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Integrated Practical Solutions

Remediation Action Plan

Villawood Park Stage 1
Kamira Court, Villawood

Prepared for
Westbourne Constructions Pty Ltd

Project 86819.02
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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.

	Signature	Date
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Executive Summary

Douglas Partners Pty Ltd (DP) has prepared this Remediation Action Plan (RAP) for Stage 1 of the proposed Villawood Park development (referred to herein as the site, as shown on Drawing 1, Appendix A) located at Kamira Court, Villawood. It is understood that the Stage 1 development is to comprise construction of a new mixed used residential / commercial development, with new open space areas, including a new pedestrian laneway facilitated by demolition of part of the existing Kamira Court roadway.

Previous investigations completed by DP for the larger Kamira Court site (refer Drawing 2, Appendix A) generally found all previous results were within adopted assessment criteria with the exception of soils beneath Kamira Court exceeding ecological based criteria and the detection of asbestos within one borehole (outside the current site) and on the ground surface (also outside the current site). Based on the similar fill profile however it is considered possible that further asbestos materials may be present within the fill at the site.

The objectives of the remediation for the proposed development are therefore to:

- Address potentially unacceptable risks to relevant environmental values from contamination; and
- Render the site suitable, from a contamination perspective, for the proposed development.

Based on previous results within the current site the remediation works are anticipated to include management of:

- Fill beneath existing Kamira Court roadway which exceeded ecological based criteria. These soils are recommended to be managed through retainment or relocation beneath areas of proposed hardstand, or otherwise through excavation and off-site disposal; and
- Management of unexpected finds, notably potentially as asbestos in soil as previously identified in surficial soils and at the ground surface in other parts of the larger previously investigated area, through the asbestos management plan outlined herein, and the excavation and off-site disposal of soils not meeting the remediation acceptance criteria.

It should be noted that this RAP does not form a detailed specification for the proposed site remediation works, but rather represents a planning document which outlines the means by which site remediation can be achieved.

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1. Introduction

Douglas Partners Pty Ltd (DP) has prepared this Remediation Action Plan for Stage 1 of the proposed Villawood Park development located at Kamira Court, Villawood. The investigation was commissioned by Declan Obrien of Westbourne Constructions Pty Ltd and was undertaken in accordance with DP's proposal 86819.02.P.001.Rev0 dated 11 March 2022.

The following key guidelines were consulted in the preparation of this report:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013);
- NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020); and
- CRC CARE *Remediation Action Plan: Development - Guideline on Establishing Remediation Objectives* (CRC CARE, 2019a).

The remediation objectives, devised in accordance with CRC CARE (2019a), are to:

- Address potentially unacceptable risks to relevant environmental values from contamination; and
- Render the site suitable, from a contamination perspective, for the proposed development.

This RAP provides details of the work that will be required at the site to meet the remediation objectives.

The proposed development involves the construction a mixed use commercial / residential buildings and public open space areas. Copies of relevant plans for the proposed development are included in Appendix A.

Based on available information, it is considered that the remediation works outlined in this report constitute Category 2 Remediation in accordance with NSW DUAP/EPA *Managing Land Contamination, Planning Guidelines, SEPP 55 - Remediation of Land* (NSW DUAP/EPA, 1998). Under Clause 4.13 of *SEPP (Resilience and Hazards) 2021*, the Council should be notified of the proposed commencement of the remediation work at least 30 days before commencement.

It should be noted that this RAP does not form a detailed specification for the proposed site remediation works, but rather represents a planning document which outlines the means by which site remediation can be achieved.

The site layout is shown on Drawing 1, Appendix A. This report must be read in conjunction with all appendices including the notes provided in Appendix A.

2. Proposed Development

The Stage 1 development is understood to comprise:

- Demolition of a portion of Kamira Court running west to east through the larger development area to facilitate further stages of the development including removal of trees and associated pathways;
- Construction of a new 10 level mixed use commercial / residential building ('Building B') with a two level above ground car park; and
- Construction of new recreational and open space areas including a new pedestrian laneway (Kamira Lane)

Minimal excavation below the existing ground level is understood to be required at the northern end of Building B to achieve design levels and further minimal excavation is anticipated to allow for footings / foundations.

3. Scope of Work

The scope of works to achieve the objectives of the RAP is as follows:

- Summarise the findings of previous investigations used to inform the status of contamination and contamination risk at the site;
- Present a conceptual site model (CSM) to list potential and likely contamination source, pathway and receptor linkages to address potentially unacceptable risks to relevant environmental values from contamination;
- Define the anticipated extent of remediation;
- Assess, select and justify a preferred approach to management and / or remediation to render the site suitable for its proposed use, and which will minimise potentially unacceptable risk to human health and/or the environment and which includes the consideration of the principles of ecologically sustainable development;
- Select an appropriate remediation strategy to render the site suitable, from a contamination perspective, for the proposed development;
- Establish the remediation acceptance criteria (RAC) to be adopted for validation of remediation;
- Identify how successful implementation of the RAP will be demonstrated / validated;
- Outline waste classification, handling and tracking requirements;
- Outline environmental safeguards required to complete the remediation works;
- Include contingency plans and an unexpected finds protocol;
- Procedures for the assessment and approval of materials to be imported; and
- Identify the need for, and nature of, any long-term management and / or monitoring following the completion of management / remediation and, if required, provide an outline of an environmental management plan.

4. Site Description

Site Address	Kamira Court, Villawood
Legal Description	Lot 382, Deposited Plan 1232437 Part Lot 37, Deposited Plan 202006
Area	5650 m^2
Zoning	R4 - High density Residential
Local Council Area	Fairfield City Council
Current Use	Public road, vacant lot
Surrounding Uses	North - Vacant lot, rail corridor East - Residential South - Open space, residential West - Residential

At the time of completing the previous investigations the site consisted of two portions of vacant land bisected by Kamira Court. The northern portion of the larger development area was fenced-off and bound by Villawood Road, Kamira Avenue and Kamira Court, and the southern portion was bound by Kamira Avenue, Kamira Court, an open public park / path to the south and vacant land at the rear of the commercial buildings to the east. The ground surface in both portions comprised open grassed areas with minimal tree cover and minor amounts of anthropogenic material, possibly fly tipped, visible on the surface.

Based on a review of recent aerial photography dated 23 March 2022[1] the site appeared to be relatively similar to that encountered in the previous investigations.

The site layout is shown on Drawing 1, Appendix A.

5. Environmental Setting

Regional Topography	Regional topography slopes gradually downhill to the north / north-east with elevations of approximately 26-30 m AHD 500 m to the south-west, falling to 18-20 m AHD along the rail corridor to the north of the site.
Site Topography	Local topography is slopes gradually downhill to the north-east with levels ranging between approximately 22-25 m AHD.
Soil Landscape	The site is mapped within the Richmond alluvial soil landscape group associated with low lying floodplains, the residual Blacktown group is mapped east of the site. Previous investigations identified residual clays more likely associated with Blacktown group soils.

[1] Accessed for latest imagery available on Metromap.com.au

Geology	The site is mapped within Wianamatta group Bringelly Shale which generally overlies deeper Ashfield Shale generally separated by thin layers of Minchinburry Sandstone.
Acid Sulfate Soils (ASS)	The site is mapped within an area of low probability of occurrence. Based on previously encountered soils the presence of ASS to the depths investigated is considered very low.
Surface Water	The nearest surface water body is Burns Creek approximately 600 m to the north
Groundwater	Groundwater was previously measured at the larger development area at depths of 7-8.55 m below ground level with an inferred flow direction towards the north-east.

6. Previous Reports and Site History

The detailed site investigation (DP, 2020) included a summary review of previous investigations, presented again in the following sections. All previous investigations targeted the larger development area shown on Drawing 2, Appendix A. All previous test locations are also shown on Drawing 2, Appendix A (i.e., including locations outside of the current site), whilst test results are summarised in Tables B1 to B3, Appendix B.

6.1 Preliminary Geotechnical and Contamination Assessment (DP 2008)

DP (2008) comprised a walkover, a review of available desktop information and a limited intrusive sampling investigation comprises eight test pits (TP1 to TP8, Drawing 2, Appendix A). Only minor exceedances of then adopted provisional phytotoxicity base investigation levels were detected. The report recommended further assessment during any earthworks specifically for potential asbestos contamination, in addition to the development of a Remediation Action Plan (RAP) and an Asbestos Management Plan (AMP).

6.2 *In-situ* Waste Classification (DP 2010)

DP (2010), comprised 17 additional test pits (TP1 to TP17, Drawing 2, Appendix A). The assessment indicated that the filling consisted of reworked natural clay with inclusions of rootlets and shale fragments with trace inclusions of anthropogenic materials including gravels, metal, concrete, brick, glass, timber, paint, tile and plastics. No asbestos containing materials (ACM) were detected.

6.3 Preliminary Site (Contamination) Investigation (PSI) (DP 2019)

DP (2019) comprised a review of previous investigations in addition to an updated review of readily available site history information and a limited intrusive investigation comprising seven additional test pits (TP101 to TP107, Drawing 2, Appendix A). The available site history information indicated that the larger development area was previously vacant land before significant residential development by 1961 as a part of housing commission accommodation, with these structures later being demolished by 2009. A previous historic dry-cleaning business was identified operating between 1965-1982 approximately 43 m south-east of the site.

Fill was encountered to depths of up to 4-5 m below ground level (bgl), consisting of silty clay soils with trace amounts of anthropogenic materials including metal, brick plastic, bone, concrete, wire, tile and terracotta.

The concentrations of the selected analytes in all samples analysed were found to be within the site assessment criteria (SAC) and / or below the laboratory practical quantification limit. No potential ACM was identified during fieldwork or by laboratory analysis. The investigation considered a low likelihood of significant contamination risk and recommended the development of an unexpected finds protocol for any excavation / development works. Further investigations were recommended within areas of the site not assessed including soils beneath the Kamira Court road surface in addition to a groundwater investigation to guide any de-watering management during the proposed development.

6.4 Detailed Site (Contamination) Investigation (DSI) (DP, 2020)

DP (2020) included a review of previous investigations (i.e. as summarised above) in addition to further targeted intrusive investigation of two test pits in the south of the larger development area (in parts previously not investigated), three boreholes within the Kamira Court roadway, three additional boreholes to facilitate the installation of groundwater monitoring wells providing coverage of the larger development area and two further test pits conducted for additional waste classification planning information,

Below ground conditions were found to be similar to previous investigations with the difference being soils beneath Kamira Court which included gravelly sands beneath the hardstand. Anthropogenic inclusions such as brick, concrete, tile and wood were noted in fill in addition to a fragment of potential ACM recovered from one borehole (MW1) confirmed to contain asbestos by laboratory analysis. Four further fragments of suspect ACM (one representative sample was confirmed by laboratory analysis to contain ACM) were noted on the ground surface in the north-west corner of the larger investigation area, which were considered possibly associated with fly tipped waste given the proximity to the nearby roads. No other signs of contamination were noted.

Groundwater was measured between 7.0 to 8.55 m bgl during sampling from the three installed groundwater wells. Based on the regional topography and the triangulation of measured water levels at this time, a groundwater flow direction towards the north-east is interpreted. It was noted that groundwater levels change over time and with varying climatic conditions.

Analytical results generally indicated similar to previous investigations with soil results within the assessment criteria with the exception of soils beneath Kamira Court exceeding ecological criteria (metals / TRH) considered associated with subgrade materials beneath hardstand.

All measured contaminants of concern from the three groundwater wells were below the SAC with the exception of nickel and zinc. These metal concentrations were however considered associated with urban groundwater conditions and not as a result of site contamination (e.g., leaching and mobilisation from soils). The groundwater results indicated that there was no obvious contamination from the previous historic dry cleaner which operated 43 m south-east of the site. Elevated concentrations of hydrocarbons (as total petroleum hydrocarbons [TPH]) were however noted in two wells (approximately upgradient of the site) which were within the site assessment criteria. Overall, the elevated TPH levels were not considered to present an immediate risk to human health for the proposed land-use and were noted as a consideration should any dewatering and associated waste disposal, be necessary during the proposed development.

The DSI recommended the development of an unexpected finds protocol is prepared and its implementation during any site works to address any soils potentially impacted by contamination (such as asbestos). Any soils potentially impacted by contamination which are identified during site works are to be segregated and assessed by a suitability qualified consultant to confirm their suitability to remain on site, or appropriate waste classification for off-site disposal.

The soils beneath Kamira Court exceeding ecological based criteria were recommended to be managed by removing from site as part of bulk excavation works (e.g., for basements) or relocating in areas not exposed to proposed landscaping.

7. Conceptual Site Model

Based on the previous investigations, the following potential sources of contamination and associated contaminants of concern were identified. No detectable concentrations of organochlorine pesticides (OCP), organophosphorus pesticides (OPP), phenols, polychlorinated biphenyls (PCB) or volatile organic compounds (VOC) have been detected in soils to date and therefore these analytes are no longer considered contaminants of potential concern (CoPC) and have been eliminated from previously identified contamination sources S1 and S2 listed below:

Table 1: Potential Contamination Sources and Contaminants of Potential Concern (CoPC)

Potential Source	Description of Potential Contaminating Activity	Contaminants of Potential Concern
S1 - Demolition and deterioration of previous site structures	Impact on soils due to demolition and removal of former structures and / or deterioration of structures prior to demolition.	Asbestos, metals, and / or other hazardous building materials.
S2 - Imported fill	Use of uncontrolled fill (and / or topsoil) for landscaped areas or site levelling.	Asbestos, heavy metals, TRH, BTEX, and PAH

Potential Source	Description of Potential Contaminating Activity	Contaminants of Potential Concern
S3 - Moderate to high risk activities surrounding the site	Historical records indicate the presence of licensed activities (including a dry cleaner) nearby the site.	Metals, TRH, BTEX, PAH, Phenols, VOC.

Notes : TRH total recoverable hydrocarbons
BTEX benzene, toluene, ethylbenzene, xylene
PAH polycyclic aromatic hydrocarbons

No indicators of significant on-site migration of contaminants were previously identified associated with the former dry cleaner nearby to the site. Slightly elevated levels of TPH were noted in groundwater samples, however this was only considered as a concern for any potential dewatering. Given the current proposed development does not comprise significant excavation at depth (e.g., for basement levels) source S3 is no longer considered significant for the current development.

7.1 Potential Receptors

7.1.1 Human Health Receptors

R1 End users (commercial and residential, including visitors);

R2 Construction and maintenance workers; and

R3 Adjacent site users (residential and commercial).

7.1.2 Environmental Receptors

R4 Groundwater; and

R5 Terrestrial ecology.

7.1.3 Potential Pathways

Potential pathways for the identified contamination to impact on the receptors include the following:

P1 Ingestion and dermal contact;

P2 Inhalation of dust and / or vapour;

P3 Leaching of contaminants and vertical migration into groundwater; and

P4 Contact with terrestrial ecology.

7.2 Summary of Preliminary CSM

A 'source - pathway - receptor' approach has been used to assess the potential risks of harm being caused to human, water or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways. The possible pathways between the above sources (S1 and S3) and receptors (R1 to R4) are provided in Table 2 below.

Table 2:Summary of Potential Complete Pathways

Potential Source and Contaminants of Concern	Pathway	Receptor
S1 - Demolition / deterioration of previous or current site structures	P1 - Ingestion and dermal contact	R1 - End users R2 - Construction and maintenance workers
	P2 - Inhalation of dust and/or vapours	R1 - End users R2 - Construction and maintenance workers R3 - Adjacent site users
S2 - Imported fill	P1 - Ingestion and dermal contact	R1 - End users R2 - Construction and maintenance workers
	P2 - Inhalation of dust and / or vapours	R1 - End users R2 - Construction and maintenance workers R3 - Adjacent site users
	P3 - Leaching and vertical migration into groundwater	R4 - Groundwater
	P4 - Contact with terrestrial ecology	R5 - Terrestrial ecology

8. Remediation Extent

Based on the previous results summarised in Section 6 the following is considered to require remediation or management during development of the site:

- Fill beneath existing Kamira Court roadway: exceeding ecological base criteria (TRH) considered associated with subgrade materials; and
- Management of unexpected finds, notably asbestos in soil as previously identified in surficial soils and at the ground surface in other parts of the larger previously investigated area.

9. Remediation Options Assessment

The objective of the remediation options assessment and evaluation is to establish a preferred remediation strategy. The process involves canvassing various remedial options which may be viable and then ranking each option based on a number of evaluation criteria. The remediation options assessment was undertaken with reference to CRC CARE *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment* (CRC CARE, 2019b).

The remediation options assessment is included in Appendix C.

10. Preferred Remediation Strategy

10.1 Rationale

The rationale for the selection of the preferred remediation strategy is outlined in Appendix C. The preferred remediation strategy is:

- On site relocation and management of fill exceeding ecological based criteria (i.e., from beneath Kamira Court) to areas beneath proposed hardstand; and
- Off-site disposal of any additional fill exceeding health-based criteria (e.g., asbestos in soils / unexpected finds) as per an asbestos management plan / unexpected finds protocol.

10.2 Sequence of Remediation

The general sequence of remediation shall be determined by the Contractor and should consider the following recommended sequence:

- Excavation and stockpiling of fill material sourced beneath Kamira Court (where not planned to be retained beneath hardstand);
- Excavation of surplus fill at suitable destination area beneath proposed hardstand (with respect to proposed design levels); and
- Relocation of the stockpiled fill material to areas beneath proposed hardstand.

Alternatively, any fill exceeding ecological based criteria may be stockpiled for off-site disposal as per Section 13.

Any asbestos or other contamination will be managed as per the asbestos management plan (AMP) attached in Appendix G.

11. Assessment Criteria

11.1 Remediation Acceptance Criteria

In the absence of derivation of Tier 2 site specific target levels (SSTL), the remediation acceptance criteria (RAC) for contaminants in soil are the same as the Tier 1 SAC adopted for DP (2020), protective of human health and ecology. The following table provides a summary of the qualitative and concentration-based RAC.

Table 3: Remediation Acceptance Criteria

Item	Remediation Acceptance Criteria
Asbestos finds / asbestos in soil	No visible asbestos in surficial soils (i.e., top ~0.1 m) No visible building rubble in surficial soils for aesthetic considerations and as potentially associated with asbestos materials No detection of asbestos in soils as initial screening criteria OR Further detailed assessment with target concentrations below the adopted HSL (refer Section 11.2)
TRH / metals exceeding ecological criteria	No exceedances of SAC for ecological criteria where the proposed landform is not to be finished with hardstand Minor exceedances may be managed as per Section 10 e.g., by finishing with new hardstand or relocation to suitable areas of the site
Imported materials	Results within SAC and any relevant resource recovery orders (RRO) and associated resource recovery exemptions (RRE)
Unexpected finds	Results within SAC. Where no SAC is currently available further reference may be given to suitable guidelines from other applicable jurisdictions e.g., US EPA.

11.2 Site Assessment Criteria

Additional area(s) of contamination encountered beyond those outlined in Section 8, during the course of the remediation and site redevelopment will be subject to the contingency plan or unexpected find protocol (Appendix G) and assessed using the SAC in Appendix D. The SAC are the same as the Tier 1 SAC adopted for DP (2020).

The adopted investigation and screening levels comprise levels for a generic residential with minimal access to soil as a conservative screen for a mixed residential / commercial development. The derivation of the SAC is included in Appendix D and the adopted SAC are listed on the summary analytical results tables in Appendix B.

12. Validation Plan

12.1 Data Quality Objectives

The data quality objectives (DQO) for the validation plan are included in Appendix E.

12.2 Validation Assessment Requirements

The following site validation work will be required:

- Field assessment by the Environmental Consultant comprising:
  - Visual inspection, including taking photographs for record purposes;
  - Collecting validation samples from excavations resulting from the removal of contaminated soils;
  - Collecting validation / characterisation samples for materials to be re-used on-site.
- Laboratory analysis of validation samples at a NATA accredited laboratory for:
  - The CoPC relevant to the remediation area; and
  - Quality control (QC) samples in accordance with Section 15.
- Comparison by the Environmental Consultant of the laboratory results with the SAC and / or RAC as appropriate (refer to Section 11); and
- Preparation by the Environmental Consultant of a validation report detailing the methods and results of the remediation works and validation assessment.

12.3 Visual Inspections

All areas to be assessed and validated will first be subject to a visual inspection by the Environmental Consultant. Any areas of fill / ACM must be removed prior to validation sampling (where appropriate).

12.4 Validation Sampling

The sampling frequency will depend on the volume or area to be assessed and the previous results. The following approximate sampling frequencies will be adopted but may be modified by the Environmental Consultant to take into account previous results, where applicable.

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

- Base of excavation: one sample per 25 m^2 to 50 m^2 or part thereof, with a minimum of three samples collected; and
- Sides of excavation: one sample per 10 m to 20 m length or part thereof with a minimum of one sample per wall. Additional samples will be collected at depths of concern where there is more than one depth of concern, with a minimum of one sample per 1.5 m depth in fill.

Large excavations (base ≥ 500 m^2):

- Base of excavation: sampling on a grid at a density in accordance with Table A in NSW EPA (1995) or a minimum of 10 samples. In sub-areas with any specific signs of concern, a higher sampling density may be required; and
- Sides of excavation: one sample per 20 m length or part thereof with a minimum of one sample per wall. Additional samples will be collected at depths of concern where there is more than one depth of concern, with a minimum of one sample per 1.5 m depth in filling.

Where contaminated soils are stored or treated on bare soils, the footprint of the stockpile will require validation following removal of the contaminated soils.

Validation samples will be analysed by a NATA accredited laboratory for the relevant CoPC relevant to the remediation area.

Validation sample test results will be compared to the RAC, as per the DQO (Appendix E). Where the RAC are considered to have not been met, the remediation excavation(s) will be expanded to 'chase-out' impacted material, as instructed by the Environmental Consultant, with the validation sampling then continuing into the extended excavation. This process will continue until the impacted material has been fully chased out.

13. Waste Disposal

Any waste disposed off-site must be initially classified by the Environmental Consultant in accordance with:

- NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW EPA, 2014a);
- NSW EPA *Waste Classification Guidelines, Part 2: Immobilisation of Waste* (NSW EPA, 2014b);
- NSW EPA *Waste Classification Guidelines, Part 4: Acid Sulfate Soils* (NSW EPA, 2014c); and
- NSW EPA *Addendum to the Waste Classification Guidelines (2014) - Part 1: Classifying Waste* (NSW EPA, 2016) [addendum for per- and poly-fluoroalkyl substances (PFAS)].

Disposal of waste must be to an appropriately licensed waste facility, as per *Protection of the Environment Operations Act 1997* NSW (POEO Act) and the *Protection of the Environment (Waste) Regulation 2014* NSW.

Samples will be collected from stockpiles / *in situ* fill at various depths to characterise the full depth of the material. The frequency is to be determined by the Environmental Consultant based on the risk of contamination and heterogeneity of the material.

The suggested sampling frequency for the initial assessment of stockpiles comprising similar materials shall be:

- One sample per 25 m^3 to 50 m^3 for stockpiles up to 200 m^3, with a minimum of three per stockpile; and

- One sample per 25 m^3 to 250 m^3 for stockpiles greater than 200 m^3, with a minimum of ten samples per stockpile, by applying statistical analysis to calculate a 95% upper confidence limit (UCL) within the respective criteria with reference to EPA Victoria *Soil Sampling* (EPA Victoria, 2009).

It may be possible to classify excavated soil / fill for reuse on another site under a relevant NSW EPA resource recovery order (RRO) so that it can be used on other sites under the requirements of the corresponding NSW EPA resource recovery exemption (RRE). For this option, the frequency of sampling should be in accordance with the relevant RRO and the contaminants to be analysed will be determined by the Environmental Consultant. The Environmental Consult will provide a report confirming the suitability of the spoil for reuse under a RRO, or otherwise.

All waste must be tracked by the Remediation Contractor from 'cradle to grave'. Copies of all consignment notes / disposal dockets (or similar) and Environment Protection Licences for receipt and disposal of the materials must be maintained by the Remediation Contractor as part of the site log and must be provided to the Environmental Consultant for inclusion in the validation report.

14. Imported Material

Any soil, aggregate etc imported for the remediation works must have contaminant concentrations that meet the relevant criteria outlined in Section 11 and have no aesthetic issues of concern. Imported materials will only be accepted for use at the site if:

- It can legally be accepted onto the site (e.g., classified as virgin excavated natural material (VENM), accompanied by a report / certificate prepared by a qualified environmental consultant);
- Visual inspection of the imported soil confirms that the soil has no signs of concern and is consistent with those described in the supporting classification documentation; and
- The materials are validated (by inspection / sampling) by the Environmental Consultant as being suitable for use at the site.

The classification report / certificate for all material proposed for import must be reviewed and approved in writing by the Environmental Consultant prior to import. Materials to be imported may need to meet geotechnical requirements which are to be assessed by others, as required.

If permitted by the development consent and approved by the site owner, Remediation Contractor and Environmental Consultant, material classified under a NSW EPA RRO may also be accepted, provided the material can be used on site in accordance with the corresponding RRE. This could include excavated natural material (ENM), classified under NSW EPA *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order 2014* (NSW EPA, 2014d).

The need for check-sampling of RRO material is to be determined by the Environmental Consultant depending on the source of the material, adequacy of the supporting documentation provided and inspection(s) of material. Quarried material / VENM may need little or no check sampling, a nominal 2-3 samples per source site may be recommended as a minimum.

Unless specified in the applicable RRO, recycled materials will be sampled at the rates set out in Section 13 for stockpiled material as a guide. Any imported recycled aggregates must be sampled at a frequency of sampling of one sample per 25 m^3, with a minimum of three samples per load. The recycled aggregate will not be permitted to be used on site until the results of the inspection and laboratory analysis have been approved in writing by the Environmental Consultant. Where practicable it is advised to inspect / sample recycled materials prior to import to the site to avoid transport / application of unsuitable materials.

15. Quality Assurance and Quality Control

Field quality assurance and quality control (QA/QC) testing will include the following:

- 5% sample inter-laboratory analysis, analysed for the CoPC of the primary sample;
- 5% sample intra-laboratory analysis, analysed for the CoPC of the primary sample;
- Rinsate samples (where re-useable sampling equipment is used), analysed for the suite of analytes analysed by the majority of the primary samples; and
- Trip spike and trip blank samples (analysed for BTEX) (approximately one per batch of samples) where sampling for volatile contaminants.

The laboratory will undertake analysis in accordance with its NATA accreditation, including in-house QA / QC procedures.

The QC analytical results will be assessed using the following criteria:

- Sampling location rationale met the sampling objective;
- Standard operating procedures (SOP) are followed;
- Appropriate QA / QC samples are collected / prepared 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;
- Conformance with specified holding times;
- Accuracy of spiked samples within the laboratory's acceptable range (typically 70-130% for inorganic contaminants and greater for some organic contaminants);
- Field and laboratory duplicate and replicate samples will have a precision average of +/- 30% relative percentage difference (RPD); and
- Rinsate samples will show that the sampling equipment (if used) is free of introduced contaminants, i.e., the analytes show that the rinsate sample is within the normal range for deionised water.

16. Management and Responsibilities

16.1 Site Management Plan

A general site management plan for the operational phase of site remediation is included in Appendix F. The management plan includes soil, noise, dust, work health safety (WHS), remediation schedule, hours of operation and incident response. The Remediation Contractor is to implement the general site management plan for the duration of remedial works by incorporating the plan into their over-arching construction environmental management plan (CEMP).

16.2 Site Responsibilities

The site management plan (Appendix F) provides a summary of the general program management and associated responsibilities. Contact details for key utilities are also included in the event of needing to respond to any incidents.

16.3 Contingency Plan and Unexpected Finds Protocol

Plans for contingency situations (e.g., encountering asbestos in fill), along with an unexpected finds protocol for dealing with unexpected finds during remediation work / earthworks, are included in Appendix X.

17. Validation Reporting

17.1 Documentation

The following documents will need to be collated and reviewed by the Environmental Consultant as part of the validation assessment (including those items that are prepared by the Environmental Consultant):

- Any licences and approvals required for the remediation works;
- Waste classification report(s);
- Transportation Record: comprising a record of all truck-loads of soil (including aggregate) entering the site, including truck identification (e.g., registration number), date, time, source site, load characteristics (e.g. type of material, i.e., quarried aggregate, etc.), approximate volume, use (e.g., general site raising, service trenches, etc.);
- Disposal dockets: for any soil disposed off-site. The Remediation Contractor will supply records of: transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site. Note: A record of the building materials disposed off-site is also be kept and provided to the Principal, on request;
- Imported materials records: records for any soil imported onto the site, including source site, classification reports, and inspection records of soil upon receipt at site;
- Records relating to any unexpected finds and contingency plans implemented;

- Laboratory certificates and chain-of-custody documentation;
- Inspections records from the Environmental Consultant;
- Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities;
- Surveys pre- and post-installation of geotextile marker layer and clean fill cap;
- Airborne asbestos monitoring records (in the event that asbestos works are undertaken); and
- Interim / final visual and sampling clearances for any asbestos related works (in the event that asbestos works are undertaken).

17.2 Reporting

A validation assessment report will be prepared by the Environmental Consultant in accordance with NSW EPA (2020).

The validation report shall describe the remediation approach adopted, methodology, results and conclusion of the assessment and make a statement regarding the suitability of the site for the proposed mixed-use development

18. Conclusions

It is considered that the site can be made suitable for the proposed residential / commercial development subject to implementation of this RAP.

19. References

CRC CARE. (2019a). *Remediation Action Plan: Development - Guideline on Establishing Remediation Objectives.* National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

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NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

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NSW EPA. (2014d). *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order 2014.* NSW Environment Protection Authority.

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NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land.* Contaminated Land Guidelines: NSW Environment Protection Authority.

20. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project in accordance with DP's proposal 86819.02.P.001.Rev0 dated 11 March 2022 and acceptance received from Westbourne Constructions Pty Ltd dated 23 May 2022. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Westbourne Constructions Pty Ltd 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.

The assessment of atypical safety hazards arising from this advice is restricted to the environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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.

Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in fill materials at the test locations sampled and analysed within the current site. Building demolition materials, such as metal, brick, plastic and tile, were, however, located in previous below-ground fill, and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos. It is also noted that asbestos was previously detected in previous below ground and surficial fill in parts outside of the current site, and this is therefore considered indicative of the potential presence of further asbestos to be present in fill within the current site.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is due to undetected variations in ground conditions. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

Douglas Partners Pty Ltd

Appendix A

Drawings

About this Report

Notes:
1. Drawing projection GDA94 / MGA zone 56
2. Latest available aerial imagery sourced from metromap.com accessed 29/06/2022

Legend

- Stage 1 Boundary
- Additional demolition area for Kamira Court
- Borehole (DP 2020)
- Testpits (DP 2020)
- Test pit (DP 2020)
- Test pit (DP 2019)
- Test pit (DP 2008)
- Test pit (DP 2010)
- Groundwater well (DP 2020)

10 0 10 20 30 40 m

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Westbourne Constructions Pty Ltd		
OFFICE:	Sydney	DRAWN BY:	JJH
SCALE:	1:750 @ A3	DATE:	29.06.2022

TITLE: **Site Layout and Previous Test Locations**
Villawood Park Stage 1
Kamira Court, Villawood

N

PROJECT No:	86819.02
DRAWING No:	1
REVISION:	0

Notes:
1. Drawing projection GDA94 / MGA zone 56
2. Latest available aerial imagery sourced from metromap.com accessed 29/06/2022

Legend

- Previous Investigation Area
- Borehole (DP 2020)
- Testpits (DP 2020)
- Test pit (DP 2020)
- Test pit (DP 2019)
- Test pit (DP 2008)
- Test pit (DP 2010)
- Groundwater well (DP 2020)

10 0 10 20 30 40 m

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Westbourne Constructions Pty Ltd		
OFFICE:	Sydney	DRAWN BY:	JJH
SCALE:	1:750 @ A3	DATE:	05.07.2022

TITLE: **Previous Test Locations**
Villawood Park Stage 1
Kamira Court, Villawood

N

PROJECT No:	86819.02
DRAWING No:	2
REVISION:	0

DEMOLISH AND REMOVE FROM SITE:
All WALLS, FLOORS, ROOF STRUCTURES, FOOTINGS, REDUNDANT PIPEWORK BELOW NATURAL GROUND LEVEL AND VEGETATION.

DEMOLITION NOTES:
1. REFERENCE IS TO BE MADE TO SERVICE AUTHORITY PLANS PRIOR TO COMMENCEMENT OF DEMOLITION WORKS. THE POSITION OF UNDERGROUND SERVICES ARE TO BE VERIFIED ON SITE AND ABUTTING SITES AND VERIFIED WITH RELEVANT SERVICE AUTHORITIES.
2. IT REMAINS THE CONTRACTOR'S RESPONSIBILITY TO INSPECT AND DETERMINE THE FULL EXTENT OF DEMOLITION AND REMOVAL OF EXISTING MASONRY RUBBLE AND SOIL FOR THE EXCAVATION.

Legend

- To be demolished
- Proposed stage 1 Site Works and Clearing
- Trees to be demolished
- +21,000 Existing RLs

Rev.	Date	By	Ckd	Description
01	13/05/2021	DKO	DKO	Issued for Draft DA
02	14/05/2021	DKO	DKO	Issued for Draft DA
A	18/06/2021	SH/TM	SO	Issue For DA

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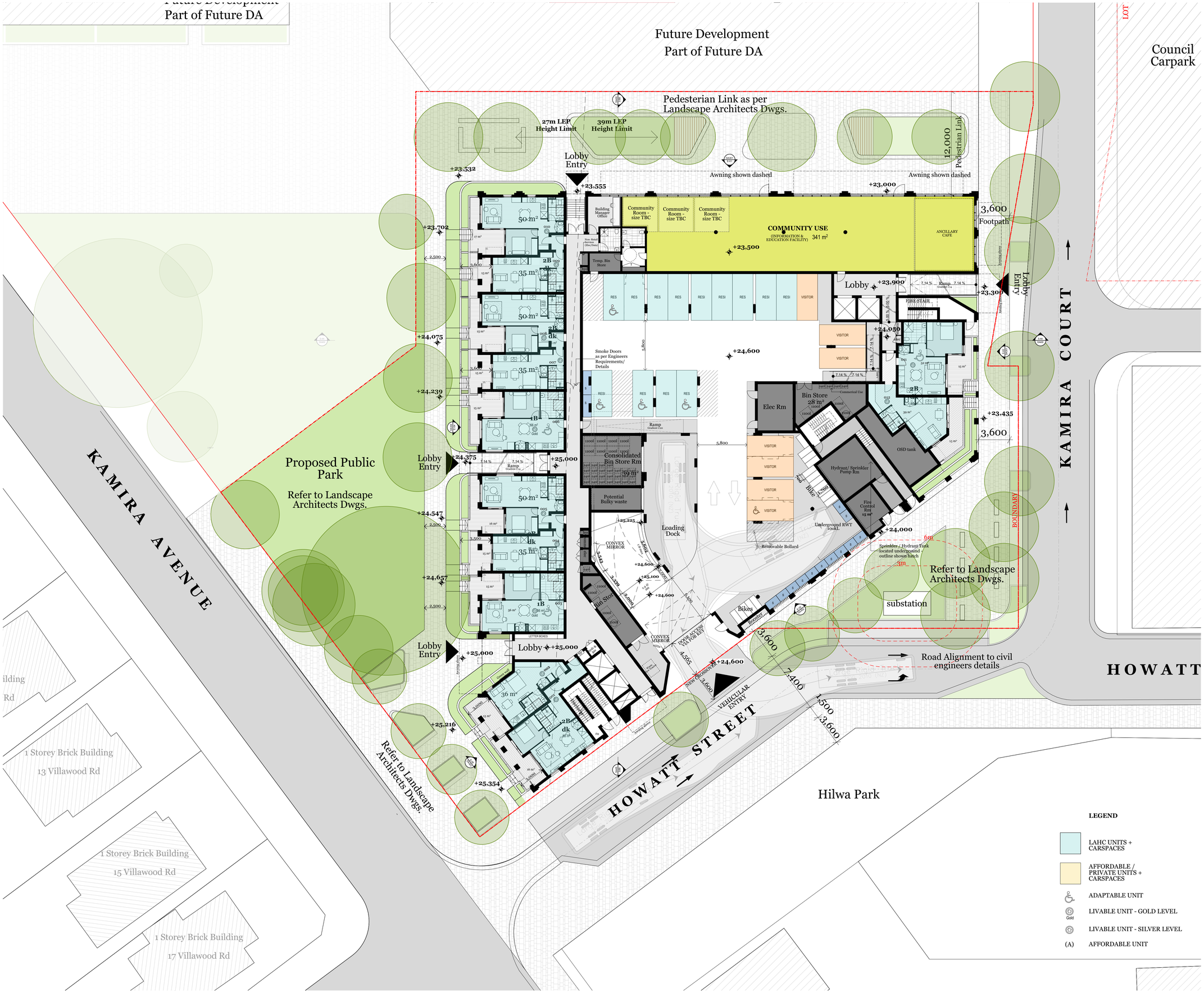
Project Name	LAHC Villawood
Project Number	12620
Project Address	Kamira Avenue, Villawood, NSW 2163
Drawn By	
Checked By	
Date	May 2021
Scale	
Drawing Series	Site Series
Drawing Name	Demolition Plan
Drawing Number	DA102
Revision	A

VILLAWOOD ROAD
CHERYL LANE
VILLAWOOD PLACE
KAMIRA COURT
KAMIRA AVENUE
KIRANG AVENUE
HOWATT STREET
Stage 2 & 3 Site Boundary
Existing Sewer
STAGE 2 & 3
Proposed Staged Boundary Line
STAGE 1
Existing Council Carpark
Hilwa Park
28 DP36718
29 DP36718
4 DP1013056
5 DP1013056
2 DP500367
9-12 Storey
9-12 Storey
2 Storey Brick Building
1 Storey Brick Building 29A Villawood Pl
2 Storey Brick Building 33 Villawood Pl
1 Storey Brick Building 35 Villawood Pl
1 Storey Brick Building 37 Villawood Pl
1 Storey Brick Building 41-43 Villawood Pl
2 Storey Brick Building 45 Villawood Pl
Petrol Station 896A Woodville Rd
1 Storey Brick Building 30 Villawood Rd
1 Storey Brick Building 1 Villawood Rd
1 Storey Brick Building 3 Villawood Rd
1 Storey Brick Building 5 Villawood Rd
1 Storey Brick Building 7 Villawood Rd
1 Storey Brick Building 9 Villawood Rd
1 Storey Brick Building 11A Villawood Rd
1 Storey Brick Building 13 Villawood Rd
1 Storey Brick Building 15 Villawood Rd
1 Storey Brick Building 17 Villawood Rd
+24,980 +24,500 +25,090 +25,140 +23,910 +22,890 +22,150 +21,620 +21,010 +20,480 +20,880 +21,500 +21,280 +21,393 +21,750 +22,000 +22,500 +23,000 +23,500 +24,000 +24,500 +24,830 +25,000 +25,000 +25,220 +25,360 +25,510 +25,640 +25,700 +25,000 +24,500 +24,190 +23,680 +25,910 +22,630 +22,910 +23,120 +23,200 +22,840 +22,600 +23,320 +23,360 +23,470



Car Parking Summary

LAHC	
Resi Car Spaces (Incl. 4 Accessible)	**13**
Evolve	
Visitor Car Spaces (Incl. 1 Accessible)	**7**
Ground Lvl Total	**20**
Bicyle Parking	**16**

Rev.	Date	By	Ckd	Description
07	26/05/2021	SH/TM	SO	Issue for consultant
08	28/05/2021	SH/TM	SO	Issue for consultant
09	3/06/2021	SH/TM	SO	Issue for review
10	11/06/2021	SH/TM	SO	Issue for review
A	18/06/2021	SH/TM	SO	Issue For DA

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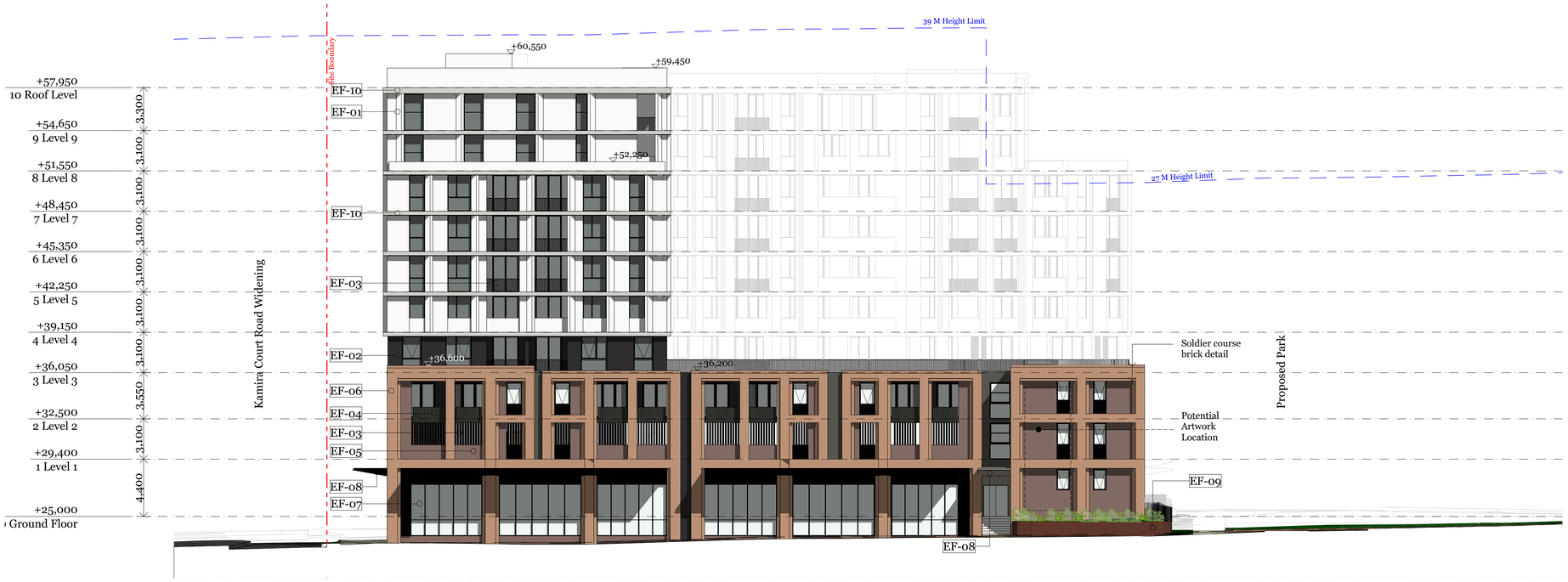
Project Name	LAHC Villawood
Project Number	12620
Project Address	Kamira Avenue, Villawood, NSW 2163
Drawn By	
Checked By	
Date	May 2021
Scale	1:200@A1
Drawing Series	GA Plans
Drawing Name	Ground Floor Plan
Drawing Number	**DA200**
Revision	**A**



E-01
-

North Elevation
1:200

-02
-

East Elevation
1:200

EXTERNAL FINISHES LEGEND

EF-01
Exterior Finish
White

EF-02
Exterior Finish
Dark Grey

EF-03
Powdercoat
Black

EF-04
Textured
Dark Grey

EF-05
Brick
Dark - Stack bond

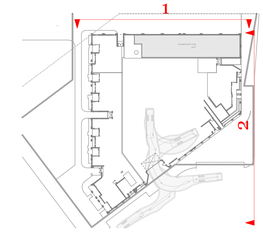
EF-06
Brick
Light

EF-07
Glazing
Clear

EF-08
Metal
Bronze Finish

EF-09
Brick
Dark

EF-10
Concrete Finish



Rev.	Date	By	Ckd	Description
04	19/05/2021	TM_SH	SO	Issue for BASIX
05	24/05/2021	PM	SO	Issue for BASIX
06	26/05/2021	SH/TM	SO	Issue for consultant
07	11/06/2021	SH/TM	SO	Issue for review
A	18/06/2021	SH/TM	SO	Issue For DA

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Project Name	LAHC Villawood
Project Number	12620
Project Address	Kamira Avenue, Villawood, NSW 2163
Drawn By	
Checked By	
Date	May 2021
Scale	
Drawing Series	Elevations
Drawing Name	North & East Elevation

Drawing Number **DA301**
Revision **A**

E-03 - **South Elevation 1:200**

E-04 - **West Elevation 1:200**

EXTERNAL FINISHES LEGEND

EF-01 Exterior Finish White

EF-02 Exterior Finish Dark Grey

EF-03 Powdercoat Black

EF-04 Textured Dark Grey

EF-05 Brick Dark - Stack bond

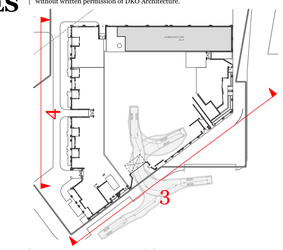
EF-06 Brick Light

EF-07 Glazing Clear

EF-08 Metal Bronze Finish

EF-09 Brick Dark

EF-10 Concrete Finish



Rev.	Date	By	Ckd	Description
04	19/05/2021	TM_SH	SO	Issue for BASIX
05	24/05/2021	PM	SO	Issue for BASIX
06	26/05/2021	SH/TM	SO	Issue for consultant
07	11/06/2021	SH/TM	SO	Issue for review
A	18/06/2021	SH/TM	SO	Issue For DA

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Project Name	LAHC Villawood
Project Number	12620
Project Address	Kamira Avenue, Villawood, NSW 2163
Drawn By	
Checked By	
Date	May 2021
Scale	
Drawing Series	Elevations
Drawing Name	South & West Elevation
Drawing Number	**DA302**
Revision	**A**

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.

Appendix B

Previous Summary Results

Douglas Partners
Geotechnics | Environment | Groundwater

Table B1: Summary of Laboratory Results –Soils

			Metals								TRH						BTEX				PAH				Phenol	OCP	OPP	PCB	Asbestos	
			Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	TRH C6 - C10	TRH >C10-C16	F1 ([C6-C10]-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes	[b] Naphthalene	Benzo(a)pyrene (BaP)	Benzo(a)pyrene TEQ	Total PAHs	Phenol	Total Positive OCP	Total Positive OPP	Total PCB	Asbestos ID	FA and AF Estimation
		PQL	4	0.4	1	1	1	0.1	1	1	25	50	25	50	100	100	0.2	0.5	1	1	0.1	0.05	0.5	0.05	5	0.1	0.1	0.1		<0.001
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	%(w/w)
TP106	0.4-0.5 m	23/07/2019	10	<0.4	18	21	70	0.5	11	160	<25	<50	<25	<50	120	<100	<0.2	<0.5	<1	<1	<0.1	0.1	<0.5	0.3	<5	<PQL	<PQL	<0.1	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP106	0.9-1.0 m	23/07/2019	<4	<0.4	7	29	13	<0.1	15	68	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.05	<0.5	<0.05	<5	<PQL	<PQL	<0.1	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP106	2.5-2.6 m	23/07/2019	<4	<0.4	9	28	11	<0.1	40	110	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.05	<0.5	<0.05	-	-	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP2	0.1-0.4 m	17/09/2008	9	0.6	17	52	140	<0.1	13	270	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	<5	<PQL	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP3	0.1-0.25m	17/09/2008	9	0.5	31	13	22	<0.1	9	18	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	0.06	-	-	<5	<PQL	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP4	0.7-1.4 m	17/09/2008	26	<0.5	12	34	19	<0.1	26	86	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	<5	<PQL	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP5	0.0-0.5 m	17/09/2008	9	<0.5	10	34	18	<0.1	20	71	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	<5	<PQL	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BD1-170908	0.0-0.5 m	17/09/2008	9	<0.5	9	31	16	<0.1	25	70	-	-	-	-	-	-	-	-	-	-	<0.1	<0.05	-	-	-	-	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP5	0.5-1.4 m	17/09/2008	6	<0.5	9	29	17	<0.1	17	94	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	-	<PQL	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP12	0.5 m	7/04/2010	7	<0.5	18	22	22	<0.1	6	31	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	-	-	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP12	2.5	7/04/2010	8	<0.5	11	27	15	<0.1	15	57	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	-	-	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP13	0.9 m	7/04/2010	11	<0.5	20	10	22	<0.1	4	17	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	<5	<PQL	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP13	0.9 m	7/04/2010	5	<0.5	14	20	15	<0.1	3	25	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	-	-	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP14	0.5 m	7/04/2010	9	<0.5	20	20	27	<0.1	7	61	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	-	-	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP15	0.2 m	7/04/2010	5	<0.5	13	24	18	<0.1	4	24	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	<5	<PQL	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP16	0.2 m	7/04/2010	6	<0.5	14	19	25	<0.1	8	170	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	<5	<PQL	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP16	1.5 m	7/04/2010	5	<0.5	15	13	14	<0.1	3	14	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	-	-	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP17	0.2 m	7/04/2010	8	<0.5	10	38	23	<0.1	18	76	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	<5	<PQL	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP17	0.5 m	7/04/2010	9	<0.5	12	34	29	<0.1	19	77	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<0.1	<0.05	-	-	-	-	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP9	0 - 0.3 m	26/11/2019	10	<0.4	59	24	32	<0.1	10	46	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	<PQL	<PQL	-	NAD	<0.001
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BD3/20191217	0 - 0.3 m	17/12/2019	6	<0.4	14	23	14	<0.1	8	45	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	-	-	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP9	0.3 - 0.5 m	26/11/2019	9	<0.4	28	16	18	<0.1	5	26	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	-	-	-	-	NAD	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP10	0 - 0.3 m	26/11/2019	6	<0.4	23	15	45	<0.1	7	55	<25	<50	<25	<50	110	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	<PQL	<PQL	-	NAD	<0.001
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
TP10	0.3 - 0.5 m	26/11/2019	-	-	-	-	-	-	-	-	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	-	-	-	-	NAD	<0.001
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BH1	0.05 - 0.15 m	17/12/2019	<4	<0.4	55	47	5	<0.1	59	43	<25	62	<25	62	240	380	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	0.2	<5	<PQL	<PQL	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BH1	0.3 - 0.5 m	17/12/2019	5	<0.4	29	17	11	<0.1	18	22	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	<PQL	<PQL	-	NAD	<0.001
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BH1	0.8 - 1 m	17/12/2019	<4	<0.4	29	76	6	<0.1	33	33	<25	64	<25	64	740	1100	<0.2	<0.5	<1	<1	<1	0.05	<0.5	0.05	-	-	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BH2	0.05 - 0.15 m	17/12/2019	5	<0.4	15	15	11	<0.1	5	18	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	<PQL	<PQL	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BH2	0.3 - 0.5 m	17/12/2019	5	<0.4	32	28	10	<0.1	25	26	<25	54	<25	54	360	400	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	<PQL	<PQL	-	NAD	<0.001
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BH2	0.8 - 1 m	17/12/2019	8	<0.4	11	22	13	<0.1	4	23	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	-	-	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BH3	0.3 - 0.5 m	17/12/2019	8	<0.4	31	19	23	<0.1	13	26	<25	64	<25	64	200	180	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	<5	<PQL	<PQL	-	NAD	<0.001
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		
BH3	0.8 - 1 m	17/12/2019	5	<0.4	14	16	10	<0.1	5	14	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<0.05	<0.5	<0.05	-	-	-	-	-	-
			500 100	150 -	500 410	30000 200	1200 1100	120 -	1200 160	60000 470	- -	- 120	45 180	110 -	- 300	- 2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	4 -	400 -	130 -	- -	- -	- -	1 -		

Lab result

HIL/HSL value EIL/ESL value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Non limiting AD = Asbestos detected NAD = No Asbestos detected

HIL = Health investigation level HSL = Health screening level (excluding DC) EIL = Ecological investigation level ESL = Ecological screening level ML = Management Limit DC = Direct Contact HSL

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Reported naphthalene laboratory result obtained from BTEXN suite

Site Assessment Criteria (SAC):

Refer to the SAC section of report for information of SAC sources and rationale. Summary information as follows:

SAC based on generic land use thresholds for Residential B with minimal opportunities for soil access

HIL B	Residential / Low - High Density (NEPC, 2013)
HSL A/B	Residential / Low - High Density (vapour intrusion) (NEPC, 2013)
DC HSL B	Direct contact HSL B Residential (High density) (direct contact) (CRC CARE, 2011)
EIL/ESL UR/POS	Urban Residential and Public Open Space (NEPC, 2013)
ML R/P/POS	Residential, Parkland and Public Open Space (NEPC, 2013)

Douglas Partners
Geotechnics | Environment | Groundwater

Table G2: Summary Waste Classification

			Metals						TRH		TPH		BTEX				PAH		Phenol	OCP		OPP	PCB	Asbestos	
			Arsenic	Cadmium	Total Chromium	Lead	Mercury (inorganic)	Nickel	TRH C6 - C9	C10-C36 recoverable hydrocarbons	C10-C36 petroleum hydrocarbons	C6-C9 petroleum hydrocarbons	Benzene	Toluene	Ethylbenzene	Xylenes (total)	Benzo(a)pyrene (BaP)	Total PAHs	Phenol	Total Endosulfan	Total Analysed OCP	Total Analysed OPP	Total PCB	Asbestos ID in soil >0.1g/kg	FA and AF Estimation
		PQL	4	0.4	1	1	0.1	1	25	50	50	25	0.2	0.5	1	1	0.05	0.05	5	0.1	0.1	0.1	0.1		<0.001
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	%(w/w)
TP106	0.4-0.5 m	23/07/2019	10	<0.4	18	70	0.5	11	<25	<50	-	-	<0.2	<0.5	<1	<3	0.1	0.3	<5	<0.1	0.1	<0.1	<0.1	NAD	-
TP106	0.9-1.0 m	23/07/2019	<4	<0.4	7	13	<0.1	15	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	NAD	-
TP106	2.5-2.6 m	23/07/2019	<4	<0.4	9	11	<0.1	40	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	-	-	-	-	-	NAD	-
TP2	0.1-0.4 m	17/09/2008	9	0.6	17	140	<0.1	13	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	<5	<0.1	<0.1	-	-	NAD	-
TP3	0.1-0.25 m	17/09/2008	9	0.5	31	22	<0.1	9	-	-	<50	<25	<0.5	<0.5	<1	-	0.06	-	<5	<0.1	<0.1	-	-	NAD	-
TP4	0.7-1.4 m	17/09/2008	26	<0.5	12	19	<0.1	26	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	<5	<0.1	<0.1	-	-	-	-
TP5	0.0-0.5 m	17/09/2008	9	<0.5	10	18	<0.1	20	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	<5	<0.1	<0.1	-	-	-	-
BD1-170908	0.0-0.5 m	17/09/2008	9	<0.5	9	16	<0.1	25	-	-	-	-	-	-	-	-	<0.05	-	-	-	-	-	-	-	-
TP5	0.5-1.4 m	17/09/2008	6	<0.5	9	17	<0.1	17	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	-	<0.1	<0.1	-	-	NAD	-
TP12	0.5 m	7/04/2010	7	<0.5	18	22	<0.1	6	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	-	-	-	-	-	NAD	-
TP12	2.5 m	7/04/2010	8	<0.5	11	15	<0.1	15	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	-	-	-	-	-	NAD	-
TP13	0.9 m	7/04/2010	11	<0.5	20	22	<0.1	4	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	<5	<0.1	<0.1	-	-	NAD	-
TP14	0.5 m	7/04/2010	9	<0.5	20	27	<0.1	7	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	-	-	-	-	-	NAD	-
TP15	0.2 m	7/04/2010	5	<0.5	13	18	<0.1	4	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	<5	<0.1	<0.1	-	-	NAD	-
TP16	0.2 m	7/04/2010	6	<0.5	14	25	<0.1	8	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	<5	<0.1	<0.1	-	-	NAD	-
TP16	1.5 m	7/04/2010	5	<0.5	15	14	<0.1	3	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	-	-	-	-	-	NAD	-
TP17	0.2 m	7/04/2010	8	<0.5	10	23	<0.1	18	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	<5	<0.1	<0.1	-	-	NAD	-
TP17	0.5 m	7/04/2010	9	<0.5	12	29	<0.1	19	-	-	<50	<25	<0.5	<0.5	<1	-	<0.05	-	-	-	-	-	-	-	-
TP9	0 - 0.3 m	26/11/2019	10	<0.4	59	32	<0.1	10	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	<5	<0.1	0.1	<0.1	-	NAD	<0.001
BD3/20191217	0 - 0.3 m	17/12/2019	6	<0.4	14	14	<0.1	8	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	-	-	-	-	-	-	-
TP9	0.3 - 0.5 m	26/11/2019	9	<0.4	28	18	<0.1	5	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	-	-	-	-	-	NAD	-
TP10	0 - 0.3 m	26/11/2019	6	<0.4	23	45	<0.1	7	<25	100	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	<5	<0.1	<0.1	<0.1	-	NAD	<0.001
TP10	0.3 - 0.5 m	26/11/2019	-	-	-	-	-	-	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	-	-	-	-	-	NAD	<0.001
BH1	0.05 - 0.15 m	17/12/2019	<4	<0.4	55	5	<0.1	59	<25	448	-	-	<0.2	<0.5	<1	<3	<0.05	0.2	<5	<0.1	<0.1	<0.1	-	-	-
BH1	0.3 - 0.5 m	17/12/2019	5	<0.4	29	11	<0.1	18	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	<5	<0.1	<0.1	<0.1	-	NAD	<0.001
BH1	0.8 - 1 m	17/12/2019	<4	<0.4	29	6	<0.1	33	<25	1199	-	-	<0.2	<0.5	<1	<3	0.05	0.05	-	-	-	-	-	-	-
BH2	0.05 - 0.15 m	17/12/2019	5	<0.4	15	11	<0.1	5	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	<5	<0.1	<0.1	<0.1	-	-	-
BH2	0.3 - 0.5 m	17/12/2019	5	<0.4	32	10	<0.1	25	<25	581	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	<5	<0.1	<0.1	<0.1	-	NAD	<0.001
BH2	0.8 - 1 m	17/12/2019	8	<0.4	11	13	<0.1	4	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	-	-	-	-	-	-	-
BH3	0.3 - 0.5 m	17/12/2019	8	<0.4	31	23	<0.1	13	<25	361	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	<5	<0.1	<0.1	<0.1	-	NAD	<0.001
BH3	0.8 - 1 m	17/12/2019	5	<0.4	14	10	<0.1	5	<25	<50	-	-	<0.2	<0.5	<1	<3	<0.05	<0.05	-	-	-	-	-	-	-
Waste Classification Criteria [f]																									
CT1			100	20	100	100	4	40	650	10000	10000	650	10	288	600	1000	0.8	200	288	60	<50	4	<50	NC	NC
SCC1			500	100	1900	1500	50	1050	650	10000	10000	650	18	518	1080	1800	10	200	518	108	<50	7.5	<50	NC	NC
TCLP1			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NC	NC
CT2			400	80	400	400	16	160	2600	40000	40000	2600	40	1152	2400	4000	3.2	800	1152	240	<50	16	<50	NC	NC
SCC2			2000	400	7600	6000	200	4200	2600	40000	40000	2600	72	2073	4320	7200	23	800	2073	432	<50	30	<50	NC	NC
TCLP2			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NC	NC

CT1 exceedance TCLP1 and/or SCC1 exceedance CT2 exceedance TCLP2 and/or SCC2 exceedance Asbestos detection

NT = Not tested NL = Non limiting NC = No criteria NA = Not applicable

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Total chromium used as initial screen for chromium(VI).

c Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)

d Criteria for scheduled chemicals used as an initial screen

e Criteria for Chlorpyrifos used as initial screen

f All criteria are in the same units as the reported results

PQL Practical quantitation limit

CT1 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste

SCC1 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

TCLP1 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste

CT2 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste

SCC2 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

TCLP2 NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste, Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Table B3: Summary of Laboratory Results for Groundwater Analysis

Sample ID	Depth [d]	Date Sampled	TRH						TPH			BTEX					VOC				PAH						Total Phenols	Priority Heavy Metals (total dissolved)							
			TRH C_6 - C_{10}	TRH >C_{10} - C_{16}	C6-C10 less BTEX (F1)	>C10-C16 less Naphthalene (F2)	>C16-C34	>C34-40	>C10-C16 (SGC)	> C16-C34 (SGC)	>C34-C40 (SGC)	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Chloroform	PCE	Other VOC	Naphthalene	BaP	BaP TEQ	Anthracene	Phenanthrene	Fluoranthene	Total PAH		As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
	m bgl		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Groundwater Investigation Levels																																		
HSL (NEPC 2013)			200	NL	-	-	-	-	-	-	-	0.5	540	-	170	170	-	-	-	NL	-	-	-	-	-	-	-	-		-		-	-	-	-
GIL - fresh water (ANZG 2018)			-	-	-	-	-	-	-	-	-	950	180 [g]	80 [g]	*75 / 200 [h, g]*	*350 [g]*	370 [g]	-	-	16	*0.1 [g], i*	-	*0.01 [g], i*	*0.6 [g], i*	*1 [g], i*	-	3.6 [f, i]	*24/13 [e, g]*	0.2	3.3/ 1 [b]	1.4	3.4	0.06 [i]	11	8
Laboratory Results																																		
MW1	7	24/1/20	<10	<50	<10	<50	<100	<100	-	-	-	<1	<1	<1	<2	<1	<1	<1	<PQL	<1	<1	<5	<1	<1	<1	NIL +VE	<0.05	<1	0.2	<1	1	<1	<0.05	16	23
BD1/20200124	7	24/1/20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<1	<PQL	<1	-	-	-	-	-	-	-	<1	0.1	<1	<1	<1	<0.05	15	15
MW2	8.1	24/1/20	<10	600	<10	600	970	<100	420	660	<100	<1	<1	<1	<2	<1	<1	<1	<PQL	<1	<1	<5	<1	3	<1	4.7	<0.05	3	0.6	<1	2	<1	<0.05	29	67
MW3	8.55	24/1/20	<10	1700	<10	1700	2500	300	1200	1700	190	<1	<1	<1	<2	<1	<1	<1	<PQL	<1	2	<5	<1	9	<1	22	<0.05	4	<0.1	<1	<1	<1	<0.05	<1	3

Notes:

a	Laboratory replicate sample of sample listed directly above
b	given in order of Cr(VI) / Cr(III)
c	Threshold value for Cr (VI)
d	Depth to groundwater as measured immediately prior to sampling
e	Given in order As(III)/ As(V)
f	threshold for pentachlorophenol as a conservative screen
g	ANZG DGV of unknown reliability
h	m-xylene threhold of 75ug/L, p-xylene threshold of 200ug/L adopted from freshwater figure
i	99% LOP adopted due to the potential for bioaccumulation
j	threshold for aldrin as a conservative screen
k	threshold for chlorpyrifos adopted as an initial screen
l	threshold for Aroclor 1242 as a conservative screen
-	Not defined/ not analysed/ not applicable
italics	ANZG DGV of unknown reliability
BOLD	Concentration Detected at or above the PQL
BOLD	Exceeds GIL or HSL

Abbreviations

ADWG	Australian Drinking Water Guideline
As	arsenic
BaP	benzo(a)pyrene
BTEX	benzene, toluene, ethyl benzene, total xylenes
Cd	cadmium
Cr	chromium
Cu	copper
GIL	groundwater investigation level
Hg	mercury
Ni	nickel
PAH	polycyclic aromatic hydrocarbons
Pb	lead
PQL	practical quantitation limit
TRH	total recoverable hydrocarbons, including total petroleum hydrocarbons (TPH)
VOC	volatile organic compounds
Zn	zinc
SGC	Silica gel cleanup

Appendix C

Remediation Options Assessment and Evaluation

Appendix C
Remediation Options Assessment

C1.0 Introduction

The following key guidelines and technical reports were consulted in the preparation of this remediation options assessment:

- NEPC National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]) (NEPC, 2013); and
- CRC CARE Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment (CRC CARE, 2019a).

The first stage of developing a remediation strategy is to establish clear and measurable remediation objectives and remediation criteria (clean-up levels). These will form the requirements against which remediation options are assessed.

The next stage of the remediation options assessment is to select technology and management options, or combinations of options, that have the potential to reduce contaminant concentrations and / or apply management controls as necessary so that the remediation objectives are achieved and no unacceptable risk is posed by the contamination in the context of the current and proposed site use. Where several viable options have been identified, an assessment of each of the options will be required to determine which option will most adequately and sustainably meet the remediation objectives (CRC CARE, 2019a).

The remediation objectives are to:

- Address potentially unacceptable risks to relevant environmental values from contamination (refer to the CSM in Section 7); and
- Render the site suitable, from a contamination perspective, for the proposed development (refer to Section 2).

C2.0 Hierarchy of Remediation Options

NEPC (2013) stipulates the preferred hierarchy of options for site clean-up (remediation) and/or management which is outlined as follows:

- On-site treatment of the contamination so that it is destroyed, or the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated soil, so that the contamination is destroyed, or the associated risk is reduced to an acceptable level, after which soil is returned to the site;

or, if these two options 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.

When deciding which option to choose, the sustainability (environmental, economic and social) of each option should be considered, in terms of achieving an appropriate balance between the benefits and effects of undertaking the option. In cases where no readily available or economically feasible method is available for remediation, it may be possible to adopt appropriate regulatory controls or develop other forms of remediation (NEPC, 2013).

C3.0 Remediation Options Assessment

C3.1 Introduction

The following issues have been identified at the site which require remediation:

- Fill exceeding ecological based criteria (TRH) beneath existing roadways; and
- Potential asbestos impacted fill / unexpected finds.

C3.2 Remediation Options

Given the straightforward nature of the contamination issues at the site and the necessary earthworks (final landform) as part of the proposed development, only three options for the soil contamination have been considered, as follows:

- Do nothing;
- Excavation and offsite disposal; and
- On-site management

The following guidelines relevant remediation of the COPC have therefore been consulted:

- CRC CARE Technology Guide: Soil - Excavation (CRC CARE, 2019b);
- CRC CARE Technology Guide: Soil - Containment (CRC CARE, 2019c);
- WA DoH Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (WA DoH, 2021); and
- WorkCover NSW Managing Asbestos in or on Soil (WorkCover NSW, 2014).

For both potential issues doing nothing is currently not considered applicable given that demolition and removal of materials is anticipated for areas beneath the existing roadway, and in the case of asbestos materials the potential risks to site users would have to be appropriately managed.

On-site management of soils is preferable under sustainability principles and is considered appropriate for fill exceeding ecological criteria where it may be retained in parts of the site without potential ecological receptors (i.e., beneath proposed hardstand).

Retainment of asbestos contaminated soils may be considered appropriate where higher quantities of impacted materials are identified. This would require construction of a suitable containment cell e.g., beneath proposed hardstand / slabs, and or retainment in situ beneath a suitable capping and marker layers. This would also require the development of a long-term environmental management plan and that the plan is legally enforceable.

Off-site disposal of fill is considered a suitable alternative strategy to on-site management where smaller volumes of contaminated soils (e.g., unexpected finds) require management. Overall, this is considered suitable given that no significant excavation at depth is proposed.

C4.0 Summary of Preferred Remediation Strategy

Based on the outcome of the options assessment, the preferred remediation strategy is:

- On-site relocation and management of fill exceeding ecological based criteria (i.e., from beneath Kamira Court) to areas beneath proposed hardstand; and
- Off-site disposal of any additional fill exceeding health-based criteria (e.g., asbestos in soils / unexpected finds).

If any significant volumes of fill exceeding health-based criteria are identified, then the proposed strategy should be re-evaluated to re-consider other options such as onsite management and capping.

C5.0 References

CRC CARE. (2019a). *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment.* National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019b). *Technology Guide: Soil - Excavation.* National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019c). *Technology Guide: Soil - Containment.* National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

WA DoH. (2021). *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.* WA Department of Health.

WorkCover NSW. (2014). *Managing Asbestos in or on Soil.* March 2014: WorkCover NSW, NSW Government.

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Appendix D

Site Assessment Criteria

Appendix D
Site Assessment Criteria

D1.0 Introduction

D1.1 Guidelines

The following key guidelines were consulted for deriving the site assessment criteria (SAC):

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).
- HEPA *PFAS National Environmental Management Plan (NEMP)* (HEPA, 2020).
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).
- NHMRC *Guidelines for Managing Risks In Recreational Water* (NHMRC, 2008).
- NHMRC, NRMMC *Australian Drinking Water Guidelines 6 2011, Version 3.2* (NHMRC, NRMMC, 2016).
- ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

D1.2 General

The SAC applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination at the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The following inputs are relevant to the selection and / or derivation of the SAC:

- Land use: residential / commercial
  - Corresponding to land use category ‘B‘, residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats; and
  - Corresponding to land use category ‘D‘, commercial / industrial such as shops, offices, factories and industrial sites.
- Soil type: sand, based on mixtures of sand and clay noted in the previous investigations as the more conservative assumption.

Given the proposed mixed use a Residential B land use was previously adopted as initial screening levels.

D2.0 Soils

D2.1 Health Investigation and Screening Levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are in Table 1 and Table 2.

Table 1: Health Investigation Levels (mg/kg)

Contaminant	HIL-B
Metals	
Arsenic	500
Cadmium	150
Chromium (VI)	500
Copper	30 000
Lead	1200
Mercury (inorganic)	120
Nickel	1200
Zinc	60 000
PAH	
B(a)P TEQ	4
Total PAH	400
Phenols	
Phenol	45 000
Pentachlorophenol	130
OCP	
DDT+DDE+DDD	600
Aldrin and dieldrin	10
Chlordane	90
Endosulfan	400
Endrin	20
Heptachlor	10
HCB	15
Methoxychlor	500
OPP	
Chlorpyrifos	340
PCB	
PCB	1

Table 2: Health Screening Levels (mg/kg)

Contaminant	HSL-A&B
SAND	**0 m to <1 m**
Benzene	0.5
Toluene	160
Ethylbenzene	55
Xylenes	40
Naphthalene	3
TRH F1	45
TRH F2	110

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX

TRH F2 is TRH >C_{10}-C_{16} minus naphthalene

The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

The HSL for direct contact derived from CRC CARE (2011) are in Table 3.

Table 3: Health Screening Levels for Direct Contact (mg/kg)

Contaminant	DC HSL-B
Benzene	140
Toluene	21 000
Ethylbenzene	5900
Xylenes	17 000
Naphthalene	2200
TRH F1	5600
TRH F2	4200
TRH F3	5800
TRH F4	8100

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX

TRH F2 is TRH >C_{10}-C_{16} minus naphthalene

D2.2 Asbestos in Soil

The HSL for asbestos in soil are based on likely exposure levels for different scenarios published in NEPC (2013) for the following forms of asbestos:

- Bonded asbestos containing material (ACM); and
- Fibrous asbestos and asbestos fines (FA and AF).

The HSL are in Table 4.

Table 4: Health Screening Levels for Asbestos

Form of Asbestos	HSL-B
ACM	0.04%
FA and AF	0.001%
FA and AF and ACM	No visible asbestos for surface soil *

Notes: Surface soils defined as top 10 cm.
* Based on site observations at the sampling points and the analytical results of surface samples.

D2.3 Ecological Investigation Levels

Ecological investigation levels (EIL) and added contaminant limits (ACL), where appropriate, have been derived in NEPC (2013) for arsenic, copper, chromium (III), nickel, lead, zinc, DDT and naphthalene. The adopted EIL, derived using the interactive (excel) calculation spreadsheet on the NEPM toolbox website are shown in Table 6, with inputs into their derivation shown in Table 5.

Table 5: Inputs to the Derivation of the Ecological Investigation Levels

Variable	Input	Rationale
Age of contaminants	"Aged" (>2 years)	Previous site history assessment
pH	6.5	Average of previous laboratory data
CEC	9.7 $cmol_c/kg$	
Clay content	10 %	Estimated from previous borehole logs
Traffic volumes	low	Site locality
State / Territory	NSW	

Table 6: Ecological Investigation Levels (mg/kg)

Contaminant	EIL-A-B-C
Metals	
Arsenic	100
Copper	200
Nickel	160
Chromium III	410
Lead	1100
Zinc	470
PAH	
Naphthalene	170
OCP	
DDT	180

Notes: EIL-A-B-C urban residential and public open space

D2.4 Ecological Screening Levels

Ecological screening levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESL are shown in Table 7.

Table 7: Ecological Screening Levels (mg/kg)

Contaminant	Soil Type	ESL-A-B-C
Benzene	Coarse	50
Toluene	Coarse	85
Ethylbenzene	Coarse	70
Xylenes	Coarse	105
TRH F1	Coarse/ Fine	180*
TRH F2	Coarse/ Fine	120*
TRH F3	Coarse	300
TRH F4	Coarse	2800
B(a)P	Coarse	0.7

Notes: ESL are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability
TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ESL-A-B-C urban residential and public open space

D2.5 Management Limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g., penetration of, or damage to, in-ground services.

The adopted management limits are in Table 8.

Table 8: Management Limits (mg/kg)

Contaminant	Soil Type	ML-A-B-C
TRH F1	Coarse	700
TRH F2	Coarse	1000
TRH F3	Coarse	2500
TRH F4	Coarse	10 000

Notes: TRH F1 is TRH C_6-C_{10} including BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ML-A-B-C residential, parkland and public open space

D3.0 References

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australia and New Zealand Environment and Conservation Council.

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

CRC CARE. (2011). *Health screening levels for petroleum hydrocarbons in soil and groundwater.* Parts 1 to 3, Technical Report No. 10: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

HEPA. (2020). *PFAS National Environmental Management Plan (NEMP).* Version 2.0: Heads of EPAs Australia and New Zealand and Australian Government Department of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

NHMRC. (2008). *Guidelines for Managing Risks In Recreational Water.*

NHMRC, NRMMC. (2016). *Australian Drinking Water Guidelines 6 2011, Version 3.2.* Canberra: National Health and Medical Research Council, National Resource Management Ministerial Council.

Appendix E

Data Quality Objectives

Appendix E
Data Quality Objectives

E1.0 Introduction

The objective of the validation plan is to the suitability of the site for the intended land use, and to provide information on any environmental impacts which may have resulted from the works.

The validation assessment will be conducted with reference to the seven step data quality objectives (DQOs) as outlined in NEPC (2013), described below. The DQO in NEPC (2013) is in turn, based on the DQO process outlined in USEPA (2006), and associated guidelines.

E2.0 Data Quality Objectives

Table 1: Data Quality Objectives

Step	Summary
1: State the problem	The site requires remediation and validation of remediation in order to render it suitable for the mixed residential / commercial land use. The objective of the validation plan is to confirm the successful implementation of this remediation action plan. A conceptual site model (CSM) for the proposed development has been prepared (Section 7).
2: Identify the decisions / goal of the study	The CSM identifies the contaminants of potential concern (CoPC) and the likely impacted media. The key CoPC impacting the site are: • Metals; • TRH; and • Asbestos The validation sampling results will be compared against the RAC. The preferred remediation strategy as outlined in the RAP is the on-site management of ecological exceedances or otherwise the excavation and disposal of contaminated soils. The success of the remediation and subsequent validation will be based on a comparison of the analytical results for all CoPC to the adopted RAC and, if necessary, compared to the 95% UCL of the mean concentrations.

Step	Summary
3: Identify the information inputs	Relevant inputs to the decision include: • The CSM, identifying the CoPC and affected media; • Results analysed for the relevant CoPC using NATA accredited laboratories and methods, where possible; • Field and laboratory QA / QC data to assess the suitability of the environmental data for the validation assessment; and • Results compared with the RAC. A photoionization detector (PID) will be used on-site to screen soils for VOC. PID readings will be used to inform sample selection for laboratory analysis.
4: Define the study boundaries	The lateral boundaries of the site are shown on Drawing 1, Appendix A. The vertical boundaries are to the extent of contamination impact as determined from the site history assessment, site observations and previous investigations used to inform the RAP.
5: Develop the analytical approach (or decision rule)	The decision rule is to compare all analytical results with RAC. Initial comparisons will be with individual results then, where required, summary statistics (including mean, standard deviation and 95% upper confidence limit (UCL) of the arithmetic mean (95% UCL) to assess potential risks posed by the site contamination. Quality control results are to be assessed according to their relative percent difference (RPD) values. For field and laboratory duplicate results, RPDs should generally be below 30% (inorganics) and 50% (organics); for field blanks, results should be at or less than the limits of reporting (NEPC, 2013).
6: Specify the performance or acceptance criteria	Baseline condition: Contaminants at the site and/or statistical analysis of data exceed the RAC and pose a potentially unacceptable risk to receptors (null hypothesis). Alternative condition: Contaminants at the site and statistical analysis of data complies with the RAC and as such, do not pose a potentially unacceptable risk to receptors (alternative hypothesis). Unless conclusive information from the collected data is sufficient to reject the null hypothesis, it is assumed that the baseline condition is true.
7: Optimise the design for obtaining data	Sampling design and procedures to be implemented to optimise data collection for achieving the DQOs include the following: • Sampling frequencies in accordance with Section 12.4 or Appendix G (asbestos management plan); • Analysis for the CoPC at NATA accredited laboratories using NATA endorsed methods will be used to perform laboratory analysis whenever possible; and • Adequately experienced environmental scientists/engineers will conduct field work and sample analysis interpretation.

E3.0 References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

USEPA. (2006). *Guidance on systematic planning using the data quality objectives process, EPA QA/G-4.* Washington DC.: United States Environmental Protection Agency, Office of Environmental Information.

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Appendix F

Site Management Plan

Appendix F
Site Management Plan

F1.0 Introduction

This site management plan (SMP) has been developed to minimise potentially adverse impacts on the environment, and worker and public health as a result of the proposed remediation works.

The Remediation Contractor must have in place a construction environmental management plan (CEMP) (or similar) which is specific to the equipment used for the remediation and the proposed methods to be adopted by the Remediation Contractor. This SMP has been prepared to augment the Remediation Contractor's CEMP and contains general details for aspects of the work, as per reporting requirements for a remediation action plan (RAP) under NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020).

Apart from the management principles outlined in this SMP, the Remediation Contractor must also ensure compliance with all relevant environmental legislation and regulations, including (but not limited to) the following:

- *Contaminated Land Management Act 1997* NSW (CLM Act);
- *Protection of the Environment Operations Act 1997* NSW (POEO Act);
- *Protection of the Environment Legislation Amendment Act 2011* NSW;
- *Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008* NSW.
- *Environmentally Hazardous Chemicals Act 1985* NSW;
- *Environmental Offences and Penalties Act 1989* NSW;
- *Pesticide Act 1999* NSW and *Pesticides Regulation 2017*; and
- *Work Health and Safety Act 2011* Cth (WHS Act) and *Work Health and Safety Regulations 2011* Cth.

F2.0 Roles and Responsibilities

F2.1 Principal

The Principal is responsible for the environmental performance of the proposed remediation works, including implementation of acceptable environmental controls during remediation 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), who is responsible for overseeing the implementation of this RAP. The actual implementation of the RAP will, however, be conducted by the Principal Contractor on behalf of the Principal.

The Principal is responsible for providing appropriate information to the Contractor to allow them to safely plan the required works. This includes the asbestos register for the site and this RAP.

The Principal is also responsible for implementing an appropriate communications plan.

F2.2 Principal Contractor

The Principal Contractor ('the Contractor') will be the party responsible for daily implementation of this RAP and shall fulfil the responsibilities of the Contractor as defined by SafeWork NSW. 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 appoint a Site Manager.

In addition to the implementation of the RAP it will be the Contractors responsibility to:

- Obtain / ensure relevant sub-contractors obtain specific related approvals as necessary to implement the earthworks including permits for removal of asbestos-containing material, SafeWork NSW notification etc.;
- Develop or request and review any site plans to manage the works to be conducted;
- Ensure that all remediation works and other related activities are undertaken in accordance with this RAP;
- Maintain all site records related to the implementation of this RAP;
- Ensure sufficient information is provided to engage or direct all required parties, including sub-contractors, to implement the requirements of the RAP other than those that are the direct responsibility of the Contractor;
- Manage the implementation of any recommendation made by those parties in relation to work undertaken in accordance with the RAP;
- Inform, if appropriate, the relevant regulatory authorities of any non-conformances with the procedures and requirements of the RAP in accordance with the procedures outlined in this document;
- Retain records of any contingency actions;
- On completion of the project, to review the RAP records for completeness and update as necessary; and
- Recommend any modification to general documentation which would further improve the environmental outcomes of this RAP.

F2.3 Asbestos Contractor

The Asbestos Contractor will be responsible for undertaking all asbestos work involving any asbestos impacted filling and will hold a Class A licence for the removal of asbestos (issued by SafeWork NSW), on the basis that the asbestos identified at the site to date has included both friable and bonded asbestos.

The Asbestos Contractor can be the same entity as the Principal Contractor. Further details are provided in the asbestos management plan (AMP) and unexpected finds protocol (UFP) in Appendix G.

F2.4 Sub-contractors

All sub-contractors will be inducted onto the site, informed of their responsibilities in relation to this RAP and sign their agreement to abide by the RAP requirements. Where necessary, sub-contractors will also be trained in accordance with the requirements of this document. All sub-contractors must conduct their operations in accordance with the RAP as well as all applicable regulatory requirements.

F2.5 Environmental Consultant

The Environmental Consultant will provide advice on implementing the RAP. The Environmental Consultant will be responsible for:

- Undertake any required assessments where applicable (e.g., waste classification, validation);
- Provide advice and recommendations arising from monitoring and / or inspections, including unexpected finds; and
- Notify the Client with any results of assessments, and any observed non-conformances.

F2.6 Licenced Asbestos Assessor

A Licenced Asbestos Assessor will be required to be engaged independently of the Asbestos Contractor to undertake the following:

- Review and approve documentation prepared by the Asbestos Contractor;
- Prepare any WHS plans and advice required by the Contractor;
- Undertake airborne asbestos monitoring;
- Undertake clearance inspections;
- Provide advice and recommendations arising from monitoring and / or inspections; and
- Notify the client with the results of any assessments and any observed non-conformances.

F2.7 Site Workers

All workers on the site are responsible for observing the requirements of this RAP and other management plans. These responsibilities include the following:

- Being inducted on the site and advised of the general nature of the remediation/environmental issues at the site;
- Being aware of the requirements of this plan;
- Wearing appropriate personal protective equipment (PPE) as required by this plan;

- Only entering restricted areas when permitted; and
- Requesting clarification when unclear of requirements of this or any other plans (e.g. safe work method statements (SWMS)).

F3.0 Stormwater Management

F3.1 Stormwater

Stormwater must be managed during the remediation works such that potential adverse impacts from surface runoff (e.g., cross contamination, mobilisation of contaminants in soil particles, etc.) are appropriately mitigated. Accordingly, the Remediation Contractor will take appropriate measures which may include:

- Construction, where necessary, of stormwater diversion channels, bunding and linear drainage sumps with catch pits in and around the remediation areas to divert stormwater from the contaminated areas;
- Provision of appropriately located sediment traps including geotextiles; and
- Discharge of excess water in excavations / low points on a regular basis to limit the potential for flooding.

F3.2 Dewatering of Excavations

Any runoff or seepage water accumulated in site excavations that requires removal must initially be sampled and tested for suspended solids, pH and any contaminants of potential concern (CoPC) as identified by the Environmental Consultant. The options for management of excavation pump-out water, dependent upon the test results, are for disposal of the water as follows:

- Discharge to stormwater with prior approval from Council. Provided the test results comply with relevant ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018), or any other compliance requirements stipulated by Council. The Environmental Consultant must consider the most appropriate criteria to be used; or
- Discharge to sewer, as industrial trade wastewater, with prior approval from Sydney Water. This option would require the analysis of a larger list of analytes, and compliance with the Sydney Water acceptance standards; or
- Pumping by a liquid waste contractor for removal of the water off-site, in accordance with regulatory requirements.

Note that, depending on the type and scale of the dewatering required, a permit (water use approval) may need to be obtained through NSW Water. Based on the proposed development comprising no basement level excavations, only incidental water (e.g., run-off, rainwater etc.) is anticipated to be present.

F4.0 Soil Management Plan

F4.1 Excavation and Stockpiling of Contaminated Material

Contaminated material shall be excavated and stockpiled at a suitably segregated location(s) away from sensitive areas (e.g., water bodies, drainage lines, stormwater pits, etc.) and ongoing excavations, and in a manner that will not cause nuisance to the neighbouring properties. Soil stockpiles are to be managed as follows:

- All stockpiles of contaminated material shall be surrounded by star pickets and marking tape or other suitable material to clearly delineate their boundaries;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation;
- Any stockpile to remain on-site overnight should be adequately secured in order to reduce the risk of sediment runoff; and
- Should the stockpile remain on-site for over 24 hours, geotextile silt fences must be erected to prevent losses by surface erosion.

All movement of soil within the site and off-site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

F4.2 Loading and Transport of Contaminated Material

Transport of contaminated material from the site shall be via a clearly delineated haul route and this route shall be used exclusively for entry and egress of vehicles used to transport contaminated materials within and away from the site. The proposed waste transport route (to be determined by the Remediation Contractor) will be notified to Council and truck dispatch shall be logged and recorded by the Remediation Contractor for each load leaving the site. A record of the truck dispatch will be provided to the Environmental Consultant.

All haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site should be selected to meet the following objectives:

- Comply with all road traffic rules;
- Minimise noise, vibration and dust to adjacent premises; and
- Utilise State roads and minimise use of local roads as far as practicable.

The remediation work will be conducted such that all vehicles:

- Conduct deliveries of soil, materials, equipment or machinery only during the specified hours of remediation;
- Have securely covered loads to prevent any dust or odour emissions during transportation; and
- Exit the site in a forward direction.

In addition, measures will be implemented to ensure no contaminated material is spilled onto public roadways or tracked off-site on vehicle wheels. Roadways will be kept clean throughout the remediation works and will be broomed, if necessary, to achieve a clean environment.

All loads will be securely covered and may be lightly wetted, if required, to ensure that no materials or dust are dropped or deposited outside or within the site. Prior to exiting the site each truck should be inspected by Remediation Contractor personnel and either noted as clean (wheels and chassis) or broomed prior to leaving the site. Any soil spilled onto surrounding streets will be cleaned by mechanical or hand methods, on a daily basis.

Removal of waste materials from the site shall only be carried out contractors holding the appropriate license(s), consent or approvals to dispose the waste materials according to the waste classification and with the appropriate approvals obtained from the EPA, were required.

F5.0 Noise and Vibration Control Plan

All equipment and machinery should be operated in an efficient manner to minimise the emission of noise. The use of any plant and / or machinery should not cause unacceptable vibrations to nearby properties and should meet Council requirements.

F6.0 Dust Control Plan

Dust emissions must be confined within the site boundary as far as is practicable. The following example dust control procedures could be employed to comply with this requirement, as necessary:

- Erection of dust screens around the perimeter of the site (as applicable);
- Securely covering all loads entering or exiting the site;
- Use of water sprays across the site to suppress dust;
- Covering of all stockpiles of contaminated soil remaining on site more than 24 hours;
- Include wheel wash (if applicable); and
- Keeping excavation and stockpile surfaces moist.

Regular checking of the fugitive dust issues is to be undertaken. Remedial measures are to be undertaken to rectify any cases of excessive dust.

F7.0 Odour Control Plan

No odours should be detected at any boundary of the site during remediation works by an authorised Council Officer relying solely on sense of smell. The following example procedures could be employed to comply with this requirement as required:

- Use of appropriate covering techniques such as plastic sheeting, polythene or geotextile membranes to cover excavation faces or stockpiles;
- Fine spray of water and / or hydrocarbon mitigating agent on the impacted areas/materials;
- The use of water spray, as and when appropriate;
- Use of sprays or sprinklers on stockpiles or loads to lightly condition the material;
- Restriction of stockpile heights to ~4 m above surrounding site level. If required, restrict uncovered stockpiles to appropriate sizes to minimise odour generation;
- Ceasing works during periods of inclement weather such as high winds or heavy rain;
- Regular checking of the fugitive dust and odour issues to ensure compliance. Undertake immediate remediation measures to rectify any cases of excessive dust or odour (e.g., use of misting sprays or odour masking agent); and
- Adequate maintenance of equipment and machinery to minimise exhaust emissions.

F8.0 Work Health and Safety Plan

F8.1 General

It is the Remediation Contractor's responsibility to devise a SWMS[1] (or series thereof, for various respective tasks) and to implement proper controls that enable the personnel undertaking the remediation to work in a safe environment. This RAP and SMP does not relieve the Remediation Contractor or other contractors of their ultimate responsibility for occupational health and safety of their workforce and to prevent contamination of areas outside the 'remediation' workspace. This RAP and SMP sets out general procedures and the minimum standards and guidelines for remediation that will need to be used in preparing the safe work method statement.

This work health safety plan (WHSP) has been prepared with refence to CRC CARE *Remediation Action Plan: Implementation - Guideline on Health and Safety* (CRC CARE, 2019). The requirements of this WHSP must be incorporated into the Remediation Contractor's SWMS.

All site work must be undertaken in a controlled and safe manner with due regard to potential hazards, training and safe work practices. To attain this the SWMS developed by the Remediation Contractor must comply with policies specified in the Work Health and Safety Regulation 2011.

All appropriate permits, licences and notifications required for the remediation activities must be obtained prior to the commencement of remediation works.

[1] Either a SWMS or construction environmental management plan (CEMP), or other equivalent document incorporating health and safety aspects of the proposed remedial works.

F8.2 Site Access

Appropriate fencing and signage must be installed around and within the site to prevent unauthorised access and restrict access to remediation areas and / or deep excavations. Access restrictions and administrative arrangements for management of entry of workers or related personnel on site is the responsibility of the Remediation Contractor.

Any existing pits or unstable areas on site that may generate potential safety, or operational risk should be demarcated and taped off, with appropriate rectification action undertaken (e.g., backfilling of pits).

F8.3 Personnel and Responsibilities

Before undertaking works on site, all personnel will be made aware of the officer responsible for implementing WHS procedures. All personnel must read and understand this WHSP and over-arching SWMS prior to commencing site works and sign a statement to that effect. Contractors employed at the site will be responsible for ensuring that their employees are aware of, and comply with, the requirements of this WHSP and Remediation Contractor's SWMS.

F8.4 Chemical Contamination Hazards

The risks associated with the identified contaminants to site personnel and workers involved in the remediation are considered to be low due to the concentrations within groundwater and soil vapour and limited exposure durations. These risks are associated with:

- Ingestion of contaminated soil and/or water;
- Dermal contact with contaminated soil and / or water; and
- Inhalation of dusts or vapours of the CoPC.

Asbestos will be managed as per the AMP in Appendix G

Personnel will endeavour, wherever possible, to avoid direct contact with potentially contaminated material. Workers must avoid the potential exposures listed above as far as is practicable. Appropriate personal protective equipment (PPE) must be used to mitigate potential risks.

F8.5 Physical Hazards

The following physical hazards are associated with conditions that may be created during remediation works:

- Heat exposure;
- Excavations;
- Buried services;
- Noise;
- Dust;

- Electrical equipment;
- Heavy equipment and truck operation; and
- Asbestos.

Safe work practices must be employed to manage the physical risks identified above. For the most part these risks can be managed through appropriate demarcation, access controls and the use of appropriate PPE.

F8.6 Safe Work Practices

The appropriate safe work practices should be clearly defined by the Remediation Contractor in their SWMS. As a minimum, all personnel on site will be required to wear the following PPE:

- Steel-capped boots (mandatory);
- High visibility clothing / vest (mandatory);
- Safety glasses or safety goggles with side shields requirements (as necessary);
- Hard hat (as necessary);
- Appropriate respiratory and protective equipment for any works involving asbestos (as necessary); and
- Hearing protection when working in the vicinity of machinery or plant equipment if noise levels exceed exposure standards (as necessary).

Each item of PPE should meet the corresponding relevant Australian Standard(s).

Specific safe work practices will be adopted when working with asbestos as per the AMP in Appendix G.

F9.0 Remediation Schedule and Hours of Operation

The remediation works will be conducted within the days and hours specified in the development consent.

F10.0 Response to Incidents

The key to effective management of incidents is the timely action taken before any situation reaches a reportable or critical level. Therefore, surveillance activities are extremely important, and should be conducted for the measures prescribed herein and any other measures prescribed in any additional environmental management plan developed subsequently. During construction activities on the site, the following inspection or preventative actions should be performed by the Remediation Contractor:

- Regular inspection of works;
- Completion of routine environmental checklists and follow-up of non-compliance situations;

- Maintenance and supervision on-site; and
- An induction process for site personnel involved in the remediation works that includes relevant information on the contamination status of the site, the remediation works being undertaken, worker health and environmental protection requirements and ensures that all site personnel are familiar with the site emergency procedures.

An emergency response plan will be in place for all aspects of site works. Any emergency will be reported immediately to the site office and / or the Site Manager (and Safety Officer), and the appropriate emergency assistance should be sought. The Site Manager should be responsible for initiating an immediate emergency response using the resources available on the site. Where external assistance is required, the relevant emergency services should be contacted. A table such as that below, containing contact details for key personnel who may be involved in an environmental emergency response should be completed and be readily available to personnel at all times. The table should be completed, and thereafter amended, as required.

The Remediation Contractor will be responsible for ensuring that site personnel are aware of the emergency services available and the appropriate contact details. A site Safety Officer should be contactable, or available, on-site during remediation and development works.

Contact details for key utilities are included in the event of needing to respond to incidents. Blank cells are ‘to be confirmed’ and should be completed prior to works commencing when all entities are confirmed.

Table 1: Summary of Roles and Contact Details

Role	Personnel / Contact	Phone Contact Details
Principal		
Principal's Representative		
Site Manager		
Remediation Contractor and Builder		
Site Office		
Environmental Consultant		
Consent Authority		
Regulator	NSW EPA (pollution line and general enquiries)	131 555
Utility Provider	Water (Sydney Water Corporation)	13 20 92
Utility Provider	Power (Ausgrid)	13 13 88
Utility Provider	Gas (Jemena Limited)	131 909
Utility Provider	Telecommunications (Telstra Corporation Limited)	13 22 03
Utility Provider	Telecommunications (Optus)	1800 505 777
Utility Provider	Telecommunications (NBN Co Limited)	1800 687 626

F11.0 References

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

CRC CARE. (2019). *Remediation Action Plan: Implementation - Guideline on Health and Safety.* National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

NOHSC. (2005). *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Ed.* Canberra, April 2005, NOHSC:3003: National Occupational Health and Safety Commission, Commonwealth of Australia.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land.* Contaminated Land Guidelines: NSW Environment Protection Authority.

SafeWork NSW. (2019a). *Code of Practice, How to Manage and Control Asbestos in the Workplace.* August 2019.

SafeWork NSW. (2019b). *Code of Practice, How to Safely Remove Asbestos.* August 2019: SafeWork NSW, NSW Government.

WorkCover NSW. (2014). *Managing Asbestos in or on Soil.* March 2014: WorkCover NSW, NSW Government.

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Appendix G

Asbestos Management Plan and Unexpected Finds Protocol

Appendix G
Asbestos Management Plan and Unexpected Finds Protocol
Villawood Park Stage 1

G1.0 Asbestos Management Plan

The following asbestos management plan (AMP) has been developed to manage any potential finds of asbestos which are considered possible based upon the previous site investigations which identified asbestos in soil at one test location and surficial fragments of asbestos, albeit outside of the current site. Additionally, indicators of potential asbestos were noted in fill (i.e., building demolition materials) such as tile, concrete and brick, furthermore signs of fly tipping of waste in parts of the larger assessment area were noted which may indicate the potential for further surficial fragments of asbestos materials. A separate unexpected finds protocol (UFP) is also provided Section G2.0 to manage any other potential finds.

G1.1 Asbestos Finds Protocol

If suspected asbestos materials are encountered during excavation.

- Immediately stop work and notify the Site Manager;
- Move away (minimum 10 m) from the suspicious materials, and leave all tools;
- Site Supervisor / Asbestos Contractor to create exclusion zone around the suspicious materials and erect signage “Danger Asbestos - Do Not Enter”;
- Occupational Hygienist / Environmental Consultant to inspect / sample the material to confirm if it is asbestos or not. The Occupational Hygienist / Environmental Consultant can instruct works to continue in a different area if deemed safe to do so and to oversee the excavation remediation process; and
- If the materials are confirmed not to be asbestos containing the Occupational Hygienist will issue a clearance certificate and / or advise that works may resume in the area.
- Development of a suitable remediation strategy by the Environmental Consultant based upon the framework in the following sections

G1.2 Remediation and Validation

Where materials are confirmed or otherwise assumed to contain asbestos the following general process will apply.

- Demarcate the work area as per Section G1.7, as advised by the Environmental Consultant. For isolated finds a nominal 5 x 5 m around the finds is recommended as an initial extent;
- Preparation of any requisite WHS plans and notification as per the nature of the asbestos finds;
- Prior to commencing work prepare airborne asbestos monitoring as per Section G1.9;

- Excavate to the nominated lateral extent of potential contamination, the depth of excavation will depend upon visual inspection and advice from the Environmental Consultant, but may be expected to extend a minimum of 0.5 m below the identified finds or otherwise to the depth of fill observed;
- Stockpile and manage the excavated waste as per Section 13 of the RAP;
- Visual inspection and validation of the excavation by the Environmental Consultant by collection of samples from the walls and base of the excavation at the following rates;
  - 1 sample per 10 – 20 m length (minimum 1 per side of excavation);
  - One sample per 25 - 50 m^2 (minimum 3);
- Field screening of recovered samples by sieving ~10 L (~20 kg) through a 7 mm sieve to identify potential bonded fragments of ACM;
- Submission of 500 mL samples to a NATA accredited laboratory for asbestos fines / fibrous asbestos (AF / FA), at the rate the above sampling rate. Where the base of the excavation is considered small a minimum of one sample from the base may be submitted for analysis;
- Based on visual inspection and analytical results, expansion of the excavation as necessary and as advised by the Environmental Consultant repeating the above steps until the validation sampling meets the remediation acceptance criteria (RAC) outlined in the RAP; and
- Inspection and issue of a clearance certificate by the Occupational Hygienists as per Section G1.12.

Following issue of a clearance certificate by the Occupational Hygienist and the recommendations of the Occupational Hygienist and/or the Environmental Consultant, workers can resume work under normal conditions.

Where isolated fragments are present on the ground surface (e.g., suspected fly tipped fragments) and are not suspected to be related to nearby or below fill, the fragments may be removed by the asbestos contractor, followed by inspection by the Occupational Hygienist / Environmental Consultant and issue of a clearance certificate and / or advice that works may resume in the area.

G1.3 Regulatory Framework

In New South Wales (NSW), occupational health and safety is regulated under the NSW Work Health and Safety Act 2011 (WHS Act) and the NSW Work Health and Safety Regulation 2017 (WHS Regulation). Additionally, there are a range of National Codes of Practice and Guidance Notes, Australian Standards and other guidelines relating to the management of asbestos and ACM in the workplace. All works must be conducted in accordance with the development consent conditions.

Safe Work Australia (SWA) has issued the following codes of practice that have been adopted in NSW:

- Code of Practice, How to Safely Remove Asbestos (SafeWork NSW, 2019a);
- Code of Practice, How to Manage and Control Asbestos in the Workplace (SafeWork NSW, 2019b); and
- NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)].

These codes and guidance note detail the requirements for the identification, assessment and management of ACM in the workplace, including the specific controls required for asbestos and ACM removal. Electronic copies of these documents are available on the SafeWork NSW website (https://www.safework.nsw.gov.au/)

Any Asbestos waste will be managed as per Section 13

Reference to relevant Codes of Practice, Australian Standards and industry standards should also be made in determining appropriate safe work practices. These include, *inter alia:*

- National Occupational Health and Safety Commission (NOHSC) Code of Practice for the Safe Removal of Asbestos [2002(2005)];
- NOHSC Code of Practice for the Management and Control of Asbestos in the Workplace [NOHSC:2018(2005)];
- NOHSC Guidance Note on the Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:3008 (1995)] 3rd edition;
- AS/NZS 1715:2009 Selection, Use and Maintenance of Respiratory Protective Devices;
- AS/NZS 1716:2012 Respiratory Protective Devices; and
- AS/NZS 1716:2003/Amdt 1:2005: Respiratory protective devices.

G1.4 Notification

SafeWork NSW must be notified at least five days in advance of any licensable asbestos works.

The asbestos contractor must, before commencing the licensed asbestos removal work, inform the following people that asbestos removal works are to be conducted and the date the work will commence:

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

G1.5 WHS Plans

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

- Safe Work Method Statements (SWMS);
- 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 licensed asbestos contractor in accordance with the WHS Regulations.

The ARCP will also detail specific requirements relating to works in either non-friable or friable asbestos conditions. Based on results to date only bonded ACM has been detected, however, there is the potential for extremely damaged/weathered ACM to be present which will require management as friable asbestos.

G1.6 Licensed Contractor Training

All asbestos workers at the site must be appropriately trained in asbestos works and in accordance with this AMP and any applicable ARCP. The training must include information on health risks associated with asbestos, and the rights of asbestos workers under the WHS Regulation.

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

The Asbestos Contractor will hold either a Class A or B licence (issued by SafeWork NSW) as appropriate. For friable (Class A licence) works a certified supervisor must be present at all times, for bonded works > 10 m^2 (Class B licence) a certified supervisor must be readily available to the certified removalist workers.

DP would recommend that a Class A licenced Asbestos Contractor be engaged for the works, to minimise potential delays of engaging additional appropriately licensed contractions during construction should friable asbestos be encountered.

G1.7 Fencing and Signage

Prior to the commencement of the asbestos works, the area will be delineated by erecting barricades and affixing warning signs. The type of barricade should be in keeping with the risk and warning signs shall be specific to asbestos removal hazards and be clearly placed at all entry points.

G1.8 Restriction of Access

Access to the asbestos works area is to be restricted to:

- Workers engaged in 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.

G1.9 Airborne Asbestos Monitoring

Asbestos air monitoring during the remediation and civil works is recommended given the find of ACM during previous investigation and the sensitivity of nearby receptors (residential and commercial).

Monitoring for airborne asbestos fibres is to be carried out by an independent Occupation Hygienist who is to be a competent person or licenced asbestos assessor[1] (as required) during asbestos removal works, as required, to meet WHS (2011) and SafeWork NSW requirements. The competent person or licensed asbestos assessor will be responsible for determining when air monitoring is required, and an appropriate scope of monitoring for the works.

Monitoring is to be undertaken in accordance with the NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:300392005)].

If a respirable asbestos fibre count of equal to or greater than 0.01 fibres/ml is recorded, the immediate actions stated in Table 1below, will be undertaken in accordance with the requirements of the WHS Regulation 2011.

Table 1: Immediate Actions for Exceedances of Asbestos Fibre Count Requirements

Respirable Asbestos Fibre Count	Immediate Actions
≥0.01 fibres/ml to <0.02 fibres/ml	(i) investigate the cause of the respirable asbestos fibre level; (ii) implement controls to prevent exposure of anyone to asbestos; and (iii) prevent the further release of respirable asbestos fibres.
≥0.02 fibres/ml	(i) order the asbestos removal work to stop; (ii) notify the regulator; (iii) investigate the cause of the respirable asbestos fibre level; (iv) implement controls to prevent exposure of anyone to asbestos; and (v) prevent the further release of respirable asbestos fibre.

G1.10 Personal Protection Equipment

The Occupational Hygienist is to propose the personal protective equipment (PPE) for the asbestos work at the site in the ARCP, which will be supplied by the Asbestos Contractor.

G1.11 Decontamination and Asbestos Clearance

At the direction of the Occupational Hygienist, facilities must be provided by the Asbestos Contractor 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.

[1] Refer to the Safework NSW Website for relevant definitions: https://www.safework.nsw.gov.au/hazards-a-z/asbestos2/what-is-asbestos/asbestos-professionals-who-does-what

G1.12 Clearance Inspection and Certificate

Upon completion of all asbestos removal works, the Occupational Hygienist is to undertake a visual clearance inspection. When they are satisfied the works area and immediate surrounding areas are free from any visible asbestos contamination and validation air monitoring results are below 0.01 f/ml then a final clearance certificate is to be issued.

G2.0 Unexpected Finds Protocol

This unexpected finds protocol (UFP) has been developed to provide guidance on processes to follow if any unexpected find is encountered during the remediation or future civil and construction works. Any unexpected finds should be surveyed and the location documented.

All site personnel are to be inducted into their responsibilities under this (UFP), which should be included or referenced in the Contractors Environmental Management Plan.

All site personnel are required to report unexpected signs of environmental concern to the Site Manager if observed during the course of their works e.g., presence of potential unexploded ordinance, unnatural staining, potential contamination sources (such as buried drums or tanks) or chemical spills.

Should signs of concern be observed, the Site Manager, as soon as practical, will:

- Stop work in the affected area and ensure the area is barricaded to prevent unauthorised access;
- Notify authorities needed to obtain emergency response for any health or environmental concerns (e.g., fire brigade);
- Notify the Principal's Representative of the occurrence;
- Notify any of the authorities that the Contractor is legally / contractually required to notify (e.g., EPA, Council); and
- Notify the Environmental Consultant.

The Principal's Representative is to notify any of the authorities which the Principal is legally / contractually required to notify (e.g. EPA, Council). Where appropriate the Principals Representative will also implement appropriate community consultation.

The Environmental Consultant will assess the extent and significance of the find and develop an investigation, remediation or management approach using (where possible) the principles and procedures already outlined in the RAP. Where a Site Auditor is involved, the proposed approach will be discussed and agreed with the Site Auditor prior to implementation.

G3.0 Contingency Plan

Where the site conditions are found to be different than that anticipated during the remediation works, the proposed remediation approach may not be appropriate for the contamination encountered. In such cases the Environmental Consultant is to re-assess the contamination and remediation approach. Where necessary the Environmental Consultant will prepare an addendum to, or revision of, this RAP.

This contingency plan has been developed to provide guidance on processes to follow if contamination (or indicators of contamination), other than that included in the remediation strategy, (Section 10) is encountered during the remediation works. Any such finds shall be surveyed, and the location documented.

Although the site has been subject to previous investigation(s), there remains a potential for soil contamination to be present between sampled locations. In the event that signs of soil contamination, other than that included in the remediation strategy, are encountered during remediation e.g., petroleum, or other chemical odours which weren't previously identified the following protocols will apply:

- The Site Manager is to be notified and the affected area closed off by the use of barrier tape and warning signs;
- The Environmental Consultant is to be notified to inspect the area and assess the significance of the potential contamination and determine extent of remediation works (if deemed necessary) to be undertaken. An assessment report and management plan detailing this information will be compiled by the Environmental Consultant and provided to the Principal's Representative;
- The assessment results together with a suitable management plan shall be provided by the Principal's Representative to the Consent Authority (if required by the development consent);
- The agreed management / remedial strategy, based on the RAP and relevant guidelines shall be implemented; and
- All details of the assessment and remedial works are to be included in the site validation report.

G4.0 References

SafeWork NSW. (2019a). *Code of Practice, How to Safely Remove Asbestos.* August 2019: SafeWork NSW, NSW Government.

SafeWork NSW. (2019b). *Code of Practice, How to Manage and Control Asbestos in the Workplace.* August 2019.

WA DoH. (2021). *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.* WA Department of Health.

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