos and only authorised people shall enter the work area, which must be surrounded by a perimeter barrier to restrict entry that is clearly marked with asbestos removal caution signs, as per AS1319[2].
- If greater than 10 m^2 of ACM sheeting will be removed or disturbed then:
    - Submit an application to undertake asbestos removal to SafeWork NSW no later than 5 business days prior to the proposed commencement date.
    - Prepare a site specific Asbestos Removal Control Plan prior to any non-friable asbestos impacted materials being removed from the site.

During Works

- If greater than 10 m^2 of ACM sheeting will be removed or disturbed then works shall be undertaken by a Class B Licensed Asbestos Removal Contractor.

[2] *Safety signs for the occupational environment AS 1319-1994*, Standards Australia dated 1994 (AS1319)

- Static air monitoring surrounding each asbestos impacted area and with consideration to neighbouring receptors is recommended to be undertaken in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC: 3003(2005)]* for the duration of the work by a Competent Person.
- An exclusion zone shall be established around the perimeter of the asbestos work area. The dimensions of the exclusion zone shall be dictated by the Competent Person or Removal Contractor.
- All personnel working within the asbestos work area shall wear appropriate PPE described in **Section 4.6**. PPE shall be decontaminated or disposed of prior to leaving the work area.
- Personal protective equipment used during the works shall be disposed of as asbestos waste.
- Excavator operator cabins shall be kept closed during excavation works with air conditioners set to recycle.
- Spoil generated from intrusive works must be treated as asbestos impacted materials and handled accordingly. Any excess spoils must be disposed off site to a suitably licensed waste facility and in accordance with (**Section 4.10**).
- Any obvious pieces of asbestos containing materials shall be picked up and placed into a labelled asbestos waste bag.
- Soil and dust management procedures described in **Section 4.8** must be followed. This includes that any stockpiled excavated material shall be kept within the work area and kept damp, and stockpiles must be covered if left for more than 24 hours.
- Appropriate leak proof transport vehicles must be used to transport materials off-site.
- Transport vehicle shall be covered prior to leaving site and any material removed from wheels to prevent tracking outside the site.

Post Works

- At the completion of the works the cover layer (if formerly present) shall be re-instated in accordance with **Section 4.9**.
- An asbestos clearance inspection of the work area, including any excavation floor and wall surface that are not proposed to be covered, should be conducted by a Competent Person in accordance with **Section 5.4.2**. Any changes to site conditions should be detailed in an updated Asbestos Register (**Appendix B**).
- Upon completion of the clearance inspection by a Competent Person, a clearance report for the resultant / reinstated area surface shall be prepared confirming the absence of asbestos.

5.4 Monitoring Program

To ensure that the control measures being implemented at the site are effective, the following monitoring procedures will be implemented when undertaking works involving disturbance of materials containing friable asbestos (including excavation, handling or transport), and are recommended during works involving disturbance of non-friable asbestos materials:

- Daily static airborne asbestos fibre monitoring;
- Clearance monitoring (if friable asbestos is encountered only); and
- Clearance inspections.

5.4.1 Air monitoring

Airborne asbestos fibre monitoring will be undertaken by a LAA using calibrated portable air sampling pumps. Monitoring locations shall be determined by a LAA at each work area, reflective of the extent of work area and prevailing weather conditions. A Competent Person may undertake monitoring if friable asbestos is not present in the work area. At the end of each monitoring period the pump and attached filter will be collected and analysed at a NATA-accredited laboratory.

Monitoring works shall be conducted in accordance with NOHSC *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres* 2nd Edition (NOHSC:3003 [2005]).

The results of air monitoring will be available on a 24-hour turnaround time basis. Daily air monitoring reports shall be displayed in the decontamination works zone area associated with the work area.

The following action levels will be applied upon receipt of daily results, as outlined in the Safe Work Australia (2018):

- Reading of less than 0.01 fibres/mL – control measures in place are working effectively, site works to continue;
- Reading between 0.01 and 0.02 fibres/mL – a review of control measures shall be completed in the work area; and
- Reading greater than 0.02 fibres/mL – works shall cease until the cause of contamination is identified and rectified.

It is noted that these action levels adopted are more conservative than the exposure standard for airborne asbestos (0.1 fibres/mL (TWA)) as outlined in the *Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment* [NOHSC: 1003(1995)] for an 8 hour shift.

5.4.2 Clearance Inspections

On completion of works, an inspection of the work area shall be conducted by an independent LAA or Competent Person (if no friable asbestos is was, or potentially was, present) to confirm that no visible asbestos is present at the ground surface.

If a work area requires a friable asbestos clearance, an independent LAA shall perform a clearance inspection, sampling and monitoring. A Competent Person may conduct a clearance for non-friable asbestos. The clearance shall include:

- Inspection of the ground surface within and adjacent to the work area for visible asbestos;
- Where friable asbestos is encountered, or is expected to be encountered, during the works, clearance airborne asbestos monitoring shall be required following the completion of all asbestos removal works in the vicinity of the work area to show that there is no residual asbestos contamination remaining; and
- Where friable asbestos has been previously identified, or was potentially present, collection of representative samples of residual materials within the work area for asbestos analysis consistent with guidance in NEPC (2013) to show that there is no residual asbestos contamination remaining.

6. Revision of the AMP

It may, from time to time, be necessary to revise this AMP to reflect changes to legislation, changes on site and/or improvements in technologies or knowledge. As a minimum, the AMP should be reviewed following significant changes to the site condition and once every five years.

Review and revision of the AMP should be undertaken by an appropriately qualified and experienced environmental professional. Copies of the revised AMP should be distributed to the current Site Owners and occupiers and all PCBU.

7. References

AECOM (2011)	*Remedial Action Plan, 2 Christina Rd, Villawood, NSW*. AECOM Australia Pty Ltd, Ref S4149701, 17 March 2011
AECOM (2015)	*Addendum to the Orica Villawood Remedial Action Plan (Asbestos in Soils) – 2 Christina Road, Villawood, NSW*, AECOM, 11 February 2015
enHealth (2005)	*Management of Asbestos in the non-occupational environment*. enHealth, 2005
JBS&G (2015a)	*Soil Remediation Validation Report, Former Orica Villawood Site, 2 Christina Road, Villawood, NSW*, draft in progress, 20 October 2015, JBS&G Australia Pty Ltd
JBS&G (2015b)	*Ground Surface Visual Inspection for Asbestos Containing Material, Orica Villawood, 2 Christina Road, Villawood, NSW*, draft report, 24 December 2015, JBS&G Australia Pty Ltd
JBS&G (2019)	*Long-Term Environmental Management Plan, Lots 1 and 2 DP1258519 2 Christina Road, Villawood, NSW.* Revision 0 dated 14 December 2019. JBS&G Australia Pty Ltd
NEPC (2013)	*National Environment Protection (Assessment of Site Contamination) Measure*, National Environment Protection Council, 1999 as amended in 2013
NOHSC 2002(2005)	*Code of Practice for the Safe Removal of Asbestos* [NOHSC 2002(2005] (NOHSC, 2005)
Safe Work Australia (2018)	*How To Safely Remove Asbestos*, Code of Practice, Safe Work Australia, December 2018
Safe Work Australia (2020)	*How To Manage And Control Asbestos In The Workplace*, Code of Practice, Safe Work Australia, March 2020

8. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

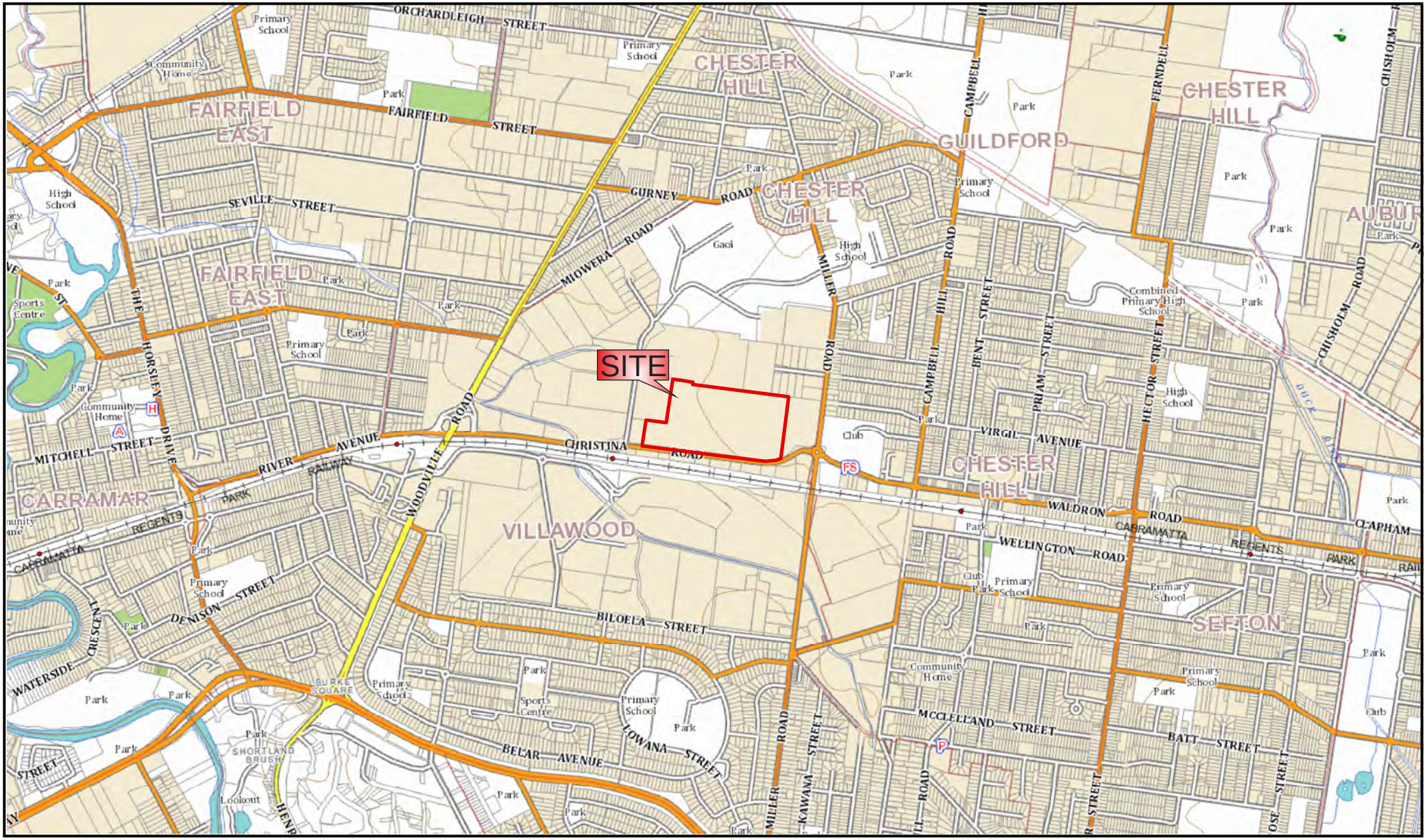
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Appendix A Figures



Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, accessed 21-05-2013

0 200 400 800 m

Scale:1:20,000

Datum: GDA 1994 MGA Zone 56 - AHD

Legend:

Approximate Site Boundary

Rev	Description	Drn.	Date:
A4			
A	Original Issue - R01	SE	17-12-2015

JBS&G **Figure 1: Site Location**

Client: Orica Australia Pty Ltd

Project: Lots 1 and 2 DP1258519 LTEMP

Job No: 51144 File Name: 51144_01

Source: Base Image - © Near Map www.nearmap.com, imagery date 5-12-2015

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Scale:1:1,750

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
A	Original Issue - R01	RF	22-12-2015

Legend:

- Western Storage Area - Coordinates
- Western Storage Area
- ISZ Excavation Areas - Coordinates
- ISZ Excavation Areas
- Approximate Site Boundary
- Site Grid (10 x 10 m)

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Figure 2: Site Layout

Client: Orica Australia Pty Ltd

Project: Lots 1 and 2 DP1258519 LTEMP

Job No: 51144 File Name: 51144_02

Table: Coordinates of ISZ Area and Western Storage Area in Figure 3
Project Number: 51144
Project Name: LTEMP - Lot 1 DP634604, 2 Christina Road Villawood

ID	Area	Easting	Northing
1	ISZ 5	313994.3	6249435.9
2	ISZ 5	314006.5	6249434.3
3	ISZ 5	314005.5	6249425.4
4	ISZ 5	313993.6	6249430.8
5	ISZ 5	314041.0	6249387.9
6	ISZ 5	314049.5	6249387.9
7	ISZ 5	314049.3	6249381.0
8	ISZ 5	314041.0	6249379.8
9	ISZ 5	314041.0	6249387.9
10	ISZ 9	314226.2	6249404.5
11	ISZ 9	314233.4	6249402.9
12	ISZ 9	314237.6	6249399.0
13	ISZ 9	314238.5	6249393.1
14	ISZ 9	314228.4	6249373.7
15	ISZ 9	314228.4	6249373.7
16	ISZ 9	314228.3	6249373.7
17	ISZ 9	314228.3	6249373.7
18	ISZ 9	314223.6	6249372.4
19	ISZ 9	314217.7	6249373.9
20	ISZ 9	314213.3	6249378.1
21	ISZ 9	314212.4	6249383.9
22	ISZ 9	314220.2	6249399.9
23	ISZ 9	314213.1	6249400.8
24	ISZ 9	314214.2	6249409.1
25	ISZ 9	314226.7	6249407.5
26	ISZ 7	314331.1	6249389.7
27	ISZ 7	314329.4	6249376.1
28	ISZ 7	314321.7	6249368.6
29	ISZ 7	314314.5	6249365.4
30	ISZ 7	314307.5	6249367.3
31	ISZ 7	314304.1	6249376.6
32	ISZ 7	314307.4	6249385.7
33	ISZ 7	314315.4	6249392.8
34	ISZ 7	314323.6	6249393.4
35	ISZ 7	314331.1	6249389.7
36	ISZ 4a	313840.5	6249262.7
37	ISZ 4a	313832.4	6249254.8
38	ISZ 4a	313821.5	6249255.2
39	ISZ 4a	313790.5	6249242.3
40	ISZ 4a	313795.8	6249275.2
41	ISZ 4a	313825.0	6249261.4
42	ISZ 4a	313830.3	6249261.6
43	ISZ 4a	313833.8	6249263.8
44	ISZ 4a	313836.2	6249275.8
45	ISZ 4a	313841.6	6249275.2
46	ISZ 4a	313840.5	6249262.7
47	ISZ 1a/8	314282.3	6249333.5
48	ISZ 1a/8	314313.9	6249319.9
49	ISZ 1a/8	314301.9	6249289.7
50	ISZ 1a/8	314299.4	6249271.4
51	ISZ 1a/8	314298.3	6249269.6
52	ISZ 1a/8	314261.9	6249285.0
53	ISZ 1a/8	314272.1	6249306.2
54	ISZ 1a/8	314272.0	6249310.1
55	ISZ 1a/8	314282.3	6249333.5
56	ISZ 1a/8	314280.0	6249258.6
57	ISZ 1a/8	314290.4	6249257.4
58	ISZ 1a/8	314306.5	6249246.4
59	ISZ 1a/8	314308.6	6249257.4
60	ISZ 1a/8	314315.5	6249256.2
61	ISZ 1a/8	314310.3	6249221.6
62	ISZ 1a/8	314303.6	6249212.3
63	ISZ 1a/8	314293.0	6249205.5
64	ISZ 1a/8	314288.3	6249205.2
65	ISZ 1a/8	314281.9	6249200.6
66	ISZ 1a/8	314281.2	6249196.4
67	ISZ 1a/8	314288.7	6249191.5

Table: Coordinates of ISZ Area and Western Storage Area in Figure 3
Project Number: 51144
Project Name: LTEMP - Lot 1 DP634604, 2 Christina Road Villawood

ID	Area	Easting	Northing
68	ISZ 1a/8	314302.1	6249193.1
69	ISZ 1a/8	314300.8	6249185.0
70	ISZ 1a/8	314281.9	6249179.5
71	ISZ 1a/8	314281.8	6249176.2
72	ISZ 1a/8	314285.3	6249167.7
73	ISZ 1a/8	314285.3	6249162.9
74	ISZ 1a/8	314278.7	6249163.1
75	ISZ 1a/8	314276.6	6249153.0
76	ISZ 1a/8	314261.0	6249153.3
77	ISZ 1a/8	314260.9	6249150.8
78	ISZ 1a/8	314247.2	6249151.6
79	ISZ 1a/8	314249.0	6249156.3
80	ISZ 1a/8	314247.1	6249168.9
81	ISZ 1a/8	314223.6	6249171.8
82	ISZ 1a/8	314224.2	6249191.0
83	ISZ 1a/8	314213.4	6249193.2
84	ISZ 1a/8	314211.9	6249197.2
85	ISZ 1a/8	314215.9	6249212.8
86	ISZ 1a/8	314221.1	6249213.7
87	ISZ 1a/8	314226.5	6249215.4
88	ISZ 1a/8	314227.0	6249223.2
89	ISZ 1a/8	314237.0	6249242.3
90	ISZ 1a/8	314241.2	6249253.1
91	ISZ 1a/8	314263.7	6249244.6
92	ISZ 1a/8	314270.6	6249237.4
93	ISZ 1a/8	314280.0	6249258.6
94	ISZ 1a/8	314293.2	6249181.0
95	ISZ 1a/8	314305.8	6249182.8
96	ISZ 1a/8	314302.8	6249159.4
97	ISZ 1a/8	314297.5	6249159.2
98	ISZ 1a/8	314293.2	6249181.0
A	Western Storage Area	314036.3	6249356.3
B	Western Storage Area	314033.3	6249354.0
C	Western Storage Area	314025.6	6249356.1
D	Western Storage Area	314011.4	6249357.8
E	Western Storage Area	314009.1	6249355.4
F	Western Storage Area	314003.9	6249356.6
G	Western Storage Area	313988.8	6249363.3
H	Western Storage Area	313977.5	6249360.6
I	Western Storage Area	313911.6	6249368.2
J	Western Storage Area	313922.8	6249435.9
K	Western Storage Area	313982.8	6249415.9
L	Western Storage Area	313989.0	6249415.9
M	Western Storage Area	313994.5	6249423.8
N	Western Storage Area	314032.2	6249417.5
O	Western Storage Area	314035.4	6249406.8
P	Western Storage Area	314050.0	6249399.4
Q	Western Storage Area	314053.2	6249395.7
R	Western Storage Area	314054.3	6249381.3
S	Western Storage Area	314047.9	6249374.5
T	Western Storage Area	314039.9	6249366.2
U	Western Storage Area	314036.3	6249356.3

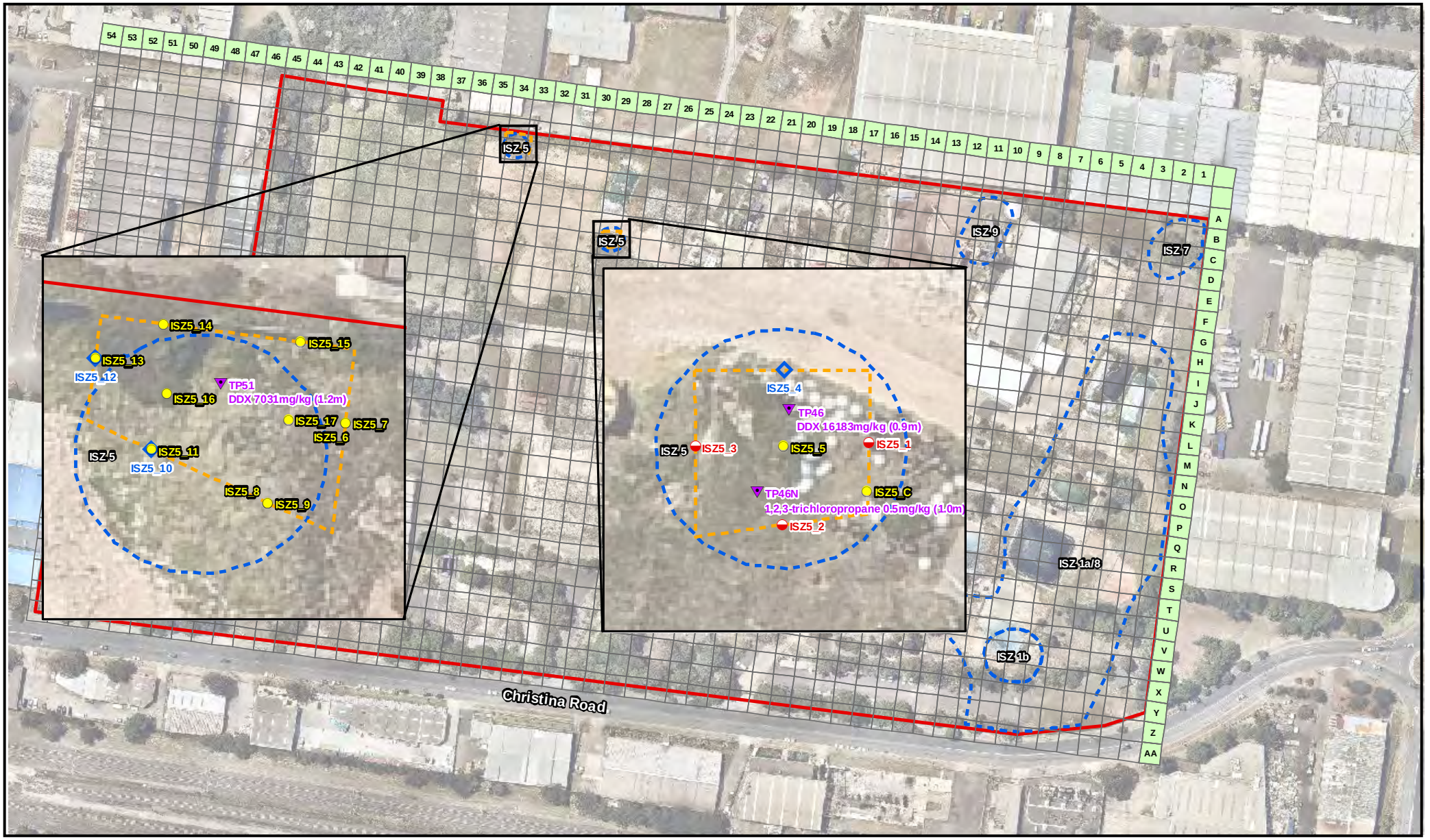
Asbestos Register
Lots 1 and 2 DP 1258519, 2 Christina Road,
Villawood, NSW Revision A, 16 March 2016

LOCATION/ SAMPLE IDENTIFICATION	MATERIAL DESCRIPTION	MATERIAL CONDITION	DATE OF LAST INSPECTION / SAMPLING	ANALYTICAL RESULT	CONTROL ACTION & DATE
^Various Locations around the Site. Refer to drawing RP1 -3002	Former Trade Waste and Water Pipes	Bonded	19th, 23rd, 26th April 2013	Lab report No. 89503	Unknown
^Within Effluent Treatment Plant located in central northern part of Site	Former WWTP Purifier bed gaskets	Bonded**	See Report L11 - 15th July 2013	NA	Unknown
^Located on Crop Care Finished Goods Warehouse footprint	Fibro fragments in stockpile of bricks	Bonded	19th, 23rd, 26th April 2013	Lab report No. 89503	Unknown
^New haul road to Treatment Pad, located east of Pilot Lab footprint	Broken pipe and fibro in soil	Bonded	19th, 23rd, 26th April 2013	Lab report No. 89503	Unknown
^Western end of Pond 1, adjacent to Switch Room footprint	Broken pipe in soil	Bonded	19th, 23rd, 26th April 2013	Lab report No. 89503	Unknown
^West of Remediation Area ISZ9. North of former Bipyridyl tank farm footprint	Broken fibro in soil	Bonded	15th May 2013	Lab report No. 90438	Unknown
^Southwest corner of FSB footprint	Broken pit and cable tray material in soil	Bonded	16th July 2013	Lab report No. 93941	Unknown
^Various locations around site, as detailed in JBS reports L09, and L10(RevA)	Asbestos lino materials	Friable	Unknown	Unknown	Unknown
^Southwest corner of Store No. 10 footprint	Asbestos sheeting formwork	Bonded	NA	NA	Unknown
ISZ 5 (north) – adjacent to excavation	Suspected bonded ACM fragment observed	Non-friable	See 1,2	NA	Covered. No visible asbestos at surface[2]. See 1,2.
ISZ 5 – sample locations ISZ 5_01, ISZ 5_02, ISZ 5_03	Friable asbestos in soil	Friable	See 1,2	Friable asbestos at concentrations exceeding 0.001% w/w. See 1.	Covered. No visible asbestos at surface[2]. See 1,2.
ISZ 5 – sample locations ISZ 5_04, ISZ 5_10, ISZ 5_12	Friable asbestos in soil	Friable	See 1,2	Friable asbestos at concentrations less than or equal to 0.001% w/w. See 1.	Covered. No visible asbestos at surface[2]. See 1,2.
ISZ 1a/8	Bonded ACM fragments observed	Non-friable	See 1,2	NA	Covered. No visible asbestos at surface[2]. See 1,2.
ISZ 1a/8 – sample ISZ 1A/8-21	Bonded ACM in soil	Non-friable	See 1,2	Bonded ACM at concentration exceeding 0.05% w/w. See 1.	Covered. No visible asbestos at surface[2]. See 1,2.
ISZ 1a/8 – sample locations ISZ 1A/8-21, ISZ1A/8-64, ISZ1A/8-121, ISZ1A/8_239 (base of former excavation)	Friable asbestos in soil	Friable	See 1,2	Friable asbestos at concentrations exceeding 0.001% w/w. See 1.	Covered. No visible asbestos at surface[2]. See 1,2.

Asbestos Register
Lots 1 and 2 DP 1258519, 2 Christina Road,
Villawood, NSW Revision A, 16 March 2016

LOCATION/ SAMPLE IDENTIFICATION	MATERIAL DESCRIPTION	MATERIAL CONDITION	DATE OF LAST INSPECTION / SAMPLING	ANALYTICAL RESULT	CONTROL ACTION & DATE
ISZ 1a/8 – sample locations ISZ 1A/8-58 (wall of former excavation)	Friable asbestos in soil	Friable	See 1,2	Friable asbestos at concentrations exceeding 0.001% w/w. See 1.	Excavation covered, but location in excavation wall. Covered. No visible asbestos at surface[2]. See 1,2
ISZ 1a/8 – sample locations ISZ1A/8_72, ISZ1A/8_75, ISZ1A/8_79, ISZ1A/8_84, ISZ1A/8-108, ISZ1A/8-111, ISZ1A/8-120, ISZ1A/8_160 (base of former excavation)	Friable asbestos in soil	Friable	See 1,2	Friable asbestos at concentrations less than or equal to 0.001% w/w. See 1.	Covered. No visible asbestos at surface[2]. See 1,2.
ISZ 1a/8 – sample locations ISZ1A/8_35, ISZ1A/8_43, ISZ1A/8_51, ISZ1A/8_63, ISZ1A/8-103, ISZ1A/8-122, ISZ1A/8-124, ISZ1A/8-127, ISZ1A/8_155, ISZ1A/8_157, ISZ1A/8_214 (wall of former excavation)	Friable asbestos in soil	Friable	See 1,2	Friable asbestos at concentrations less than or equal to 0.001% w/w. See 1.	Excavation covered, but location in excavation wall. No visible asbestos at surface[2]. See 1,2.
Surface soils in footprint of former Secure Storage Facility (SSF) – SSF_001	Friable asbestos in soil	Friable	See 1,2	Friable asbestos at concentrations less than or equal to 0.001% w/w. See 1.	None required – concentration below NEPM 2013 assessment criteria and no visible asbestos at surface[2]. See 1,2.
Surface soils in footprint of former Secure Storage Facility (SSF) – SSF_003, SSF_005	ACM in soil	Non-friable	See 1,2	ACM reported in laboratory analysis of soil samples at concentrations less than or equal to 0.05% w/w. See 1.	None required – concentration below NEPM 2013 assessment criteria and no visible asbestos at surface[2]. See 1,2.
WSA	Material containing friable and identified or potential bonded ACM underlying cover layer	Non-friable and Friable	See 1,2	Friable asbestos may be present at concentrations exceeding 0.001% w/w and non-friable asbestos at concentrations exceeding 0.05% w/w. See 1.	Covered. No visible asbestos at surface[2]. See 1,2.
Grid locations D20, K20, L14, M15, M34, N34, T52, T53, V20, V24, W31, W32, X29, X49, Y31, Z31, Z40 and AA53	Suspected ACM visually observed at the ground surface	Non-friable	See 2.	NA	Orica arranged for the removal of identified suspected ACM, with subsequent inspection of the ground surface at the grid location not visually identifying ACM. See 2.
Grid location M15	Suspected friable asbestos was visually observed at the ground surface	Friable	See 2.	NA	Orica arranged for the removal of identified suspected friable asbestos, with subsequent inspection of the ground surface at the grid location not visually identifying ACM. See 2.

Notes:
^ Information provided by Orica via email dated 24 February 2016
NA – Not available / not applicable
1. Soil Remediation Validation Report, Former Orica Villawood Site, 2 Christina Road, Villawood, NSW, draft in progress, 20 October 2015, JBS&G Australia Pty Ltd
2. Ground Surface Visual Inspection for Asbestos Containing Material, Orica Villawood, 2 Christina Road, Villawood, NSW, draft report, 24 December 2015, JBS&G Australia Pty Ltd.



Source: Base Image - © Near Map www.nearmap.com, imagery date 21-11-2014, accessed 26-02-2015

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Scale: 1:2,500

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
A	Original Issue - L048	SE	13-03-2015

Legend:

- Approximate Site Boundary
- Area of Concern
- Site Grid (10 x 10 m)
- Previous Sample Location (AECOM, 2011)
- Excavation Extent
- Validation Sample Location
- Validation Sample Location - ACM Above Adopted Criteria
- Validation Sample Location - ACM Below Adopted Criteria, above Laboratory LOR

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Figure B1: Validation Sample Locations

Client: Enviropacific Services

Project: Orica Villawood Remediation

Job No: 41672 File Name: 41672_03

0 5 10 20 m

Scale:1:550

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
A	Original Issue - R03	SE	30-09-2015

Legend:

- Approximate Site Boundary_RevB
- Area of Concern
- Indicative Extent of Excavation
- Site Grid (10x10 m)
- Previous Sample Locations
- Base
- Wall
- Hand Auger
- Removed
- Trade Waste Line

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Figure E1: Validation Samples ISZ1A Overview of Area

Client: Enviropacific Services

Project: Orica Villawood Remediation

Job No: 41672 File Name: 41672_E1

Document Distribution

Rev No.	Copies	Recipient	Date
A	electronic	Ben Dewhurst, Orica	16 March 2016
B	electronic	Ben Dewhurst, Orica	31 March 2016
C	electronic	Ben Dewhurst, Orica	17 May 2016
0	electronic	Ben Dewhurst, Orica	16 June 2016
1	electronic	James Stening, Orica	14 December 2019

Document Status

Rev No.	Author	Reviewer	Approved for Issue		
		Name	Name	Signature	Date
A (draft)	A Woinarski	M Samuel			16 March 2016
B (draft)	A Woinarski	M Samuel			31 March 2016
C (draft)	D Pringle	G Dasey	G Dasey		17 May 2016
0 (FINAL)	D Pringle	G Dasey	G Dasey		16 June 2016
1	D Pringle	G Dasey	G Dasey		14 December 2019

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Appendix H Properties of Chemical of Potential Concern

Table H1: Chemical Properties of Chemicals of Potential Concern

Contaminant Name	Abbreviation	Properties					
		Form	Colour	Odour	Solubility	Volatility	Toxicity to Humans
1,2,3-trichloropropane	-	Liquid	Colourless to light yellow	Strong acidic odour	Slightly soluble in water and heavier than water (sinks in water)	Volatile	Probable Carcinogen
1,4-dichlorobenzene	-	Solid (crystalline)	White	Moth ball-like odour	Practically insoluble in water	Volatile	Possible Carcinogen
Lindane [a-HCH (a-BHC), b-HCH (b-BHC), d-HCH (d-BHC) and g-HCH (g-BHC)]	-	Solid (crystalline)	Colourless to white	Slight musty odour	Practically water insoluble	Volatile	Possible Carcinogen
Benzene	-	Liquid	Clear, colourless	Petroleum-like odour	Insoluble and lighter than water (floats in water)	Volatile	Known Carcinogen
DDX (DDT + DDE + DDD)	-	Solid (crystalline)	White	Odourless	Insoluble in water	Not volatile, persistent	Possible Carcinogen
Endosulfan II	-	Solid (crystalline or flakes)	Cream to brown	Turpentine-like odour	Practically water insoluble	Volatile	Not known to be Carcinogenic
Hexachlorobenzene	HCB	Solid (crystalline)	Colourless to white	No description provided	Insoluble in water and heavier than water (sinks in water)	Semi-volatile	Probable Carcinogen
1,1,2-trichloroethane		Liquid	Clear, light coloured	Sweet chloroform-like odour	Insoluble in water and slightly heavier than water (sinks in water)	Volatile	Not known to be Carcinogenic
1,2-dichloroethane	DCA or EDC	Oily Liquid	Clear, colourless	Sweet chloroform-like odour	Insoluble in water and heavier than water (sinks in water)	Volatile	Possible Carcinogen
Vinyl chloride	VC	Gas	colourless	Mild, sweet odour	Slightly soluble in water	Volatile	Known Carcinogen
Chloroform	CFM	Liquid	colourless	Ether-like odour	Insoluble in water	Volatile	Probable Carcinogen
Carbon tetrachloride	CTC	Liquid	Clear, colourless	Sweet ether-like odour	Insoluble in water	Volatile	Probable Carcinogen

Contaminant Name	Abbreviation	Properties					
Trichloroethene	TCE	Liquid	Colourless	Sweet, chloroform-like odour	Slightly soluble in water	Volatile	Probable Carcinogen
Tetrachloroethene	PCE	Liquid	Colourless	Ether-like odour	Low solubility in water, heavier than water (sinks in water)	Volatile	Probable Carcinogen
Chlorobenzene	MCB	Liquid	Colourless to clear yellow	Sweet almond-like odour	Practically insoluble in water and heavier than water (sinks in water). Vapours heavier than air	Volatile	Not known to be Carcinogenic
Toluene	-	Liquid	Clear, colourless	Sweet, pungent, benzene-like odour	Insoluble in water and lighter than water (floats on water)	Volatile	Not known to be Carcinogenic
Ethylbenzene	-	Liquid	Clear, colourless	Petroleum aromatic odour	Insoluble in water and lighter than water (floats on water)	Volatile	Not known to be Carcinogenic
Xylenes	-	Liquid	Colourless	Petroleum aromatic odour	Insoluble in water and lighter than water (floats on water)	Volatile	Not known to be Carcinogenic
Polycyclic aromatic hydrocarbons, as benzo(a)pyrene	PAHs, as B(a)P	Liquid/crystalline	Light yellow	Faint aromatic odour	Low solubility in water	Semi-volatile	Known Carcinogen an Mutagen
Bis(2-chloroethyl)ether	-	Liquid	Colourless to light brown	Strong unpleasant odour	Low solubility in water	Volatile	Not known to be Carcinogenic
Dieldrin	-	Solid (flakes)	White to light brown	Mild, chemical odour	Insoluble in water	Semi-volatile	Probable Carcinogen
Inorganic mercury (total)	Hg	Solid (crystalline)	white	Odourless	Soluble in water	Semi-volatile	Possible Carcinogen

Sourced from the PubChem database, maintained by the U.S. Department of Health & Human Services (https://www.ncbi.nlm.nih.gov/pcsubstance)

Document Distribution

Rev No.	Copies	Recipient	Date
0	electronic	James Stening/Kevin Sonnemann, Orica	14 December 2019
1	electronic	James Stening/Kevin Sonnemann, Orica	23 April 2020

Document Status

Rev No.	Author	Reviewer	Approved for Issue		
		Name	Name	Signature	Date
0	G Dasey	J De Martin	G Dasey		14 December 2019
1	G Dasey	J De Martin	G Dasey		23 April 2020

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APPENDIX C – EPA Letter

DOC20/883762

Orica Australia Pty Ltd
1 Nicholson Street
EAST MELBOURNE VIC 3002
Email: james.stening@orica.com

Attention: Mr James Stening – Senior Environmental Technologist

Dear Mr Stening

Gate 1, 2 Christina Road, Villawood NSW 2163 (Lot 1 of DP 634604)

I am writing to inform you that the Environment Protection Authority (**EPA**) does not object to Orica Australia Pty Ltd (**Orica**) lodging a modification application to Department of Planning, Industry and the Environment (**DPIE**) in relation to Project Approval MP09_0147 (**Approval**) for the above premises.

We understand that Orica intends to lodge a modification application, broadly seeking to:

- amend the conditions of Approval to require ongoing compliance with a long-term environmental management plan and groundwater management plan for the premises; and
- subdivide the premises into two lots.

The EPA has provided preliminary comments to Orica on the draft Modification Report for the intended modification application, so there is an opportunity to resolve any issues prior to lodgement. When the application is lodged, the EPA will provide formal comments to DPIE on the proposal as per the usual process for State Significant Development.

We will continue to work with Orica in relation to the public positive covenant required under Environment Protection Licence No. 2149, issued to Orica under the *Protection of the Environment Operations Act 1997*, and the associated class 1 proceedings.

Yours sincerely

10 November 2020

ROB HOGAN
Manager Regulatory Operations Metropolitan

APPENDIX D – Proposed Subdivision Plan and 88B/88E Instrument

PLAN FORM 6 (2018)	DEPOSITED PLAN ADMINISTRATION SHEET	Sheet 1 of 2 sheet(s)

Office Use Only

Registered:

Title System:

Office Use Only

Draft
15th Oct., 2020

PLAN OF SUBDIVISION OF LOT 1 D.P.634604

LGA: CANTERBURY - BANKSTOWN
Locality: VILLAWOOD
Parish: LIBERTY PLAINS
County: CUMBERLAND

Survey Certificate

I, GREGORY JON FRITH

of RYGATE & COMPANY PTY. LIMITED, SYDNEY

a surveyor registered under the Surveying and Spatial Information Act 2002, certify that :

*(a) The land shown in the plan was surveyed in accordance with the Surveying and Spatial Information Regulation 2017, is accurate and the survey was completed on .....

~~*(b) The part of the land shown in the plan (*being/*excluding ^ ....)~~
was surveyed in accordance with the Surveying and Spatial Information Regulation 2017, the part surveyed is accurate and the survey was completed on, ... the part not surveyed was compiled in accordance with that Regulation, or

~~*(c) The land shown in this plan was compiled in accordance with the Surveying and Spatial Information Regulation 2017.~~

Datum Line : "X" - "Y"

Type : *Urban/~~*Rural~~

The terrain is ~~*Level-Undulating / *Steep-Mountainous~~

Signature : ..... Date : .....

Surveyor Identification No : 1066
Surveyor registered under
the Surveying and Spatial Information Act 2002

* Strike out inappropriate words.

** Specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey

Crown Lands NSW/Western Lands Office Approval

I, ... (Authorised Officer) in approving this plan certify that all necessary approvals in regard to the allocation of the shown herein have been given.

Signature: .....

Date: .....

File Number: .....

Office: .....

Subdivision Certificate

I, ...

* Authorised Person/*General Manager/*Accredited Certifier, certify that the provisions of section 6.15 Environmental Planning and Assessment Act 1979 have been satisfied in relation to the proposed subdivision, new road or reserve set out herein.

Signature : .....

Accreditation number : .....

Consent Authority : .....

Date of endorsement : .....

Subdivision Certificate number : .....

File number : .....

* Strike through if inapplicable.

Plans used in preparation of survey/~~compilation~~

D.P.25403, D.P.27324, D.P.30451, D.P.205051, D.P.228318, D.P.244775, D.P.412909, D.P.573207, D.P.597303, D.P.628716, D.P.634604, D.P.746322, D.P.791754, D.P.1017468, S.P.31496

Statements of intention to dedicate public roads, public reserves and drainage reserves, acquired/resume land.

If space is insufficient continue on PLAN FORM 6A

Surveyors Reference : 79075

Signatures, Seals and Section 88B Statements should appear on PLAN FORM 6A

PLAN FORM 6A (2017) DEPOSITED PLAN ADMINISTRATION SHEET Sheet 2 of 2 sheet(s)

Office Use Only

Registered:

PLAN OF SUBDIVISION OF LOT 1 D.P.634604

Office Use Only

Draft
15th Oct., 2020

This sheet is for the provision of the following information as required :

- A schedule of lots and addresses - See 60(c) SSI Regulation 2017
- Statements of intention to create and release affecting interests in accordance with section 88B Conveyancing Act 1919
- Signatures and seals - see 195D Conveyancing Act 1919
- Any information which cannot fit in the appropriate panel of sheet 1 of the administration sheets.

Subdivision Certificate number : .....

Date of Endorsement : .....

SCHEDULE OF LOTS AND ADDRESSES				
Lot	Street number	Street Name	Street Type	Locality
1	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A

PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT 1919 IT IS INTENDED TO CREATE :-

1. EASEMENT TO INSTALL AND ACCESS GROUND WATER WELLS (WHOLE OF LOT) [CC]
2. EASEMENT FOR ACCESS (WHOLE OF LOT) [DD]
3. EASEMENT TO INSTALL AND ACCESS FUTURE WORKS 5 WIDE [EE]
4. RESTRICTION ON THE USE OF LAND [FF]
5. POSITIVE COVENANT (WHOLE OF LOT) [GG]

If space is insufficient use additional annexure sheet

Surveyors Reference : 79075

PLAN FORM 2 (A2)

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

SHEET 1 OF 1 SHEETS

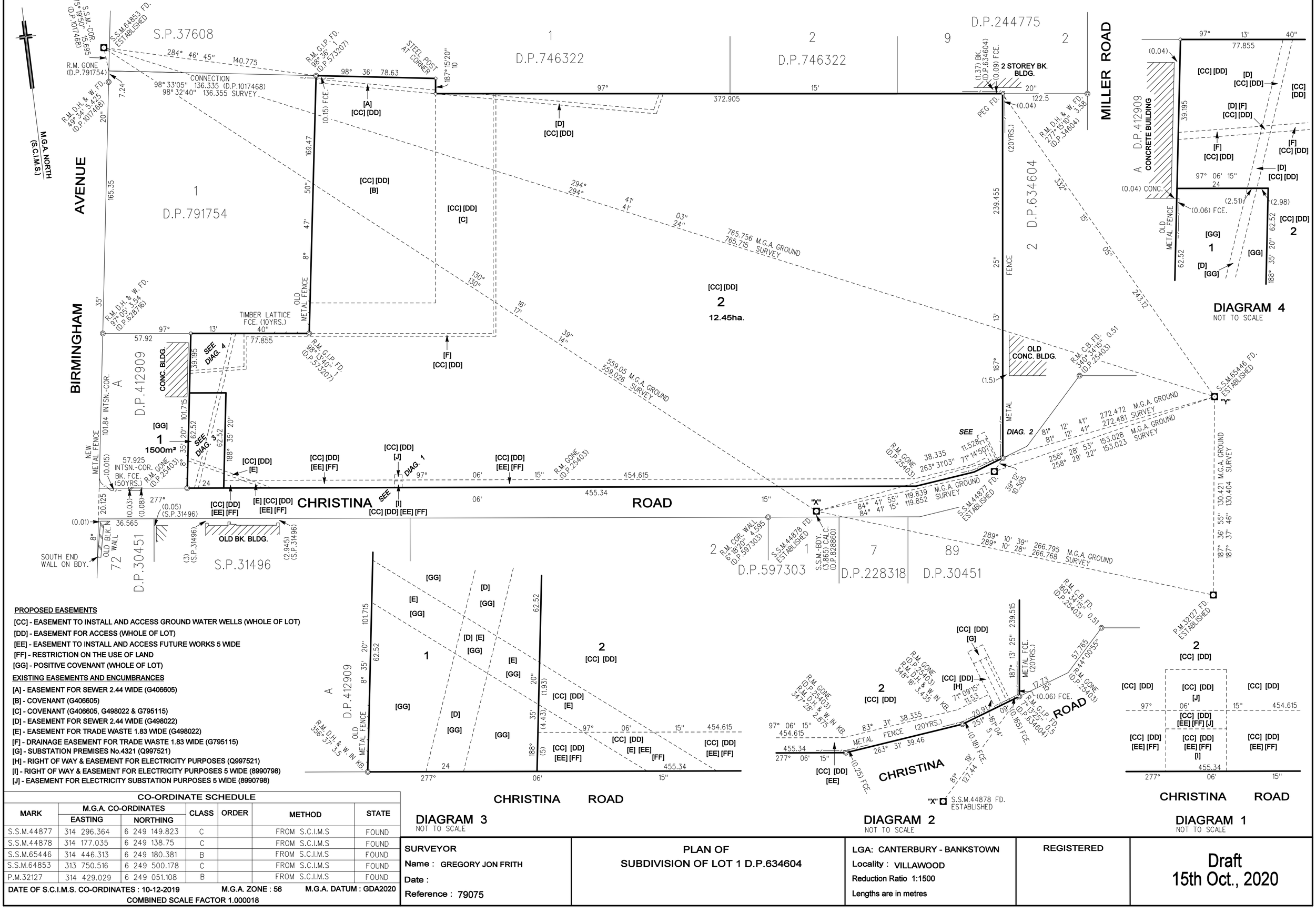

DIAGRAM 4
NOT TO SCALE

DIAGRAM 3
NOT TO SCALE

DIAGRAM 2
NOT TO SCALE

DIAGRAM 1
NOT TO SCALE

PROPOSED EASEMENTS

[CC] - EASEMENT TO INSTALL AND ACCESS GROUND WATER WELLS (WHOLE OF LOT)
[DD] - EASEMENT FOR ACCESS (WHOLE OF LOT)
[EE] - EASEMENT TO INSTALL AND ACCESS FUTURE WORKS 5 WIDE
[FF] - RESTRICTION ON THE USE OF LAND
[GG] - POSITIVE COVENANT (WHOLE OF LOT)

EXISTING EASEMENTS AND ENCUMBRANCES

[A] - EASEMENT FOR SEWER 2.44 WIDE (G406605)
[B] - COVENANT (G406605)
[C] - COVENANT (G406605, G498022 & G795115)
[D] - EASEMENT FOR SEWER 2.44 WIDE (G498022)
[E] - EASEMENT FOR TRADE WASTE 1.83 WIDE (G498022)
[F] - DRAINAGE EASEMENT FOR TRADE WASTE 1.83 WIDE (G795115)
[G] - SUBSTATION PREMISES No.4321 (Q997521)
[H] - RIGHT OF WAY & EASEMENT FOR ELECTRICITY PURPOSES (Q997521)
[I] - RIGHT OF WAY & EASEMENT FOR ELECTRICITY PURPOSES 5 WIDE (8990798)
[J] - EASEMENT FOR ELECTRICITY SUBSTATION PURPOSES 5 WIDE (8990798)

CO-ORDINATE SCHEDULE

MARK	M.G.A. CO-ORDINATES EASTING	M.G.A. CO-ORDINATES NORTHING	CLASS	ORDER	METHOD	STATE
S.S.M.44877	314 296.364	6 249 149.823	C		FROM S.C.I.M.S	FOUND
S.S.M.44878	314 177.035	6 249 138.75	C		FROM S.C.I.M.S	FOUND
S.S.M.65446	314 446.313	6 249 180.381	B		FROM S.C.I.M.S	FOUND
S.S.M.64853	313 750.516	6 249 500.178	C		FROM S.C.I.M.S	FOUND
P.M.32127	314 429.029	6 249 051.108	B		FROM S.C.I.M.S	FOUND

DATE OF S.C.I.M.S. CO-ORDINATES : 10-12-2019 M.G.A. ZONE : 56 M.G.A. DATUM : GDA2020
COMBINED SCALE FACTOR 1.000018

SURVEYOR
Name : GREGORY JON FRITH
Date :
Reference : 79075

PLAN OF
SUBDIVISION OF LOT 1 D.P.634604

LGA: CANTERBURY - BANKSTOWN
Locality : VILLAWOOD
Reduction Ratio 1:1500
Lengths are in metres

REGISTERED

Draft
15th Oct., 2020

INSTRUMENT SETTING OUT TERMS OF EASEMENTS OR PROFITS À PRENDRE INTENDED TO BE CREATED OR RELEASED AND OF RESTRICTIONS ON THE USE OF LAND OR POSITIVE COVENANTS INTENDED TO BE CREATED PURSUANT TO SECTION 88B, CONVEYANCING ACT, 1919

Lengths are in metres **(Sheet 1 of 12 Sheets)**

Plan: DP Plan of Subdivision of Lot 1 Deposited Plan 634604 covered by subdivision certificate No. …….. dated……..

Full name and address of proprietor of the land: Orica Limited, Level 3, 1 Nicholson Street, East Melbourne, Victoria 3002

Part 1 – Creation

Number of item shown in the intention panel on the Plan:	**Identity of easement, profit a prendre, restriction or positive covenant to be created and referred to in the Plan:**	**Burdened Lot(s) or parcel(s):**	**Benefited Lot(s), road(s), bodies or Prescribed Authorities:**
1	Easement to install and access Groundwater Wells (whole of lot) [identified as [CC] on the Plan]	Lot 2	Lot 1
2	Easement for access (whole of lot) [identified as [DD] on the Plan]	Lot 1 Lot 2	New South Wales Environment Protection Authority
3	Easement to install and access future works 5 wide [identified as [EE] on the Plan]	Lot 2	Lot 1
4	Restriction on the use of the land [identified as [FF] on the Plan]	Lot 2	Lot 1
5	Positive covenant (whole of lot) [identified as [GG] on the Plan]	Lot 1	New South Wales Environment Protection Authority

Plan: DP	Plan of Subdivision of Lot 1 Deposited Plan 634604 covered by subdivision certificate No. …….. dated……..
Full name and address of proprietor of the land:	Orica Limited, Level 3, 1 Nicholson Street, East Melbourne, Victoria 3002

Part 2 – Terms

1 Definitions and interpretation

1.1 Definitions

These meanings, in any form, apply unless the contrary intention appears:

(a) **Act** means the *Conveyancing Act 1919* (NSW).

(b) **Authorised User** means every other person authorised by the Grantee or the Grantor or the EPA, as applicable, for the purposes of an easement, positive covenant and restriction on use created by this instrument. Subject to the terms of an easement, positive covenant and restriction on use, an Authorised User includes the employees, agents, contractors, licensees and invitees of the Grantee or Grantor or the EPA, as applicable and, in the case of the Grantor only, includes the Grantor's tenants and any subtenants.

(c) **Authority** means a governmental or semi-governmental administrative, fiscal or judicial department or entity, a statutory agency or authority or the local council.

(d) **Contamination** means the presence in, on, under or migrating from the Burdened Lots, whether in soil or groundwater, of a substance (whether solid, liquid or gas) at a concentration above the concentration that the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents, or has the potential to present, a risk of harm to human health or to the environment or is otherwise subject to regulation or action or attracts or has the potential to attract liability or remediation obligations under any Environmental Laws.

(e) **Easement Site** means, in relation to an easement in this instrument, the site of that easement as identified on the Plan.

(f) **Environmental Law** means any law, whether statute or common law, concerning environmental matters, and includes but is not limited to law concerning land use, development, pollution, contamination, waste disposal, toxic and hazardous substances, conservation of natural or cultural resources and resource allocation including any law relating to exploration for, or development or exploitation of, any natural resource and includes the *Environmental Planning and Assessment Act 1979* (NSW), the *Contaminated Land Management Act 1997* (NSW) and the *Protection of the Environment Operations Act 1997* (NSW).

(g) **EPA** means the New South Wales Environment Protection Authority constituted by the *Protection of the Environment Administration Act 1991* (NSW).

(h) **GMP** means the Groundwater Management Plan dated 23 April 2020 prepared by JBS&G Australia Pty Ltd (or any subsequent version or replacement approved by the Site Auditor), which contains:

(1) a plan for the management of groundwater Contamination; and

(2) requirements in relation to the management of that groundwater Contamination.

(i) **Grantee** means the prescribed authority, or registered proprietor or mortgagee in possession of the Lot Benefited.

(j) **Grantor** means the registered proprietor or mortgagee in possession of the Lot Burdened.

(k) **Groundwater Wells** means any well designed for the purposes of sampling groundwater or extraction, recirculation, or reinjection of groundwater.

(l) **Lot** means a Lot as shown in the Plan.

(m) **Lot Benefited** means a Lot benefited by an easement, positive covenant or restriction on use in this instrument.

(n) **Lot Burdened** means a Lot burdened by an easement, positive covenant or restriction on use in this instrument.

(o) **LTEMP** means the Long-Term Environmental Management Plan dated 23 April 2020 prepared by JBS&G Australia Pty Ltd (or any subsequent version or replacement approved by the Site Auditor).

(p) **Monitoring Activities** means performing or causing to be performed environmental testing and remediation that includes the installation and maintenance of Groundwater Wells, taking groundwater samples, extraction of groundwater, soil samples, excavation and other minor earthwork activities and any other activities reasonably required by the EPA.

(q) **Monitoring Equipment** means the Groundwater Wells and any equipment associated with their installation, operation, maintenance and repair and any equipment associated with Monitoring Activities.

(r) **Monitoring Equipment and Activities** means Monitoring Equipment and Monitoring Activities.

(s) **Plan** means the deposited plan to which this instrument relates.

(t) **Registered Proprietor** means the registered proprietor from time to time of Lot 1 or of any part of Lot 1.

(u) **Site Auditor** means a person accredited under the EPA's NSW Site Auditor Scheme.

(v) **Service** includes those services defined in section 196L of the Act and those services for:

(1) the supply of water, gas, recycled water, electricity or artificially heated or cooled air; and

(2) fire safety or control services (including fire hydrant sprinkler systems); and

(3) the provision of sewerage and drainage; and

(4) telephone, radio, television or other transmission means; and

(5) security systems; and

(6) mechanical ventilation; and

(7) irrigation systems; and

(8) any other facility, supply or transmission, including wires, ducts, cables, conduit tracks, pipes and risers for that service provided those Services do not interfere with any Monitoring Equipment and Activities.

1.2 References to certain terms

Unless a contrary intention appears, a reference in this instrument to:

(a) **(reference to any thing)** a reference to any thing is a reference to the whole or each part of it;

(b) **(reference to statute)** a law, ordinance or code includes regulations and other instruments under it and consolidations, amendments, re-enactments or replacement of them;

(c) **(singular includes plural)** the singular includes the plural and vice versa; and

(d) **(meaning not limited)** the words "include", "including", "for example" or "such as" are not used as, nor are they to be interpreted as, words of limitation and, when introducing an example, do not limit the meaning of the words to which the example relates to that example or examples of a similar kind.

1.3 Headings

Headings do not affect the interpretation of this instrument.

1.4 Positive covenants and maintenance requirements

A requirement for an easement which requires a Grantee or Grantor to maintain or repair an Easement Site or anything in an Easement Site is a positive covenant according to section 88BA of the Act.

2 General provisions

2.1 Application of this clause

This clause applies to each easement, positive covenant and restriction on use in this instrument, except where the contrary intention is expressed.

2.2 Easements are covenants and agreements between Grantee and Grantor

Except for clause 7, the conditions, covenants and restrictions, including in this clause and in each of the easements, positive covenants and restrictions on use in this instrument (to the extent applicable), are covenants and agreements between:

(a) each Grantee for itself, its successors and every person who is entitled to an estate or interest in possession of the Lot Benefited or any part of it with which the right is capable of enjoyment; and

(b) each Grantor for itself, its successors and every person who is entitled to an estate or interest in possession of the Lot Burdened or any part of it with which the right is capable of enjoyment,

to the intent that the benefit and burden of those covenants and agreements are annexed to and pass with the benefits and burdens of the easements, positive covenants and restrictions on use.

2.3 Release and indemnity

(a) The Grantee and its Authorised Users entering upon a Lot Burdened pursuant to the rights granted by an easement created by this instrument shall do so at its or their own risk.

(b) The Grantee releases the Grantor and the Grantor's relevant Authorised Users from all claims and demands of every kind and from all liabilities which may arise in respect of any accident or damage to property or death of or injury to any person entering upon the relevant Lot Burdened in pursuance of the rights granted by an easement created by this instrument except to the extent caused or contributed to by the wilful or negligent act or omission of the Grantor or the Grantor's relevant Authorised Users, as applicable.

(c) The Grantee must indemnify and keep indemnified the Grantor and the Grantor's Authorised Users from and against all claims, actions, demands, losses, damages, costs and expenses incurred by the Grantor or for which such Grantor or the Grantor's Authorised Users may become liable in respect of any loss, damage, death or injury from any cause whatsoever occurring on a Lot Burdened or to any person or property within or without the Lot Burdened, occasioned or contributed to by any act, omission, neglect, breach of the conditions of an easement created by this instrument or default of the Grantee or the Grantee's Authorised Users upon the relevant Lot Burdened in pursuance of the rights granted by this instrument, except to the extent caused or contributed to by the wilful or negligent act or omission of the Grantor or the Grantor's relevant Authorised Users, as applicable.

2.4 Obligations of Grantees and Grantors

Each Grantee and Grantor must, as appropriate, comply with the terms of the easements, positive covenants and restrictions on use in this instrument.

2.5 Obligations for Authorised Users

For each easement, positive covenant and restriction on use in this instrument, the Grantee must procure that its Authorised Users comply with the terms of this instrument when they exercise their rights or comply with their obligations under this instrument.

2.6 Grantee's acknowledgement

The Grantee acknowledges and agrees that the Grantor may erect signage, structures or other improvements on the Lot Burdened at any time, subject to the access and related rights granted under this instrument.

3 Terms of easement to install and access Groundwater Wells [CC] numbered 1 in the Plan

3.1 Access and related rights

The Grantor grants to the Grantee and its Authorised Users full and free right and liberty to enter upon the Easement Site with or without vehicles, machines, equipment, implements or tools, for the purpose of sampling, testing, installing, maintaining, repairing, replacing or relocating of Groundwater Wells, including:

(a) inspecting, testing, measuring, surveying and evaluating the land within the Easement Site;

(b) Monitoring Equipment and Activities;

(c) complying with its obligations under any environmental agreements which apply or relate to the Lot Burdened;

(d) complying with any obligations which may be imposed on it under any Environmental Law; and

(e) complying with any obligations which may be imposed on it by the EPA or any other Authority.

3.2 Obligations of Grantee

The Grantee must comply with all applicable laws and approvals and requirements of all Authorities when carrying out works in the Easement Site.

3.3 Grantor's acknowledgement

The Grantor acknowledges and agrees that the Grantee may install and leave equipment in the Easement Site for the purposes of the Grantee exercising its rights under this clause 3.

3.4 Obligations of the Grantor

(a) The Grantor will not interfere with the Grantee exercising any of the Grantee's rights under clause 3.1.

(b) The Grantor will not interfere with any existing or installed Groundwater Wells and must ensure that the Grantee can access the Groundwater Wells.

(c) The Grantor acknowledges that it may build improvements over the Lot Burdened provided that:

(1) the Grantor will not interfere with any existing or installed Groundwater Wells and must ensure that the Grantee can access the Groundwater Wells; and

(2) the Grantor may be required to remove any improvements over the Lot Burdened if requested by the Grantee in order that the Grantee can install new Groundwater Wells.

3.5 Costs

The Grantor and the Grantee must bear its own costs and expenses in relation to and arising out of the exercise of its rights, including costs and expenses, incurred in complying with its obligations associated with the easement in this clause 3.

3.6 Indemnity

The indemnity provided in clause 2.3(c) does not apply to any loss or damage caused to the Grantor's property due to the Grantee exercising its rights under this clause.

4 Terms of easement for access [DD] numbered 2 in the Plan

4.1 Right of access

Subject to other provisions of this clause 4, the EPA and the EPA's Authorised Users are granted the full and free right at all times by any reasonable means, to go, pass and repass across the Lot Burdened, but only within the Easement Site, for the purpose of monitoring compliance with obligations under the GMP and the LTEMP.

4.2 Obligations relating to access - EPA

(a) When exercising a right under this easement the EPA must, and must ensure that its Authorised Users:

(1) cause as little disturbance and inconvenience as is possible to the Grantor and any Monitoring Equipment and Activities on the Lot Burdened;

(2) promptly make good and repair any damage, to the extent caused by the EPA or its Authorised Users, to the reasonable satisfaction of the Grantor;

(3) leave the Lot Burdened in a clean and tidy state;

(4) comply with all applicable laws and approvals and requirements of all Authorities;

(5) comply with all reasonable directions of the Grantor and any occupier of the Lot Burdened; and

(6) not unreasonably obstruct the use of the Lot Burdened.

(b) For the purposes of this clause 4 the EPA acknowledges and agrees that the rights granted under this easement may be restricted by all applicable laws and approvals and requirements of all Authorities.

5 Terms of easement to install and access future works [EE] numbered 3 in the Plan

5.1 Access and related rights

(a) The Grantor grants to the Grantee and its Authorised Users full and free right and liberty to enter upon the Easement Site with or without vehicles, machines, equipment, implements or tools and carry out any works for any purpose required for the Grantee to comply with the requirements of the GMP and any contingency actions that result from the groundwater Contamination required by the LTEMP (including any ancillary actions or works required).

(b) The Grantor acknowledges that these works may include but are not limited to carrying out work, such as constructing, placing, installing, repairing, using, operating, maintaining, examining, re-laying, altering, renewing, cleaning, replacing, enhancing, adding to or removing pipes, poles, wires, cables, ducts, conduits, structures and equipment in the Easement Site.

5.2 Obligations of Grantee

The Grantee must comply with all applicable laws and approvals and requirements of all Authorities when carrying out works in the Easement Site.

5.3 Grantor's acknowledgement

The Grantor acknowledges and agrees that the Grantee may install and leave equipment and improvements in the Easement Site for the purposes of the Grantee exercising its rights under this clause 5.

5.4 Costs

The Grantor and the Grantee must bear its own costs and expenses in relation to and arising out of the exercise of its rights, including costs and expenses incurred in complying with its obligations associated with the easement in this clause 5.

5.5 Indemnity

The indemnity provided in clause 2.3(c) does not apply to any loss or damage caused to the Grantor's property due to the Grantee exercising its rights under this clause.

6 Terms of restriction on the use of the land [FF] numbered 4 in the Plan

(a) The Grantor covenants that it will not, without the written permission of the Grantee (and in accordance with such conditions as the Grantee may reasonably impose), carry out any works, install any Services or build any improvements in the Easement Site.

(b) The Grantor may:

(1) carry out surface works in the Easement Site to allow for safe access by the Grantor and its Authorised User to cross the Easement Site with or without vehicles to the remainder of the Lot Burdened;

(2) temporarily park cars in the Easement Site provided the cars will be removed at the request of the Grantee; and

(3) carry out any activity within the Easement Site reasonably considered necessary to:

(A) comply with any notice issued by an Authority;

(B) remove or reduce the risk of personal injury or damage to property except to the extent that it interferes with the any equipment or improvements installed in accordance with the rights granted under clause 5 of this instrument.

(c) The Grantor acknowledges that in any proposal by the Grantor to install Services across the Easement Site that these will generally be placed on a north/south axis and the Grantor must minimise any installation of Services along the Easement Site in an east/west axis (ie parallel to Christina Road).

(d) The Grantor will at its own cost inform the EPA of any changes in ownership or occupancy of the Lot Burdened.

7 Terms of positive covenant [GG] numbered 5 in the Plan

(a) The Registered Proprietor covenants with the EPA that the Registered Proprietor will at its own cost:

(1) comply with the requirements imposed on the Registered Proprietor by the GMP and any contingency actions that result from the groundwater Contamination required in the LTEMP at all times, including the provision of reports as is required to be prepared by the GMP and LTEMP, to the EPA or any other specified person at the specified periods or on the occurrence of a specific event for review and/or approval;

(2) carry out such monitoring in the manner and at the times required by the GMP;

(3) carry out any contingency actions required in the LTEMP to address risks to human health or the environment that result from the groundwater Contamination; and

(4) inform the EPA of any changes in ownership or occupancy of the Lot Burdened.

(b) The conditions and covenants in this clause 7 are covenants and agreements between:

(1) the EPA for itself and its successors, assignees and transferees; and

(2) the Registered Proprietor for itself and its successors.

(c) The positive covenant under clause 7(a) of this instrument must only be released, varied or modified with the written consent of the EPA.

[***Drafting note: EPA form of execution block to be confirmed and inserted***]

INSTRUMENT SETTING OUT TERMS OF EASEMENTS OR PROFITS À PRENDRE INTENDED TO BE CREATED OR RELEASED AND OF RESTRICTIONS ON THE USE OF LAND OR POSITIVE COVENANTS INTENDED TO BE CREATED PURSUANT TO SECTION 88B, CONVEYANCING ACT, 1919

Lengths are in metres **(Sheet 11 of 12 Sheets)**

Plan: DP Plan of Subdivision of Lot 1 Deposited Plan 634604 covered by subdivision certificate No. …….. dated……..

Full name and address of proprietor of the land: Orica Limited, Level 3, 1 Nicholson Street, East Melbourne, Victoria 3002

Signed sealed and delivered by
Orica Limited
in accordance with section 127 of the *Corporations Act 2001* (Cth) by:

sign here ► _____
Director

print name _____

sign here ► _____
Company Secretary

print name _____

[***Drafting note: the proposed plan below has been inserted into this document for reference and convenience only. On finalisation of this instrument this page (and plan) should be deleted and the instrument printed single sided in black and white on A4 paper.]***