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Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Remediation Action Plan

Student Housing Development
90-102 Regent Street, Redfern

Prepared for
The Trust Company (Australia) Limited ATF WH
Regent Trust

Project 86852.02
October 2020

Executive Summary

This Remediation Action Plan (RAP) was devised by Douglas Partners Pty Ltd (DP) for The Trust Company (Australia) Limited ATF WH Regent Trust for a site located at 90 - 102 Regent Street, Redfern (Drawing 1, Appendix A). The RAP outlines the steps required to remediate the site to a condition which would render the site suitable for the intended 18 storey student housing land use.

The RAP includes a summary of previous investigations to date which included a detailed site (contamination) investigation (DSI) (DP 2020a) and an additional round of groundwater monitoring (DP 2020b), both undertaken by DP. Based on published mapping and results of the DSI, the site is generally underlain by fill, overlying silty and sandy clays overlying Ashfield Shale (Siltstone and Laminite). The site and the surrounding areas have a history of industrial, commercial and mixed land use with potentially contaminating activities operated both on and near the site.

A fragment of asbestos containing material (ACM) in a garden bed was identified during a site walkover undertaken for the DSI and was considered likely associated with the deterioration of buildings on site. Analysis of samples from the boreholes drilled on site (BH1 to BH7) identified lead, TRH and PAH impacted fill around BH3 and lead impacted fill around BH6 was noted above the previously adopted site assessment criteria. Fill across the site was preliminarily classified as general soil waste, with the exception of BH3 (restricted solid waste), BH6 (hazardous solid waste), BH7 (scheduled chemicals - organochlorine pesticides) and any areas with asbestos as special waste asbestos in conjunction with the aforementioned chemical classifications. Groundwater samples from the DSI noted elevated levels of heavy metals, TRH and a detection of VOC. After the additional round of monitoring, the TRH and VOCs were considered potentially associated with the impacts of drilling and heavy metals reflective of urban groundwater levels, and the groundwater was not considered to be heavily contaminated nor requiring remediation.

The RAP includes a conceptual site model (CSM) which considers the results of the DSI and additional groundwater monitoring to create a model of the contamination on site. The model links the areas of environmental concern (AEC), as listed above, the potential human receptors (construction workers, future users and adjacent land users) and the potential pathways for contamination to migrate (ingestion/dermal contact and the inhalation of dust and vapours). The CSM assists to identify the areas requiring remediation, namely:

- Asbestos on the surface of garden bed (likely associated with existing buildings);
- Lead, TRH and PAH in fill at BH3;
- Lead in fill at BH6; and
- For disposal purposes, scheduled chemicals in fill at BH7 (concentrations identified within SAC but exceed the concentration requiring management in the NSW EPA *Scheduled Chemical Wastes Chemical Control Order 2004*.

Prior to remediation, additional investigations to determine the extent of remediation are required and comprise of:

- A hazardous building material (HAZMAT) survey of existing building on site it to be completed by a licensed occupational hygienist; and
- The delineation of lead, TRH, PAH and OCP in soil is to be completed by a suitably qualified environmental consultant.

Additional investigations and remediation are to be undertaken to achieve the remediation action criteria (RAC) outlined in section 7 which have been selected base on the proposed land use - Residential B. DP notes that changes to the RAP may be required following the completion of the additional investigations.

Remediation options were subsequently considered with the proposed development in mind and the preferred remediation approach is a combination of disposal to landfill (in areas requiring bulk excavation for a proposed basement extension) and a cap and contain approach with an appropriately designed barrier for the remaining AECs. The steps required to removal contaminated soil to landfill as well as the steps required to cap contaminated soils on site are outlined in the RAP along with the associated relevant regulatory requirements. Any material requiring off-site disposal requires a formal waste classification in line with the NSW EPA *Waste Classification Guidelines 2004.*

The RAP details the roles and responsibilities of the parties involved with remediation including the Principal, Principal Contractor, Asbestos Contractor, Sub-contractors, Environmental Consultant, Occupational Hygienist and site workers.

General site management considerations which includes the stockpiling of soil (dust, height and erosion management measures), waste disposal (classification, transportation and record keeping requirements) and importation of soil (importation requirements, source, sampling and validation assessment) are to be followed during remediation works.

The remediation works are to be documented and a validation undertaken to confirm the remediation has been achieved in a Validation Report. The validation works involve site inspections, sampling and documentation in order to validate all remediation works include:

- A post demolition asbestos clearance;
- Validation of excavated material;
- Validation of capping;
- Validation of the footprint of temporarily stockpiled impacted material;
- Documentation of all remediation works, surveys of the capping installation and records of materials being imported or exported from site.

The RAP also stipulates the responsibilities of the different parties involved in relation to record keeping and actions required for the validation, such as, *inter alia* inspections and sampling undertaken by the environmental consultant and record keeping, documentation and surveying and site works as the responsibility of the Principal Contractor.

Other general management considerations including site delineation, dust controls, soil and sediment containment, noise management and odour control may also be necessary. Noting that a worker health and safety plan should also be developed for the site.

An unexpected finds protocol and contingency plan has also been included to detail the actions required should additional contamination (not anticipated) is/are discovered during the course of the works.

It is also noted that if a cap and contain approach is followed, a long-term environmental management plan (LTEMP) is required to be prepared and included on the site's Section 10.7 Planning Certificate to allow for appropriate future management to be maintained.

The site should be suitable for the proposed land use if the RAP is followed and remediation is successfully completed and validated as per the procedures and requirements outlined in the RAP.

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Document History

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

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Student Housing Development
90-102 Regent Street, Redfern

1. Introduction

This Remediation Action Plan (RAP) describes the work required to remediate the property identified as 90-102 Regent Street, Redfern ('the site') to render the site suitable for the proposed student housing development (the site is shown on Drawing 1, Appendix A). The RAP was commissioned by The Trust Company (Australia) Limited ATF WH Regent Trust.

It is understood that the proposed development on the site will include an 18 storey student housing building with an extension of the existing split-level basement.

This RAP details the methods and procedures by which the remediation and site validation will be achieved. It is intended that following implementation of the RAP, the site can be considered:

- Remediated to a condition which would prevent unacceptable risks to human health and / or the environment; and
- Suitable for the intended land-use.

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 render the site suitable for the intended use.

1.1 Site Identification

The site is almost rectangular in shape and has a surveyed area of 1,287 m^2. The site is located within the local government area of City of Sydney and is identified as follows:

- Lot 1, Section 2, Deposited Plan 3954 (90 Regent Street, Redfern);
- Lot 2, Section 2, Deposited Plan 3954 (92 Regent Street);
- Lot 3, Section 2, Deposited Plan 3954 (94 Regent Street);
- Lot 1, Deposited Plan 184335 (96 / 96A Regent Street); and
- SP57425 (98 - 102 Regent Street).

The location of the site is shown in Figure 1 below and Drawing 1 included in Appendix A.

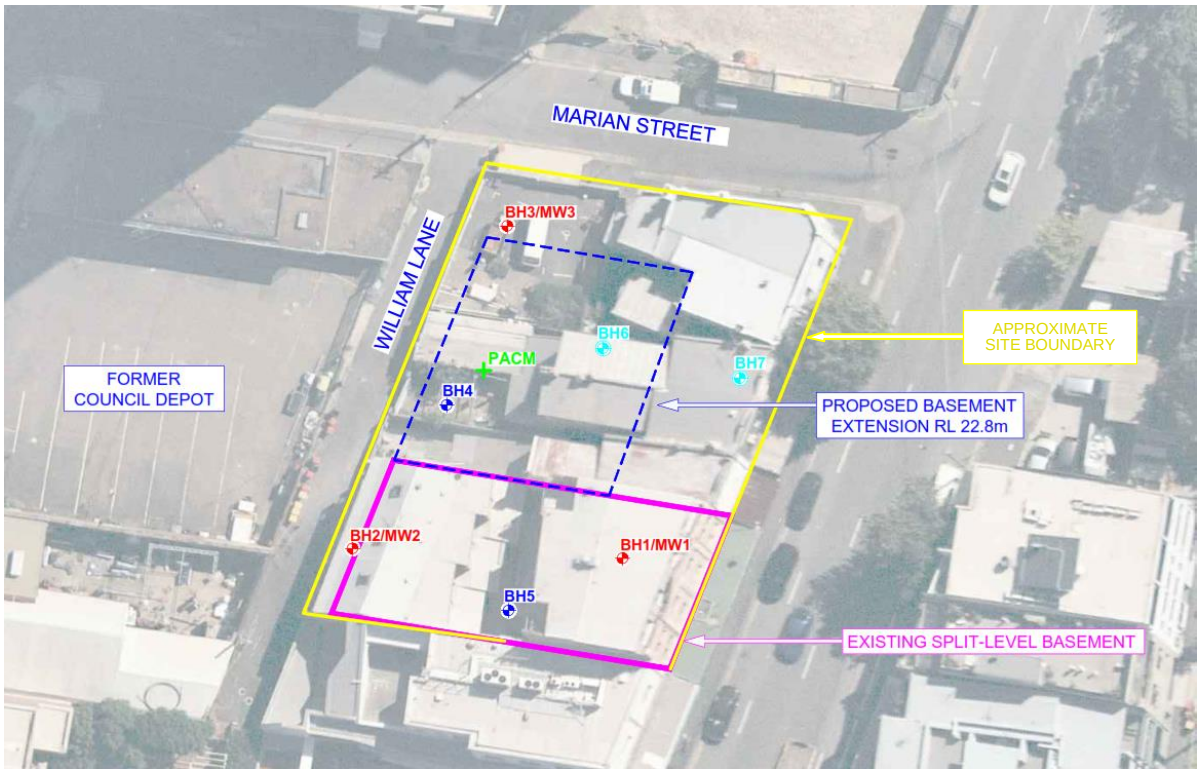


Figure 1. Site Location

1.2 Proposed Development

It is understood that the proposed development on site will include an 18-storey student housing building with an extension of the existing split-level basement to the north, to give a basement floor level at RL 22.8 m. The basement would be utilised to house utilities such as stormwater detention tanks, fire relay pump, storage rooms, bike storage and lifts. It is also understood that the ground level may be used for the building reception, retail and general common areas.

The approximate site boundary, the existing split-level basement and the proposed basement are shown in Drawing 1, Appendix A. Interpreted geotechnical cross sections showing the proposed basement extension and the existing split-level basement are included in Drawings 2 and 3, Appendix A.

2. Objectives and Scope

The objectives of the RAP are as follows:

- Set remediation goals that will allow the site to be suitable for the proposed use as student housing and will not pose an unacceptable risk to human health;

- Document the remediation options that may be implemented to reduce risks to acceptable levels for the proposed site use as student housing;
- Provide information which will be required to detail the environmental safeguards necessary to complete the remediation in an environmentally acceptable manner;
- Identify the general legislative requirements of the relevant authorities for the remediation works; and
- Comply with the relevant planning instruments.

The general scope of work designed to achieve the RAP objectives stated above is described below:

- Provide an adequate description of the site, its history and available background information;
- Develop site criteria by identifying the chemicals of concern;
- Provide a summary of the results of the previous site investigations and assess the contamination status of the site;
- Identify remaining data gaps in regard to the site contamination status which will need to be incorporated into the remediation plan;
- Identify potential remediation options available for the site and nominate the preferred remediation strategy;
- Develop contingency plans and an unexpected finds protocol (UFP) for the various situations that may arise during the remediation programme; and
- Highlight the requirement for the works to be undertaken in accordance with a construction environmental management plan (CEMP) and a Work Health and Safety Plan prepared for the remediation works.

3. Site Information

3.1 Regional Topography, Geology and Hydrogeology

Reference to the Sydney 1: 100 000 Soil Landscape Sheet indicates the site is underlain by the Tuggerah soils landscape group comprising deep podzols on dunes and humus podzol integrades on swales. These soils typically have extreme wind erosion hazard, are non-cohesive, highly permeable soil, very low soil fertility and have permanently high water tables.

Reference to the Sydney 1:100 000 Geological Series Sheet 9130 indicates that the site is located within Quaternary-aged transgressive dunes typically comprising medium to fine-grained sand. The boundary with Triassic-aged Ashfield Shale occurs about 140 m to the west of the site. Ashfield Shale typically comprises black to dark grey shale and laminite and weathers to residual clay.

The site has an overall topographic difference of approximately 4 m from the highest part (approximately 27 m, relative to the Australian height datum (AHD) within the north eastern portion of the site), to the lowest part (approximately 23 m AHD, taking into account the basement plan) within the south western portion of the site as shown on 2 m elevation contours obtained through published

topographic maps. The regional topography slopes from the north towards Alexandra Canal, located approximately 1 km south of the site.

Surface water is anticipated to drain to the local stormwater system and follow the general regional topography, ultimately draining into Alexandra Canal. Likewise, regional groundwater is also anticipated to flow in the direction of Alexandra Canal.

Reference to the Atlas of Australian Acid Sulfate Soils site lies in a "Class C" area, where there is an extremely low probability of occurrence of acid sulfate soils (ASS). Furthermore, given that the site lies at an elevation of approximately 26 m AHD, the probability of ASS being present on site is considered extremely unlikely.

3.2 Previous Reports

3.2.1 Detailed Site (Contamination) Investigation (DP 2020a)

The detailed site (contamination) investigations (DSI)[1] previously prepared by DP comprised a review of site history, a site walkover and an intrusive investigation that included the drilling of seven boreholes (BH1 to BH7), converting three into groundwater monitoring wells (MW1 to MW3) and the collection and analysis of selected soil and groundwater samples.

The site history review indicated that the site and surrounding areas have been used for commercial / mixed land use since the early 1900s with several high-risk activities (*inter alia* dry cleaners, motor garages and printing services) located either on-site or up-gradient and within 150 m of the site. The site has been redeveloped numerous times and the risk for hazardous building materials from existing or previous buildings was identified, particularly if demolition practices were poorly controlled.

The intrusive investigation identified varying depths of fill across the site with shallow fill to depths of up to 0.3 m in BH1 and BH5, and deeper fill to depths of up to 2 m (typically 1.4 m) in BH2, BH3, BH4, BH6 and BH7 noting that BH 6 and BH7 terminated in fill. Groundwater was not observed during drilling, however, groundwater levels observed during well development and sampling ranged between 6.6 m bgl to 10.7 m bgl and ranged between 16.2 m relative to the Australian height datum (AHD) to 17.9 m AHD. The site was assessed based on the proposed development comprising student housing with minimal access to soils. Both soil and groundwater samples were analysed for potential contaminants of concern at a National Association of Testing Authorities (NATA) accredited laboratory.

Apropos contamination in soil, the following was identified:

- A fragment of asbestos containing material (ACM) in a garden bed and is suspected to be associated to the deterioration and spalling of existing structures;
- A contamination hotspot at BH3 due to total recoverable hydrocarbons (TRH) and polycyclic aromatic hydrocarbons (PAH) concentrations recorded above the adopted site assessment criteria (SAC) in sample BH3 depth 0.5 - 0.6 m;

[1] Douglas Partners Pty Ltd, *'Report on Detailed Site (Contamination) Investigation, Student Housing Development, 90-102 Regent Street, Redfern'*, DP ref: 86852.01.R.001.Rev1, October 2020 (DP, 2020a).

- Elevated concentrations of lead were identified above the SAC in samples BH6 depths 1 – 1.1 m, 1.4 - 1.5 m and 1.9 - 2.0 m; and
- High leachability of lead (toxicity characteristic leaching procedure (TCLP)) was identified in samples BH3 depth 1 - 1.1, BH6 depths 1 - 1.1 m, 1.4 - 1.5 m and 1.9 - 2.0 m. Leachability testing undertaken using the Australian standard leaching (ASLP) procedure indicated some leachability of metals namely lead, chromium, copper and zinc.

In regard to groundwater, the results were assessed based on the 95% species protection in freshwater and the investigation identified the following:

- Groundwater assessment was undertaken in two rounds and the results of the first round indicated detections of TRH, VOCs and metals with concentrations above the SAC for chromium, copper;
- The second round indicated lower concentrations of TRH recorded, detections of TRH, VOC and metals with concentrations above the SAC detected for copper and zinc; and
- Concentrations of benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP) and phenols were below the SAC in both rounds.

A preliminary *in situ* waste classification was provided as part of the DSI as follows:

- Fill in the vicinity of BH3 was preliminarily classified as restricted solid waste (RSW);
- Fill in the vicinity of BH6 was preliminarily classified as hazardous waste;
- Fill at the remaining borehole locations (BH1, BH2, BH4, BH5 and BH7) were preliminarily classified as general solid waste;
- Scheduled Chemical Waste was identified in sample BH7 depth 0.5 - 0.6 m given it exceeded 2 mg/kg assessment criteria and would need to be managed according to the NSW EPA *Scheduled Chemical Wastes Chemical Control Order 2004*; and
- As a fragment of asbestos was identified on the ground surface, ACM may be present in the fill. Any fill containing ACM would be classified as Special Waste (Asbestos) in conjunction with the chemical classifications listed above.

The DSI recommended the following:

- Further testing surrounding soils at BH3 and BH6 to delineate the extent of contamination identified, followed by remediation;
- Another round of groundwater monitoring (which has since been undertaken, see DP (2020b) below;
- A RAP be prepared to outline the procedures required to render the site suitable for the proposed development (this report);
- A hazardous building material survey by an appropriately qualified and licensed occupational hygienist should be conducted prior to demolition of existing structures; and
- A detailed waste classification assessment should be undertaken to classify fill materials and natural soils should removal be required as part of the remediation process or if materials are surplus to the development. It is noted that further delineation around BH3 and BH6 and BH7

was recommended to delineate the extent of RSW, hazardous waste and scheduled chemical waste, respectively.

3.2.2 Ground Water Monitoring (DP 2020b)[2]

DP undertook a round of monitoring in October 2020 from the three monitoring wells installed as part of the DSI (DP 2020a). The wells were developed on 8 October 2020 and sampled on 15 October 2020, with samples dispatched to a NATA accredited laboratory for analysis of metals, TRH and VOC. Field readings indicated groundwater levels between 16.59 m AHD to 17.15 m AHD.

Analytical results recorded no detections of TRH or VOC above the laboratory practical quantification limit (PQL) and detections of some heavy metals, particularly copper and zinc consistent with previous results. There were detections of some heavy metals, in particular copper and zinc, which is consistent with DP (2020a). The initial detections of TRH and VOC recorded in DP (2020a) were therefore not considered to be reflective of stabilised groundwater conditions. In summary, the analytical results confirmed that groundwater at the site was not subject to contamination that was considered to be of concern, with the recorded heavy metal concentrations reflective of typical groundwater conditions in an urban setting.

4. Conceptual Site Model

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

4.1 Areas of Environmental Concern

Based on the DSI, the following areas of environmental concern were identified (borehole locations shown on Drawing 1, Appendix A):

- Asbestos on surface in the garden bed (which was considered to be associated with the deterioration of the existing buildings);
- Lateral extent of lead, TRH and PAH around BH3 above the SAC in BH3 depth 0.5 - 0.6 m with concentrations of TRH, PAH and lead below the SAC but high lead leachability in the deeper sample at BH3 depth 1 - 1.1 m;
- Lead (including high leachability) around BH6 above the SAC in BH6 depths 1 - 1.1 m, 1.4 - 1.5 m and 1.9 - 2.0 m with no further analytical results below 2.0; and
- Scheduled chemical wastes identified at BH7 in sample BH7 depth 0.5 - 0.6 m.

[2] Douglas Partners Pty Ltd, *'(Memorandum) Proposed Student Housing Development Groundwater Monitoring'*, DP ref: 86852.02.R.001.Rev0 dated 21 October 2020 (DP, 2020b).

As such, the following potential sources of contamination and associated contaminants of potential concern (COPC) have been identified and are summarised in Table 1 below.

Table 1: Potential Contamination Sources and Associated Contaminants of Potential Concern

Potential Source	Description of Potential Contaminating Activity	Contaminants of Potential Concern
Fill and surficial soil (S1).	It is likely that fill was placed at the site to achieve existing design levels. As the source of fill is unknown, there is potential for contaminants to be present in the fill. Furthermore, the deterioration of the former and existing structures (likely to contain hazardous building materials) may over time have impacted the fill / soil.	Heavy metals, TRH, PAH, OCP and asbestos.
Hazardous building materials in existing structures (S2).	Given the age of the existing structures, it is considered likely that hazardous building materials were used in the construction materials.	Asbestos, lead and PCB.
Former site uses (S3).	Review of the historical business listings indicated there was a motor dealer formerly located on site (102 Regent Street) and possibly laundry facilities. Based on review of Google Maps, it appears a printing shop was also located onsite.	Heavy metals, TRH, PAH, OCP.

Notes:
TRH - total recoverable hydrocarbons
BTEX - benzene, toluene, ethylbenzene, xylene
PAH - polycyclic aromatic hydrocarbons
PCB - polychlorinated biphenyls
OCP - organochlorine pesticides
OPP - organophosphorus pesticides
VOC - volatile organic compounds

DP notes that previous and current off-site activities do not appear to be impacting the site based on previous groundwater and soil results. The presence of heavy metals in the groundwater is considered to be more reflective of regional groundwater and background conditions.

4.2 Potential Receptors

The following potential receptors (R) have been identified:

Human Health Receptors:

R1 - Construction workers (during site redevelopment);

R2 - Future site users (students, visitors, commercial tenants); and

R3 - Land users in adjacent areas.

Environmental Receptors:

DP notes that as indicated by the current design plans, the proposed development footprint is to be covered in hardstand / by the building footprint (i.e., without landscaped areas / accessible soils). Therefore, terrestrial ecosystems have not been included as potential environmental receptors.

Surface water runoff and infiltration are also not considered to be relevant, and therefore have not been considered further. Similarly, groundwater monitoring results indicate that groundwater is not impacted by contamination of concern and as such has not been considered further. Should the design plans be updated to include landscaped areas, the CSM may need to be revised.

4.3 Potential Pathways

The following potential exposure pathways are primarily relevant to human receptors:

- P1 - Ingestion and dermal contact; and
- P2 - Inhalation of fibres/dust and / or vapours.

The following CSM has been updated from the DSI to incorporate the results of the additional groundwater monitoring and the following potential sources of contamination and associated contaminants of potential concern (COPC) have been identified and are summarised in Table 2 below.

Table 2: Conceptual Site Model

Source	Transport Pathway	Receptor	Risk Management Action Recommended
Fill and surficial soil particularly fill (S1). Former Site Uses (S3).	P1 - Ingestion and dermal contact. P2 - Inhalation of fibres / dust and / or vapours.	R1 - Construction workers. R2 - Future site users.	Delineation investigation, including chemical testing of soils, around BH3, BH6, BH7 and in the north eastern area of the site are to be undertaken following demolition works. Implementation of UFP and contingency plan during construction works.
	P2 - Inhalation of fibres/ dust and / or vapours.	R3 - Land users in adjacent areas.	
Hazardous building materials in existing structures (S2).	P1 - Ingestion and dermal contact. P2 - Inhalation of fibres / dust and / or vapours.	R1 - Construction workers. R2 - Future site users.	A hazardous buildings material survey is conducted prior to demolition with a clearance certificate provided for the ground surface post demolition.
	P2 - Inhalation of fibres/ dust and / or vapours.	R3 - Land users in adjacent areas.	

5. Remediation Options

Based on the results of the DSI (DP 2020a) and additional groundwater monitoring round (DP 2020b), contamination was identified on the surface of the garden beds, BH3 and BH6, although the extent of the contamination is not known. It is also noted that although BH7 identified scheduled chemical wastes, results indicate that the materials are able to remain on site and only impact waste disposal.

Therefore, with reference to NEPC (2013)[3] and in consideration of the potential exposure pathways of the contaminated fill/soil and the proposed development, it is considered that the aforementioned areas can be rendered suitable for use with respect to the contamination present by either:

a) Management of contaminated soils by placement at depth so as to minimise future disturbance and exposure. This management strategy would comprise the construction of a barrier (such as the proposed building slab) between site users and the contaminant of concern and preparation of a long term management plan to prevent future inadvertent exposure of the contaminated fill/soil to site users; and / or

b) Removal of contaminated soils from areas requiring excavation and disposal off-site.

Given the nature of the development (i.e. proposed basement excavation in some areas of the site), the preferred remediation approach will be a combination of both options. *Viz.* Option B will be adopted for areas requiring excavation and Option A adopted for the remaining areas of site to reduce the generation of waste and hence disposal to landfill.

6. Adopted Remediation Strategy and Assessment

The remediation works must be conducted by experienced and appropriately licensed contractors. An experienced Environmental Consultant is to be engaged to inspect the progress of the works and to provide ongoing advice and recommendations as required. The success of the remediation works will be validated by the Environmental Consultant in consultation with other consultants (e.g., Geotechnical Engineer, Structural Engineer, Occupational Hygienist, etc.).

6.1 Additional Investigation

Prior to remediation, the following additional investigations are to be undertaken by a suitably qualified environmental consultant. Noting that a hazardous building materials (HAZMAT) survey is to be undertaken by a licenced occupational hygienist.

The HAZMAT survey is to be undertaken prior to any demolition works and the remaining investigations are recommended to be undertaken after demolition works have been completed and a clearance for asbestos has been obtained.

If the results of these investigations impact the remediation approach or information outlined herein, this RAP is to be updated as required.

[3] National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure 1999* (amended 2013) (NEPC, 2013)

6.1.1 Hazardous Building Materials

A HAZMAT survey of the buildings present on site must be undertaken by a licenced occupational hygienist and any identified hazardous building materials are to be removed appropriately by licenced contractor/s prior to building demolition.

Following building demolition, a clearance for asbestos of the demolition footprint and surrounding work areas is to be undertaken by a licenced occupational hygienist to ensure that there is no visible asbestos present on the surface (including top 100 mm where fill is exposed).

6.1.2 Delineation Lead, TRH, PAH and OCP

Given the elevated concentrations of lead, TRH and PAH around BH3 and BH6 (lead only), step out sampling by the Environmental Consultant is to be undertaken to gain a better understanding of the contaminant concentrations and the extent of contaminated soil required for either off-site disposal or to be retained under a cap and contain strategy.

DP notes that the delineation works around BH3 and BH6 are also to be used to further characterise the north east section of the site, in which only limited sample locations were positioned as part of the DSI (DP 2020a).

As a minimum, the additional investigations are to include:

Borehole BH3:

- Drill and soil sample two step-out 'rings' of four test pits / boreholes (one bore in each direction for each ring) 1 m into natural soils or to a depth of 3 m. Boreholes for the first ring are to be located 1-2 m from borehole BH3 (in each direction) with boreholes for the second ring 5 m from borehole BH3;
- Drill and soil sample three additional boreholes approximately 10 m, 20 m and 30 m to the east of BH3 to provide coverage of the north eastern section of the site;
- Log soil description of each borehole;
- Collect samples at regular intervals, changes in strata and where signs of potential contamination are noted to the depth of investigation;
- Despatch of samples for laboratory analysis of lead, TRH and PAH including TCLP for lead and PAH;
- Comparison of the results against the remediation assessment criteria and waste classification criteria outlined in Section 7 to confirm suitability of the remedial approach in the area; and
- It is noted that where results from the step-out assessment do not delineate the extent of the contamination, additional step-out 'rings' may be required to be subsequently undertaken.

Borehole BH6:

- Drill and soil sample two step-out 'rings' of four test pits / boreholes (one bore in each direction for each ring) 1 m into natural soils or to a depth of 4 m. Boreholes for the first ring are to be located 1-2 m from borehole BH6 (in each direction) with boreholes for the second ring 5 m from borehole BH6;

- Log soil description of each borehole;
- Collect samples at regular intervals, changes in strata and where signs of potential contamination are noted to the depth of investigation;
- Despatch of samples for laboratory analysis of lead and TCLP for lead;
- Comparison of the results against the remediation assessment criteria and waste classification criteria outlined in Section 7 to confirm suitability of the remedial approach in the area; and
- It is noted that where results from the step-out assessment do not delineate the extent of the contamination, additional step-out 'rings' may be required to be subsequently undertaken.

Borehole BH7

DP notes that the results from the DSI are within the adopted SAC and these additional investigations are required to determine the extent of scheduled chemical waste should off-site disposal be required for material in this area. Under these circumstances the following should be undertaken:

- Drill and soil sample two step-out 'rings' of four test pits/boreholes (one bore in each direction for each ring) 1 m into natural soils or to a depth of 3 m. Boreholes for the first ring are to be located say 1-2 m from borehole BH7 (in each direction) with boreholes for the second ring 5 m from borehole BH7;
- Log soil description of each borehole;
- Collect samples at regular intervals, changes in strata and where signs of potential contamination are noted to the depth of investigation;
- Despatch of samples for laboratory analysis of OCP;
- Comparison of the results against the site assessment criteria and waste classification criteria outlined in Section 7 to confirm suitability of the remedial approach in the area; and
- It is noted that where results from the step-out assessment do not delineate the extent of the contamination, additional step-out 'rings' may be required to be subsequently undertaken.

Following the delineation of the contamination hot spots around BH3, BH6 and BH7 (plus any additional areas identified through the investigation), the extent of the 'contaminated soils' (i.e., exceeding the RAC outlined in Section 7) and hence the extent of remediation can be confirmed and the following remediation options adopted:

- Contaminated soils within the proposed basement excavation are to be removed for off-site disposal in accordance with the procedure set out in Section 6.2.
- Contaminated soils beyond the proposed basement excavation are to remain on site to be capped and contained by an appropriate barrier in accordance with the procedure set out in Section 6.3.

6.2 Off-Site Disposal of Contaminated Soils (BH3 and BH6)

Removal of contaminated soils previously delineated around BH3 and BH6 (see Section 6.1) within the areas of subsurface disturbance (such as excavations for the proposed basement extension / service trenches and levelling of the site) is a straight forward process entailing the following general approach:

- Segregation of the contaminated soils from the underlying natural soils and stockpiling. Soils are also to be segregated based on waste classification;
- Inspection of the hot spot excavation area by the Environmental Consultant to confirm that all contaminated soil has been removed;
- Collection of validation samples from the exposed natural soils to confirm contaminated soils have been removed;
- Inspection and sampling of the stockpiled soils to confirm the waste classification of the soils prior to off-site disposal (note: particular attention should be made for the presence of ash, clinker (coal), slag and asbestos in the fill);
- Survey of the area subject to the removal of contaminated soils required for bulk excavation at a minimum density of one survey point per 10 m^2. Surveys are to be included on a drawing which are to show, at a minimum, the following:
  - Boundary of the remediated area; and
  - Relative level (m AHD) of the remediated area post removal of contaminated soils.
- Classification and disposal of the stockpiled soils to an appropriately licensed waste facility based on the final waste classification.

6.3 Capping of Contaminated Soils (BH3 and BH6)

The following is for areas of contaminated soils previously delineated around BH3 and BH6 that are beyond the proposed basement excavation (see Section 6.1) that will be retained onsite and managed through a cap and contain approach (such as building footprint beyond the proposed basement where bulk excavations are not required). As this approach retains contamination on the site, a long-term management plan for the site will need to be implemented to manage the contaminated soils post-development.

Concrete slabs and pavements provide a robust cap that can mitigate against a complete source – pathway – receptor linkage. For areas where contaminated soils are to be retained below concrete slabs/pavements the following remediation approach is to be implemented. Drawing 4, Appendix A, shows the general capping approach outlined below:

- Undertake required subsurface works and earthworks to prepare site surface for the slab / pavement;
- Inspection of the surface by the Environmental Consultant for signs of any significant contamination of concern on the surface;
- Placement of the marker layer over the area of contaminated soil that is to remain. A non-woven geotextile, such as Geofabrics A24, would be considered suitable. For concrete slabs builders

plastic would be a suitable alternative (if required by the structural engineer). High visibility marker layers (e.g., orange) are also preferred;

- Survey of the area subject to remediation at a minimum density of one survey point per 10 m^2. Surveys are to be included on a drawing which are to show, at a minimum, the following:
  - Boundary of the placed marker layer;
  - Type of marker layer used; and
  - Relative level (m AHD) that the marker layer has been installed.
- Construction of the overlying thick concrete slab (minimum 100 mm thick). Reference to the relevant structural / drawings should be made for the specific construction requirements; and
- Survey at the same locations on completion of works to confirm the capping layer of 100 mm has been placed. These final levels are to be overlaid on the marker layer survey drawing to demonstrate this has been achieved. The survey data from both surveys is to be recorded on a site survey drawing and overlayed on a recent aerial image of the site.

Notes:

– If areas of asbestos contamination (if any are later identified) require capping, prior to placement of the marker layer the surface is to be inspected by a suitably qualified Environmental Consultant or Occupational Hygienist to confirm the surface is free of asbestos containing material.

– For areas where subsurface services are installed within contaminated soils areas (hot spots around BH3 and BH6, or any other areas identified as per Section 6.1), it would assist long term management of the service if the maker layer was located in the base of the service trench and backfilled with a non-contaminated backfill.

7. Remediation Assessment Criteria

For any materials being imported onto site or areas requiring further validation (e.g. unexpected finds), laboratory results are to be compared to NEPC (2013) health screening/investigation levels. Table 3 provides a summary of the levels derived from DP (2020a). Reference to DP (2020a) and NEPC (2013) should be undertaken for greater information on how these levels have been generated.

Table 3: Adopted HIL and HSL Values

Contaminants		HIL – B / HSL B (Direct Contact)	HSL A&B Sand
			0 m to <1 m
Metals	Arsenic	500	-
	Cadmium	150	-
	Chromium (VI)	500	-
	Copper	30 000	-
	Lead	1200	-

Contaminants		HIL – B / HSL B (Direct Contact)	HSL A&B Sand
			0 m to <1 m
	Mercury (inorganic)	120	-
	Nickel	1200	-
	Zinc	60 000	-
PAH	Benzo(a)pyrene TEQ[1]	4	-
	Total PAH	400	-
	Naphthalene	*2200	3
Phenols	Phenol (Pentachlorophenol as initial screen)	130	-
TRH	C6-C10	*5600	-
	>C10-C16	*4200	-
	>C16-C34	*5800	-
	>C34-C40	*8100	-
	C6 – C10 (less BTEX) [F1]	-	45
	>C10-C16 (less Naphthalene) [F2]	-	110
BTEX	Benzene	*140	0.5
	Toluene	*21 000	160
	Ethylbenzene	*5900	55
	Xylenes	*17000	40
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	PCBs	2	-

Notes to Table 3:

1 Sum of carcinogenic PAH.

2 Non dioxin-like PCB only.

3 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'.

* Direct contact HSL.

With respect to asbestos concentrations for a Residential B land use, as per NEPC (2013) *Table 7: Health Screening Levels for Asbestos Contamination in Soil* no asbestos is to be visible at the surface whilst concentrations for bonded ACM is to be less than 0.04% w/w and fibrous asbestos/asbestos fines (FA and AF) is to be less than 0.001% w/w.

Material to be disposed of off-site require a formal waste classification under the Protection of the Environment Operations Act 1997 (POEO Act) and is to be undertaken in accordance with the NSW EPA *Waste Classification Guidelines 2014* (NSW EPA 2014).

8. Regulatory Requirements

All works must be conducted in accordance with the development consent conditions issued by the Inner West Council. All works must be also undertaken in accordance with the relevant regulatory criteria, including *inter alia*:

- NSW *Work Health and Safety Act* 2011 (WHS Act);
- NSW *Work Health and Safety Regulation* 2017 (WHS Regulation);
- NSW *Contaminated Land Management Act* 1997 (CLM Act);
- NSW *Protection of the Environment Operations Act* 1997 (POEO Act);
- National Environment Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013)* (NEPC, 2013);
- NSW EPA *Waste Classification Guidelines 2014* (EPA 2014);
- WA Department of Health, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia 2009* (WA DoH 2009);
- SafeWork NSW, *Code of Practice How to Manage and Control Asbestos in the Workplace* July 2020; and
- SafeWork NSW *Code of Practice How to Safely Remove Asbestos* July 2020.

9. Roles and Responsibilities

9.1 Principal

The Principal retains the overall responsibility for ensuring that this RAP is appropriately implemented. The Principal may nominate a representative (the Principal's Representative), who is responsible for overseeing the implementation of this RAP. The actual implementation of the RAP may be conducted by the Principal Contractor on behalf of the Principal.

9.2 Principal Contractor

The Principal Contractor (referred to hereon as the Contractor) is foreseen to be the party responsible for the day-to-day implementation of this RAP and shall fulfil the responsibilities of the Principal Contractor as defined by 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.

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

- To obtain specific related approvals as necessary to implement the earthworks, including for example, permits for removal of asbestos-containing materials, SafeWork notification, etc.;
- To develop or request and review plans to manage site works, such as an environmental management plan;
- That all site works and other related activities are undertaken in accordance with this RAP;
- To maintain all site records related to the implementation of the RAP;
- To estimate quantities related to remediation and provide quantities of placed and/or disposed materials resulting from the remedial works;
- To obtain sufficient information to engage and/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;
- To manage the implementation of any recommendation made by those parties in relation to work undertaken in accordance with the RAP;
- To 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;
- To retain records of any contingency actions;
- On completion of the project, to review the RAP records for completeness and update as necessary; and
- To recommend any modification to general documentation which would further improve the environmental outcomes of this RAP.

9.3 Asbestos Contractor

The Asbestos Contractor will be responsible for undertaking all asbestos works involving any asbestos contaminated soil (if encountered) or asbestos that is required to be removed from buildings (e.g., see Section 6.1 for HAZMAT survey requirements) prior to demolition. Contractor is to hold an appropriate licence for the removal of asbestos (issued by SafeWork NSW) in accordance with the WHS Regulations (i.e., Class A for friable works and Class A or B for non-friable works). The Asbestos Contractor can be the same as the Principal Contractor.

9.4 Sub-contractors

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

9.5 Environmental Consultant

The Environmental Consultant will provide advice on implementing this RAP.

The Environmental Consultant will be responsible for:

- Undertaking additional investigations (refer to Section 6.1) to confirm the suitability of the proposed remediation approach for these areas;
- Undertaking any required assessments where applicable (e.g. waste classification, site validation, etc.);
- Providing advice and recommendations arising from inspections;
- Reviewing documentation and results provided by the contractor (e.g., surveys, proposed materials to be imported); and
- Notifying their client with the results of any assessments and any observed non-conformances in a timely manner.

9.6 Occupational Hygienist

The Occupational Hygienist will provide advice on Work Health and Safety (WHS) issues related to any hazardous materials related works (e.g., asbestos, lead paint). The Occupational Hygienist will hold an Asbestos Assessor Licence, where appropriate, in accordance with the WHS Regulations.

The Occupational Hygienist will be responsible for:

- Developing an asbestos management plan (AMP);
- Any WHS plans and advice requested by the Contractor;
- Undertaking airborne asbestos monitoring;
- Undertaking clearance inspections for hazardous materials;
- Providing advice and recommendations arising from monitoring and/or inspections; and
- Notifying their client with the results of any assessments and any observed non-conformances in a timely manner.

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

9.7 Site Workers

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

- Being inducted on 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 PPE;
- Only entering restricted areas when permitted; and
- Requesting clarification when unclear of requirements of this or any other plans (e.g. SWMS).

10. General Site Management Considerations during Remediation

This section provides general information which is to be considered during the remedial works.

10.1 Stockpiling of Soils

It is envisaged that temporary stockpiles may be formed during the works. Stockpiles must be managed to minimise the risk of dust generation and erosion given the likely presence of contaminants in some of the stockpiled materials. The measures required to achieve this should include:

- Restrict the height of stockpiles to reduce dust generation (less than 2.5 m);
- Place stockpiles of contaminated soil within areas yet to be remediated (where feasible);
- Construct erosion and sediment control measures;
- Cover stockpiles at the end of each day or when not in use with plastic; and
- Keep temporary stockpiles moist, by using water spray where required.

10.2 Waste Disposal

All off-site disposals of waste soils are to be undertaken in accordance with the POEO Act and the EPA (2014). Copies of all necessary approvals from the receiving site shall be given to the Principal's Representative prior to any contaminated material being removed from the site. Preliminary waste classification has been provided in DP (2020a) for reference.

The indicative sampling rate for validation / waste classification / assessment of stockpiled soils is (note actual frequency will be determined based on volume, contamination risk and homogeneity of the material):

- Stockpiles ≤250 m^3: 1 sample per 25 m^3 or a minimum of 3 samples; and
- Stockpiles >250 m^3: 1 sample per 100-250 m^3 and a minimum of 3 samples.

During excavation or stockpiling but prior to loading out the waste material is to be periodically inspected (and sampled) by the Environmental Consultant to confirm the waste classification of the material. Inspection of the waste for the presence of ash, clinker (coal) or slag should be noted to assess the suitability of applying the NSW EPA Immobilisation of Wastes (1999/05 or 2009/07) particularly around previous borehole BH3. No soil is to leave the site without a formal waste classification report.

Transport of spoil shall be via a clearly delineated, pre-defined haul route. Copies of all consignment notes for the transport, receipt and disposal of all materials are to be maintained as part of the site log and made available to the Environmental Consultant for inspection and reporting purposes upon request.

All relevant analysis results, as part of waste classification reports, shall be made available to the Contractor and proposed receiving site/ waste facility to enable selection of a suitable disposal location which is legally able to accept the waste.

10.3 Importation of Soil

Any soils (including service trench backfill aggregates) imported are to be classified as VENM, or must be compliant with an appropriate Resource Recovery Exemption/Order (RRE/RRO). All material classifications are to be supported by the relevant chemical and physical testing results and at a minimum include analysis for heavy metals, TRH, BTEX, PAH, PCB and asbestos. In this regard, materials imported under a RRE/RRO are to be compliant with the relevant resource recovery criteria (RRC) in addition to the preceding. Results are to be compared against the RAC outlined in Section 7 and relevant RRE criteria where applicable. Note, where there is a difference between the SAC and the RRC, the more conservative criteria is to be adopted.

VENM is to be sampled for each source site at a minimum rate of three samples for the first 1,000 m^3 and then 1 sample per 1,000 m^3 thereafter.

Prior to importation appropriate documentation confirming the classification and any relevant certification needs to be provided to, and approved by, the Environmental Consultant. If necessary, the material should be inspected at the source site (and sampled if required) to confirm the classification given and to confirm that there are no signs of contamination.

The material must be inspected during importation by the Contractor, and any materials not meeting the description given in the provided documentation or displaying signs of contamination are to be rejected. The Environmental Consultant is to conduct periodic inspection(s) during and / or following importation to check the same. Additional testing of the imported material may be required, as recommended by the Environmental Consultant, commensurate with the documentation and the material type / classification.

11. Validation Plan

11.1 Data Quality Objectives and Indicators

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

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

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

A checklist of Data Quality Indicators (DQI) in accordance with NEPC (2013) Schedule B2 is to be completed as part of the validation assessment. The DQIs are:

- Documentation completeness;
- Data completeness;
- Data comparability and representativeness; and
- Data precision and accuracy.

Based on a fulfilment of the DQOs and DQIs an assessment of the overall data quality is to be presented in the validation assessment report.

11.2 Site Inspections

The Environmental Consultant is to conduct periodic site inspections during each phase of the remediation works and when any issue of concern is identified. A record of the inspections and observations is to be provided as part of the Validation Assessment Report. This is to include a photographic record.

11.3 Validation Inspection and Sampling

Remediation of the areas requiring remediation (around BH3 and BH6 as identified in Section 6.1) are considered complete upon removal and disposal off-site of the contaminated soils or the appropriate construction of the capping barriers (concrete slab and pavements).

Validation inspections are required at various stages of the remediation works and the following describes the requirements for the various types of validation inspections and sampling events anticipated to be required.

Validation of Asbestos Clearance (post demolition)

When inspecting areas for the presence of ACM at the surface, this is to be undertaken on a 3 m x 3 m cross grid pattern to confirm the absence of any visual identifiable asbestos. This can be undertaken by either the Environmental Consultant or the Occupational Hygienist.

Validation for Removal of Contaminated Soils for Off-site Disposal

For removal of contaminated soil for off-site disposal, inspection is required on completion of excavation to confirm removal of all contaminated soils within the remediation area has occurred. The environmental consultant will validate the excavation footprint as follows:

- Visual inspection of the excavation;
- Sampling and analysis of the soil by the environmental consultant with reference to NEPC (2013) and guidelines as follows:
- For small to medium excavations (base <500 m^2):
  - Base of excavation: one sample per 25-50 m^2 or part thereof; and
  - Walls of excavation: one sample per 10 linear metres and one sample per 1.5 m vertical height along the excavation side walls. Sample depths and materials to be logged in each case.
- For large excavations (>500 m^2):
  - Base of excavation: sampling on a grid at a density in accordance with the EPA *Contaminated Sites: Sampling Design Guidelines* (1995); and
  - Walls of excavation: one sample per 15 linear metres and one sample per 1.5 m vertical height along the excavation side walls. Sample depths and materials to be logged in each case noting that validation samples at multiple depths may be required based on the observations of the environmental consultant.
- Analysis of collected samples for (as a minimum) the contaminants of concern (such as lead, PAH (including B(a)P), TRH, OCP and asbestos) respective to the source of the material;
- Where the reported concentration of the COC are greater than the RAC, further chase out of that location will be required and steps 1 to 3 will be repeated. The additional soil generated during the chase out will require remediation with reference to Section 6; and
- A record of the validation is to be kept and included as part of the final validation report.

Validation of Capped Areas

Inspections of areas to be capped (around BH3 and BH6 and any additional identified in Section 6.1) are required at the completion of the earthworks and prior to installation of the marker layer to confirm no significant contamination of concern is present on the surface. Subsequent inspections are also required following installation of the marker layer and on completion of the capping. The following is also to be noted:

- The boundaries and reduced levels of each area to be capped will be surveyed;
- The principal contractor is to coordinate survey levels to be collected at the following hold points with a visual observation undertaken by the environmental consultant:
  - At the laying of the marker layer; and
  - At the completion of the construction of the physical barrier system (building slab).

The observations and survey information will form part of the final validation report.

Validation of Stockpiled Material

In the scenario that contaminated soils are temporarily stockpiled in areas of the site which have been capped, validated following the removal of contaminated soils or in an area which do not require remediation, the environmental consultant is to validate the stockpile footprint as follows:

- Visual inspection of stockpile footprint;
- Sampling and analysis of the soil by the environmental consultant with reference to NEPC (2013) and guidelines. Sampling is to be at a rate of one sample per 25-50 m^2 or part thereof and a minimum of three samples;
- Analysis of collected samples for (as a minimum) the contaminants of concern (such as lead, PAH (including B(a)P), TRH, OCP and asbestos) respective to the source of the material;
- Where the reported concentration of the COC is greater than the RAC, further excavation of the surface soils will be required and the validation process repeated (as outlined above). The additional soil generated during the chase out will require remediation with reference to Section 6; and
- A record of the validation is to be kept and included as part of the final validation.

Validation of Unexpected Finds

For areas subject to unexpected finds, soil validation sampling is likely to be required. The sampling rate adopted by the Environmental Consultant is to be reflective of the works being assessed, area and risk. In this regard, reference should be made to the NSW EPA *Sampling Design Guidelines 1995* for general validation of areas and to the WA DOH (2009) for validation associated with asbestos impacted areas.

Results of the validation sampling are to be compared to the RAC as outlined in Section 7.

11.4 Documentation Requirements

The following documents will need to be reviewed as part of the validation assessment by the Environmental Consultant. These are to include and be provided to the Environmental Consultant by the relevant parties.

- Any Licences and Approvals required for the remediation works;
- Transportation Record: this will comprise a record of all truck-loads of soil entering or leaving the site, including truck identification (e.g., registration number), date, time, load characteristics (i.e., classification, on-site source, destination);
- Disposal dockets: for any soil materials disposed off-site, the contractor will supply records of: transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility (i.e., the receiving sites transportation records, WasteLocate tracking for asbestos, etc.);
- Imported materials records: records for any soil imported onto the site, including source site, classification reports, inspection records of soil upon receipt at site and transportation records;
- Records relating to the marker layers properties (data sheets) and delivery of the materials to site;
- Records relating to any unexpected finds and contingency plans implemented;
- Incident Reports: any WHS or Environmental Incidents which occur during the works will be documented and the PR and appropriate regulatory authority will be informed in accordance with regulatory requirements;
- Laboratory certificates and chain-of-custody documentation;
- Letters / memos as required to provide instruction or information to the Principal and Contractor;
- Airborne asbestos monitoring records (if required);
- Visual clearance or asbestos removal records (if required);
- Inspections records from the Environmental Consultant and Occupational Hygienist; and
- Surveys of the levels of the remediated areas as outlined in Sections 6, including any other relevant construction quality assurance documents.

11.5 Validation Reporting

A validation assessment report is to be prepared for the site by the Environmental Consultant in accordance with NSW EPA *Guidelines for Consultants Reporting on Contaminated Land. Contaminated Land Guidelines: NSW Environment Protection Authority* (NSW EPA 2020) and other appropriate guidance documentation. The validation report shall describe the methodology, results and conclusion of the assessment and make a clear statement regarding the suitability of the remediated areas (i.e. areas subject to subsurface disturbance) for the proposed land use as student housing with limited access to soil (Residential B). It is also to provide details of any ongoing (post construction) environmental management requirements (i.e., a LTEMP) in order to maintain the remediation system (i.e., ensure the integrity of the capping system over time).

12. Sample Collection and Analysis Requirements

12.1 Field Methods

When required, the following general sampling methodology is to be implemented for all soil sampling:

- Preparing records of samples, including sample date, location, description, signs of concern, and any field results;
- Sampling from surface or from the utilised plant using disposable sampling equipment or stainless steel hand tools;
- Decontaminating all re-useable sampling equipment prior to collecting each sample using a 3% solution of phosphate free detergent (Decon 90, Liquinox or equivalent) and distilled water;
- Transferring samples into a sealable plastic bag, and then placement in a second plastic bag/ sealed container (i.e., double bagging) (for asbestos analysis);
- Transferring samples into laboratory-prepared glass jars with Teflon-lined lid, and capping immediately (for chemical analytes);
- Labelling sample containers with individual and unique identification, including project number and sample number;
- Placing the samples in plastic bags for asbestos analysis into a sealed container for transport to the laboratory;
- Placing the glass jars for chemical analysis into a cooled, insulated and sealed container for transport to the laboratory; and
- Using chain-of-custody documentation so that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

12.2 Laboratory Analysis

Laboratory analysis of all samples is to be undertaken by laboratories with NATA accreditation for the analyte being tested and with appropriate QA/QC assessment. It is noted the FA/AF asbestos analysis as per NEPC (2013) is not a NATA accredited laboratory test and hence is exempt from this requirement.

At least two laboratories will be required to undertake the testing, a primary laboratory, and secondary laboratory which will analyse inter-laboratory replicate samples. In this regard replicates are to be analysed at a rate of 1 replicate sample per 10 primary samples. At least 50% of the replicates are to comprise inter-laboratory analysis.

Samples are to be analysed for the contaminants of concern identified for the sampling purpose. These contaminants are to be identified based on available laboratory results from previous testing, field observations and the objective of the analysis. The primary contaminants of concern identified to date are lead, PAH (including B(a)P), TRH, OCP and asbestos.

13. Environmental Management During Remediation and Construction

A construction environmental management plan (CEMP) is to be followed in conjunction with any other environmental management protocols stipulated in relevant SafeWork NSW, Australian Standard, Council and / or development consent conditions requirements. The CEMP shall be provided by the remediation and construction contractor(s). As a minimum, the site specific CEMP shall detail the following:

- Works sequence and timeline;
- Health and Safety Protocols;
- Dust minimisation measures;
- Noise minimisation measures;
- Environment protection measures;
- Equipment to be used;
- Nominated landfill(s);
- Truck movements / site access / site egress;
- Proposed source(s) of materials for import, and methods of certification;
- Method(s) for surveying before and after physical barrier construction;
- Measures to prevent cross contamination between areas being remediated and those already remediated or not subject to remediation; and
- Method(s) for inspecting and certifying construction of the physical barrier systems or contaminated soil removal, including any hold points (*may be organised and commissioned by the Principal*).

The remediation and construction works shall be undertaken with all due regard to the minimisation of environmental effects and to meet all statutory requirements. The successful contractor shall have in place the site specific CEMP such that work on the site complies with the requirements as laid down in relevant legislation, guidelines and codes.

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

- Fugitive dust leaving the confines of the site is mitigated;
- No water containing any suspended matter or contaminants leaves the site in a manner which could pollute the environment;
- Vehicles shall be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas; and
- Noise and vibration levels at the site boundaries comply with the legislative requirements.

The appointed remediation and construction contractors will be provided with a copy of this RAP and any other site management plans (e.g., CEMP) so that they are aware of the contamination status of the soils and building materials and the remediation methodology to be adopted.

The following sub-sections provide details of the environmental management practices to be employed as a minimum at the site in order to minimise and / or prevent environmental impact as a result of the remediation and / or construction works. Again, it is noted that other statutory requirements must also be followed.

The following is intended for the period during development of the site. A separate environmental management plan for long-term management of the site will be required following completion of works.

13.1 Site Delineation

Each stage of remediation and construction is to be appropriately fenced off from the remainder of the property (where appropriate). The fencing will be designed to:

- Prevent unauthorised entry to the work site;
- Minimise the potential for cross contamination between areas requiring and not requiring remediation; and
- Capture and contain minor dust generation.

The fencing alignment applicable to each stage of works is to be included in the CEMP.

13.2 Dust Control

During working hours, water sprays are to be used to keep the surface of any works areas and stockpiled soils (which will be kept to a minimum) reasonably damp, in order to suppress any dust. Water used for dust suppression is to be only the minimum required to reduce dust generation and must not to be allowed to escape the confines of the works areas. If excessive dust is being generated, works are to cease until the dust is sufficiently suppressed.

During non-working hours, all soil stockpiles impacted or potentially impacted by contaminated materials are to be covered with plastic, securely weighted to ensure they are not blown away by strong winds.

Should asbestos be identified by the HAZMAT survey (Section 6.1) or in soils, air monitoring will be required during removal of asbestos from buildings and when handling / exposed soils impacted by ACM are on site, as directed by the Occupational Hygienist. Air monitoring devices are to be kept at locations nominated by an appointed Occupational Hygienist, which will generally be at the works area boundaries. If asbestos fibres are detected during the course of the works above acceptable limits, the remediation works will cease, and dust prevention measures improved. Should asbestos be identified in either the buildings or in the soil, then information regarding asbestos air monitoring requirements is to be incorporated into the AMP.

13.3 Soil / Sediment Containment

Industry standard sediment control measures (such as outlined in the 'blue book'), including sediment fencing and / or hay bales, shall be installed where there is a potential for sediment to spill outside the construction area, neighbouring properties, public roads or the stormwater drainage lines.

The sediment control measures shall be regularly inspected and maintained by the site foreman. The Contractor is to carry out regular inspections.

13.4 Noise Management

Noise impacts will generally result from the excavators, truck movements and construction equipment within the site and surrounding streets, all of which have noise levels within levels normally expected at a construction site.

In order to minimise noise impacts during the remediation works, the following measures are to be implemented:

- Construction noise is to be confined to the hours stipulated by the development consent. No machinery / trucks are to be permitted access to the site outside these hours of operation;
- Signage at the site entrance providing contact details for the site superintendent, so that noise complaints can be readily addressed;
- Establishment and monitoring of a complaints log;
- All equipment and machinery are to comply with regulatory standards for noise generation;
- Fitting mobile equipment with exhaust mufflers, when and if required; and
- Adopting traffic management measures to reduce noise.

13.5 Odour Control

In order to control odours at the site boundaries, the following processes are to be adopted:

- All plant and equipment exhaust levels are to be monitored by the site foreman / superintendent to ensure acceptable levels. If unacceptable levels are determined, the equipment is to be replaced or repaired;
- If strong hydrocarbon odours are detected from any of the machinery a hydrocarbon mitigating agent is to be used;
- A complaints register is to be set up on-site for recording complaints, adjacent residents, etc., with respect to odours or dust. The complaints register is to be completed by the Site Superintendent, as well as the corrective actions implemented; and
- Once a complaint is received, the site superintendent is to implement a corrective action to rectify any problems associated with the odour or dust source.

Investigations performed to date have not identified any volatile contaminants in the soil that could generate odours and, therefore, odours are not anticipated or expected to be significant. If, however, odours are detected during the works the following protocol will be applied:

- Odour source and type of odour to be investigated by the Environmental Consultant. This could include air monitoring or sampling of any suspect media in addition to observations of physical conditions;
- Temporary covering of the source to mitigate odours whilst waiting for monitoring / analytical results. This could include the temporary reinstatement of ground conditions; and
- Assessing more permanent ways of dealing with the issue. This is to include disposal of odorous material off site, the use of masking agents or the controlled progressive excavation etc.

The re-use of odorous soils for construction purposes are not be undertaken unless the material has been aerated or suitably treated and the odorous material assessed by the Environmental Consultant to be suitable and the odour to have adequately attenuated.

14. Worker Health and Safety

A site specific WHS Plan is to be prepared and submitted for approval to the Principal by the appointed remediation and construction contractor(s). Detailed plans, such as for asbestos removal from buildings and associated monitoring, the CEMP, etc., are, where appropriate, to be incorporated or appended to the WHS plan.

15. Unexpected Finds Protocol and Contingency Plan

15.1 Unexpected Finds Protocol

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

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

Should signs of concern be observed, the contractor is to, as soon as practical:

- Place barricades around the affected area and cease work in that area. Covering of the surface with a geofabric or similar is also to be undertaken, where required;
- 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 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 required to notify (e.g., EPA, Council).

Following the immediate response in the UFP a contingency plan is to be implemented.

15.2 Contingency Plan

The contingency plan for the site is as follows:

- The Environmental Consultant (or Occupational Hygienist as appropriate) to inspect the issue of concern and determine the nature of the issue and the appropriate approach to assessing or (if appropriate) managing the issue;
- The Environmental Consultant (or Occupational Hygienist as appropriate) to undertake an assessment considered necessary to determine the management strategy for the area;
- If contamination is found and remediation action is considered necessary, a remediation strategy for the area is to be prepared by the Environmental Consultant; and
- If the area or proposed remediation strategy is significantly different than that detailed in the RAP, the Consent Authority or Private Certifier (as appropriate) is to be provided notification of the proposed works.

16. Future Requirements - Environmental Management Plan

On completion of each stage of the redevelopment, and assuming a cap and contain approach will be implemented for at least some areas, a long-term post construction environmental management plan (LTEMP) is to be developed for the site. This should outline the management practices to be implemented to prevent damage or degradation of the capping layer and hence protect its integrity. It is also to outline processes to repair and make good the capping in the event of planned or inadvertent breaches such that related risks are mitigated and potential exposure of site users to the contaminated soils is minimised.

In summary, the LTEMP is required to be developed by a suitably qualified Environmental Consultant and appropriate public notification of the plan for the site is to be undertaken. Typically, this forms Council notifying the presence of the LTEMP on the site's Section 10.7 Planning Certificate.

17. Conclusions

It is considered that the areas requiring remediation can be rendered suitable following the proposed student housing redevelopment subject to appropriate remediation, management, and site validation in accordance with this RAP.

The success of the remediation is to be validated and reported as outlined herein.

Prior to commencing the construction works, the Environmental Consultant is to be informed of the proposed remedial approach to be adopted for each stage. If there are any proposed changes to the remediation approach outlined herein, this RAP must be updated in consultation with the relevant parties.

18. Limitations

Douglas Partners (DP) has prepared this remediation action plan (RAP) for this project at 90 - 102 Regent Street, Redfern in accordance with DP's proposal SYD190418 variation dated 6 October 2020 and acceptance received from The Trust Company (Australia) Limited ATF WH Regent Trust dated 7 October 2020. The work was carried out under DP's Conditions of Engagement (with added Trustee Limitation of Liability Clause). This RAP is provided for the exclusive use of The Trust Company (Australia) Limited ATF WH Regent Trust for this project only and for the purposes as described in the RAP. 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 RAP 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 RAP, DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the RAP 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 previous detailed site (contamination) investigation was carried out by DP. 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 the previous detailed site (contamination) investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

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

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

Douglas Partners Pty Ltd

Appendix A

About This Report

Drawings

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

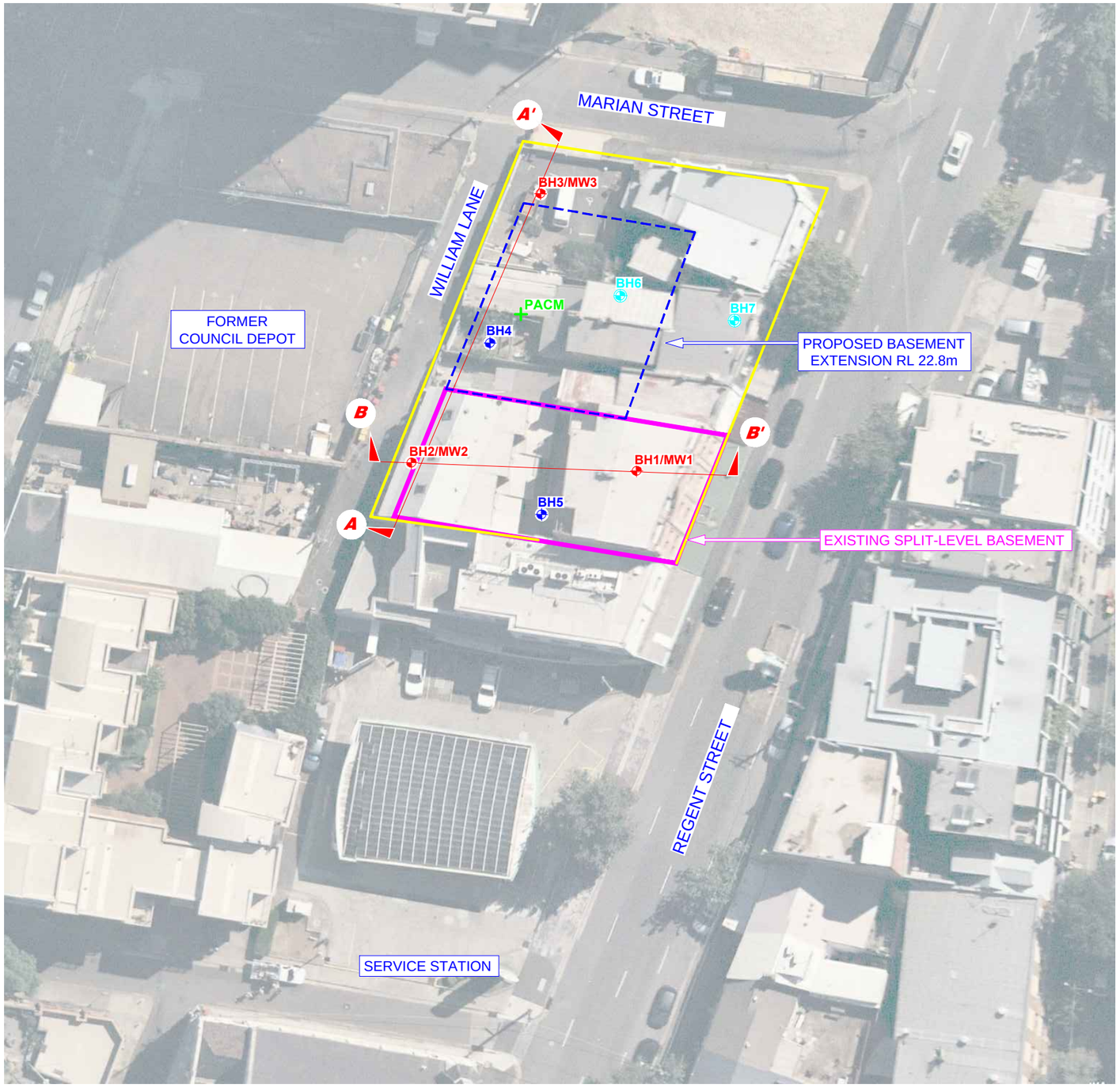
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later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

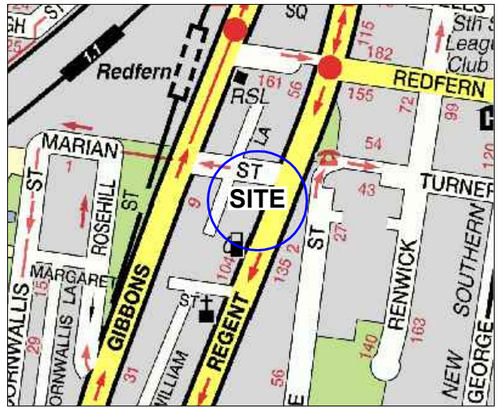
Information for Contractual Purposes

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.





Locality Plan

LEGEND

- Auger borehole to rock
- Rock cored borehole/ Groundwater well
- Shallow hand auger borehole
- PACM - Material Surface Sample
- Site Boundary
- A — A' Geotechnical Cross-Section A-A'

NOTE:
1: Base image from Nearmap.com (Dated 04.03.2019)

0 5 10 15 20 30 40 50m

1:500 @ A3

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	The Trust Company (Australia) Limited ATF WH Regent Trust	TITLE:	**Site and Test Locations** **Proposed Student Housing Development** **90-102 Regent Street, REDFERN**
OFFICE: Sydney	DRAWN BY: JDB		
SCALE: 1:500 @ A3	DATE: 2/10/2020		

N

PROJECT No:	86852.02
DRAWING No:	1
REVISION:	0

A

A'

116 REGENT STREET / SERVICE STATION

MARIAN STREET

BH2
Offset 0.5m

BH4
Offset - 1.8m

BH3
Offset - 0.2m

EXISTING BASEMENT (UPPER LEVEL)

RL 23.0m

EXISTING BASEMENT (LOWER LEVEL)

PROPOSED BASEMENT EXTENSION RL 22.8m

PAVEMENT MATERIALS / FILL

SANDY CLAY: Generally Firm

SILTY CLAY: Very Stiff and Hard

LAMINITE: Very Low and Low Strength

LAMINITE AND SILTSTONE: Medium and High Strength

N = 1
s
N = 14
st
N = 26
vst
N = 26
refusal
h
N = 33
VL
EL & VL
M
H
H
H
H

VL-L
M-H
VL
M
H
H

Bottom Depth 13.69 m

Bottom Depth 7.3 m

Bottom Depth 20 m

ELEVATION (AHD)

26 24 22 20 18 16 14 12 10 8 6

0 5 10 15 20 25 30 35 40 45 50

DISTANCE ALONG PROFILE (m)

NOTES:
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs included only and should be read in conjunction with detailed logs.

LEGEND

- Core Loss
- Asphaltic Concrete
- Bricks
- Concrete
- Fill
- Laminite
- Sandy Clay
- Siltstone
- Silty Clay

ROCK STRENGTH
VL - Very low
L - Low
M - Medium
H - High

SOIL STRENGTH
vl - Very loose
l - Loose
md - Medium dense
d - Dense
vd - Very dense
s - Soft
f - Firm
st - Stiff
vst - Very stiff
h - Hard

TESTS / OTHER
N - Standard penetration test value
- Water level
- Existing Basement (Upper Level)
- Existing Basement (Lower Level)
- Proposed Basement Extension
- Interpreted geological boundary

0 3
Horizontal Scale (metres)

Vertical Exaggeration = 1.5

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: The Trust Company (Australia) Limited ATF WH Regent Trust		TITLE: **Interpreted Geotechnical Cross-section A-A'**	PROJECT No: 86852.02
OFFICE: Sydney	DRAWN BY: IT	**Proposed Student Housing Development**	DRAWING No: 2
SCALE: 1:150 (H) 1:100 (V) @ A3	DATE: 29.09.2020	**90-102 Regent Street, REDFERN**	REVISION: 1

B

B'

WILLIAM LANE

REGENT STREET

BH2
Offset - 0.1m

BH5
Offset - 4.8m

BH1
Offset - 0.1m

EXISTING BASEMENT (UPPER LEVEL)

PROPOSED BASEMENT EXTENSION RL 22.8m

EXISTING BASEMENT (LOWER LEVEL) RL. 23.0m

CONCRETE / FILL

SANDY CLAY: Generally Firm

CONCRETE / FILL

SILTY CLAY:
Appears Stiff to Hard

LAMINITE:
Very Low and Low to Medium Strength

LAMINITE AND SILTSTONE:
Medium and High Strength

LAMINITE:
Low to Medium Strength

Bottom Depth 6.2 m

Bottom Depth 13.69 m

Bottom Depth 12.9 m

VL-L
M-H
VL
M
H
H
L-M
VL & L-M
L-M
H
M
H

ELEVATION (AHD)

26 24 22 20 18 16 14 12 10 8 6

-5 0 5 10 15 20 25 30 35 40 45

DISTANCE ALONG PROFILE (m)

NOTES:
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs included only and should be read in conjunction with detailed logs.

LEGEND

- Core Loss
- Concrete
- Fill
- Laminite
- Sandy Clay
- Siltstone
- Silty Clay

ROCK STRENGTH
VL - Very low
L - Low
M - Medium
H - High

SOIL STRENGTH
vl - Very loose
l - Loose
md - Medium dense
d - Dense
vd - Very dense
s - Soft
f - Firm
st - Stiff
vst - Very stiff
h - Hard

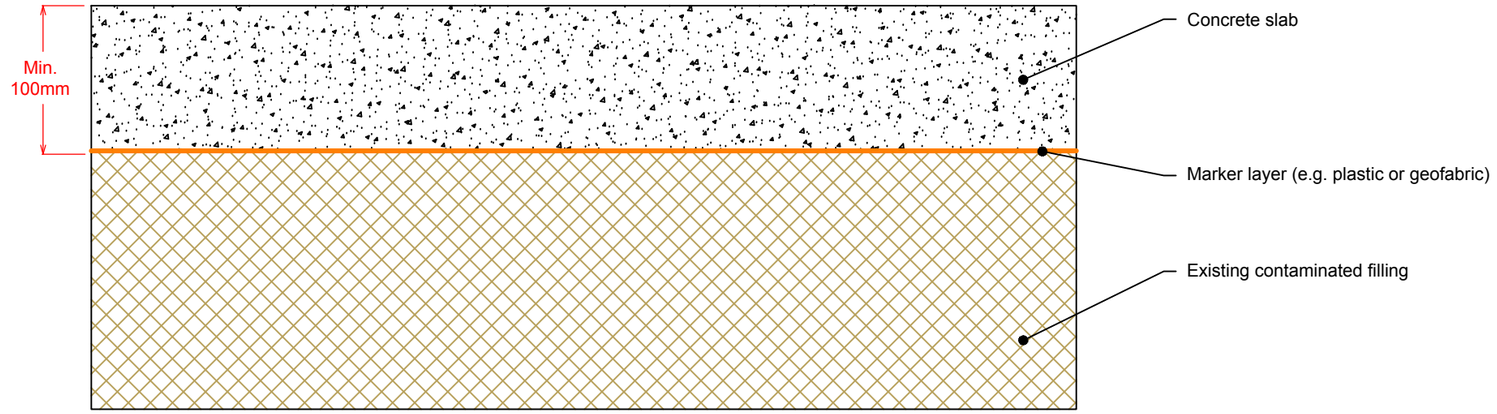
TESTS / OTHER
N - Standard penetration test value
- Water level
- Existing Basement (Upper Level)
- Existing Basement (Lower Level)
- Proposed Basement Extension
- Interpreted geological boundary

0 3
Horizontal Scale (metres)
Vertical Exaggeration = 1.5

Douglas Partners
Geotechnics / Environment / Groundwater

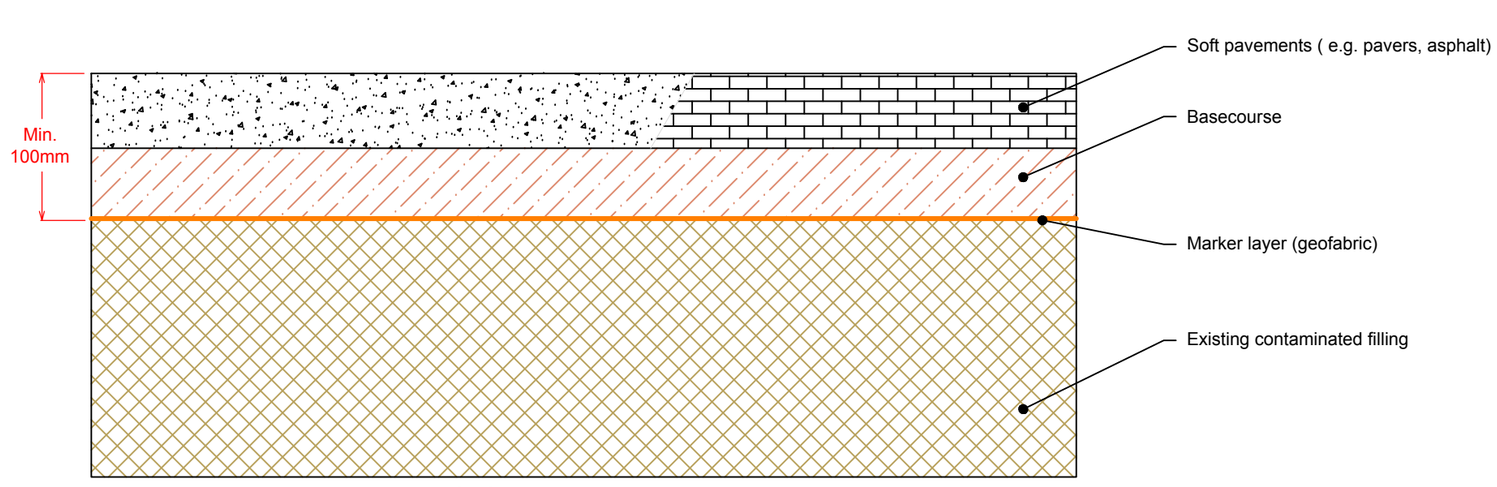
CLIENT: The Trust Company (Australia) Limited ATF WH Regent Trust		TITLE: **Interpreted Geotechnical Cross-section B-B'**	PROJECT No: 86852.02
OFFICE: Sydney	DRAWN BY: IT	**Proposed Student Housing Development**	DRAWING No: 3
SCALE: 1:150 (H) 1:100 (V) @ A3	DATE: 29.09.2020	**90-102 Regent Street, REDFERN**	REVISION: 1

NOTE:
Refer to structural/ civil drawings for information on concrete slab requirements



Concrete Slab (sketch)

NOTE:
Refer to civil/ landscape drawings for information on pavement requirements



Soft Pavements (sketch)

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: The Trust Company (Australia) Limited ATF WH Regent Trust	TITLE: **Capping Mitigation Measures - Hard Stands** **Remediation Action Plan** **90 - 102 Regent Street, REDFERN**	PROJECT No: 86852.02
	OFFICE: Sydney / DRAWN BY: LT		DRAWING No: 4
	SCALE: N.T.S. / DATE: 26.10.2020		REVISION: 0