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Remediation Action Plan

Proposed Residential Subdivision
120 Tenth Avenue, Austral, NSW

Prepared for
RSL LifeCare c/- TSA Management Pty Limited

Project 76725.02
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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.

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Table of Contents

Remediation Action Plan
Proposed Residential Subdivision
120 Tenth Avenue, Austral, NSW

1. Introduction

Douglas Partners Pty Ltd (DP) was commissioned by RSL LifeCare (RSL) c/- TSA Management (TSA) to prepare a Remediation Action Plan (RAP) for identified contamination with respect to the proposed residential development (aged care facility) of Stage 3, 120 Tenth Avenue, Austral NSW (the site, as shown on Drawing 1 – Appendix A). The works was carried out in accordance with DP's proposal MAC160399 dated 25 November 2016.

The RAP has been prepared with reference to NSW Environment Protection Authority (EPA) guidelines under the Contaminated Land Management (CLM) Act 1997, and the findings of DP report titled *Report on Detailed Site Investigation and Stockpile Assessment, Proposed Residential Subdivision, Stage 3, 120 Tenth Avenue, Austral, NSW,* prepared for TSA Management Pty Ltd, Project 76725.01, Rev 0, dated 12 January 2017 ('the DSI').

In summary, the DSI identified bonded asbestos containing materials (ACM) on the surface of the eastern part of the site and localised ACM impact in filling at location TP 125. Additionally, the source of a number of soil stockpiles containing anthropogenic materials located at the site is currently not well understood. Although the DSI confirmed the contamination status of the stockpiles were suitable (in a general sense) for the proposed development, the retention of such material may breach of the *Protection of the Environment Operations* (POEO) Act, 1995. Therefore, the RAP includes measures to handle and dispose of such stockpiles.

1.1 Scope of Works

The scope of the RAP has been prepared on the basis of the proposed future land use for the site (residential – aged care facility) and the findings of the DSI. The scope of the RAP is therefore as follows:

- Establish an appropriate remediation strategy so as to render the site suitable for the proposed use;
- Establish appropriate requirements for the validation and confirmation of the successful implementation of the remediation strategy, and the remediation acceptance criteria to be adopted for the validation of the remediation areas;
- Outline the requirements for the remediation works to be completed in an environmentally acceptable manner; and
- Outline the requirements for appropriate Work Health and Safety (WHS) procedures to be adopted for the remediation works so as not to pose a threat to the health of site workers or users.

2. Site Information

2.1 Site Identification

The site is identified as Part Lots 1 and 2 of Deposited Plan 1146302 within the local government area of Liverpool City Council ('Council') and comprises an area of approximately 1.7 hectares (ha). The site location and boundaries are shown on Drawing 1, Appendix A.

2.2 Site Description

The site is bounded by Stages 1 and 2 of the aged care development located to the north, consisting of residential buildings, Edmondson Avenue to the east, beyond which is a public school; and rural residential properties to the south and west. The site is a 'U' shaped area with general north-south and east-west dimensions of approximately 80 m and 240 m respectively. At the time of the investigation, the site consisted of vacant land. The site can be split into two broad areas:

- East Side – the eastern part of the site fronting Edmondson Avenue was previously occupied by four residential properties which have been demolished since the completion of fieldwork associated with the PSI (DP, 2016). At the time of the DSI, the eastern part of the site comprised exposed ground with an unpaved access path traversing the northern portion of the site toward the western part of the site. Approximately six small (total volume approximately 80 m^3) soil stockpiles (silty clays) were located along the northern boundary, adjacent to the fence line and three smaller stockpiles were situated towards the western side with similar material composition. The stockpiles differed in composition from the underlying soils; based on their description these stockpiles were likely sourced for building purposes. Site levels generally fall from the north – east corner (RL 82 m AHD) towards the south-west corner (RL 79 m AHD) with slopes up to 5º.
- West Side – the topography of the western two thirds of the site vary significantly, with some areas near natural (original) surface levels, while other areas have been excavated with near-vertical and battered slopes up to 4 m high owing to cut to generate a haul road that bisects the site. Site levels vary from RL 75 m to 80 m AHD with slopes generally up to 10º but with some steeper areas where cuts have been excavated. The eastern and southern portions of the west side of the site have largely been used for stockpiling of materials. It is estimated that there is a total volume of approximately 1830 m^3 of stockpiled material within the western two thirds of the site. An electrical kiosk is present near the north eastern part.

2.3 Soil Landscapes

Reference to Bannerman S.M. and Hazelton P.A., 1990, *Soil Landscapes of the Penrith* 1:100,000 Sheet, Soil Conservation Service of NSW, Sydney indicates that the site is underlain by the Blacktown soil landscape (mapping unit bt), characterised by gently undulating rises on Wianamatta Group shales and Hawkesbury shale, with local relief to 30 m and slopes usually less than 5 %. The landscape is typically represented by broad rounded crests and ridges with gently inclined slopes. Soils range from shallow (<1 m) red-brown podzolic soils – comprising mostly clayey soils on crests and upper slopes – to deep (1.5 m – 3 m) yellow-brown clay soils on lower slopes and areas of poor drainage. These soils are typically moderately reactive with low fertility, poor soil drainage and highly plastic subsoil.

2.4 Proposed Development

TSA propose to develop the site for residential (aged care subdivision) purposes.

3. Previous Assessments

The following previous investigations have been completed for the site or for parts of the site:

- Geotechnique Pty Ltd (2004) *Proposed Residential Subdivision Development, Lot 863 in DP2475 and Lots 11 &12 in DP413603, Tenth Avenue, Austral, Preliminary Contamination Assessment*. Letter report Ref. 10348 / 1, dated 4 May 2004 (Geotechnique, 2004);
- Consara Pty Ltd (2013) *RE: Environmental Conditions of Surface and Sub-surface Soils, 120 - 130 Tenth Avenue, Austral NSW*. Letter report dated 28 June 2013 (Consara, 2013);
- DP (2016) *Report on Preliminary Site (Contamination) Investigation, Austral Tobruk Independent Living Units, 120 Tenth Avenue, Austral*, Project 76725.00, dated 13 May 2016 prepared by DP (DP, 2016); and
- DP (2017) *Report on Detailed Site Investigation and Stockpile Assessment, Proposed Residential Subdivision, Stage 3, 120 Tenth Avenue, Austral NSW*. Report number 76725.01, dated 12 January 2017 ('the DSI').

Based on the findings of the above referenced reports (in particular the DSI), the following remediation works are required to render the site suitable for the proposed development:

- ACM fragments observed on the surface of the eastern part of the site associated with stockpiled soil and building materials, and in fill soils in the south western portion of the site in the vicinity of TP 125 will require remediation. Based on observations made during the DSI, ACM impact in the eastern part of the site may be restricted to surficial ACM only (deposited during demolition) or in the top 0.2 – 0.4 of the fill soil profile; and
- From a contamination perspective the stockpiles of soil located at the site are suitable for retention as part of the development. However, as the source of a number of the stockpiles is not fully understood, the waste should be classified and disposed to landfill accordingly.

4. 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 (linkages). 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).

4.1 Identified Contamination

Based on the findings of the DSI, the identified potential contamination is as defined in Table 1 following page.

Table 1: Potential Areas of Environmental Concern and COC

Potential Source	Description	Issues / COC
S1	Recently demolished structures (east side of site)	Asbestos (ACM)
S2	Fill at location TP 125	Asbestos (ACM)

4.2 Potential Receptors

The following potential human receptors (R) have been identified for the site:

R1 – Construction and maintenance workers (during site redevelopment);

R2 – Future site users following development of the site; and

R3 – Land users in adjacent areas (public school to the east/rural residential).

4.3 Potential Pathways

Potential pathways for contamination include the following:

P1 – Inhalation of airborne fibres, dust and/or vapours;

5. Remediation Acceptance Criteria

Table 2 below presents the adopted remediation acceptance criteria (RAC) for the site, along with their source documents.

Table 2: Remediation Acceptance Criteria for Soil (RAC)

Contaminant	RAC	Rationale
Asbestos	• 0.01% w/w of asbestos in soil with bonded ACM generally comprising 15% asbestos; • 0.001% w/w FA and AF; and • No visible asbestos on the ground surface.	NEPC (2013) defines the various terminology for asbestos: • Bonded ACM: Asbestos containing material which is in sound condition, bound in a matrix of cement or resin, and cannot pass a 7 mm x 7 mm sieve. • FA: Fibrous asbestos material including severely weathered cement sheet, insulation products and woven asbestos material. This material is typically un-bonded or was previously bonded and is now significantly degraded and crumbling. • AF: Asbestos fines including free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7mm x 7mm sieve. Given that the proposed land use is residential, the 'Residential A' Asbestos Health Screening Levels (in accordance with Table 7, Schedule B1 of NEPC 2013) has been adopted.

6. Assessment of Remediation Options

A number of remediation options were reviewed with reference to the principles and criteria defined in relevant documents, including, the following:

- NEPC, "*National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013*", 11 April 2013 (NEPC, 2013); and
- NSW EPA, Contaminated Site, "*Guidelines for the NSW Site Auditor Scheme 2nd Edition*", April 2006.

NEPM (2013) states that the preferred hierarchy of options for site clean-up and/or management are as follows:

- On-site treatment of the contamination to either eliminate the associated risk or reduce the concentration of the contamination to an acceptable level; and
- Off-site treatment of excavated soil, to either eliminate the associated risk or reduce the concentration of the contamination to an acceptable level, after which soil is returned to the Site; or,

If the above are not practicable,

- Consolidation and isolation of the soil on site by containment with a properly designed barrier; and
- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material; or
- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

6.1 Remediation Goal

The ultimate goal/objective of the remediation will be to render the site compatible with the proposed residential land use.

6.2 Extent of Remediation

The extent of remediation will require delineation as part of the remediation works, however in a general sense the extent consists of the following:

- The surface/surface in the eastern part of the site (near recently demolished structures); and
- Fill soils in the top 0.5 m of the soil profile at TP 125.

Whilst not explicitly requiring remediation, the source of stockpiles in the eastern part of the west side of the site is not known, therefore the DSI recommends that this material is disposed of during the remediation works. The disposal of this material is therefore included in this RAP.

6.3 Remediation Options

Based on the observed type and distribution of impact (ACM) at the site, three general remediation options were considered as follows:

1. Off-site disposal of all asbestos contaminated soils to a licensed landfill; and
2. Treatment of ACM impacted soils by emu picking.

Opportunities and constraints associated with each option were assessed and are broadly summarised in the following sub sections.

6.3.1 Off-Site Disposal

Off-site disposal is technically a straight forward option and could be completed in a relatively short time scale prior to development of the site. The option would remove from the site any maintenance and risk legacy associated with impacted soils.

If ACM impact is on the site surface only, disposal costs will be minimal. If however ACM impact likely extends to the underlying fill, disposal costs will potentially be significant.

Based on observations during the DSI, demolition practices and ground disturbance in the eastern part of the site occurred across an area of approximately 5,200 m^2. Soil test pits completed in this part of the site identified the depth of fill here ranges from 0.2 m to 0.9 m below the current site level (average depth 0.4 m). Therefore, should ACM impact extend to the base of the fill soil, the volume of fill requiring disposal could potentially be as high as 2,900 m^3 (assuming a soil bulking factor of 1.4). Current soil disposal costs are approximately $250/tonne, therefore disposal costs could be as high as approximately $1,015,000 (assuming a tonnage conversion factor of 1.4). Additional costs will apply for disposal of ACM impacted soil at location TP 125.

6.3.2 On-Site Treatment

ACM impact in fill soil can be remediated to reduce the quantity of ACM fragments to levels below remediation criteria. Treatment cannot however completely eliminate the presence of ACM in such soils. As such, the reuse of treated and validated material does require some restrictions, such as:

- Treated and validated material must be placed at least 0.1 m below the final site level (DP recommends a cover layer of 0.4 m is more prudent so to prevent re exposure); and
- Treated and validated material must be placed below an impermeable surface (e.g. car park, house footprint etc.).

The costs to treat ACM impacted material is generally equivalent to approximately 30% – 60% of the equivalent cost for disposal. Time-scales to complete the remediation works can be significant (generally 120 m^3 treated per day) therefore this may have a bearing on TSA's decision making.

6.3.3 Preferred Remediation Option

DP understands the client preferred remediation option is off-site disposal however this may change and is subject to the appointed Contractor and / or assessment of cost benefit analysis that may be undertaken by the client.

7. Remediation Strategy

The detailed procedures and sequence for the remediation work will rest with the contractor and will depend upon the equipment to be used and the overall sequence of the remediation or development. It is the contractor's responsibility to devise a safe work method statement and to implement proper controls that enable the personnel undertaking the remediation to work in a safe environment.

This RAP does not relieve the contractor(s) of their ultimate responsibility for occupational health and safety of their workforce and to prevent contamination of areas outside the immediate workspace. This RAP sets out the minimum standards and guidelines for remediation that will need to be used in preparing a method statement.

Remediation works must be undertaken by an appropriately licensed asbestos remediation contractor and in accordance with *Work Health and Safety Regulation NSW 2011* and any other applicable WorkCover NSW or Safe Work Australia regulations or guidelines.

DP recommends that the remediation contractor must be licensed for Class B asbestos removal. A Class B licence is suitable for the site given that asbestos at the Site has generally been identified in a bonded (non-friable) form (i.e. ACM in good condition).

The licensed asbestos remediation contractor must give written notice to WorkCover NSW at least five days before remediation work commences.

7.1 Site Establishment

Prior to the implementation of remediation, the site is to be established in accordance with all NSW legislative requirements.

Air quality monitoring for airborne asbestos fibres using the Membrane Filter Method in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres* (NOHSC: 3003, April 2005) is to be conducted on a daily basis when works involving the excavation, transport or placement of asbestos impacted and potentially impacted soils/materials are being conducted within the site. The environmental consultant is to conduct the air quality monitoring or manage the works through an experienced contractor. If friable asbestos is recorded at any stage of the remediation works, air quality monitoring will be required to be carried out by a licensed asbestos assessor.

TSA will be notified by the environmental consultant of any laboratory detections of airborne asbestos fibres during the course of the works. In the event of detections the remediation contractor should make appropriate modifications to works methods, as required.

7.2 Delineation of ACM Impact

In order to minimise the scope of remediation works as much as practicable, DP recommends that identified ACM impact is delineated as defined in Sections 7.2.1 and 7.2.2 below. The findings of the initial delineation works will therefore have a bearing on the decided remediation approach.

7.2.1 East Side

In order to establish if ACM impact in the eastern part of the site is restricted to the surface, or near surface (i.e. ACM impacted fill), the following should occur prior to remediation:

- Completion of a detailed site walkover with reference to the requirements of Western Australian Department of Health – *Guidelines for Assessment Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (DoH, 2009); and
- Completion of an asbestos investigation with reference to DoH (2009) requirements. Based on the site area where ground disturbance appears to have occurred during recent demolition works, the investigation should include sampling at 22 test pit locations targeting fill material.

7.2.2 TP 125

In order to confirm if ACM impact in fill soils in the proximity of TP 125 exceeds the relevant guideline values (as per DoH, 2009) an asbestos investigation should be completed. Based on the general site area where fill containing anthropogenics has been observed, the investigation should include sampling at 10 test pit locations here, targeting fill material.

7.3 Contingency for Unexpected Findings

If unexpected conditions are encountered during the remediation (such as buried tanks, unexpected contaminated soil or contaminants including additional ACM or FA/AF asbestos), the following general approach will be adopted:

- Stop work in the area of impact and barricade area to prevent access;
- The remediation contractor is to contact the principal's representative (PR) and the environmental consultant;
- The environmental consultant will make an assessment of the severity of the find in terms of the potential impact to human health and the environment;
- The environmental consultant will liaise with the PR as required;
- The environmental consultant will provide advice to the PR regarding the recommended course of action;
- TSA will obtain necessary approvals from Liverpool City Council; and
- The remediation contractor is to implement the agreed management/remedial strategy.

7.4 Minimisation of Cross-Contamination

Appropriate measures should be adopted, as required, to eliminate or at least minimise the potential for cross contamination. In addition to the recommendations provided in the following sections for management of the remediation works, plant movement within areas of active remediation should be restricted and monitored to ensure vehicles do not unnecessarily pass over validated surfaces or through contaminated areas.

7.5 Waste Disposal

Based on the findings of the DSI, the following waste classification for each material type applies:

- Stockpiles in eastern part of the west side of the site: General Solid Waste;
- ACM impact: General Solid Waste: Special Waste Asbestos (GSW: SWA); and
- ACM impacted fill soils: GSW: SWA

If it is necessary to dispose of material that is not included in the above list, waste classification sampling and assessment at a minimum frequency of 1 sample per 100 m^3 will be necessary.

7.6 Contingency for Stockpiling of Contaminated Material

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

All stockpiles of contaminated material to remain on the site overnight shall be demarcated to clearly delineate their boundaries and be adequately secured in order to reduce the risk of sediment runoff and dust blow. Should the stockpiles remain 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).

The defined stockpile footprint area will be subject to validation upon completion of the remediation works (refer to Section 8.1.4).

7.7 Loading and Transport of Spoil

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

Transport of spoil 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 the NSW DECCW *Waste Classification Guidelines* (2009) 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.

7.8 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 Environmental Consultant prior to any contaminated material being removed from the site. A record of the disposal of materials will be maintained and provided to the Environmental Consultant for waste reconciliation purposes.

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.

Details of all contaminated and spoil materials removed from the site 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.

7.9 Materials for Use in Backfilling and Imported Fill

Any additional material required for redevelopment works, including backfilling of remedial excavations shall be either:

- uncontaminated material from the site (i.e.: materials meeting the RAC and SAC as per the DSI; or
- imported material, which is to be analysed and certified as VENM, as well as meeting the RAC and SAC via a validation certificate by the Contractor. The material and material management should also comply with relevant legislation (e.g.: POEO Act 1997).

The report for any imported VENM is to be prepared by a suitably qualified consultant. Sampling and analysis of any imported material should be undertaken to confirm its suitability for use on the site as follows:

- Collect samples at a density of 1 sample per 1,000 m^3 of imported VENM, or a minimum of 3 samples per source site;
- Analysis of samples for heavy metals, PAH, TPH, BTEX, PCB, OCP, OPP, phenol, asbestos and any other identified contaminant of concern;
- Collection and analysis of Quality Assurance/Quality Control (QA/QC) samples in accordance with Section 8; and
- Comparison of results with published background levels and the RAC and SAC to determine its status as VENM and its suitability for use on the site.

Materials used on site should also meet other requirements (e.g.: geotechnical and salinity requirements or any specific fill management plan which is devised for the site).

8. Validation Plan

8.1 Validation Scope

8.1.1 Validation Data Quality Objectives (DQO)

The objective of the validation plan is to assess the results of post remediation testing against the RAC stated within this RAP and to provide information on environmental impacts which may have resulted from the works.

The validation assessment will be conducted in accordance with Data Quality Objectives (DQOs) and Quality Assurance/Quality Control (QA/QC) procedures to demonstrate the repeatability and reliability of the results.

The following DQOs will be adopted based on those provided in Appendix B, Schedule B2 of NEPC (2013). The DQO process is outlined as follows:

- 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) will be completed as part of the validation assessment.

8.1.2 Validation of the Removal of Surficial ACM (East Side)

If the delineation works for the east side demonstrates ACM impact comprises residual material on the surface only, the validation of the removal of surficial ACM in the east side of the site shall be carried out on a visual basis and in general in accordance with DoH (2009). The visual validation will involve at least three passes on a 5 m grid basis, each pass 90^{o} from the previous over the east side of the site, collecting and removing surface ACM. The final pass must target no visible ACM. Where possible, the visual validation is to be complemented by raking (7 mm rake) to a depth of 0.1 m below the site surface.

This process does not apply if ACM is identified to be present in fill, including shallow fill across the east side.

8.1.3 Validation of the Removal of Impacted Fill (East Side and/or TP 125)

Following the excavation and off-site disposal of ACM impacted material, the remediation contractor must provide the environmental consultant with volumes exported from each location together with the appropriate landfill tipping receipts.

8.1.4 Validation of Remediation Excavations and Stockpile Footprints

Following the excavation of impacted fill the environmental consultant will validate the remediation excavation and stockpile footprints:

- Visual inspection for signs of anthropogenic material including ACM and C&D Waste. The visual inspection will be conducted on a 2 m grid; and
- The results of the visual inspection will be confirmed through soil sampling. Sampling of the base of excavations will be undertaken at the densities equivalent to that required in Table 1 of DoH (2009). Sampling of the side walls of excavations will be undertaken at 10 m lateral and 1 m depth intervals.
- Sampling and analysis of ACM impacted fill excavations by the environmental consultant with reference to NEPM (2013) and DoH (2009) guidelines as follows:
  - Collection of ~10 L bulk samples by the environmental consultant;
  - Collection of a 500 ml sample for each ~10 L bulk sample for laboratory analysis of AF and FA to calculate the asbestos %w/w and compare against the RAC;
- Where impacted fill (ACM and/or construction and demolition waste) is observed, or analytical results identify asbestos above the laboratory LOR, further chase out of that location will be required and steps 1 to 3 will be repeated. The additional soil generated during the chase out will require off-site disposal; and
- A survey of the final remediation excavation areas is to be undertaken and provided to the Environmental Consultant prior to final validation.

8.2 Quality Assurance Plan

8.2.1 Sample Collection and Handling

The general sampling procedures comprise:

- the use of stainless steel or disposable sampling equipment;
- washing of all re-usable sampling equipment, including excavator parts in contact with the sample, in a 3% solution of phosphate free detergent (Decon 90) then rinsing with distilled water prior to each sample being collected; transfer of the sample into an appropriate sampling container, sealing of containers to eliminate cross contamination during transportation to the laboratory;
- use of laboratory prepared sampling containers. Samples to be tested for asbestos will be placed in a sealable plastic bag;
- labelling of the sample containers with individual and unique identification including project number and sample number;
- placement of the sampling containers into an enclosed and secure container for transport to the laboratory; and
- use of chain-of-custody documentation to ensure 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.

8.2.2 Field QA/QC

Quality assurance (QA) and quality control (QC) procedures will be adopted throughout the field sampling programme to ensure sampling precision and accuracy and prevent cross contamination. Furthermore, all site management personnel are to be qualified and experienced in dealing with asbestos (supporting information to be provided and included in the validation report).

The following QA/QC samples will be collected/prepared and analysed:

- 10% intra-laboratory duplicate samples; and
- 10% inter-laboratory duplicate samples.

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

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

8.2.3 Laboratory Quality Assurance and Quality Control

NATA accredited laboratories will be used to conduct analysis. The laboratory will need to undertake analysis in accordance with its accreditation, including in-house QA/QC procedures involving the routine testing (where applicable) comprising statistical analysis of laboratory QA/QC data.

Based on a fulfilment of the data quality objectives, an assessment of the overall data quality will be presented in the validation report.

8.3 Validation Reporting

A validation assessment report will be prepared by the Environmental Consultant in accordance with NSW DECC Contaminated Sites *Guidelines for Consultants Reporting on Contaminated Sites* (reprint 2011) and other appropriate guidance documentation. The objective is for the validation report to confirm that the site has been remediated to a suitable standard for the proposed redevelopment and occupation and that no related adverse human health and environmental effects have occurred as a result of the temporary works. The validation report will also include a summary of the information from previous investigations.

The validation report will include:

- Details of the total volume of contaminated materials removed from the site;
- Drawings showing contamination assessment sample locations and validation sample locations;
- Survey drawing showing the extent of the remediation areas;

- Detailed analytical results as applicable;
- Daily air monitoring reports for asbestos works (where required);
- The final disposal destination of the materials removed from site and disposal dockets, where appropriate; and
- Details of backfill source(s) and the assessment of material suitability, including assessment of imported VENM.

9. Site Management Plan

It is the responsibility of the Contractor to develop a Site Management Plan (SMP) detailing overall site management, environmental management (including soil, air and water) and occupational health and safety (OH&S) plans. This section provides a brief summary of some of the items which need to be included in the Contractor's plans.

Works shall 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) (under review);
- *Environmental Offences and Penalties* Act (1989);
- *Agricultural and Veterinary Chemicals* Act (1994);
- *Protection of the Environment Operations* Act (POEO) (1997) and associated exclusions;
- *Pesticide* Act (1999);
- *Work Health and Safety* Act 2011;
- *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).

9.1 Site Operations

The schedule of remedial works, including timing and staging is to be prepared by the Contractor to meet the requirements of this RAP.

Remediation works will be restricted to the hours set out by Council.

It is the site owner/developers responsibility to ensure that appropriate personnel are appointed to manage and conduct the remediation and validation works. This will include:

- The Principal's Representative (PR - RSL), who is responsible for overseeing the implementation of this RAP;

- The Contractor, who is responsible for overseeing the implementation of this RAP, conducting the remedial works (may be subcontracted) and managing the site; and
- An Environmental Consultant, who will be responsible for providing advice as required for the remedial works and undertaking the validation works in accordance with this RAP.

Other parties who may be employed to assist in the implementation of this RAP include, but are not limited to, occupational hygienist(s) and asbestos licensed contractor(s).

The Contractor will be responsible for preparing a list of contacts for the works, including emergency contacts for the site operations and provision of signage at the site to allow the public to contact nominated site personnel out of hours.

9.2 Environmental Management

The work shall be undertaken with all due regard to the minimisation of environmental effects and to meet all statutory requirements. The Contractor shall have in place an Environmental Management Plan (EMP) which addresses the following items:

- Site stormwater management plan;
- Soil management plan;
- Noise control plan;
- Dust control plan;
- Odour control plan; and
- Contingency measures for environmental incidents.

The Contractor shall also be responsible to ensure that the site works comply with the following conditions:

- fugitive dust leaving the confines of the site is minimised;
- no water containing suspended matter or contaminants leaves the site in a manner which could pollute the environment;
- vehicles shall be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas;
- spoil is managed in accordance with this RAP; and
- noise and vibration levels at the site boundaries comply with the legislative requirements.

9.3 Occupational Health and Safety

The Contractor should develop a site emergency response plan (ERP) and work health and safety management plan (WHS). This will ensure the safety of the personnel working on site, given any likely emergency situation which may occur. The WHS and ERP should include emergency phone numbers and details of local emergency facilities.

Appropriate fencing and signage should be installed around and within the site to prevent unauthorised access to the site, restricted access remedial areas (e.g.: asbestos remediation areas) and deep excavations. Signage should be appropriate to inform of the occurrence of asbestos remediation works.

All asbestos works will be conducted by an appropriately licensed asbestos contractor and in accordance with WorkCover requirements.

All personnel on site should be required to wear the following personnel protective equipment (PPE) at all times (as a minimum):

- Steel-capped boots;
- High visibility clothing; and
- Hard hat meeting AS1801-1981 requirements.

The following additional PPE will be worn as required:

- All PPE required by the A1 Licenced asbestos contractor (e.g.: P2 disposable dust mask or a particulate half-face mask with a P3 filter, disposal coveralls);
- Hearing protection meeting AS1270-1988 requirements when working around machinery or plant equipment if noise levels exceed exposure standards;
- Safety glasses or safety goggles with side shields meeting AS1337-1992 requirements (as necessary, particularly during demolition);
- Disposable coveralls (if necessary) to prevent contact with splashed contaminated soil, materials or water;
- Nitrile work gloves meeting AS2161-1978 requirements or heavy duty gauntlet gloves; and
- Any additional protection identified by the Environmental Consultant.

All contractors are required to show compliance with the Work Health and Safety Regulation 2011, including the preparation of a Site Safety Management Plan and Safe Work Method Statements.

10. Conclusion

It is considered that remediation of the site in accordance with this RAP will render the site suitable for the proposed residential development and will facilitate the appropriate management of potential temporary impacts on the environment.

11. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report (or services) for this project at 120 Tenth Avenue, Austral in accordance with DP's proposal dated 25 November 2016 and acceptance received from Luke Gunson dated 7 February 2017. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of TSA Management Pty Limited 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 results provided in the 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 the conditions encountered during this 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.

Douglas Partners Pty Ltd

Appendix A

About This Report and Drawing 1

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

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

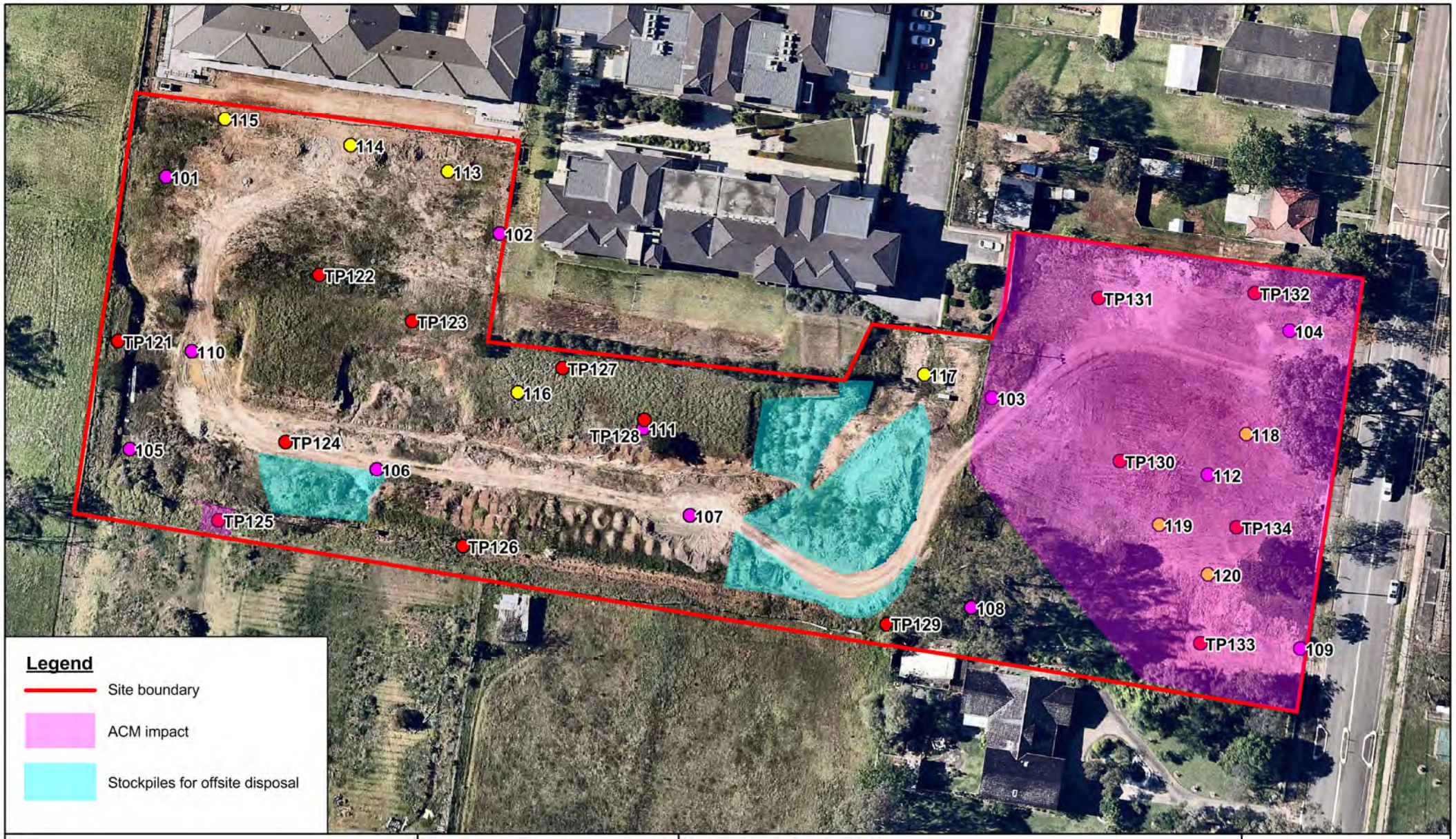
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later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



Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	TSA Management
OFFICE:	Macarthur
DATE:	17-Feb-17

Proposed Remediation Areas
Remediation Action Plan
120 Tenth Avenue, Austral, NSW

PROJECT No:	76725.02
DRAWING No:	1
REVISION:	A