Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Conceptual Remediation Action Plan

Proposed Rezoning
Lot 1 Military Road, Port Kembla

Prepared for
Mr Olly Vujic

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author	for Michael Gol	5 September 2016
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Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
1/1 Luso Drive
Unanderra NSW 2526
PO Box 486
Unanderra NSW 2526
Phone (02) 4271 1836
Fax (02) 4271 1897

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1. Introduction

This conceptual remediation action plan (RAP) has been prepared by Douglas Partners Pty Ltd (DP) for the proposed rezoning of Lot 1 Military Road, Port Kembla (hereafter referred to as 'the site'). The RAP was commissioned in an email dated 9 November 2015 by Mr Luke Rollinson of MMJ on behalf of Mr Olly Vujic and was prepared in accordance with Douglas Partners' proposal WOL150579 dated 30 October 2015.

The following previous investigations have been undertaken for the site and provided to DP for review:

- Golder Associates Pty Ltd, *DSI – Detailed Site Investigation, Former Port Kembla Primary School, Military Road, Port Kembla, NSW*, dated December 2013 (Golder, 2013); and
- Senversa Pty Ltd Letter, *Re: Management Options, Former Port Kembla Primary Public School*, dated 17 April 2015 (Senversa, 2015).

It is understood that the site is to be redeveloped for medium density residential use. However, no further detail on the proposed development has been provided for the preparation of this RAP.

It is understood that in NSW medium density residential zone is defined as providing for medium density housing such as town houses, villas and residential flat buildings as well as supportive non-residential uses including neighbourhood shops.

It is noted that based on the limited design information, further data assessment following finalisation of the proposed development design may be required. Furthermore, a detailed asbestos investigation is required prior to remediation. Therefore this RAP has been prepared to provide conceptual remediation strategies and general remediation management practices only. This RAP will require review following finalisation of the proposed development design and further assessment.

The scope of works includes a review of the provided reports and the preparation of this RAP outlining conceptual remediation strategies as well as a potential preferred conceptual strategy and methods to be followed to remediate and validate the site to a standard suitable for the proposed medium density residential land use.

2. Objectives of the RAP

The RAP sets out the conceptual methodology by which the site could be remediated in an acceptable manner, with minimal environmental impact, to a condition suitable for the proposed medium density residential land use.

The objectives of the final remediation and validation programme will be to:

- Render the site compatible for a proposed medium density residential land use;
- Maintain records of the remediation works undertaken and validate the success of the remediation works;
- Mitigate adverse impacts on surrounding land and waterways during the remediation works by the management of dust, water and noise emissions; and
- Maximise the protection of workers involved with remediation and earthworks.

3. Site Information

The site location is shown on the Golder (2013) Figures, Appendix B. Table 1 presents a summary of the site identification details.

Table 1: Summary of Site Details

Site Identification	
Street Address	Lot 1 Military Road, Port Kembla, NSW, 2505. Australia
Lot Description	Lot 1 Deposited Plan 811699
County	Camden
Parish / Local Government Area	Wollongong
Suburb	Port Kembla
Ownership	Mr Olly Vujic
Zoning	B4 Mixed Use
Local Environmental Plan	Wollongong Local Environmental Plan 2009
Area	2.19 hectares

The site is approximately trapezoidal in shape and is vacant and fenced from public access.

The site is bound to the north by Electrolytic Street, to the north east by Reservoir Street, to the south east by Marine Street and to the south west by Military Road. The land use beyond the adjoining streets to the north and northeast is heavy industry and the land use beyond the adjoining streets to the east, south and west is residential.

The site is located approximately 900 m south of Port Kembla Outer Harbour, 750 m north east of Coomaditchy Lagoon and 700 m west of the Tasman Sea.

The site was used as a primary school from 1916 until 2002 after which the site has been unused with the majority of the former primary school infrastructure removed shortly after closure of the school, apart from a heritage listed building which was present at the site up until 2013.

The site surface is a mix of grass cover, hardstand areas and former building footprints. The heritage listed building that was recently demolished was located in the centre of the site on a small hill on the crest of a ridgeline trending north west to south east, with the ground surface sloping down from this area in every direction. Following review of the NSW 2 m contour map the crest of the ridge in the central portion of the site is approximately 34 m Australian Height Datum (AHD) with the north western

point of the site being between 24 and 26 m AHD and the southern corner of the site boundary being between 26 and 28 m AHD.

Reference to the Wollongong-Port Hacking 1:100,000 Soils Landscape Sheet indicates that the site is underlain by residual soils of the Gwynneville soil landscape. Reference to the Wollongong-Port Hacking 1:100,000 Geology Sheet indicates that the residual soil in turn is underlain by the Dapto Latite Member of the Shoalhaven Group from the Permian age.

4. Previous Reports

4.1 Golder (2013)

The objectives of Golder (2013) were to:

- *"Assess the nature and extent of contamination to soil and groundwater resulting from the potential contaminating activities identified in the previous contaminated land reports;*
- *Assess the suitability of the site for potential future mixed business and medium density residential land use; and*
- *Assess sufficient information to develop remediation and/or management measures to render the site suitable for the proposed future use."*

As detailed in Golder (2013), a number of previous reports have been prepared for the site, including the Golder report *Phase 1 Environmental Site Assessment - Former Port Kembla Primary School, Military Road, Port Kembla, NSW*, (reference not provided) dated November 2012 (Golder, 2012). Golder (2012) has not been reviewed as part of this RAP. However, Golder (2013), which was reviewed for this RAP, provided a brief summary of the previous reports made available at the time of Golder (2013) preparation.

Based on the results of Golder (2012) the onsite potential areas of environmental concern identified and targeted for sampling as part of Golder (2013) included:

- Areas of the site filled with slag and coal washery rejects;
- Suspected asbestos-containing cement fragments observed on concrete hardstand south of former buildings;
- Surficial soil impacts from historical fallout of airborne deposits from nearby industrial activities;
- Lead containing paint residues in soils surrounding demolished buildings;
- Mounded / stockpiled soil of unknown composition;
- Areas of demolished buildings;
- Seepage water in northern portion of site near Electrolytic Street; and
- Septic tank.

In order to achieve the identified objectives, and investigate the on-site potential areas of environmental concern, Golder (2013) comprised the excavation of 24 test pits and the drilling of six

boreholes, which were located on an approximate 30 m grid across the site (Golder Figure 2, Appendix B). Soil samples were collected from the test pits and boreholes at surface, 0.5 m below ground level (bgl), 1 m bgl, at every metre thereafter and/or at signs of contamination. Four shallow monitoring wells were installed, either converted from a borehole (BH4 converted into MW4) or installed near the locations where water seepages had been observed in the test pits. Following installation all newly installed shallow groundwater monitoring wells were dry and were not sampled. Two pre-existing deep groundwater monitoring wells were sampled as part of Golder (2103).

The obtained soil and groundwater samples were submitted to a National Association of Testing Authorities, Australia (NATA) accredited laboratory for chemical analysis of potential contaminants of concern, associated to the sites and surrounding sites former land uses as identified in previous assessments.

Golder (2013) was undertaken and prepared in accordance with National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM, 1999 – amended 2013). The site assessment criteria (SAC) used in Golder (2013) were site specific and (in general) adopted in accordance with NEPM (1999 – amended 2013). It is further noted that the SAC were selected for the then proposed development comprising mixed business and medium residential land use (i.e. residential with minimal access to soil and commercial/industrial).

Golder (2013) reported the following findings:

- Ground conditions generally comprised a thin layer of fill material (typically less than 0.5 m thick) overlying natural soils typically comprising gravelly silty clay and clay overlying bedrock which was generally encountered at approximately 1 m bgl;
- Coal washery rejects were reported in approximately one-third of the sampling locations undertaken;
- The concentrations of chemicals of interest in soils samples were not reported greater than the limits of reporting and / or health investigation levels (HIL) or health screening levels (HSL) adopted in Golder (2013) for the proposed mixed business and medium density residential land use;
- Concentrations of arsenic (three soil samples), copper (22 soil samples) and zinc (seven soil samples) exceeded the adopted ecological investigation levels (EIL);
- The concentrations of total recoverable hydrocarbons (TRH) F3 ($>C_{16}$-C_{34}) in soil samples from two test pits located near Electrolytic Street were greater than the adopted residential ecological screening levels (ESL);
- Asbestos-containing material (ACM) was detected in seven test pits located in the central portions of the site and along north eastern site boundary. Analysis indicated that one soil sample containing ACM had a concentration of non-friable asbestos above the adopted asbestos HSL for both residential and commercial land use;
- Golder (2013) considered that the soil issues identified may require future management in residential portions of the site which could include on site retention and management through an environmental management plan (EMP);
- Groundwater was reported within the pre-existing deep groundwater wells (D1 and D4) at depths of 0.45 to 1.7 m bgl. The newly installed groundwater monitoring wells (which were installed at depths of between 1.6 m and 2.5 m bgl) were all dry following installation;

- Shallow groundwater under the site was considered to be perched, of limited extent, potentially ephemeral and, therefore, have limited potential use;
- Inferred groundwater flow was identified towards the north and since the site is located on a ridge it was considered to represent a recharge zone and groundwater divide. Groundwater movement in other directions was also considered possible;
- Concentrations of chemicals of interest in groundwater were not reported greater than the limit of reporting or adopted investigation levels apart from copper and zinc which were greater than the Australian and New Zealand Environment and Conservation Council (ANZECC, 2000) guidelines for marine ecosystems and chromium, copper, lead, nickel and zinc which were greater than the ANZECC (2000) guidelines for freshwater ecosystems; and
- Golder (2013) considered that the concentrations of chemicals of interest in groundwater above the adopted groundwater investigation criteria represented ambient background groundwater quality, given the industrial history of the region, the similarity in the concentrations of metals in soils on site and at background soil sample locations and the location of the site in a recharge zone. On this basis management of groundwater under the site was not considered to be required.

Despite being identified as an objective of Golder (2013), no comment was made regarding the suitability of the site for the proposed mixed business and medium density land use.

The Golder (2013) Figures are provided in Appendix B.

4.2 Senversa (2015)

The objective of Senversa (2015) was to provide a summary of site conditions and management options to permit future medium density residential and commercial use of the site.

Senversa (2015) reviewed both Golder (2013) and Golder (2012) and considered that the staging and scope of the Golder investigations were consistent with guidance provided in the National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM, 1999 – amended 2013)

Based on the findings reported in Golder (2013), Senversa (2015) identified the following issues at the site and identified possible management strategies for them:

- Asbestos in soil in the central / northern parts of the site;
- Metals and TRH in soil (fill) which exceed the EILs and ESLs; and
- Aesthetic aspects of some of the fill material.

Senversa (2015) subsequently considered the following on-site management options:

A. Consolidation and containment of asbestos impacted soils – potentially under paved areas of the future development. Senversa (2015) noted that Schedule B1 of the NEPM (1999 – amended 2013) encourages on site management of asbestos in soil.

B. Movement of aesthetically unsuitable soils and soils containing metals greater than the EILs and ESLs under roadways, footpaths or paved common areas of the future development.

C. Preparation and implementation (by the development body corporate) of an environmental management plan (EMP), which would document:
   - The locations at which asbestos, aesthetically unsuitable soils and soils with metal and TRH concentrations greater than the EILs and ESLs have been placed, and
   - Management measures to be implemented if these soils are to be disturbed.

Senversa (2015) further considered that the excavation and offsite disposal of the asbestos impacted soils, aesthetically unsuitable soils, and soils containing metals and TRH greater than the EILs and ESLs could be conducted, but was not considered necessary in the context of the proposed future use of the site.

4.3 Comments on Previous Reports

Following the review of Golder (2013) and Senversa (2015) the following comments are made:

- Golder (2013) was assessed to SAC developed on the then proposed future land use of residential with limited access to soils and commercial/industrial.
- Golder (2013) comprised sufficient sampling locations to meet the minimum sample points required for site characterisation based on detecting hotspots using a systematic sampling pattern as detailed in the NSW EPA Sample Design Guidelines (1995). It is further noted that sufficient information is provided in Golder (2013) for the development of broad scale contaminated land remediation and validation strategies. However, it is considered that further delineation is required to establish the extent of the identified contamination issues if the development of targeted management and validation strategies is required;
- The incorrect ESL for benzo(a)pyrene (BaP) a polycyclic aromatic hydrocarbon (PAH) has been adopted as part of the Golder (2013) assessment. An ESL for B(a)P of 1.4 mg/kg (Commercial and industrial land use) was adopted as opposed to the appropriate ESL for B(a)P of 0.7 mg/kg for urban residential and public open spaces. One sample (TP28 0 – 0.1 m) was reported with a concentration of B(a)P of 0.7 mg/kg. It is considered most likely that this isolated low exceedance of the ESL could be reassessed using statistical analysis to determine the 95% upper confidence limit of the average concentration of the B(a)P in fill material. This statistical analysis should be undertaken as part of further assessment following finalisation of the proposed development design;
- The samples selected for asbestos analysis were from a specific area of the site based on observations of the surface condition. Asbestos sampling and analysis was limited to samples from ten test pits (TP3, TP7, TP10, TP11, TP12, TP12A, TP15, TP16A, TP16B and TP20 and was detected in seven of these pits, refer to Golder Figure 3, Appendix B. Anthropogenic material, possibly demolition rubble, was recorded in fill at several sampling locations that were not assessed for asbestos through laboratory analysis on the basis of asbestos fragments not

being observed in these sampling locations. However, anthropogenic material and demolition rubble are a secondary indicator of the potential presence of ACM, therefore based on the fill encountered and the site history it is considered that there is potential for asbestos to exist elsewhere on the site. Therefore it is considered prudent to undertake a detailed asbestos assessment in order to delineate the extent of asbestos impacted material prior to remediation;

- The uncontrolled fill comprising coal washery rejects requires further assessment to establish if it complies with the Wollongong City Council Development Control Plan 2009 and its suitability to remain on site;
- A waste classification assessment will be required for any material proposed to be disposed of from site. This assessment may use raw data obtained during previous investigations, if made available for this use; and
- Senversa (2015) considered, in a very brief manner, that excavation and on-site management of the identified asbestos, EIL and aesthetic issues was appropriate for the proposed future medium density residential and commercial use, subject to implementation of an appropriate ongoing environmental management plan. However, Senversa (2015) did not identify in which land use areas the contamination issues could be managed. Therefore the conclusion provided in Senversa (2015) may not be applicable if the final proposed development is for a more sensitive land use such as residential with accessible soils (i.e. townhouses or villas with gardens) with no commercial component.

From the information reviewed it is considered that the site can be rendered suitable for the proposed medium density residential development subject to further data assessment following finalisation of the proposed development design, review of the conceptual remediation strategies and subsequent remediation of the identified contamination issues. A detailed asbestos assessment to delineate the actual extent of asbestos impacted material is considered prudent prior to any remediation. However, it is considered that there is sufficient information for the development of conceptual remediation strategies such as excavation for on-site management or off-site disposal, subject to appropriate ongoing management or appropriate waste classification (respectively).

5. Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e. it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

5.1 Contamination Sources

Based on the review of Golder (2013) and Senversa (2015) the sources of contamination at the site comprise

- S1-Asbestos-containing materials (ACM) in fill.
- S2-Heavy metals in fill above the EIL and TRH and B(a)P in fill at or above the ESL.

The contaminants of concern for the site are, therefore, asbestos, heavy metals, TRH and B(a)P.

5.2 Potential Receptors

Human health receptors:

- R1 – Construction workers during the development.
- R2 – End users (residential).
- R3 – Adjacent users (residential).

Environmental receptors:

- R4 – Terrestrial ecology.

5.3 Potential Pathways

Potential pathways (P) for contaminants on the site, with consideration to the site's proposed end use, current condition, and geological, topographical and hydrogeological characteristics, include:

- P1 – Inhalation of dust.
- P2 – Direct contact with terrestrial ecology.

5.4 Summary of Potential Complete Pathways

A 'source–pathway–receptor' approach has been used to assess the potential risks to human or environmental receptors from the identified potential contamination sources on the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 and S2) and receptors (R1 to R4) are shown on Table 2.

Table 2: Potential Complete Pathways

Source	Transport Pathway	Receptor	Action Recommended	Screening Criteria
S1 - ACM in fill	P1 - Inhalation of dust	R1 - Construction and maintenance workers R2 - End users R3 - Adjacent users	Delineation of asbestos impacted soils and remediation as outlined in this RAP.	Remediation action criteria (RAC) as discussed in Section 9.
S2 – Heavy metals, TRH and B(a)P in fill	P2 - Direct contact with terrestrial ecology	R4 - Terrestrial ecology	Remediation as outlined in this RAP.	RAC as discussed in Section 9

6. Conceptual Remediation / Management Options

Prior to any remediation / management options being undertaken the following is required:

- Further data assessment and if required, further site assessment, following finalisation of the proposed development design;
- The identified ACM will need to be delineated to determine the vertical and lateral extent of ACM impact; and
- Review of the conceptual remediation strategies.

The area of concern associated to the Golder (2013) investigation locations are shown on Golder (2013) Figures 2 and 3 provided in Appendix B.

Based on Golder (2013) the identified EIL and ESL contaminated fill is considered to be associated with the site wide fill.

There are four main conceptual options for remediation / management of the identified soil contamination issues, these comprise:

- Risk assessment to show that the materials do not pose a risk under the proposed land use;
- Off-site disposal;
- On-site treatment; and
- On-site management.

A combination of the above approaches may be adopted.

The conceptual remediation options are discussed in more detail below.

6.1 Risk Assessment

A potential remediation / management option would be to undertake an ecological risk assessment (ERA) with the intention of developing site specific Tier 2 SAC for the identified contaminants with exceedances of the Tier 1 SAC.

It is noted that the ERA may require further intrusive investigation at the site. It is further noted that the conclusions of the ERA may still be that the remediation / management is required.

6.2 Off-Site Disposal

Off-site disposal comprises the excavation of the contaminated soils, waste classification of soil and disposal to a facility which can legally receive it. Disposal of the contaminated soils off-site is technically straightforward, and provides a “clean” site with no restrictions or notices on title. Off-site disposal is, however, an expensive option and the total volume of material that would require disposal would need to be determined through a delineation assessment.

This potential option may be suitable for localised issues that cannot be treated or managed on site.

6.3 On-Site Treatment

On-site treatment of metals, TRH and B(a)P in soil is technically feasible subject to the actual contaminant, concentration and the form in which it is present, but can be comparatively expensive and time consuming and can require large work areas. Options include soil washing, soil flushing, landfarming and electrokinetic treatment.

Treatment of asbestos impacted soil can be conducted by hand picking bonded ACM fragments, but is not possible for soil impacted by friable asbestos.

6.4 On-Site Management

On-site management comprises retaining the contaminated soil on site with appropriate management strategies to prevent unacceptable impacts on human health or the environment. For non-leachable contaminants, on-site management requirements may consist of constructing a containment cell and / or capping mechanism which places a physical barrier between the contamination and potential receptors.

Soils with contaminant concentrations above the EIL, but within the HIL could be managed by the placement of impacted materials below less sensitive areas of the site (e.g. hard cover areas) or placed below a depth of 2 m below the final development ground level (i.e. the depth to which the EIL apply).

It is noted that on-site management of asbestos would require ongoing environmental management plans and / or notices on titles.

6.5 Preferred Strategy and Rationale

The preferred remediation strategy should be refined once the proposed development design is finalised, further data assessment and if required, further site assessment is undertaken based on the finalised proposed land use or uses and a detailed asbestos investigation to delineate the extent of the ACM impacted fill.

The appropriate remediation strategy should be adopted based on the following considerations:

- Protecting the health of site users during and post-development;
- Protecting the health of users of neighbouring properties;
- Protecting the local environment and ecosystems;
- Minimising the overall environmental impact of the development, including volume of wastes disposed to landfill; and
- Cost effectiveness.

Based on these considerations the preferred remediation strategy should further developed in a finalised RAP.

However, based on the contamination identified in Golder (2013) the following conceptual remediation strategies are considered likely to be most favourable:

- Following detailed asbestos investigation to delineate the area of ACM impact, remediation of the identified ACM impacted fill will be undertaken prior to bulk excavation works. All asbestos remediation works will be undertaken by a suitably licensed Asbestos Contractor in accordance with WorkCover requirements, a summary of which is provided in Section 12.1. The ACM impacted fill could be managed on-site through excavation and on-site capping and containment. It is noted that land use restrictions may apply to any part of the site used for on-site capping. ACM is non-leachable and, as such, the purpose of the containment cell will be to provide a physical barrier between the ACM and future site users. No leachable contaminants will be placed in the containment cell. Therefore no management of water, such as infiltration, leachate control or ongoing groundwater monitoring will be required for the containment cell;
- Based on Golder (2013) site wide fill is considered to be impacted by heavy metals exceeding the EIL with localised areas impacted by B(a)P and/or TRH exceeding the ESL. Soils with EIL or ESL exceedances, but no HIL/HSL exceedances, could be re-assessed based on the final development design to establish appropriate on site management which could include placement below less sensitive areas of the site (e.g. hard cover areas) or placed below a depth of 2 m.

7. Further assessment

7.1 Further Data Assessment Following Final Design

Subsequent to the finalisation of the proposed development design but prior to the selection of the preferred remediation strategy, an assessment of the existing data for the finalised land use (i.e. either residential with accessible soils, residential with limited access to soils or commercial/industrial) should be undertaken.

If the proposed land use remains residential with limited access to soils, the findings in Golder (2013) would still be considered relevant. However, statistical analysis of the B(a)P issue would be required to establish if further management of BaP is required.

If the proposed land use changes to the more sensitive residential with accessible soils land use (i.e. including townhouses and villas with gardens), reassessment of the existing data will be required. The outcome of the reassessment of the existing data may indicate that further site assessment may also be required.

7.2 Detailed Asbestos Investigation

Based on the review of Golder (2013), further detailed asbestos investigation is required to identify the extent of the area of fill impacted by ACM and to assist the selection of the appropriate remediation strategy.

The detailed asbestos investigation is required to delineate the vertical and lateral extent of the ACM impacted area as well as to assess the potential for Fibrous Asbestos (FA) or Asbestos Fines (AF) to

be present. As such the detailed asbestos investigation must be undertaken in accordance with NEPM (1999 – amended 2013).

7.3 Site Assessment Criteria

The SAC for any further assessment of existing data or site assessment would be dependent on the finalised development design.

If the final development design has the same land use as considered in Golder (2013), i.e. residential with limited access to soils and commercial/industrial, the HIL and HSL established in Golder (2013) would be considered to be suitable for any further data or site assessment.

However, if the final development design has a residential with accessible soils land use, the HIL and HSL would have to be re-established for further data or site assessment.

As the development of the appropriate EIL and ESL is not impacted by the difference between residential with accessible soils and residential with limited access to soils land uses, the EIL and ESL provided in Golder (2013) are considered to be suitable for any further data or site assessment. However, it is noted that the appropriate ESL for B(a)P for residential land use of 0.7 mg/kg should be applied (1.4 mg/kg incorrectly selected in Golder (2013))

8. Remediation Action Criteria

The remediation action criteria (RAC) will be the SAC for the further assessment and detailed asbestos assessment as discussed in Section 7.3.

9. Overview and Site Management

9.1 Overview

The remediation works will be carried out by experienced and appropriately licensed contractors. An experienced environmental consultant will be engaged to inspect the progress of the works and to provide ongoing advice and recommendations as required. The success of the remediation works will be validated by the environmental consultant, and it is recommended that the environmental consultant would inspect the site depending on the activities being undertaken.

9.2 Material Tracking

The Contractor will track the movement of all materials excavated from the site. This will include:

- Determining stockpile areas for various types of soil based on the contaminant of concern and required treatment/ management strategy. Types of soil may include “clean”, “Asbestos impacted” and “EIL/ESL exceedance”;
- Placing all excavated soil into the appropriate stockpiling areas or directly into the containment or capping area;
- Details of any soils disposed off-site (where applicable); and
- Estimated volume(s).

The Environmental Consultant will review the material tracking records and compare them with the observed site activities during their site inspections.

9.3 Minimising Cross Contamination

Prevention of cross contamination of soils during remediation works is vital to the successful remediation of the site. The following measures must be conducted to manage the potential for cross contamination:

- Undertaking all work in accordance with the RAP;
- Segregating soils with different contaminant profiles during handling works. This includes separation during excavation and placement in clearly identified, separate, stockpiles;
- Use of suitable trucks for transport of soils within the site. Trucks must be appropriate to prevent spillage of soils during transport;
- Where practical, vehicles should not cross between “contaminated” works areas and “clean” areas. Where vehicles are required to exit a “contaminated” area into a “clean” area, they will exit via a truck wash down area where they will be cleaned and checked off as clean prior to entering the “clean” area; and
- No contaminated soils to be tracked across or stockpiled on “clean” area following their final validation.

9.4 Roles and Responsibilities

9.4.1 Principal and Principals Representative

The Principal, Mr Olly Vujic, is responsible for the environmental performance of the proposed remediation works, including implementation of acceptable environmental controls during all site works. The Principal will retain the overall responsibility for ensuring this RAP is appropriately implemented. The Principal is to nominate a representative (the Principal’s Representative - PR), who is responsible for overseeing the implementation of this RAP. The actual implementation of the RAP will, however, be conducted by the Contractor on behalf of the Principal.

The Principal will also be responsible for acquiring all necessary approvals for the remediation works proposed.

9.4.2 Principal Contractor and Site Manager

The Principal Contractor (referred to herein as the Contractor) is anticipated to be the party responsible for the day-to-day implementation of this RAP and shall fulfil the responsibilities of the Principal Contractor as defined by WorkCover. It is noted that the Contractor may appoint appropriately qualified sub-contractors or sub-consultants to assist in fulfilling the requirements of the procedures.

The Contractor will nominate a Site Manager who will be responsible for day to day site management and first response to any unexpected finds encountered during works.

In addition to implementation of the RAP it will be the Contractor's responsibility:

- To obtain specific related approvals as necessary to undertake the remediation works e.g. WorkCover notification;
- To develop or request and review plans to manage work health and safety (WHS) issues at the site, e.g. work health and safety plan(s), safe work method statements;
- To ensure all site works and other related activities are undertaken in accordance with this RAP;
- To induct all site personnel into the site management procedures, including coverage of WHS management and this RAP;
- To maintain all site records related to the implementation of the RAP;
- To provide the Principal with sufficient information to engage, or direct the Contractor to engage all required parties, including sub-contractors, to implement the requirements of the RAP other than those that are the direct responsibility of the Contractor;
- To manage the implementation of any recommendation made by those parties in relation to work undertaken in accordance with the RAP;
- To inform the Principal and, if appropriate, the relevant regulatory authorities, of any non-conformances with the procedures and requirements of the RAP;
- To retain records of any contingency actions; and
- To recommend any modification to general documentation which may further improve the environmental outcomes of this RAP.

9.4.3 Asbestos Contractor

The Asbestos Contractor will be responsible for undertaking all asbestos works, anticipated to comprise removal of the asbestos impacted fill, and will include an employee who is a licenced removalist with a Class A or B licence (issued by WorkCover NSW) who will be the works supervisor.

The Asbestos Contractor and Principal Contractor can be the same entity.

9.4.4 Project Surveyor

The project surveyor will be a Registered Surveyor and will be responsible for undertaking the surveying work detailed herein at the instruction of the Contractor.

9.4.5 Environmental Consultant

The Environmental Consultant will provide advice on implementing this RAP.

The Environmental Consultant will be responsible for:

- Undertaking the required delineation and validation assessments in a accordance with a sampling analysis plan, which will be incorporated into the delineation and validation reports;
- Undertaking and reporting the contamination delineation assessment;
- Overseeing the implementation of the RAP;
- Identification of the remediation areas;
- Undertaking the required assessments (e.g. waste classification, validation);
- Providing advice and recommendations arising from inspections and/or observations;
- Notifying their client with the results of any assessments and any observed non-conformances in a timely manner; and
- Validating the remediation works and provision of a validation assessment report detailing the results of the remediation work and making a clear statement regarding the suitability of the site for the proposed land use.

9.4.6 Occupational Hygienist

The Occupational Hygienist will provide advice on workplace health and safety (WHS) issues related to the asbestos works.

The Occupational Hygienist will be suitably qualified/ licenced as required in accordance with the WHS Regulations.

The Occupational Hygienist will be responsible for:

- Preparing any WHS plans and advice requested by the Contractor;
- Undertaking airborne asbestos monitoring (if and when required);
- Undertaking clearance inspections;
- Providing advice and recommendations arising from monitoring and/or inspections; and
- Notifying their client with the results of any assessments and any observed non-conformances in a timely manner.

The Occupational Hygienist and Environmental Consultant can be the same entity.

10. Management of Spoil and Imported Fill

10.1 Stockpiling of Contaminated Material

Potentially contaminated material shall be stockpiled at a suitable and designated location. Dust control is required for all stockpiled materials and should include light conditioning with water for exposed materials or covering with an anchored geotextile or similar.

All stockpiles of contaminated material to remain on the site overnight shall be surrounded by star pickets and marking tape or other suitable material to clearly delineate their boundaries and be adequately secured in order to reduce the risk of sediment runoff. Should stockpiles remain on the site for over 48 hours, they should be appropriately managed to prevent fugitive dust leaving the site (e.g. light wetting or covering with anchored geotextile depending on weather conditions) and geotextile silt fences or hay bales should be erected around each stockpile to prevent losses by surface erosion.

The defined stockpiling area(s) will be subject to validation upon completion of the remediation works. Validation of stockpile footprints should be carried out in accordance with Section 11 (as relevant based on the potential contaminants identified in the stockpiles).

10.2 Storage and Disposal of Contamination Soils

Heavy metal contaminated material excavated during the remediation process should be stored in a defined area and kept damp or covered to minimise the generation of dust.

ACM impacted fill excavated during the remediation process, as a minimum, should be stored in a defined area and kept damp to minimise release of asbestos fibres to the air.

If required, the disposal of ACM impacted fill (following appropriate waste classification) will be the responsibility of the Asbestos Contractor, and should be disposed of to an appropriately licensed landfill as “Special Waste- Asbestos” in accordance with NSW EPA (2014) *Waste Classification Guidelines- Part 1* (NSW EPA, 2014). Transport of such waste must be tracked and undertaken by appropriately licensed vehicles and operators.

The footprints of stockpiles containing heavy metal contamination and ACM/asbestos will be subject to validation upon completion of the remediation works. Validation will be undertaken in accordance with Section 11.

10.3 Spoil Contingency Plan

If required, any materials which fail to meet the NSW EPA criteria for direct landfill disposal (i.e.: hazardous waste materials) following initial waste classification, will require segregation and separate stockpiling pending further testing and treatment. The contingency plan to cater for the storage, treatment and disposal of these materials is as follows:

- On the basis of site observations and the contaminant exceedances detected, materials will be carefully segregated and placed in well delineated locations;

- Stockpiles of materials will be appropriately bunded with hay bales / sandbags and if required conditioned with water, covered and/or lined with anchored impermeable plastic sheeting or geotextile to prevent dust generation;
- If considered appropriate, further sampling and analysis will be conducted to more fully characterise the subject material, and confirm its contamination status. If the further characterisation works show that material can be classified as General Solid or Restricted Solid Waste, dispose of the material directly to an appropriately licensed landfill under such waste classification in accordance with NSW EPA (2014);
- If the material is deemed suitable for treatment and re-use at the site, review potential options for the treatment, re-use or recycling of the material, and adopt options identified to be suitable for the subject material; and
- Review *General Immobilisation Approvals* on the EPA website. If an applicable General Immobilisation Approval exists, further assess/dispose of the waste in accordance with the approval and other approvals or licences as required by the EPA.

10.4 Waste Classification for Off-site Disposal

If excavated/stockpiled materials (fill/soil) are required to be disposed of at an off-site licensed waste disposal facility, then sampling and analysis of such materials should be undertaken by the Environmental Consultant to provide a classification of the materials for waste disposal according to the provisions of *Waste Classification Guidelines* (NSW EPA, 2014).

10.5 Loading and Transport of Spoil

All transport of waste and disposal of materials must be conducted in accordance with the requirements of the *Protection of the Environment Operations Act* (1997) (POEO Act). All required licences and approvals required for disposal of the material should be obtained prior to removal of the materials from the site.

Transport of spoil/stockpiles shall be via a clearly delineated, pre-defined haul route. Removal of waste materials from the site shall only be carried out by a licensed contractor holding the appropriate licence, consent or approvals to dispose of the waste materials according to the classification outlined in NSW EPA (2014) and with the appropriate approvals obtained from the NSW EPA, if required.

The proposed waste transport route will be notified to the local Council and truck dispatch shall be logged and recorded by the contractor for each load leaving the site. A record of the truck dispatch will be provided to the PR.

10.6 Disposal of Material

All materials excavated and removed from the site shall be disposed in accordance with the POEO Act 1997 and to a facility/site legally able to accept the material. Copies of all necessary approvals from the receiving site shall be given to the PR prior to any contaminated material being removed from the site. A record of the disposal of materials will be maintained.

All relevant analysis results shall be made available to the Contractor and proposed receiving site/ waste facility to enable selection of a suitable disposal location. Holding arrangements, treatment and disposal requirements for excavated materials which fail to meet the landfill disposal guideline levels are discussed in Section 10.3.

Details of all contaminated and spoil materials removed from the site (including asbestos) shall be documented by the contractor with copies of weighbridge slips, trip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and the Principal's Representative. A site log will be maintained by the PR to track disposed loads against on-site origin.

10.7 Minimisation of Cross-Contamination

Measures should be enforced as required to minimise the potential for cross contamination of validated areas. The following are the minimum requirements to be adopted:

- Plant movements within areas of active remediation should be restricted and monitored to ensure vehicles do not pass over validated surfaces; and
- Areas that have been remediated and validated should be delineated with a clear marking system and isolated. Truck and vehicle movements into these areas should be restricted, however, if required, vehicles should pass through a wheel washing bay on entering the remediated area.

10.8 Importation of Soil

If soils are to be imported onto the site they must meet the following requirements:

- The soils must be legally able to be imported onto the site in accordance with the *Protection of the Environment Operations (Waste) Regulation* 2014 and any required Council approvals; and
- The soils must meet the RAC (Section 8) and the finalised SAC (Section 7.3).

The process for importation of soils will comprise:

- The Contractor will obtain appropriate paperwork, including any available validation report(s) by appropriately qualified environmental consultants, and/or analytical results for potential contaminants, to the Environmental Consultant and the PR prior to importation of the soils;
- The Environmental Consultant will review the documentation; determine if the material is suitable for importation and/or what additional confirmatory laboratory testing is required prior to or during importation to validate that the soil is suitable for use on site. An inspection of the source site by the Environmental Consultant may be required;
- The Contractor will inspect the material as it is delivered to ensure it meets the description of the material provided in the documentation. Any material not meeting the description, or with signs of environmental concern (e.g. odours, staining, building rubble inclusions) will be rejected by the Contractor, and will be returned to the source site;
- The Environmental Consultant will inspect the imported material and (if required) collect validation samples and have them analysed at a NATA accredited laboratory. The inspection and validation

sampling may be conducted regularly for any source site, depending on the volume of soil being imported;

- If any signs of concern are observed in the soil or if analytical results do not meet the requirements for importation, the Environmental Consultant will inform the Contractor and PR as soon as practical. Where possible the material will be returned to the source site. If this is not possible, the material will be managed in accordance with the Contingency Plan; and
- The results will be included in the validation report.

11. Validation Plan

11.1 Validation Sample Collection and Analysis

Validation using laboratory analysis is required. The sampling frequency will depend on the volume/ area to be assessed and the availability of previous results. In general, if no applicable previous results are available the following sampling frequencies will be used. These frequencies may be reduced for large volumes/ areas or if previous results are available.

Visual Inspections and Signs of Environmental Concern
All areas to be assessed/ validated will first be subject to a visual inspection.

If any signs of environmental concern (e.g. ACM, odours or staining) are observed in the area or material being tested, targeted sampling will be conducted as required to assess the contamination potentially associated with the observed sign of concern. This may require additional samples to those required by the testing frequencies given below.

Validation of ground surface:
Small to medium areas (<500 m^2):

- Ground surface: one sample per 25-50 m^2 or part thereof. Where high local variation is expected, a minimum of three samples will be collected.

Large areas:

- Sampling on a grid at a density in accordance with the NSW EPA *Contaminated Sites: Sampling Design Guidelines* (1995).

Validation of excavation:
Small to medium excavations (base <500 m^2):

- Base of excavation: one sample per 25-50 m^2 or part thereof; and
- Sides of excavation: one sample per 10 m length or part thereof. Additional samples will be collected at depths of concern where there is more than one depth of concern (e.g. multiple fill horizons).

Large excavations:

- Base of excavation: sampling on a grid at a density in accordance with the EPA *Contaminated Sites: Sampling Design Guidelines* (1995); and
- Sides of excavation: one sample per 20 m length or part thereof. Additional samples will be collected at depths of concern where there is more than one depth of concern (e.g. multiple fill horizons).

Stockpiles

Validation or assessment of stockpiled soils (note actual frequency will be determined based on volume, contamination risk and homogeneity of the material):

- Stockpiles ≤250 m^3: one sample per 25 m^3 with a minimum of three samples.
- Stockpiles >250 – 2,500 m^3: one sample per 25-250 m^3, with a minimum of ten samples.
- Stockpiles > 2,500 m^3: one sample per 250 m^3.

Characterisation of Contaminated Soil to be Placed in Containment Cell

- One sample per 1,000 m^3 or a minimum of 50 samples for ASLP testing for the identified contaminant(s) of concern (such as PAH, TRH).

The validation samples collected should be analysed for the relevant contaminant of concern (i.e. copper, arsenic, zinc, TRH, B(a)P or asbestos (10L bulk samples for screening and 500mL for FA/AF analysis)).

Excavation of contaminated material shall continue until the analytical results indicate the remaining material complies with the RAC and is, therefore, suitable to remain on-site from a contamination perspective. If results indicate that additional excavation is necessary, such excavation shall extend until the samples indicate that the remaining material complies with the RAC.

11.2 Data Quality Objectives and Indicators

The validation assessment will be conducted in accordance with Data Quality Objectives (DQOs) and Quality Assurance/Quality Control (QA/QC) procedures.

The validation assessment will be planned in accordance with the following DQOs:

- State the Problem;
- Identify the Decision;
- Identify Inputs to the Decision;
- Define the Boundary of the Assessment;
- Develop a Decision Rule;
- Specify Acceptable Limits on Decision Errors; and
- Optimise the Design for Obtaining Data.

A checklist of Data Quality Indicators (DQI) in accordance with Appendix C of NEPM (1999 – amended 2013) will be completed as part of the validation assessment. The DQIs are:

- Completeness;
- Comparability;
- Representativeness;
- Precision; and
- Accuracy.

Based on the data quality objectives and indicators an assessment of the overall data quality will be presented in the validation assessment report.

11.3 Survey

A survey should be undertaken by the project surveyor of the vertical and lateral extents of remediation excavations and/or contaminant management/treatment areas.

11.4 Quality Assurance Plan

11.4.1 Sample Collection and Handling

The general sampling procedures comprise:

- The use of stainless steel or disposable sampling equipment;
- Decontamination of non-disposable sampling equipment prior to the collection each sample;
- Labelling of the sample containers with individual and unique identification including Project No. and Sample No.; and
- The use of chain-of-custody documentation so that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

11.4.2 Field QA/QC

Appropriate sampling procedures will be undertaken to prevent cross contamination. These include:

- Standard DP operating procedures are followed;
- Replicate field samples are collected and analysed;
- Samples are stored under secure, temperature controlled conditions;
- Chain-of-custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory; and
- Proper disposal of contaminated soil, fill or surface water originating from the site.

11.4.3 Laboratory Quality Assurance and Quality Control

A NATA accredited laboratory will be used to conduct analysis.

A validation assessment report will be prepared by the environmental consultant in accordance with EPA NSW *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (2011) and NEPM (1999 – amended 2013). The objective is for the validation report to confirm that the site has been remediated to a suitable standard for the proposed redevelopment and that no related adverse human health and environmental effects have occurred as a result of the works. The validation report will also include a summary of the information from previous investigations.

The validation report will include:

- Documentation of the implementation of the Remediation Strategy;
- Details of the location and total estimated volume of materials excavated and removed from the site;
- Photographic record during the works and of final excavations;
- Drawings showing validation sample locations;
- Detailed analytical results; and
- Details of materials imported to the site, as required.

12. Site Management Plan

It is the responsibility of the Contractor to develop a Site Management Plan (SMP) detailing site management, environmental management and work health and safety (WHS) (including site emergency response) plans for the site. Works will comply with all legislative requirements including, but not limited, to those set out under the following Acts (and subsequent amendments and regulations):

- Environmentally Hazardous Chemicals Act (1985);
- Hazardous Chemicals Act (1985);
- Environmental Offences and Penalties Act (1989);
- Agricultural and Veterinary Chemicals Act (1994);
- Protection of the Environment Operations Act (1997) (the POEO Act);
- Contaminated Land Management Act (1997) (the CLM Act);
- Pesticide Act (1999);
- Work Health and Safety Act (2011) (the WHS Act);
- OHS Amendment (Dangerous Goods) Act 2003 (including OHS Amendment (Dangerous Goods) Regulation 2005); and
- POEO Amendment Act 2005 (including POEO Amendment (Scheduled Activities and Waste) Regulation 2008).

The work will be undertaken with all due regard to the minimisation of environmental effects and to meet all statutory requirements. The Contractor will implement the SMP for the work which includes the following items:

- Site stormwater management;
- Spoil management;
- Noise control;
- Dust control; and
- Incident reporting.

12.1 Specific Requirements for Asbestos

In addition to the above, the WHS Act and associated regulation has specific requirements for asbestos works. The Occupational Hygienist is responsible for providing advice on all regulatory requirements related to asbestos works and the Asbestos Contractor is responsible for implementing these requirements. A summary of the WHS requirements related to asbestos is provided below.

12.1.1 Notification

WorkCover NSW must be notified 5 days in advance of any asbestos works. The Asbestos Contractor must, before commencing the licensed asbestos removal work, inform the following people of that asbestos removal works is to be conducted, and the date the work will commence:

- The person with management or control of the workplace and any adjacent occupied buildings; and
- The entity/ person who commissioned the asbestos removal work.

The person with management of control of the workplace must inform workers and any other persons in the workplace.

12.1.2 WHS Plans

The Asbestos Contractor will prepare the following plans complying with regulatory requirements, including the WHS Regulation and WorkCover NSW requirements:

- Safe Works Method Statement (SWMS); and
- Asbestos Removal Control Plan (ARCP). The ARCP must:
  - Be provided to the person who commissioned the work;
  - Include details of how the asbestos removal will be carried out, including the method to be used and the tools, equipment and personal protective equipment to be used;
  - Include details of the asbestos to be removed, including the location, type and condition of the asbestos; and
  - Be kept by the licenced asbestos contractor in accordance with the WHS Regulations.

12.1.3 Licenced Contractor and Training

All asbestos works must be undertaken by an Asbestos Contractor with a Class A or B licence issued by WorkCover NSW. The Class A or B licenced removalist must be named as supervisor and is to be on site at all times during asbestos works.

All asbestos workers at the site must be appropriately trained in asbestos works and in the Asbestos Removal Control Plan. The training must include information on health risks associated with asbestos, and the rights of asbestos workers under the WHS Regulation.

The licenced asbestos removalist must keep records of all training works.

12.1.4 Fencing and Signage

Prior to the commencement of the asbestos works, the area will be closed off with the use of secure fencing and enclosure (e.g. shade cloth installed on the fencing) and warning signs.

Warning signs shall be specific to Asbestos Hazards.

12.1.5 Restriction of Access

Access to the asbestos works area will be restricted to:

- Workers engaged in the asbestos removal work;
- Other persons associated with the asbestos removal work; and
- Anyone allowed under the WHS Regulation or another law to be in the asbestos removal area.

12.1.6 Airborne Asbestos Monitoring

Monitoring for airborne asbestos fibres is to be carried out by the independent Occupational Hygienist during the asbestos works as required to meet WHS (2011) regulation and WorkCover requirements. The Occupational Hygienist will be responsible for determining when air monitoring is required, and an appropriate scope of monitoring for the works.

It is anticipated that monitoring will commence prior to commencement of excavation of the fill at locations nominated by the Occupational Hygienist. The monitoring should include locations aimed at assessing the potential for asbestos fibres to impact nearby residences.

The Occupational Hygienist is to provide prompt results to the Asbestos Contractor to allow appropriate action to be taken if any respirable asbestos is detected.

If respirable asbestos fibre levels are recorded at 0.01 fibres/ml or more, but not more than 0.02 fibres/ml the following must be implemented immediately:

a. investigate the cause of the respirable asbestos fibre level, and

b. implement controls to prevent exposure of anyone to asbestos, and

c. prevent the further release of respirable asbestos fibres.

If respirable asbestos fibre levels are recorded at more than 0.02 fibres/ml the following must be implemented immediately:

a. order the asbestos removal work to stop, and

b. notify the regulator, and

c. investigate the cause of the respirable asbestos fibre level, and

d. implement controls to prevent exposure of anyone to asbestos, and

e. prevent the further release of respirable asbestos fibre.

12.1.7 Personal Protective Equipment

The following minimum personal protective equipment (PPE), in addition to standard construction PPE, should be worn during works involving the handling and/or removal of soils impacted by asbestos:

- Half-face P1/P2 respirator;
- Disposable coveralls (Tyvek suit or equivalent);
- Gloves; and
- Safety glasses or safety goggles.

12.1.8 Decontamination

At the direction of the Occupational Hygienist, facilities must be provided to decontaminate:

- The asbestos removal area;
- Any plant used in the asbestos removal area;
- Workers carrying out asbestos removal work; and
- Other persons who have access to the asbestos removal area.

12.2 Unexpected Finds Protocol

All site personnel will be inducted into their responsibilities under this Unexpected Finds Protocol (UFP), which should be included in the Contractors Site Management Plan.

All site personnel are required to report the following to the Site Manager if observed during the course of their works:

- Signs of unexpected environmental concern, e.g. presence of unexpected fibre cement, petroleum or other chemical odours, unnatural staining, potential contamination sources (such as buried drums or tanks), chemical spills.

Should the above signs of concern be observed, the Contractor will, as soon as practical:

- Place barricades around the affected area (the area of environmental concern - AEC) and cease work in that area;
- Notify any authorities needed to obtain emergency response for any health or environmental concerns (e.g. fire brigade);
- Notify the PR of the occurrence;
- Notify any authorities that the Contractor is legally required to notify (e.g. EPA, Council); and
- Notify the Environmental Consultant.

The PR will notify any authorities which the Principal is legally required to notify (e.g. EPA, Council).

Following the immediate response in the UFP, the below contingency plan will be implemented.

12.3 General Contingency Plan

The general contingency plan for the site is as follows:

- The Environmental Consultant will inspect the AEC and determine the nature of the issue and the appropriate approach to assessing or (if appropriate) managing the issue;
- If appointed and considered necessary, the Site Auditor will be informed of the AEC and the proposed assessment and / or management approach;
- The Environmental Consultant will undertake an assessment considered necessary to determine the management strategy for the AEC;
- If contamination is found and remediation action considered necessary, a remediation strategy for the AEC will be prepared as an addendum to this RAP by the Environmental Consultant; and
- If the AEC or proposed remediation strategy is significantly different than that detailed in the RAP, Wollongong City Council will be provided notification of the proposed works.

13. Conclusions

This is an outline RAP with conceptual remedial strategies only, which will require review following further detailed asbestos assessment and detailed design of the proposed development.

It is considered that the site can be rendered compatible for the proposed residential development subject to detailed asbestos delineation, finalisation of the remedial strategy and appropriate remediation in accordance with the finalised remedial strategy.

The success of the remediation will need to be validated as detailed herein and the finalised RAP.

14. Limitations

Douglas Partners (DP) has prepared this report for this project at Lot 1 Military Road, Port Kembla in accordance with DP's proposal WOL150579 dated 30 October 2015 and acceptance received from Mr Luke Rollinson of MMJ on behalf of Mr Olly Vujic dated 9 November 2015. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Mr Olly Vujic for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The Golder (2013) information reviewed as part of this report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon information reviewed from Golder (2013) and conditions encountered during the Golder (2013) investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the (geotechnical / environmental / groundwater) components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Golder (2013) Figures

PHASE II - ENVIRONMENTAL SITE ASSESSMENT - FORMER PORT KEMBLA PRIMARY SCHOOL

PORT KEMBLA COPPER PTY LTD

SITE LOCATION

LEGEND

Site Location

0 50 100 200 300 400 500 metres

SCALE (at A4) 1:15,000

Coordinate System: GDA 1994 MGA Zone 56

PROJECT: 137623028
DATE: 19/11/2013
DRAWN: FA
CHECKED: CO

FIGURE 1

Golder Associates

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Base map data copyright MapInfo Australia Pty Ltd

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File Location: J:\Jobs\2013\137623028_PH CPhase II Primary School\Port Kembla, NSW\Technical Docs\GIS\Project\137623028_F0004.mxd

PHASE II - ENVIRONMENTAL SITE ASSESSMENT - FORMER PORT KEMBLA PRIMARY SCHOOL

PORT KEMBLA COPPER PTY LTD

TEST PIT AND GROUNDWATER MONITORING WELL LOCATIONS

LEGEND

- Test Pit Locations
- Borehole Location
- Offsite Locations
- New Shallow Monitoring Wells
- Existing Monitoring Wells
- Site Location
- Cadastre

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1. Imagery Copyright - Service Layer Credits: © 2010 DigitalGlobe © 2010 GeoEye © 2013 Microsoft Corporation

2. Base map data copyright MapInfo Australia Pty Ltd

3. Digital Cadastre Database, NSW Department of Lands, 2004

0 10 20 40 60 80 metres

SCALE (at A3) 1:1,500

Coordinate System: GDA 1994 MGA Zone 56

PROJECT: 137623028
DATE: 5/11/2013
DRAWN: FA
CHECKED: CO

FIGURE 2

Golder Associates

PHASE II - ENVIRONMENTAL SITE ASSESSMENT - FORMER PORT KEMBLA PRIMARY SCHOOL

PORT KEMBLA COPPER PTY LTD

LOCATIONS WITH ASBESTOS DETECTED

LEGEND

- Test Pit Locations
- Borehole Location
- Offsite Locations
- New Shallow Monitoring Wells
- Existing Monitoring Wells
- Site Location
- Cadastre

NOTE

Total metal concentrations expressed in mg/kg.

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2. Base map data copyright MapInfo Australia Pty Ltd

3. Digital Cadastre Database, NSW Department of Lands, 2004

0 10 20 40 60 80 metres

SCALE (at A3) 1:1,500

Coordinate System: GDA 1994 MGA Zone 56

PROJECT: 137623028
DATE: 10/12/2013
DRAWN: FA
CHECKED: OB

FIGURE 3

Golder Associates