Douglas Partners
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Integrated Practical Solutions

Remediation Action Plan

DaCA and Social Science Buildings
30-32 Redmyre Road and 3 Margaret Street,
Strathfield

Prepared for
Meriden School

Project 204585.03
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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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Executive Summary

Douglas Partners Pty Ltd (DP) has been engaged by Carmichael Tompkins Property Group Pty Limited on behalf of Meriden School to complete this Remediation Action Plan (RAP) for the proposed Design and Creative Arts (DaCA) and Social Science Buildings at Meriden School, 30-32 Redmyre Road and 3 Margaret Street, Strathfield (the site).

It is understood that the proposed development will comprise the development of a new three storey DaCA building in the western section of the site with a two-level basement, in the eastern section of the site a new three storey social science building with a single basement level, including alterations to the existing administration building to provide internal connection to the proposed social science building, and demolition of an existing residential building in the far western end of the site to be used a staging area / temporary relocation of demountable structures, prior to its incorporation into the school grounds as an open space / landscaped area.

Previous investigations have identified exceedances of Tier 1 screening criteria of polycyclic aromatic hydrocarbons (PAH) as benzo(a)pyrene (B(a)P), B (a)P toxicity equivalent quotient [B(a)P TEQ]) and total PAH associated with inclusions of ash / charcoal in fill used in historic fill placed at the site. Isolated exceedances of metals (arsenic and lead) were also identified. Detection of asbestos was considered indicative of the potential for further asbestos given the investigation methods (boreholes) are not ideally suited to identifying asbestos in soils, and the presence of building materials (brick / tile) in surficial fill in areas.

The objectives of this RAP were 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.

A remediations options assessment was conducted considering economic, environmental and social impacts, with the preferred remediation strategy being determined as follows:

- Data gap investigation of any soils previously inaccessible for inspection / analysis, including footprints of existing buildings / hardstand post demolition and quantification of asbestos in soil impacts;
- Targeted excavation of any identified contamination exceeding the adopted remediation acceptance criteria (RAC) outside of bulk excavation areas;
- Further assessment of retained fill for site suitability as required, including development of site specific health investigation levels for PAH; and
- Excavation and off-site disposal of fill within proposed basement footprints and otherwise as required for site preparation works.

Contingency strategies are also provided for on-site management of fill and off-site disposal of all fill.

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

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1. Introduction

Douglas Partners Pty Ltd (DP) has been engaged by Carmichael Tompkins Property Group Pty Limited (CTPG) on behalf of Meriden School to complete this Remediation Action Plan (RAP) for or the proposed Design and Creative Arts (DaCA) and Social Science Buildings at Meriden School, 30-32 Redmyre Road and 3 Margaret Street, Strathfield. The site is shown on Drawing 1, Appendix A, and is divided into the following parts as relevant to previous investigations:

- The DaCA and Social Sciences Building areas – sited within the Secondary School Campus located 3 Margaret Street Strathfield; and
- 30-32 Redmyre Road – residential lot located adjacent to the west of the school site.

The investigation was undertaken in general accordance with DP's proposal 204585.03.P.001.Rev0 dated 27 February, and acceptance received from Robin Merrick of CTPG on behalf of Meriden School.

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) [the '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 these stated remediation objectives.

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 is understood that the report will be used to support a State Significant Development Application (SSDA) (SSD-39005127).

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

It is understood that the proposed development will comprise the development of a new three storey DaCA building in the western section of the site with a two-level basement, and in the eastern section of the site a new three storey social science building with a single basement level. Works are understood to also include alterations to the existing administration building to provide internal connection to the proposed Social Science building and the demolition / filling of the pool near the proposed social sciences building. Basement levels are understood to extent to approximately RL 8 to11 m (ground level RL of ~15 to16 m) relative to Australian Height Datum (AHD).

The lot at 30-32 Redmyre Road is understood to be proposed to be used for the temporary relocation of existing demountable buildings, and as a staging area for overall development works, prior to ultimately being developed into an area of open space / landscaping within the school grounds.

The works will also comprise the construction of peripheral open-space landscaping, walkways etc. around the new structures (DaCA / Social Sciences Buildings).

Relevant drawings of the proposed development are attached in Appendix A.

3. Scope of Work

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

- Summarise the findings of previous investigations used to inform the status of contamination and contamination risk at the site;
- Develop a conceptual site model (CSM) to list potential and likely contamination sources, pathways and receptor linkages to address potentially unacceptable risks to relevant environmental values from contamination;
- Define the anticipated extent of remediation;
- Assess potential approaches 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 and justify 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; and
- Include contingency plans and an unexpected finds protocol.

4. Site Description

Site Address	30-32 Redmyre Road and 3 Margaret Street, Strathfield
Legal Description	Lot 101, Deposited Plan 862040 (3 Margaret Street) Strata Plan 16610 (30-32 Redmyre Road)
Area	1,200 m^2 (Social Science building) 1,200 m^2 (DaCA building) 1,250 m^2 (30-32 Redmyre Road)
Zoning	R3 - Medium density residential
Local Council Area	Strathfield Council (SC)
Current Use	Secondary School
Surrounding Uses	North - Commercial / residential East - Commercial / residential South - School / residential West - Residential

The site is currently occupied by existing school structures including demountable sheds, fixed structures and open gassed areas, and a residential apartment building located at 30-32 Redymre Road.

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

Figure 1: Site Location. Red boundaries (the site) – 30-32 Redmyre Road (far left), proposed DaCA building (left) and Social Science building development areas (right); yellow boundary - secondary school campus.

5. Environmental Setting

Regional Topography	Regional topography generally slopes downwards to the north towards Strathfield station.
Site Topography	Site topography gently slopes to the north with levels ranging from approximately 18 to 15 m AHD.
Soil Landscape	The site is underlain by the Blacktown residual soil landscape group generally consisting of clay and silty clays.
Geology	The site is further underlain by Ashfield Shale of the Wianamatta group consisting of light to dark grey shale and laminite. It is noted that land further to the north (further across Redmyre Road) is underlain by alluvial / fluvial soils likely associated with valley areas and creek / tributaries of Powells Creek further to the north near Strathfield Station.
Acid Sulfate Soils	The site is noted to be located in an area of extremely low probability of occurrence of acid sulfate soils (ASS).

Surface Water	The nearest surface water body receptor is Powells Creek located approximately 450 m to the north which in turn discharges into Homebush Bay.
Groundwater	No registered groundwater wells were noted within the vicinity of the site. Based on topography groundwater is anticipated to flow towards the north towards Powell Creek.

6. Previous Reports and Site History

6.1 Previous Reports

The following previous reports are relevant to this RAP:

- Preliminary Site Investigation (Contamination) (DP, 2014a);
- Factual Report on Contamination Testing (DP, 2014b);
- Preliminary Site Investigation for Contamination - Meriden Centre of Music and Drama (DP, 2019);
- Detailed Site Investigation (Contamination) (DSI) (DP, 2022) ;and
- Preliminary Site Investigation (DP, 2023)

The DSI (DP, 2022) comprised targeted investigation of the currently proposed DaCA and Social Science building areas, and also included a review of the above reports which were previously conducted for the larger secondary school campus and the nearby Meriden Centre within the school campus, including a review of the site history and the previous intrusive testing which has been summarised below in the following sections.

A supplementary PSI (DP, 2023) was completed for the additional lot at 30-32 Redmyre Road to facilitate its inclusion within this RAP, which comprised a desktop review, a site walkover and review of previous results to assess the potential contamination risks, and whether they were likely similar in nature to those previous assessed in the DSI (DP, 2022).

6.2 Site History Summary

A review of historical aerial imagery indicated the larger secondary school site was occupied by a mixture of residential buildings and two school buildings from 1930, with continued expansion and redevelopment of the secondary school campus. Historical title deeds obtained indicate that the second school campus was previously subdivided into multiple lots with residential ownership and ownership by the Meriden School noted for certain previous lots as early as 1929, with additional acquisitions of the residential lots by the school in the 1930s, 1940s, 1950s, 1960s and 1980s.

30-32 Redmyre Road was apparently used for residential purposes from at least 1943. In 1943 the area had small residential dwellings in close proximity of each other that covered most of the area. This layout remained until at least 1971, until circa 1986 where the site was redeveloped with the configuration being apparently similar to the current layout.

Impacts from previous land-uses were therefore previously considered to be potentially relating to the demolition of structures (including hazardous building materials such as asbestos containing materials (ACM)) and fill associated with residential properties, which may include historic use of waste such as incinerator waste typical within inner-city areas. The supplementary PSI (DP, 2023) concluded that similar risks were present at 30-32 Redmyre Road (i.e., to the secondary school area).

A review of the Section 149 (2) Planning Certificate (circa 2013) and newer Section 10.7 Planning Certificate (circa 2018) did not identify any notable records associated with the secondary school campus. A review of current EPA registers did not identify any relevant records for the site.

6.3 Field Work Results

Previous field work as relating to the larger secondary school campus indicated a general ground profile of shallow fill of up to 1.1 m with inclusions of gravel, concrete, terracotta, charcoal and ash. As relating to the current site (DaCA and Social Sciences Buildings), the ground profile was more recently summarised as:

- FILL: sandy clay, silty clay and silty sand fill, with inclusions of rootlets, gravel, asphaltic concrete fragments, charcoal to depths of up to 0.3 m to 1.2 m below ground level (bgl);
- Silty CLAY: red-brown / yellow-brown mottled grey, pale orange-brown residual clays, with inclusions of ironstone gravel to depths of up to 2.0 m to2.75 m bgl; overlying; and
- INTERLAMINATED SILTSTONE / SANDSTONE: brown and dark grey siltstone interlaminated with fine grained sandstone to the limit of investigation (10.2 m bgl).

No other obvious signs of contamination e.g., staining or odours were previously identified. Photoionisation detector (PID) screening indicated the soils were generally free of volatile organic compounds (VOC).

A site walkover of 30-32 Redmyre Road noted the presence of brick and tile in fill present in a soil mound located in the north-western portion of the property. A fragment of potential asbestos containing material (PACM), i.e., fibre cement material, was identified in the northern landscaped areas. Based on proximity to the DaCA investigation area the below ground profile at 30-32 Redmyre Road was anticipated to be similar in nature.

6.4 Analytical Results

6.4.1 (DP, 2014a) (DP, 2014b)

Analytical results for the soil sampling (including limited testing near / within the current site) indicated elevated concentrations of polycyclic aromatic hydrocarbons (PAH) (3 to 40 mg/kg as Benzo(a)Pyrene TEQ [B(a)P TEQ]) from fill profiles containing ash and charcoal. Leachability testing on the samples indicated the contamination was immobile and therefore likely due to ash and charcoal visually observed in the filling. No other significant contamination was identified.

6.4.2 (DP, 2019)

All analytical results for testing locations to the south-east of the proposed DaCA building were found to be within the adopted assessment criteria except for PAH from one sample exceeding ecological based criteria (as 0.85 mg/kg benzo(a)pyrene (B(a)P), exceeding the adopted criterion of 0.7 mg/kg).

6.4.3 (DP, 2022)

The analytical results of the DSI were previously summarised as below in Table 2. Previous test locations are shown on Drawing 1, Appendix A, and results are provided in Appendix B.

Table 1: Summary of Results that Exceeded the Site Assessment Criteria

Location	Depth (m)	Ecological Criteria (Concentration | SAC) (mg/kg)	Health-Based Criteria (Concentration | SAC) (mg/kg)
BH1	0.4-0.5	B(a)P (6.3 | 0.7) B(a)P (4.5 | 0.7) *	B(a)P TEQ (9.1 | 3) B(a)P TEQ (6.5 | 3)*
BH2	0.4-0.5	B(a)P (3.3 | 0.7)	B(a)P TEQ (4.7 | 3)
BH6	0.3-0.4	Lead (500 | 300) B(a)P (3.6 | 0.7)	B(a)P TEQ (5.1 | 3)
BH7	0.3-0.4	Arsenic (250 | 100) B(a)P (0.9 | 0.7)	-
BH8	0.3-0.4	B(a)P (3.5 | 0.7) B(a)P (4 | 0.7) *	B(a)P TEQ (4.9 | 3) B(a)P TEQ (5.7 | 3)* Asbestos detected **
	0.9-1.0	B(a)P (5.7 | 0.7)	B(a)P TEQ (8.1 | 3)
BH9	0.1-0.2	B(a)P (4.1 | 0.7)	B(a)P TEQ (5.7 | 3)
	0.9-1.0	B(a)P (32 | 0.7)	B(a)P TEQ (44 | 3) Total PAH (350 | 300)
BH10	0.4-0.5	B(a)P (1.1 | 0.7)	-

* Duplicate result of primary sample at same depth

** Detected at below the reporting limit of 0.1g/kg

6.4.4 Summary and Discussion

Previous exceedances of B(a)P above the low reliability ecological criteria (ESL) of 0.7 mg/kg were not considered significant when compared to higher reliability screening levels published in CRC CARE *Risk-based Management and Remediation Guidance for Benzo(a)pyrene* (CRC CARE, 2017) of 33 mg/kg (21 mg/kg to 135 mg/kg, 95% percentile range).

Based on additional statistical analysis (summarised below in Table 2) it was that the detected exceedances of arsenic, lead, and total PAH did not indicate widespread contamination. However, the analysis did indicate likely widespread elevated concentrations of PAH (as benzo(a)pyrene [B(a)P] and B(a)P toxicity equivalent quotient [B(a)P TEQ]) and total PAH).

Table 2: Summary of Additional Statistical Analysis

Contaminant	Mean (mg/kg)	Standard deviation (mg/kg)	95% UCL (mg/kg)	95% UCL with outlier (mg/kg)	SAC (mg/kg)
Arsenic	7.1	2.6	8.4	83.7	100
Lead	86.1	77.8	120.2	194.4	300
B(a)P	2.5	2.1	3.4	9.1	0.7
B(a)P TEQ	3.7	2.9	4.9	11.4	3
Total PAH	26.5	24.5	37.2	111.3	300

Concentrations of B(a)P TEQ from the more recent 2022 investigation were considered similar to previous 2014 results, with the elevated concentrations considered associated with similar inclusions of ash, charcoal in fill (as identified in the borehole logs), and as per additional PAH fingerprint analysis, which indicated the PAH concentrations were indicative of PAH in ash from coal / coke combustion products. Leachable PAH concentrations were also observed to be low which further indicated the concentrations were attributable to immobile inclusions in fill, such ash or charcoal.

Detection of asbestos at one location was considered indicative of the potential for further asbestos given the investigation methods (boreholes) are not ideally suited to identifying asbestos in soils.

Based on the outcomes of the supplementary PSI (DP, 2023) it was considered that similar contamination risks were also present at 30-32 Redymre Road, and therefore that the existing remediation strategies discussed in Revision 1 of this RAP, i.e., the data gap investigation may also be applied to characterise this additional site area.

7. Initial Data Gap Investigation

As per Revision 1 of this RAP (dated June 2022), the remediation strategy included a task for data gap investigation for assessment of potential / known asbestos outside of building footprint areas, and to assess any building footprints / hardstand areas (refer Section 11.2.1).

To provide further planning information for the remediation works part of the recommended data gap investigation was conducted in April 2023 following issue of Revision 1 of the RAP, (i.e., prior to commencement of site / demolition works) as follows:

DaCA Area:

For the purposes of assessing asbestos previously detected at sampling location BH8 the following scope was conducted. Given previous results of PAH and metals in the area, opportunistic testing was also conducted to provide further information of these potential contaminants.

- Excavation of three test pits within in the eastern edge of the DaCA area, including one location near previous sample location BH8, and two other locations outside of the proposed basement / bulk excavation for the DaCA area. Test pits were extended until reaching natural soils;
- Collection of soil samples at regular intervals, changes in strata or based upon professional judgement, including sampling for general contaminants as identified in the CSM and ~10L bulk samples for asbestos quantification;
- Screening of samples using a PID to identify any VOC in soil;
- Assessment of asbestos in soil by screening the ~10L bulk samples through a 7 mm sieve to identify potential asbestos in soil;
- Analysis of recovered fill samples for
  - Asbestos (asbestos fines and fibrous asbestos), and asbestos identification in soil;
  - Eight metals / metalloids;
  - TRH; and
  - BTEX.

30-32 Redmyre Road

For the purposes of assessing potential asbestos in soils, and to provide limited characterisation of the additional site area the following scope was conducted:

- Excavation of five test pits the accessible northern part of the property, with two locations placed within visible fill mounds where suspect ACM was previously identified and the remainder for site coverage in accessible areas. Test pits were excavated until reaching natural soils;
- Collection of soil samples at regular intervals, changes in strata or based upon professional judgement, including sampling for general contaminants as identified in the CSM and ~10L bulk samples for asbestos quantification;
- Screening of samples using a PID to identify any VOC in soil;
- Assessment of asbestos in soil by screening the ~10L bulk samples through a 7 mm sieve to identify potential asbestos in soil;

- Analysis of recovered samples for:
  - Asbestos (asbestos fines and fibrous asbestos), and asbestos identification in soil;
  - Asbestos material identification (recovered potential ACM fragments);
  - Eight metals / metalloids;
  - TRH;
  - BTEX;
  - OCP;
  - OPP; and
  - Phenols.

Test locations for the initial data gap investigation are shown on Drawing 1, Appendix A.

7.1 Field Work Results

Test pit logs and asbestos field screening records from the data gap investigation are provided in Appendix B.

The below ground conditions encountered during the data gap investigation can be summarised as follows:

30-32 Redmyre Road:

- FILL: silty sand / clayey silt / silty clay, dark brown with inclusions of tile, terracotta, brick. To depths of up to 1.5 m bgl, with deeper fill present within the fill mounds. PACM fragments were recovered from two locations (TP14 and TP15); and
- CLAY: medium to high plasticity, orange mottled grey residual clay.

DaCA Area

- FILL: silty sand / silty clay, dark brown with inclusions of brick gravel, and ash. To depths of up to 1.2 m bgl.
- CLAY: medium to high plasticity, orange mottled grey residual clay.

7.1.1 Asbestos in Soil

Results of the on-site field screening of bulk samples is included below in Table 3. Asbestos in soil concentrations have been calculated using an assumed asbestos content of materials of 15%.

Table 3. Summary Asbestos in Soils (on-site field screening)

Sample ID	Depth (m)	Weight of Bulk Sample (g)	Weight of ACM recovered (g)	Asbestos in Soil (% w/w)
TP11	0-0.2	~10,000	0	-
TP11	0.2-0.5	~10,000	0	-
TP12	0-0.2	~10,000	0	-
TP12	0.2-0.2	~10,000	0	-
TP13	0-0.2	~10,000	0	--
TP13	0.2-0.5	~10,000	0	
TP14	0-0.4	~10,000	37 [a]	0.06%
TP14	0.4-0.8	~10,000	55 [a]	0.08%
TP14	0.8-1.4	~10,000	0	-
TP15	0-0.5	~10,000	221 [a]	0.33 %
TP15	0.5-1.0	~10,000	132 [a]	0.20 %
TP15	1.0-1.5	~10,000	0	-
TP16	0-0.3	~10,000	0	-
TP16	0.3-1.0	~10,000	0	-
TP16	1.0-1.2	~10,000	0	-
TP17	0-0.4	~10,000	0	-
TP17	0.4-0.6	~10,000	0	-
TP18	0-0.3	~10,000	0	-
TP18	0.3-0.7	~10,000	0	-

a – confirmed to contain asbestos per laboratory analysis (refer Table D1, Appendix D)

It is noted that only approximate bulk weights were obtained using a standard scale, and that ~10 kg samples were screened. Preferred methodology typically comprises up to ~16-20 kg samples (i.e., for a 10L sample, depending on soil density). However, it is considered that where asbestos was detected (> 7 mm) the recovered mass (later weighed on a laboratory scale) was significant enough that the estimated asbestos concentration in soil (% w/w) are in excess of the HSL (i.e., not borderline), particularly at TP15 (refer further discussion in Section 7.2 below).

7.2 Analytical Results

Analytical results are summarised on Table B1, Appendix B. Laboratory documentation for the data gap investigation results is provided in Appendix H[1]. Results of the data gap investigation were compared against the Remediation Acceptance Criteria (RAC) outlined in Revision 1 of the RAP (refer Section 12).

[1] Note attached laboratory documentation identifies the samples as BH11 to BH18, these correspond to TP11 to TP18 respectively

Table 4: Summary of the Initial Data Gap Investigation Analytical Results that Exceeded the Tier 1 Site Assessment Criteria

Location	Depth (m)	Ecological Criteria (Concentration | SAC) (mg/kg)	Health-Based Criteria (Concentration | SAC) (mg/kg)
TP11	0.3-0.5	B(a)P (1.4 | 0.7)	-
TP13	0-0.2	B(a)P (7.7 | 0.7) TRH F3 (460 | 300)	Asbestos detected (as AF/FA)* B(a)P TEQ (11 | 3)
TP13	0.3-0.5	B(a)P (3 | 0.7)	Asbestos detected (as AF/FA)* Lead (360 | 300) B(a)P TEQ (4.1| 3)
TP14	0-0.2	B(a)P (2.3 | 0.7)	Asbestos detected (as AF/FA)* Lead (940 | 300) B(a)P TEQ (3.3| 3)
TP14	0.4-0.6	B(a)P (0.79 | 0.7)	-
TP15	0-0.2	-	Asbestos detected
TP15	1.3-1.5	B(a)P (1.1 | 0.7)	-
TP16	0-0.2	B(a)P (1.5 | 0.7)	Asbestos detected (as AF/FA)*
TP17	0.4-0.6	B(a)P (1.6 | 0.7)	-

7.3 Discussion

7.3.1 30-32 Redmyre Road

Based on the field screening results, fill from TP14 and TP15 (to depths of up to 1.0 m bgl) are in excess of the asbestos in soil HSL of 0.01% w/w (HSL A) and 0.02% w/w (HSL C). The elevated fill mound in the northern part of the property is therefore considered likely to contain further unidentified asbestos.

Asbestos was also detected at TP13 in surficial soils (as AF/FA, but within the HSL of 0.001%), however given that the materials may be within the upper 10cm of soils it is considered that this is an effective exceedance of the RAC. Overall, it is considered that there is an elevated risk for further unidentified asbestos to be present in the soils in the northern area of 30-32 Redmyre Road (i.e., as low concentrations in surficial soils), and in any parts of the fill mounds in the area (including shallow and deeper fill).

Elevated lead concentrations above the adopted HIL were noted at TP13 (0.3-0.5 m) and TP 14 (0- 0.2 m).

A marginal exceedance of the adopted ESL for TRH (F3 C_{16}-C_{34}) was also detected at TP13 (0-0.2 m), however this is likely in part due to organic carbon content in the soils. However, given the detection of asbestos at this location necessitates the requirement for remediation at this location.

Similar elevated concentrations of BaP / BaP TEQ were identified, however the maximum concentrations for each were less than previous results and within the adopted RAC (Refer Section 12).

7.3.2 DaCA Area

Asbestos was not detected during field screening in the DaCA area, however, trace quantities of AF/FA was detected at TP16 (i.e., near former sample location BH8). Again, this concentration was within the adopted HSL of 0.001% w/w and given that the materials may be within the upper 10 cm of soils it is considered that this is also an effective exceedance of the RAC.

All other chemical analytes results are considered similar to previous results for the DaCA area, with minor elevated concentrations of BaP and metals (albeit within the current adopted RAC).

7.3.3 Preliminary Waste Classification (30-32 Redmyre Road)

Based on the elevated lead and BaP concentrations the materials within 30-32 Redymre Road will require further assessment once excavated to confirm their waste classification. Preliminarily results indicate concentrations are exceeding CT1 guidelines for General Solid Waste, however based on the aged nature and likely source of the contamination (e.g., ash / charcoal), further leachability assessment may lower the current preliminary classification.

The fill would also be preliminarily classified as Special Waste (asbestos) based on the current field screening and laboratory results. Subject to removal of the fill mounds (i.e., up to 1.0 m in this area) and otherwise stripping of surficial soils, any deeper fill may be excavated and stockpiled separately with further assessment required to establish the presence of any additional asbestos.

8. Conceptual Site Model

A Conceptual Site Model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e., it enables an assessment of the potential source - pathway - receptor linkages (complete pathways). The following CSM has been based off the CSM developed in the DSI report (DP, 2022) and supplementary PSI (DP, 2023).

Potential Sources (S)

Based on the current investigation, the following potential sources of contamination and associated contaminants of potential concern (CoPC) have been identified.

- S1: Fill: Associated with levelling and demolition of former buildings on the site;:
  - Various CoPC and may include metals, TRH, BTEX, PAH, PCB, OCP, OPP, phenols and asbestos.
- S2: Burial or use of incinerator ash as fill;
  - CoPC include metals, PAH TRH.

- S3: Hazardous building materials - demolition and deterioration of structures:
  - CoPC include asbestos, synthetic mineral fibres (SMF), lead (in paint) and PCB.

Potential Receptors (R)

The following potential human receptors have been identified:

- R1: Current users [educational i.e., students, teachers, staff and other site workers, and residential];
- R2: Construction and maintenance workers;
- R3: End users [educational]; and
- R4: Adjacent site users [residential / commercial].

The following potential environmental receptors have been identified:

- R5: Surface water [Powells Creek];
- R6: Groundwater; and
- R7: Terrestrial ecology.

Potential Pathways (P)

The following potential pathways have been identified:

- P1: Ingestion and dermal contact;
- P2: Inhalation of dust and / or vapours;
- P3: Surface water run-off;
- P4: Leaching of contaminants and vertical migration into groundwater;
- P5: Lateral migration of groundwater providing base flow to water bodies; and
- P6: Inhalation, ingestion and ecological absorption.

Summary of Potentially Complete Exposure Pathways

A 'source-pathway-receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 to S4) and receptors (R1 to R4) are provided in Table 3 below.

Currently pathways P3, P4 and P5 are not considered significant given that contaminants detected to date are not considered mobile and are therefore unlikely to leach into surface water / groundwater and migrate off-site. These pathways have however been left for source S1 to account for any potential unexpected finds in uncontrolled fill.

Table 5: Summary of Potentially Complete Exposure Pathways (Proposed Land Use)

Source and COPC	Transport Pathway	Receptor
S1: Fill COPC: Metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols and asbestos	P1: Ingestion and dermal contact P2: Inhalation of dust and / or vapours	R1: Current users [educational / residential] R2: Construction and maintenance workers R3: End users [educational]
	P2: Inhalation of dust and/or vapours	R4: Adjacent site users [residential / commercial]
	P3: Surface water run-off P4: Leaching of contaminants and vertical migration into groundwater	R5: Surface water
	P5: Lateral migration of groundwater providing base flow to water bodies	R6: Groundwater
	P6: Inhalation, ingestion, and absorption	R7: Terrestrial ecosystems
S2: Incinerator ash COPC: metals, PAH, TRH	P1: Ingestion and dermal contact P2: Inhalation of dust and/or vapours	R1: Current users [educational / residential] R2: Construction and maintenance workers R3: End users [educational]
S3: Hazardous building materials COPC: asbestos, lead, SMF, PCB	P1: Ingestion and dermal contact P2: Inhalation of dust and/or vapours	R1: Current users [educational] R2: Construction and maintenance workers R3: End users [educational]

9. Remediation Extent

The identified extent of remediation therefore currently comprises:

DaCA and Social Sciences Buildings:

- PAH contaminated fill: currently considered likely to include all fill beneath the site as being potentially contaminated with PAH as B(a)P TEQ and exceeding the previous Tier 1 assessment criteria (SAC);
- Possibly isolated metalloid / metal contamination, including arsenic (BH7) and lead (BH6); and
- Identified asbestos contamination:
  - BH8 / TP16 (surficial soils <0.2 m and potentially to ~0.5 m); and
  - Potential for further unexpected / unidentified asbestos finds in fill across the site.

30-32 Redmyre Road

- PAH contaminated fill: considered likely to be present beneath untested parts of the site as per the assessment in the neighbouring DaCA area exceeding the previous Tier 1 SAC;
- Lead contaminated soils at TP13 / TP14 (up to 0.5 m deep);
- Identified asbestos contamination:
  - TP13 (surficial soils <0.2 m);
  - TP14 / TP15 – fill mounds of depths of up to 1 m (and potentially up to 1.5 m); and
  - Potential for further asbestos finds in surficial fill in the northern landscaped area, and potential unidentified finds beneath existing structures / hardstand.
- Potential demolition impacts (i.e., due to incorrect / poor demolition practices).

Given the presence of existing structures (Social Sciences / 30-32 Redmyre Road) the actual extent (the final remediation extent) will be established at the completion of the excavation of the area during remediation, and following completion of the remaining proposed data gap assessments.

10. Remediation Options Assessment and Evaluation

The objective of the remediation options assessment and evaluation is to establish a preferred remediation strategy. The process involves identifying 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, with the preferred strategy outlined in Section 10 below.

11. Preferred Remediation Strategy

11.1 Rationale

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

- A data gap investigation of any soils previously inaccessible for inspection / analysis;
- Targeted excavation of any identified contamination outside of bulk excavation areas;
- Further assessment of retained fill for site suitability as required; and
- Excavation and off-site disposal of fill within proposed basement footprints.

Contingency Option 1

- On-site management of all fill; and otherwise; and
- Off-site disposal of any surplus fill.

Contingency Option 2

- Excavation and off-site disposal of all fill.

The sequency for the preferred strategy is outlined below in Section 10.2, and contingency strategies are outlined in Appendix E.

11.2 Sequence of Remediation

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

- Task 1: Data gap investigation:
  - Further data-gap investigation of the Social Science building area and 30-32 Redmyre Road following demolition;
  - Further assessment of suitability of fill soils against site specific health investigation levels and assessment of asbestos in soils against health screening levels.
- Task 2: Targeted excavation of any identified contamination exceeding the RAC outside of the proposed basement footprints e.g., additional finds or asbestos contamination above the RAC.
- Task 3: Site preparation works for 30-32 Redmyre Road
  - Waste classification of fill;
  - Off-site disposal of fill; and
  - Validation / further visual assessment upon reaching final bulk excavation levels.
- Task 4: Excavation of all fill from basement footprints / bulk excavation areas:
  - Waste classification of fill;
  - Off-site disposal of fill; and
  - Validation of excavation upon reaching natural soils.

11.2.1 Task 1: Data Gap Investigation

Building Footprints / Hardstand Areas

Following demolition of structures within the proposed development area the following process will apply:

- Visual inspection of the inspection area by an occupational hygienist or environmental consultant following removal of hardstand in the area. If suspected hazardous building materials are identified, it may be recommended to remove materials (with reference to Section 13) to a depth specified by the environmental consultant prior to proceeding to the following step;

- Excavation of test pits within the building footprints at the rates set out in Section 12.4, this is anticipated to comprise approximately three locations for structures within DaCA building area, six for the Social Science building area, and eight for 30-32 Redmyre Road. Test pits will be extended to 0.5 into natural soils, prior refusal or a nominal maximum depth of 3 m;
- Collection of soil samples at regular depth intervals, changes in strata or based on professional judgement, including sampling for general contaminants as identified in the CSM and ~10L bulk samples for asbestos quantification;
- Screening of samples using a PID to identify any VOC in soil;
- Assessment of asbestos in soil by screening the ~10L bulk samples through a 7mm sieve to identify any potential asbestos containing materials (PACM) in the soil. Representative PACM will be sent for further laboratory analysis to confirm or otherwise, the presence of asbestos in the materials;
- Analysis of recovered samples at least minimally for (or as otherwise advised by the environmental consultant) the following identified CoPC:
  - Metals;
  - PAH; and
  - Asbestos (asbestos fines and fibrous asbestos).
- Revision of this document to outline any additional contamination requiring management, or otherwise preparation of a supplementary remediation works plan. Alternatively, any similar contamination finds may be addressed using the existing strategies presented in this RAP.

Contingency: Asbestos Assessment (to characterise further finds if required)

The following will apply to areas outside of the proposed basement footprints / bulk excavation areas should further confirmed asbestos in soil is identified. As outlined in Section 7 of this RAP, this part of the data gap investigation has since been conducted following Revision 1 of the RAP for the eastern parts of the DaCA area and 30-32 Redmyre Road. The contingency comprises:

- Excavation of test pits within these areas at the densities set out in Section 12.4.
- Collection of soil samples at regular intervals, changes in strata or based upon professional judgement, including sampling for general contaminants as identified in the CSM and ~10L bulk samples for asbestos quantification;
- Screening of samples using a PID to identify any VOC in soil;
- Assessment of asbestos in soil by screening the ~10L bulk samples through a 7 mm sieve to identify potential asbestos in soil;
- Analysis of recovered fill samples for asbestos (asbestos fines and fibrous asbestos) where PACM is identified and otherwise to provide adequate lateral and vertical characterisation of fill; and
- Revision of this document to outline any additional contamination requiring management, or otherwise preparation of a supplementary works plan.

11.2.2 Task 2: Targeted Excavation of Contamination

For areas outside of the basement footprints / bulk excavation areas the following process will apply to identified contamination exceeding the adopted RAC.

This is anticipated to currently comprise:

DaCA Area

- BH9 (PAH); and
- BH8 / TP16 (surficial soils <0.2 m and potentially to ~0.5 m).

30-32 Redmyre Road

- TP13 to depths of 0.5 m, for identified surficial asbestos, and slightly deeper lead contamination; and
- TP14 / TP15 to remove fill mounds contaminated with asbestos and lead. Contamination has currently been identified to depths of 1.0 m bgl, however based on the total fill depth observed further contamination (notably asbestos) may be present to depths of up to 1.5 m.

Excavated soils from 30-32 Redmyre Road are recommended to be subject to further ex-situ leachability testing.

This sequence is generally considered appropriate for isolated exceedances only and where widespread exceedances of the adopted RAC are identified, the contingency capping strategy may be considered more appropriate.

For each location:

- Environmental consultant to define the extent of excavation, by default this will comprise excavation of 5 x 5 m around the previous test location and to the depth of the identified contamination (or otherwise to natural soils);
- Collection of validation samples from the walls and base of the excavation at the densities presented in Section 12.4;
- Where asbestos is a contaminant of concern: field screening of recovered 10 L samples through a 7mm sieve to identify any PACM;
- Laboratory analysis of recovered samples for the identified contaminants of concern, as specified by the Environmental Consultant; and
- Expansion of the excavation where results do not meet the RAC and repeating of the above steps until the validation results meet the RAC.

11.2.3 Task 3: 30-32 Redymre Road, Site Preparation Works

For the northern parts of 30-32 Redmyre Road the following will apply

- Removal of fill mounds and other targeted excavation in the area as per Task 2;
- Excavate / stripping of surficial fill from the area i.e., to a nominal depth of ~0.2 m, (or otherwise as required). This is generally expected to be required for the removal of existing garden beds and other landscaping features and for general levelling requirements;
- Confirmation of the formal waste classification of the soils by the Environmental Consultant prior to loading;

- Off-site disposal of soils to an appropriately licenced waste facility; and
- Visual inspection by the Environmental Consultant and collection of surficial soil samples for AF / FA at the densities set out in Section 13.4.

Excavated soils from 30-32 Redmyre Road are recommended to be subject to further ex-situ leachability testing. Excavation of deeper fill may then allow for further assessment of stockpiled soils to establish whether further asbestos may be present in the soils.

11.2.4 Task 4: Bulk Excavation of Fill

For areas within the proposed basement footprints / bulk excavation areas the following process will then apply, following completion of the data gap investigations:

- Excavate and stockpile fill from the excavation area;
- Test pitting into the formed stockpiles at the rates set out in Section 12.4 and inspection by the environmental consultant;
- Collection of soil samples to meet the specified densities outlined as per the point above, where practicable this will include previous in situ sampling data to reduce additional analysis;
- Confirmation of the formal waste classification of the soils by the environmental consultant prior to loading; and
- Off-site disposal of soils to an appropriately licenced facility.

It is noted that where space is not available for stockpiling then the direct loading of soils may be conducted. However, this will present a higher risk for certain potential contaminants (e.g., asbestos in soils) in which case some degree of inspection during excavation by the environmental consultant is recommended. This may be recommended as the preferred option depending on the results of the data gap investigation (Section 10.2.1).

12. Assessment Criteria

12.1 Remediation Acceptance Criteria

In the absence of the 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 site assessment criteria (SAC) adopted in DP (2022), protective of human health and the environment. The following table provides a summary of the adopted RAC.

Table 6: Remediation Acceptance Criteria

Item	Remediation Acceptance Criteria
Ash / charcoal contaminated fill CoPC: metals, PAH, TRH	BaP: Derived site specific (SSTL) health investigation levels (SSHIL) of 12 to 16 mg/kg (refer Appendix D)

Item	Remediation Acceptance Criteria
	Ecological exceedances are to be compared against the guideline value of 33 mg/kg (21 mg/kg to 135 mg/kg, 95% percentile range). (CRC CARE, 2017) Total PAH: Derived site specific (SSTL) health investigation levels (SSHIL) of 1,200 to 1,600 mg/kg (refer Appendix D) Metals / TRH: Tier 1 site assessment criteria (SAC) (DP 2022)
Asbestos materials in soil CoPC: asbestos	Health screening levels (HSL) for residential A land use, where subject to further assessment (i.e., as per the data gap investigation), including the absence of asbestos in the top 10 cm of soils. Otherwise, presence / absence will be adopted where quantitative assessment is not undertaken.
All other potential contaminants (e.g. unexpected finds)	Tier 1 SAC as outlined in DP (2022). Where no criteria is available additional reference will be given to other relevant guidance documentation from other recognised jurisdictions (e.g., the US EPA)
Imported materials	Tier 1 SAC will be used to assess site suitability in addition to any further requirements for recycled materials i.e., requirements under relevant resource recovery orders / exemptions.

The previous Tier 1 SAC and derived SSHIL for B(a)P and Total PAH are outlined in Appendix D.

13. Validation Plan

13.1 Data Quality Objectives

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

13.2 Validation Assessment Requirements

The following site validation work will be required:

- Field assessment by the appointed Environmental Consultant comprising:
  - Visual inspection, including maintaining a photographic record;
  - Collection of validation samples from excavations resulting from the removal of contaminated soils; and
  - Collection of validation / characterisation samples for materials to be re-used on-site.
- Laboratory analysis of validation samples at a National Association of Testing Authorities (NATA) accredited laboratory for:
  - The CoPC relevant to the remediation area; and
  - Quality control (QC) samples in accordance with Section 16.

- Comparison by the Environmental Consultant of the laboratory results with the SAC and / or RAC as appropriate (refer to Section 12); and
- Preparation by the Environmental Consultant of a site validation report detailing the methods and results of the remediation works and validation assessment.

Where the contingency capping strategy is undertaken the following will also apply:

- Surveying by the Surveyor comprising:
  - Survey of the extent and levels of the base of the excavations;
  - Survey of the extent and levels of the top of the marker layer; and
  - Survey of the extent and levels of the top of the capping layer.

13.3 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 of natural soils

13.4 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 NSW EPA (NSW EPA, 2022), with a minimum of 8 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.

Data gap investigation:

- Small areas (<500 m^2): one sample per 25 m^2 to 100 m^2 or part thereof, with a minimum of three samples collected; or
- Larger areas (>500 m^2): systematic grid sampling in accordance with Table A in NSW EPA (1995), with a minimum of 5 samples.

Where contaminated soils are stored or treated on bare soils, the footprint of the stockpile will require validation following removal of the contaminated soils, this is recommended to include minimal over-excavation of the stockpile footprint (e.g., by 0.1 m) to ensure removal of any potential cross contamination.

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 F). 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.

14. 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 the *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 stockpile. 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 for stockpiles up to 200 m^3, with a minimum of three per stockpile; and
- One sample per 50 m^3 to 250 m^3 for stockpiles greater than 250 m^3, by applying statistical analysis with reference to EPA Victoria *Soil Sampling* (EPA Victoria, 2009), with a minimum of ten total samples.

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 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 Contractor as part of the site log and must be provided to the Environmental Consultant for inclusion in the validation report.

15. 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 be aesthetically acceptable. 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 gross contamination (e.g., staining, odours or anthropogenic inclusions) 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 importation 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.

15.1 Resource Recovery Materials

If permitted by the development consent and approved by the site owner, Remediation Contractor and Environmental Consultant and Site Auditor (where subject to audit), 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.

It is noted that landscaping materials may potentially comprise a mixture of resource recovery materials (e.g., VENM blended with compost or recovered fines etc.). Where applicable, any imported material will be assessed for compliance with the relevant resource recovery orders in addition to the RAC. Any imported materials (excluding aggregates) will be assessed as per the rates set out in the applicable resource recovery orders, or otherwise as per the stockpile assessment rates set out in Section 13.

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.

16. 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 same analytical suite as the primary sample;
- 5% sample intra-laboratory analysis, analysed for the same analytical suite as the primary sample;
- Rinsate samples (where re-useable sampling equipment is used), analysed for the suite of analytes analysed by most of the primary samples; and
- Trip spike and trip blank samples (analysed for BTEX) (approximately one per batch of samples).

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 data quality objectives:

- Sampling location rationale met the sampling objective;
- Standard operating procedures (SOP) are followed;
- Appropriate 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
- Where re-usable sampling equipment is used, rinsate samples should demonstrate 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.

17. Management and Responsibilities

17.1 Site Management Plan

A general site management plan for the operational phase of site remediation is included in Appendix G. The management plan includes soil, noise, dust, work health safety (WHS), remediation schedule, hours of operation and incident response. The 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).

17.2 Site Responsibilities

The site management plan (Appendix G) 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.

17.3 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 E.

18. Validation Reporting

18.1 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;
- 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 (where the contingency capping strategy is undertaken);
- 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).

18.2 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 development.

19. Conclusions

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

20. References

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21. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project at 3 Margaret Street, Strathfield in accordance with DP's proposal 204585.02.P.001.Rev0 dated 11 March 2022 and acceptance received from Carmichael Tompkins Property Group on behalf Meriden School. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Meriden School 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 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 been detected by observation or by laboratory analysis in fill materials at one test locations sampled and analysed and is therefore considered as indicative of the possible presence of further hazardous building materials (HBM), including asbestos.

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 either due to undetected variations in ground conditions, or to parts of the site being inaccessible and not available for inspection/sampling. 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

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

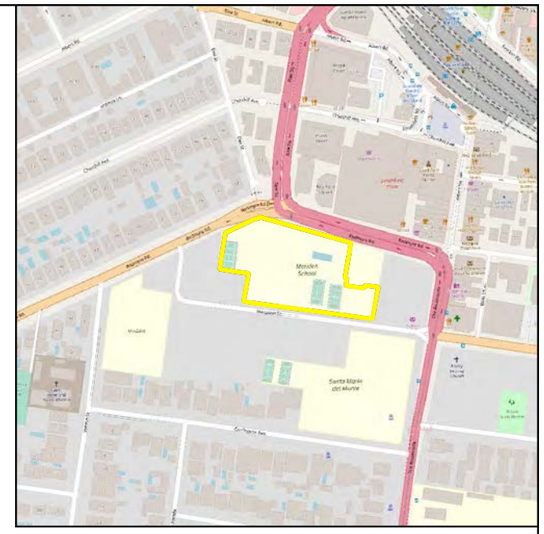
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later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



Notes:
1. Drawing projection GDA94 / MGA zone 56
2. Latest available aerial imagery sourced from metromap.com accessed 1/06/2022
3. Test locations shown are approximate only

Legend

- Environmental Borehole
- Geotechnical and Environmental Borehole
- Proposed Development Areas (the site)
- Senior School Boundary

10 0 10 20 30 40 m

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Meriden School		
OFFICE:	Sydney	DRAWN BY:	JJH
SCALE:	1:750 @ A3	DATE:	27.06.2022

TITLE: **Site Locality and Current Test Locations**
Detailed Site Investigation
Meriden School, 3 Margaret Street, Strathfield

N

PROJECT No:	204585.03
DRAWING No:	1
REVISION:	1

Locality Plan

Legend

- Proposed Development Areas (the site)
- Senior School Boundary

Previous Test Locations

- Environmental Borehole
- Geotechnical and Environmental Borehole
- Data Gap Test Location

0 10 20 30 40 50 m

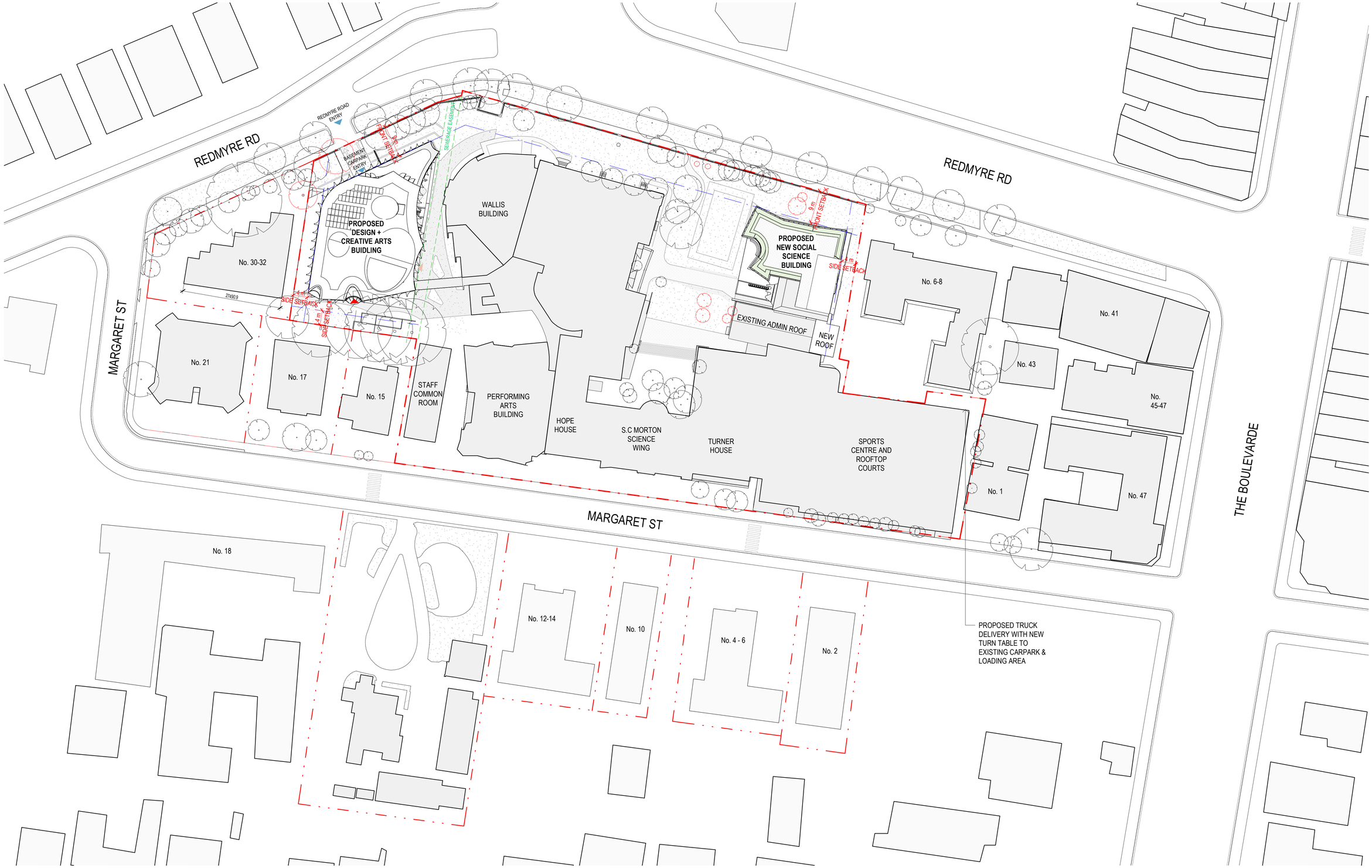
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Meriden School		
OFFICE:	Sydney	DRAWN BY:	JJH
SCALE:	1:750	DATE:	03/05/2023

TITLE: **Current and Previous Test Locations**
Remediation Action Plan
30-32 Redmyre Road and 3 Margaret Street, Strathfield

N

PROJECT No:	204585.03
DRAWING No:	1
REVISION:	2



Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	DRAFT SSDA	27/05/22
B	DRAFT SSDA	10/06/22

LEGEND

- EXISTING BUILDING
- PROPOSED BUILDING
- PRIMARY ENTRY
- SECONDARY ENTRY
- VEHICULAR ENTRY
- EXISTING TREES
- PROPOSED TREES
- REMOVED TREES - T38, T1, T32, T22, T21, G23
- DEMOLITION EXTENT

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ABN 90 131 245 684

checked	AC	scale	1 : 500@A1
drawn	JS	project no	210163

project
Meriden School Senior Campus

drawing
Site Plan Proposed

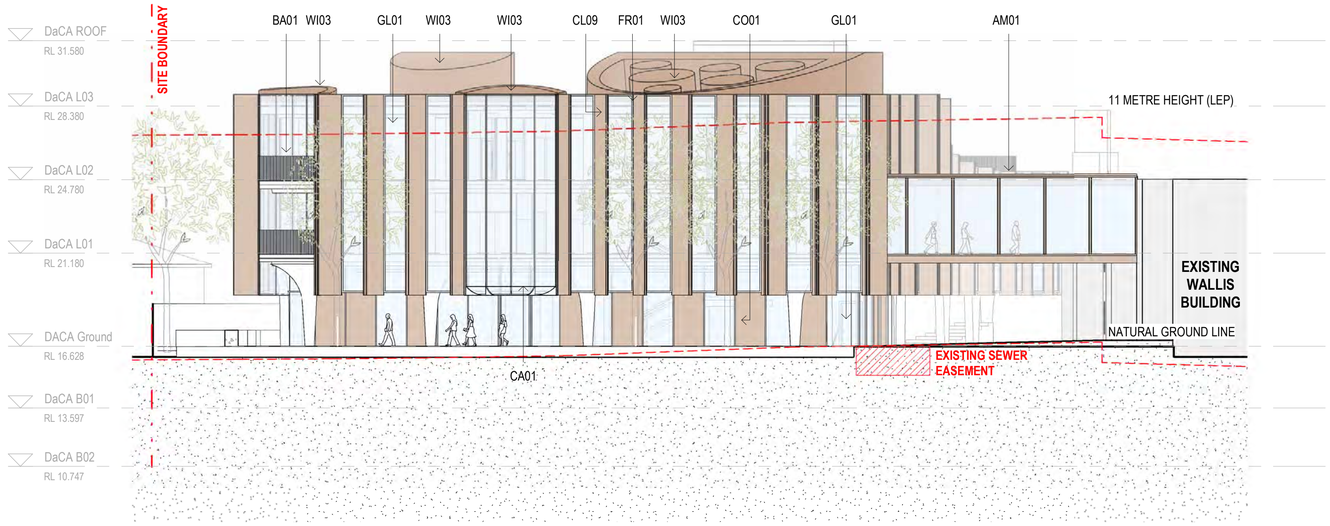
drawing no. **DA-00-0002**

issue **B**

10/06/2022 7:05:22 PM

1 DA2000 - DaCA Northern Elevation

SCALE: 1 : 150



2 DA2000 - DaCA Southern Elevation

SCALE: 1 : 150

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	DRAFT SSDA	27/05/22
B	DRAFT SSDA	10/06/22

LEGEND

- EXISTING
- PROPOSED
- PRIMARY ENTRY
- SECONDARY ENTRY
- VEHICULAR ENTRY
- EXISTING TREES
- PROPOSED TREES
- REMOVED TREES

EXTERNAL FINISHES LEGEND	
AM01	ARCHITECTURAL METALWORK
BA01	METAL BAULSTRADES
CA01	AWNING
CL05	TIMBER CLADDING SYSTEMS
CL09	SPECIALIST CLADDING SYSTEMS
COL01	CONCRETE COLUMNS
COL02	PRECAST CONCRETE PANEL

FR09	SPECALIST FRAMING - BRONZE
GL01	GLAZED SYSTEMS
LV02	FIXED WEATHER LOUVRES
RF01	METAL ROOF SYSTEMS
SG01	SIGNAGE GENERALLY
WI03	SKYLIGHTS

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checked AC scale 1 : 150@A1

drawn JS project no 210163

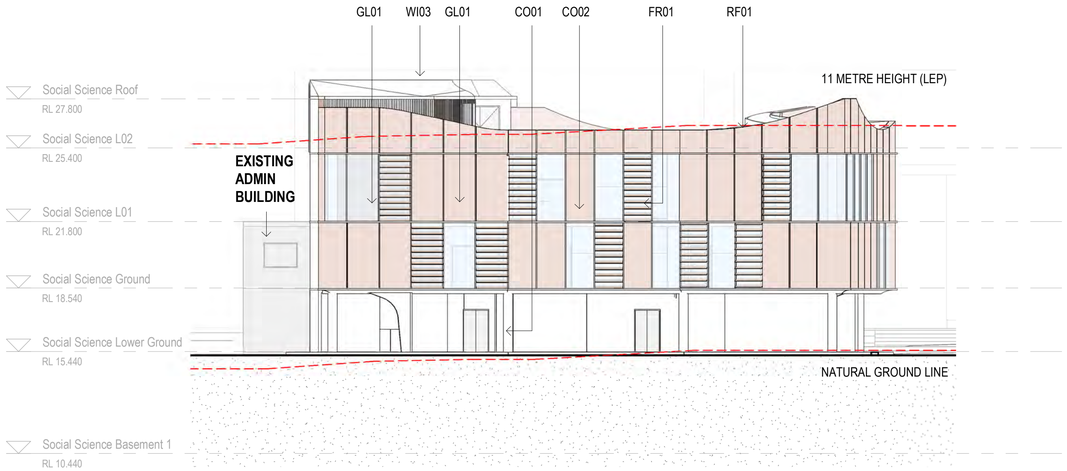
project
Meriden School Senior Campus

drawing
DaCA - North / South Elevation

drawing no. **DA-01-2000**

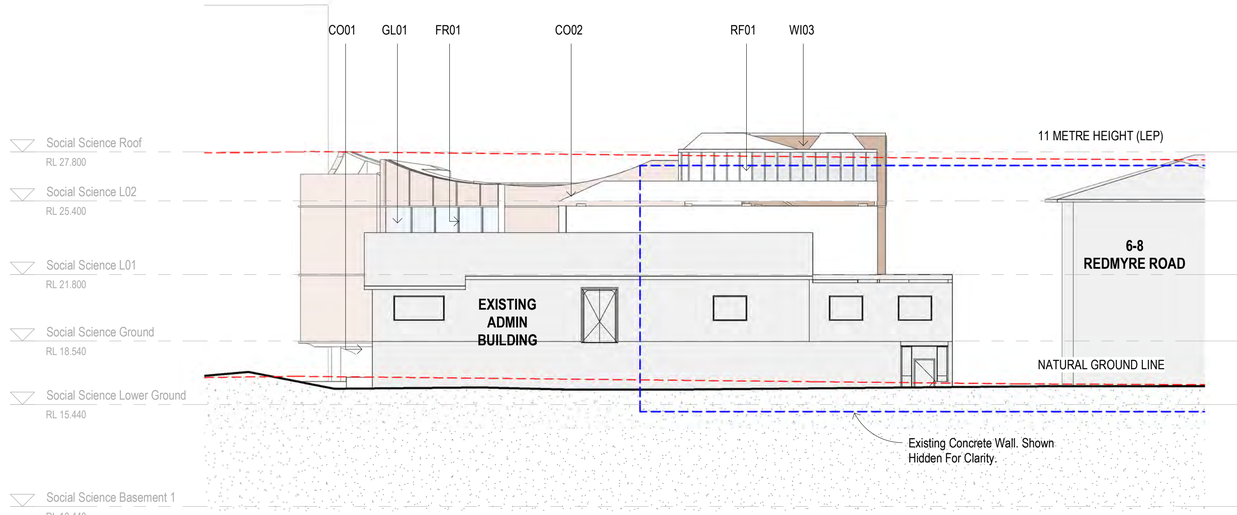
issue **B**

10/06/2022 7:07:32 PM



1 DA2000 - Social Science North Elevation

SCALE: 1 : 150



2 DA2000 - Social Science - South Elevation

SCALE: 1 : 150

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	DRAFT SSDA	27/05/22
B	DRAFT SSDA	10/06/22

LEGEND

- EXISTING
- PROPOSED
- PRIMARY ENTRY
- SECONDARY ENTRY
- VEHICULAR ENTRY
- EXISTING TREES
- PROPOSED TREES
- REMOVED TREES

EXTERNAL FINISHES LEGEND	
AM01	ARCHITECTURAL METALWORK
BA01	METAL BAULSTRADES
CA01	AWNING
CL05	TIMBER CLADDING SYSTEMS
CL09	SPECIALIST CLADDING SYSTEMS
COL01	CONCRETE COLUMNS
COL02	PRECAST CONCRETE PANEL

FR09	SPECALIST FRAMING - BRONZE
GL01	GLAZED SYSTEMS
LV02	FIXED WEATHER LOUVRES
RF01	METAL ROOF SYSTEMS
SG01	SIGNAGE GENERALLY
WI03	SKYLIGHTS

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checked AC scale 1 : 150@A1

drawn JS project no 210163

project
Meriden School Senior Campus

drawing
Social Science - North / South Elevations

drawing no. **DA-02-2000**

issue **B**

10/06/2022 7:09:26 PM

Appendix B

Previous Summary Results

Douglas Partners
Geotechnics | Environment | Groundwater

Table B1: Summary of Laboratory Results

			Metals								TRH						BTEX				PAH				Phenol	OPP	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	Naphthalene [b]	Benzo(a)pyrene (BaP)	Benzo(a)pyrene TEQ	Total PAHs	Phenol	Total Positive OCP	Total Positive OPP	Total PCB	Asbestos ID >0.1g/kg	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)
Data Gap Investigation																														
TP11	0.3 - 0.5 m	20/04/2023	13	<0.4	15	26	180	0.2	4	110	<25	<50	<25	<50	120	<100	<0.2	<0.5	<1	<1	<0.1	1.4	2	12	-	-	-	-	NAD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP12	0 - 0.2 m	20/04/2023	10	<0.4	14	17	150	0.2	3	76	<25	53	<25	53	<100	<100	<0.2	<0.5	<1	<1	<0.1	0.62	0.8	6.3	<5	<0.1	<0.1	<0.1	NAD	<0.001
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP13	0 - 0.2 m	20/04/2023	10	<0.4	15	16	220	0.2	3	100	<25	<50	<25	<50	460	110	<0.2	<0.5	<1	<1	1.2	7.7	11	100	<5	<0.1	<0.1	<0.1	AD (AF/FA)	<0.001
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP13	0.3 - 0.5 m	20/04/2023	16	<0.4	25	32	360	0.4	5	110	<25	<50	<25	<50	170	<100	<0.2	<0.5	<1	<1	<0.1	3	4.1	25	<5	<0.1	<0.1	<0.1	AD (AF/FA)	<0.001
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP14	0 - 0.2 m	20/04/2023	9	<0.4	12	30	940	0.2	2	120	<25	<50	<25	<50	180	<100	<0.2	<0.5	<1	<1	<0.1	2.3	3.3	22	<5	<0.1	<0.1	<0.1	NAD	<0.001
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BD1/2004	0 - 0.2 m	20/04/2023	8	<0.4	15	20	180	0.2	3	76	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	0.4	0.6	3.8	<5	<0.1	<0.1	<0.1	-	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BD1/2004 - [TRIPLICATE]	0 - 0.2 m	20/04/2023	8	<0.4	13	16	110	0.2	3	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP14 (material)	0 - 0.4 m	20/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP14	0.4 - 0.6 m	20/04/2023	10	<0.4	17	38	110	0.2	2	69	<25	<50	<25	<50	110	<100	<0.2	<0.5	<1	<1	<0.1	0.79	1.1	8	-	-	-	-	NAD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP14 (material)	0.4 - 0.8 m	20/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP15	0 - 0.2 m	20/04/2023	9	<0.4	15	22	130	0.2	2	130	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	0.4	<0.5	3.2	<5	<0.1	<0.1	<0.1	AD	<0.001
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP15 (material)	0 - 0.5 m	20/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP15 (material)	0.5 - 1 m	20/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP15	1.3 - 1.5 m	20/04/2023	8	<0.4	17	12	130	0.1	3	61	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	1.1	1.5	9.4	-	-	-	-	NAD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	70 180	240 -	300	2800	0.5 50	220 85	NL 70	60 105	NL 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP16	0 - 0.2 m	20/04/2023	5	<0.4	7	18	55	<0.1	5	65	<25	<50	<25	<50	180	<100	<0.2	<0.5	<1	<1	<0.1	1.5	2.2	16	<5	<0.1	<0.1	<0.1	AD (AF/FA)	<0.001
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP17	0.4 - 0.6 m	21/04/2023	10	<0.4	20	22	63	<0.1	15	66	<25	<50	<25	<50	120	<100	<0.2	<0.5	<1	<1	<0.1	1.6	2.3	17	-	-	-	-	NAD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP18	0 - 0.2 m	21/04/2023	4	<0.4	10	32	39	<0.1	5	110	<25	<50	<25	<50	200	<100	<0.2	<0.5	<1	<1	<0.1	0.3	<0.5	2.8	-	-	-	-	NAD	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP18	0.3 - 0.5 m	21/04/2023	<4	<0.4	7	23	140	0.3	5	65	-	-	-	-	-	-	-	-	-	-	<0.1	0.2	<0.5	1.5	-	-	-	-	-	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
TP18 - [TRIPLICATE]	0.3 - 0.5 m	21/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	0.6	0.8	7.4	-	-	-	-	-	-
			100 100	20 -	100 410	6000 55	300 1100	40 -	400 35	7400 150	- -	120	45 180	110 -	300	2800	0.5 50	160 85	55 70	40 105	3 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
Previous Investigation																														
BH1	0 - 0.1 m	13/04/2022	5	<0.4	6	14	40	<0.1	3	35	<25	<50	<25	<50	140	<100	<0.2	<0.5	<1	<1	<0.1	0.2	<0.5	2.3	-	<0.1	-	<0.1	NAD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH1	0.4 - 0.5 m	13/04/2022	7	<0.4	7	15	110	0.2	2	78	<25	<50	<25	<50	260	<100	<0.2	<0.5	<1	<1	0.2	6.3	9.1	82	NT	NT	NT	NT	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BD2/20220413	0.4 - 0.5 m	13/04/2022	8	<0.4	8	19	120	0.2	3	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.1	4.5	6.5	47	NT	NT	NT	NT	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH2	0 - 0.1 m	13/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH2	0.4 - 0.5 m	13/04/2022	14	<0.4	12	30	170	0.2	5	150	<25	<50	<25	<50	130	<100	<0.2	<0.5	<1	<1	<0.1	3.3	4.7	34	<5	<0.1	<0.1	<0.1	NAD	<0.001
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH5	0.4 - 0.5 m	14/04/2022	<4	<0.4	2	3	6	<0.1	<1	7	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.05	<0.5	<0.05	-	-	-	-	AD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH6	0.1 - 0.2 m	14/04/2022	4	<0.4	5	10	25	<0.1	5	34	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	0.66	1	5.6	-	<0.1	-	<0.1	AD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH6	0.3 - 0.4 m	14/04/2022	8	<0.4	14	67	500	0.3	5	140	<25	<50	<25	<50	110	<100	<0.2	<0.5	<1	<1	<0.1	3.6	5.1	36	-	-	-	-	AD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH7	0.3 - 0.4 m	14/04/2022	250	<0.4	10	23	200	1.9	7	89	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	1.9	3	17	-	-	-	-	AD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH8	0.3 - 0.4 m	14/04/2022	11	<0.4	7	20	120	0.1	5	170	<25	<50	<25	<50	140	<100	<0.2	<0.5	<1	<1	0.2	3.5	4.9	40	<5	<0.1	<0.1	<0.1	AD*	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BD1/20220414	0.3 - 0.4 m	14/04/2022	8	<0.4	7	17	78	<0.1	5	130	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.2	4	5.7	45	NT	NT	NT	NT	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH8	0.9 - 1 m	14/04/2022	7	<0.4	11	26	280	0.2	5	130	<25	<50	<25	<50	220	<100	<0.2	<0.5	<1	<1	0.1	5.7	8.1	53	-	-	-	-	AD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH9	0.1 - 0.2 m	14/04/2022	6	<0.4	9	42	49	0.1	5	120	<25	<50	<25	<50	260	<100	<0.2	<0.5	<1	<1	<0.1	4.1	5.7	43	-	<0.1	-	<0.1	AD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH9	0.9 - 1 m	14/04/2022	6	<0.4	10	16	26	0.2	3	44	<25	52	<25	52	1100	200	<0.2	<0.5	<1	<1	1.2	32	44	350	-	-	-	-	AD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH10	0.4 - 0.5 m	14/04/2022	7	<0.4	12	31	85	<0.1	10	66	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	1.1	1.8	12	<5	<0.1	<0.1	<0.1	AD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH2 - [TRIPLICATE]	0.4 - 0.5 m	13/04/2022	11	<0.4	12	56	150	0.2	6	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH1	0.4 - 0.5 m	13/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH6	0.3 - 0.4 m	14/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH7	0.3 - 0.4 m	14/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH8	0.9 - 1 m	14/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH9	0.9 - 1 m	14/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH3	0.4 - 0.5 m	22/04/2022	7	<0.4	18	18	47	<0.1	6	34	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	0.55	0.8	6.6	-	<0.1	-	<0.1	NAD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH3	1 - 1.1 m	22/04/2022	7	<0.4	20	20	18	<0.1	4	24	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.05	<0.5	<0.05	-	-	-	-	-	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	90 180	NL -	1300	5600	1 65	NL 105	NL 125	310 45	NL 170	- 0.7	3 -	300 -	100 -	6 -	160 -	1 -		
BH4	0.05 - 0.08 m	22/04/2022	<4	<0.4	6	4	4	<0.1	3	22	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.05	<0.5	<0.05	-	<0.1	-	<0.1	NAD	-
			100 100	20 -	100 620	6000 240	300 1100	40 -	400 290	7400 880	- -	120	50 180	280 -	1300	5600	0.7 65	480 105	NL 125	110 45	5 170	- 0.7	3 -	300 -	100 -	6 -	160 -	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
c Screening levels for Aldrin + Dieldrin used as initial screen
d Screening levles for Chlorpyrifos used as initial screen

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 A with garden/accessible soil

HIL A Residential / Low - High Density (NEPC, 2013)
HSL A/B Residential / Low - High Density (vapour intrusion) (NEPC, 2013)
DC HSL A Direct contact HSL A Residential (Low 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 B2: Summary Waste Classification

			Metals												TRH		TPH	BTEX				PAH				Phenol	OCP		OPP	PCB	Asbestos	
			Arsenic	Arsenic TCLP	Cadmium	Cadmium TCLP	Total Chromium	Total Chromium TCLP	Lead	Lead TCLP	Mercury (inorganic)	Mercury TCLP	Nickel	Nickel TCLP	TRH C6 - C9	C10-C36 recoverable hydrocarbons	C10-C36 petroleum hydrocarbons	Benzene	Toluene	Ethylbenzene	Xylenes (total)	Benzo(a)pyrene (BaP)	Benzo(a)pyrene (BaP) TCLP	Total PAHs	Total Positive PAH TCLP	Phenol	Total Endosulfan	Total Analysed OCP	Total Analysed OPP	Total PCB	Asbestos ID in soil >0.1g/kg	FA and AF Estimation
		PQL	4	0.05	0.4	0.01	1	0.01	1	0.03	0.1	0.0005	1	0.02	25	50	50	0.2	0.5	1	1	0.05	0.001	0.05	0.001	5	0.1	0.1	0.1	0.1		<0.001
Sample ID	Depth	Sample Date	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	%(w/w)
Data Gap Investigation																																
TP11	0.3 - 0.5 m	20/04/2023	13	-	<0.4	-	15	-	180	-	0.2	-	4	-	<25	100	-	<0.2	<0.5	<1	<1	1.4	-	12	-	-	-	-	-	-	NAD	-
TP12	0 - 0.2 m	20/04/2023	10	-	<0.4	-	14	-	150	-	0.2	-	3	-	<25	<50	-	<0.2	<0.5	<1	<1	0.62	-	6.3	-	<5	<0.1	<0.1	<0.1	<0.1	NAD	<0.001
TP13	0 - 0.2 m	20/04/2023	10	-	<0.4	-	15	-	220	-	0.2	-	3	-	<25	520	-	<0.2	<0.5	<1	<1	7.7	-	100	-	<5	<0.1	<0.1	<0.1	<0.1	AD	<0.001
TP13	0.3 - 0.5 m	20/04/2023	16	-	<0.4	-	25	-	360	-	0.4	-	5	-	<25	110	-	<0.2	<0.5	<1	<1	3	-	25	-	<5	<0.1	<0.1	<0.1	<0.1	AD	<0.001
TP14	0 - 0.2 m	20/04/2023	9	-	<0.4	-	12	-	940	-	0.2	-	2	-	<25	100	-	<0.2	<0.5	<1	<1	2.3	-	22	-	<5	<0.1	<0.1	<0.1	<0.1	NAD	<0.001
BD1/2004	0 - 0.2 m	20/04/2023	8	-	<0.4	-	15	-	180	-	0.2	-	3	-	<25	<50	-	<0.2	<0.5	<1	<1	0.4	-	3.8	-	<5	<0.1	<0.1	<0.1	<0.1	-	-
BD1/2004 - [TRIPLICATE]	0 - 0.2 m	20/04/2023	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TP14 (material)	0 - 0.4 m	20/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	-
TP14	0.4 - 0.6 m	20/04/2023	10	-	<0.4	-	17	-	110	-	0.2	-	2	-	<25	<50	-	<0.2	<0.5	<1	<1	0.79	-	8	-	-	-	-	-	-	NAD	-
TP14 (material)	0.4 - 0.8 m	20/04/2023	-	-	-	-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	-
TP15	0 - 0.2 m	20/04/2023	9	-	<0.4	-	15	-	130	-	0.2	-	2	-	<25	<50	-	<0.2	<0.5	<1	<1	0.4	-	3.2	-	<5	<0.1	<0.1	<0.1	<0.1	AD	<0.001
TP15 (material)	0 - 0.5 m	20/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	-
TP15 (material)	0.5 - 1 m	20/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	AD	-
TP15	1.3 - 1.5 m	20/04/2023	8	-	<0.4	-	17	-	130	-	0.1	-	3	-	<25	<50	-	<0.2	<0.5	<1	<1	1.1	-	9.4	-	-	-	-	-	-	NAD	-
TP16	0 - 0.2 m	20/04/2023	5	-	<0.4	-	7	-	55	-	<0.1	-	5	-	<25	220	-	<0.2	<0.5	<1	<1	1.5	-	16	-	<5	<0.1	<0.1	<0.1	<0.1	AD	<0.001
TP17	0.4 - 0.6 m	21/04/2023	10	-	<0.4	-	20	-	63	-	<0.1	-	15	-	<25	<50	-	<0.2	<0.5	<1	<1	1.6	-	17	-	-	-	-	-	-	NAD	-
TP18	0 - 0.2 m	21/04/2023	4	-	<0.4	-	10	-	39	-	<0.1	-	5	-	<25	250	-	<0.2	<0.5	<1	<1	0.3	-	2.8	-	-	-	-	-	-	NAD	-
TP18	0.3 - 0.5 m	21/04/2023	<4	-	<0.4	-	7	-	140	-	0.3	-	5	-	-	-	-	-	-	-	-	0.2	-	1.5	-	-	-	-	-	-	-	-
TP18 - [TRIPLICATE]	0.3 - 0.5 m	21/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	7.4	-	-	-	-	-	-	-	-
Previous Results																																
BH1	0 - 0.1 m	13/04/2022	5	-	<0.4	-	6	-	40	-	<0.1	-	3	-	<25	120	-	<0.2	<0.5	<1	<1	0.2	-	2.3	-	-	<0.1	<0.1	-	<0.1	NAD	-
BH1	0.4 - 0.5 m	13/04/2022	7	-	<0.4	-	7	-	110	-	0.2	-	2	-	<25	280	-	<0.2	<0.5	<1	<1	6.3	-	82	-	-	-	-	-	-	-	-
BD2/20220413	0.4 - 0.5 m	13/04/2022	8	-	<0.4	-	8	-	120	-	0.2	-	3	-	-	-	-	-	-	-	-	4.5	-	47	-	-	-	-	-	-	-	-
BH2	0 - 0.1 m	13/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	<0.001
BH2	0.4 - 0.5 m	13/04/2022	14	-	<0.4	-	12	-	170	-	0.2	-	5	-	<25	<50	-	<0.2	<0.5	<1	<1	3.3	-	34	-	<5	<0.1	<0.1	<0.1	<0.1	NAD	-
BH2 - [TRIPLICATE]	0.4 - 0.5 m	13/04/2022	11	-	<0.4	-	12	-	150	-	0.2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH3	0.4 - 0.5 m	22/04/2022	7	-	<0.4	-	18	-	47	-	<0.1	-	6	-	<25	<50	-	<0.2	<0.5	<1	<1	0.55	-	6.6	-	-	<0.1	<0.1	-	<0.1	NAD	-
BH3	1 - 1.1 m	22/04/2022	7	-	<0.4	-	20	-	18	-	<0.1	-	4	-	<25	<50	-	<0.2	<0.5	<1	<1	<0.05	-	<0.05	-	-	-	-	-	-	-	-
BH4	0.05 - 0.08 m	22/04/2022	<4	-	<0.4	-	6	-	4	-	<0.1	-	3	-	<25	<50	-	<0.2	<0.5	<1	<1	<0.05	-	<0.05	-	-	<0.1	<0.1	-	<0.1	NAD	-
BH5	0.4 - 0.5 m	14/04/2022	<4	-	<0.4	-	2	-	6	-	<0.1	-	<1	-	<25	<50	-	<0.2	<0.5	<1	<1	<0.05	-	<0.05	-	-	-	-	-	-	NAD	-
BH6	0.1 - 0.2 m	14/04/2022	4	-	<0.4	-	5	-	25	-	<0.1	-	5	-	<25	<50	-	<0.2	<0.5	<1	<1	0.66	-	5.6	-	-	<0.1	<0.1	-	<0.1	NAD	-
BH6	0.3 - 0.4 m	14/04/2022	8	<0.05	<0.4	<0.01	14	<0.01	500	0.1	0.3	<0.0005	5	<0.02	<25	<50	-	<0.2	<0.5	<1	<1	3.6	-	36	-	-	-	-	-	-	NAD	-
BH7	0.3 - 0.4 m	14/04/2022	250	0.1	<0.4	<0.01	10	<0.01	200	0.06	1.9	<0.0005	7	<0.02	<25	<50	-	<0.2	<0.5	<1	<1	1.9	-	17	-	-	-	-	-	-	NAD	-
BH8	0.3 - 0.4 m	14/04/2022	11	-	<0.4	-	7	-	120	-	0.1	-	5	-	<25	<50	-	<0.2	<0.5	<1	<1	3.5	-	40	-	<5	<0.1	<0.1	<0.1	<0.1	AD [b]	-
BD1/20220414	0.3 - 0.4 m	14/04/2022	8	-	<0.4	-	7	-	78	-	<0.1	-	5	-	-	-	-	-	-	-	-	4	-	45	-	-	-	-	-	-	-	-
BH8	0.9 - 1 m	14/04/2022	7	<0.05	<0.4	<0.01	11	<0.01	280	0.3	0.2	<0.0005	5	<0.02	<25	250	-	<0.2	<0.5	<1	<1	5.7	<0.001	53	<0.001	-	-	-	-	-	NAD	-
BH9	0.1 - 0.2 m	14/04/2022	6	-	<0.4	-	9	-	49	-	0.1	-	5	-	<25	300	-	<0.2	<0.5	<1	<1	4.1	-	43	-	-	<0.1	<0.1	-	<0.1	NAD	-
BH9	0.9 - 1 m	14/04/2022	6	-	<0.4	-	10	-	26	-	0.2	-	3	-	<25	1200	160	<0.2	<0.5	<1	<1	32	<0.001	350	<0.001	-	-	-	-	-	NAD	-
BH10	0.4 - 0.5 m	14/04/2022	7	-	<0.4	-	12	-	85	-	<0.1	-	10	-	<25	<50	-	<0.2	<0.5	<1	<1	1.1	-	12	-	<5	<0.1	<0.1	<0,1	<0.1	NAD	-

Waste Classification Criteria [f]																																
CT1	100	N/A	20	N/A	100	N/A	100	N/A	4	N/A	40	N/A	650	10000	10000	10	288	600	1000	0.8	N/A	200	N/A	288	60	<50	4	<50	NC	NC
SCC1	500	N/A	100	N/A	1900	N/A	1500	N/A	50	N/A	1050	N/A	650	10000	10000	18	518	1080	1800	10	N/A	200	N/A	518	108	<50	7.5	<50	NC	NC
TCLP1	N/A	5	N/A	1	N/A	5	N/A	5	N/A	0.2	N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NC	NC
CT2	400	N/A	80	N/A	400	N/A	400	N/A	16	N/A	160	N/A	2600	40000	40000	40	1152	2400	4000	3.2	N/A	800	N/A	1152	240	<50	16	<50	NC	NC
SCC2	2000	N/A	400	N/A	7600	N/A	6000	N/A	200	N/A	4200	N/A	2600	40000	40000	72	2073	4320	7200	23	23	800	N/A	2073	432	<50	30	<50	NC	NC
TCLP2	N/A	20	N/A	4	N/A	20	N/A	20	N/A	0.8	N/A	8	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

TEST PIT LOG

CLIENT: Carmicheal Tompkins Property Group
PROJECT: Strathfield, Meriden DaCA Env
LOCATION: 3 Margaret St, Strathfield

SURFACE LEVEL: 14.6 AHD
EASTING: 323441
NORTHING: 6250215

PIT No: TP11
PROJECT No: 204585.03
DATE: 20/4/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
14	0.0	FILL/Silty SAND: fine to coarse, dark brown, trace rootlets, tile, terracotta, wet		E	0.0		PID < 1 pmm		
	0.2	FILL/Clayey SILT: low plasticity dark brown to pale brown, fine to medium, trace brick, w~PL			0.2				
				E	0.3		PID < 1 pmm		
	0.5	CLAY CI-CH: medium to high plasticity, orange mottled brown and grey, trace silt, w~PL, apparently firm, residual		E	0.5		PID < 1 pmm		
					0.7				
	0.9	Pit discontinued at 0.9m Target depth reached							
13	1								1
12	2								2

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 3.5 tonne excavator

LOGGED: SAF

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level estimated from survey drawing SD-00-001[B]

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Carmicheal Tompkins Property Group
PROJECT: Strathfield, Meriden DaCA Env
LOCATION: 3 Margaret St, Strathfield

SURFACE LEVEL: 15.0 AHD
EASTING: 323436
NORTHING: 6250210

PIT No: TP12
PROJECT No: 204585.03
DATE: 20/4/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
15		FILL/Silty SAND: fine to coarse, dark brown, trace rootlets, tile, terracotta, wet		E	0.0		PID < 1 pmm		
	0.2	FILL/Clayey SILT: low plasticity, dark brown to pale brown, brick inclusions, w~PL			0.2				
				E	0.3		PID < 1 pmm		
	0.5	CLAY CI-CH: medium to high plasticity, orange mottled brown and grey, trace silt, w~PL, apparently firm, residual		E	0.5		PID < 1 pmm		
					0.7				
	0.9	Pit discontinued at 0.9m Target depth reached							
14	1								1
13	2								2

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 3.5 tonne excavator

LOGGED: SAF

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level estimated from survey drawing SD-00-001[B]

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Carmicheal Tompkins Property Group
PROJECT: Strathfield, Meriden DaCA Env
LOCATION: 3 Margaret St, Strathfield

SURFACE LEVEL: 14.5 AHD
EASTING: 323424
NORTHING: 6250210

PIT No: TP13
PROJECT No: 204585.03
DATE: 20/4/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
					0.0		PID < 1 pmm		
		FILL/Silty SAND: fine to coarse, dark brown, trace rootlets, tile, terracotta, glass, moist		E					
	0.2				0.2				
		FILL/Silty CLAY: low to medium plasticity, dark brown to pale brown, w~PL			0.3		PID < 1 pmm		
				E					
14	0.5				0.5		PID < 1 pmm		
		CLAY: medium to high plasticity, orange mottled grey, trace silt, w~PL, apparently firm, residual		E					
					0.7				
	1 1.0	Pit discontinued at 1.0m Target depth reached							1
13									
	2								2
12									

RIG: 3.5 tonne excavator

LOGGED: SAF

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level estimated from survey drawing SD-00-001[B]

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Carmicheal Tompkins Property Group
PROJECT: Strathfield, Meriden DaCA Env
LOCATION: 3 Margaret St, Strathfield

SURFACE LEVEL: 14.9 AHD
EASTING: 323416
NORTHING: 6250205

PIT No: TP14
PROJECT No: 204585.03
DATE: 20/4/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
14	0	FILL/Silty SAND: fine to coarse, dark brown, with angular to sub-angular gravel, brick fragments, trace tile, terracotta, glass, moist		E	0.0		PID < 1 pmm BD1/2004		
					0.2				
					0.4		PID < 1 pmm		
				E					
					0.6				
	1								1
					1.0		PID < 1 pmm		
				E					
	1.2	CLAY CI-CH: medium to high plasticity, orange mottled grey, trace silt, w~PL, apparently firm, residual			1.2				
					1.4		PID < 1 pmm		
				E					
					1.6				
	1.7	Pit discontinued at 1.7m Target depth reached							
13									
	2								2
12									

RIG: 3.5 tonne excavator

LOGGED: SAF

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level estimated from survey drawing SD-00-001[B]

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Carmicheal Tompkins Property Group
PROJECT: Strathfield, Meriden DaCA Env
LOCATION: 3 Margaret St, Strathfield

SURFACE LEVEL: 15 AHD
EASTING: 323410
NORTHING: 6250202

PIT No: TP15
PROJECT No: 204585.03
DATE: 20/4/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
15		FILL/Silty SAND: fine to coarse, dark brown, with angular to sub-angular gravel, brick fragments, trace metal, plastic, tile, terracotta, glass, moist		E	0.0		PID = 2 ppm		
					0.2				
				E	0.5		PID < 1 pmm		
					0.7				
14	1			E	1.3		PID < 1 pmm		1
	1.5	CLAY CI-CH: medium to high plasticity, orange mottled grey, trace silt, w~PL, apparently firm, residual		E	1.5		PID < 1 pmm		
					1.7				
	1.8	Pit discontinued at 1.8m Target depth reached							
13	2								2

RIG: 3.5 tonne excavator

LOGGED: SAF

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level estimated from survey drawing SD-00-001[B]

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Carmicheal Tompkins Property Group
PROJECT: Strathfield, Meriden DaCA Env
LOCATION: 3 Margaret St, Strathfield

SURFACE LEVEL: 15.7 AHD
EASTING: 323475
NORTHING: 6250221

PIT No: TP16
PROJECT No: 204585.03
DATE: 20/4/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
15		FILL/Silty SAND: fine to coarse, dark brown, trace brick, moist		E	0.0		PID = 1 pmm		
					0.2				
		Below 0.3m: with clay		E	0.3		PID < 1 pmm		
					0.5				
	1								1
	1.0	FILL/Silty CLAY: low to medium plasticity, dark brown, w~PL		E	1.0		PID < 1 pmm		
	1.2	CLAY CI-CH: medium to high plasticity, orange mottled grey, w~PL, apparently firm, residual			1.2				
				E	1.3		PID < 1 pmm		
					1.5				
14	1.7	Pit discontinued at 1.7m Target depth reached							
	2								2
13									

RIG: 3.5 tonne excavator

LOGGED: SAF

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level estimated from survey drawing SD-00-001[B]

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Carmicheal Tompkins Property Group
PROJECT: Strathfield, Meriden DaCA Env
LOCATION: 3 Margaret St, Strathfield

SURFACE LEVEL: 16.2 AHD
EASTING: 323474
NORTHING: 6250203

PIT No: TP17
PROJECT No: 204585.03
DATE: 21/4/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
16	0.0	FILL/Silty SAND: dark brown, fine to medium, trace brick, rootlets, dry		E	0.0		PID < 1 pmm		
	0.2				0.2				
	0.4	FILL/Silty CLAY: medium to high plasticity, dark brown to grey, brick fragments, dry		E	0.4		PID = 1 pmm		
	0.6	CLAY: medium to high plasticity, orange mottled grey, trace silt, w~PL, apparently firm, residual		E	0.6		PID < 1 pmm		
	0.8				0.8				
	1								1
15	1.1	Pit discontinued at 1.1m Target depth reached							
	2								2
14									

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 3.5 tonne excavator

LOGGED: SAF

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level estimated from survey drawing SD-00-001[B]

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Carmicheal Tompkins Property Group
PROJECT: Strathfield, Meriden DaCA Env
LOCATION: 3 Margaret St, Strathfield

SURFACE LEVEL: 16.3 AHD
EASTING: 323475
NORTHING: 6250190

PIT No: TP18
PROJECT No: 204585.03
DATE: 21/4/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
16	0.0	FILL/Silty SAND: fine to medium, dark brown, trace brick, tile, rootlets, dry		E	0.0		PID < 1 pmm		
					0.2				
	0.3	FILL/SAND: medium to coarse, dark grey, with fine gravel / ash, dry		E	0.3		PID < 1 pmm		
					0.5				
	0.7	CLAY: medium to high plasticity, orange mottled grey, trace silt, w~PL, apparently firm, residual		E	0.7		PID < 1 pmm		
					0.9				
	1								1
	1.2	Pit discontinued at 1.2m Target depth reached							
15									
	2								2
14									

RIG: 3.5 tonne excavator

LOGGED: SAF

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level estimated from survey drawing SD-00-001[B]

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Appendix C

Remediation Options Assessment and Evaluation

Appendix C
Remediation Options Assessment and Evaluation

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)* [the '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 conceptual site model (CSM) presented 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:

- Polycyclic aromatic hydrocarbon (PAH) contaminated fill: currently considered likely to include all fill beneath the site as potentially contaminated with PAH (i.e., as benzo(a)pyrene toxic equivalence quotient B(a)P TEQ) exceeding the previous Tier 1 site assessment, criteria (SAC);
- Possibly isolated metal contamination, including arsenic (BH7) and lead (BH6); and
- Identified asbestos contamination (BH8) and the high potential for further asbestos finds in fill across the site.

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 requiring excavation of basements for the proposed buildings, only three options for the soil contamination have been considered, as follows:

- Do nothing;
- Excavation and offsite disposal; and
- On-site management (cap and contain).

Given the relatively shallow depth of fill, available space at the site (within an operating school campus) and the nature of contaminants, options for on-site or off-site treatment of soils are not considered to be practicable.

The following key guidelines have therefore been consulted:

- CRC CARE *Technology Guide: Soil - Excavation* (CRC CARE, 2019b);
- CRC CARE *Technology Guide: Soil - Containment* (CRC CARE, 2019c);
- CRC CARE *Risk-based Management and Remediation Guidance for Benzo(a)pyrene* (CRC CARE, 2017);
- 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).

Assessment of each of the considered options is outlined below:

Do Nothing

Generally based on the proposed land use and identified contamination to date this option is not considered practicable in isolation to the other strategies.

It is however noted that minor exceedances of health-based criteria for PAH may be potentially further evaluated against more site-specific criteria utilising available information of the proposed land use and nature of the contamination detected to date. This may potentially manage minor exceedances, however results >2.5 times the previously adopted SAC would still likely require management. If adopted this would still therefore require some degree of management as per the options presented below.

Excavation and Off-site Disposal

Based on the proposed development requiring the excavation of basement levels beneath the buildings and therefore the majority of fill will require excavation for the final landform, this option is considered practicable where material cannot be retained on site i.e., through encapsulation or further assessment.

This option is also noted likely be the most expedient option requiring fewer approvals and additional investigation.

It is noted that targeted excavation of fill near identified contamination is likely to be impracticable given the widespread detection of PAH and the potential for further finds (i.e., asbestos materials) to be present without any further assessment of site specific risks including derivation of site specific health investigation levels, and quantitative assessment of any potential asbestos containing materials (PACM) in soils.

On-site Management (Cap and Contain)

This option is considered preferrable under sustainability considerations for the minimisation of waste generation to landfill and transport / handling of materials. This option would require available space at depth to encapsulate the materials beneath an appropriate capping layer which will likely require over-excavation, and therefore would have additional geotechnical / structural considerations for any building design and for any nearby existing structures outside of the site. Depending on available volumes some material may ultimately remain surplus and require off-site disposal.

This option would also require the development and implementation of a long-term environmental management plan (EMP) and require that the EMP is reasonably, legally enforceable.

C4.0 Summary of Preferred Remediation Strategy

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

- Excavation and off-site disposal of fill within the proposed basement footprints;
- Data gap investigation of any soils previously inaccessible for inspection and / or analysis;
- Targeted excavation of any additional identified contamination outside of these areas; and
- Further contamination assessment of retained fill for site suitability as required.

Contingency Option 1

- On-site management of all fill; or otherwise; and
- Off-site disposal of any fill surplus to encapsulation.

Contingency Option 2

- Excavation and off-site disposal of all fill.

C5.0 References

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene.* Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

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

Remediation Acceptance Criteria

Appendix D
Remediation Acceptance 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) [the 'NEPM']* (NEPC, 2013).
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).

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), except for PAH which are discussed in further detail in Section D3.

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

- Land use: educational;
  - Corresponding to land use category 'A', residential with garden / accessible soil (home grown produce <10% fruit and vegetable intake, (no poultry)), also includes children's day care centres, preschools and primary schools; and
  - Corresponding to land use category 'C', public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate.
- Soil type: clay, based on predominate soil type (refer borehole logs Appendix E).
- Depth to groundwater: potentially 0-1 m based on up to two basement levels and previous recorded groundwater levels at the larger secondary school campus of 3.4 m below ground level.

A Residential A land-use scenario has been initially adopted as being protective of both primary and secondary school uses. It is also noted that Residential A is otherwise applicable for health screening levels (HSL) for secondary schools.

D2.0 Soils

D2.1 Health Investigation and Screening Levels

The generic health investigation levels (HIL) and 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-A
Metals	
Arsenic	100
Cadmium	20
Chromium (VI)	100
Copper	6000
Lead	300
Mercury (inorganic)	40
Nickel	400
Zinc	7400
PAH	
B(a)P TEQ	3
Total PAH	300
Phenols	
Phenol	3000
Pentachlorophenol	100
OCP	
DDT+DDE+DDD	240
Aldrin and dieldrin	6
Chlordane	50
Endosulfan	270
Endrin	10
Heptachlor	6
HCB	10
Methoxychlor	300
OPP	

Contaminant	HIL-A
Chlorpyrifos	160
PCB	
PCB	1

Table 2: Health Screening Levels (mg/kg)

Contaminant	HSL-A&B	HSL-A&B
CLAY	**0 m to <1 m**	**1 m to <2 m**
Benzene	0.7	1
Toluene	480	NL
Ethylbenzene	NL	NL
Xylenes	110	310
Naphthalene	5	NL
TRH F1	50	90
TRH F2	280	NL

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-A	DC HSL-IMW
Benzene	100	1100
Toluene	14 000	120 000
Ethylbenzene	4500	85 000
Xylenes	12 000	130 000
Naphthalene	1400	29 000
TRH F1	4400	82 000
TRH F2	3300	62 000
TRH F3	4500	85 000
TRH F4	6300	120 000

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

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

IMW intrusive maintenance worker

D2.2 Asbestos in Soil

Based on the CSM and / or current site access limitations, a detailed asbestos assessment was not considered to be warranted at this stage. However, due to the history of widespread use of ACM products across Australia, ACM can be encountered unexpectedly and sporadically at a site. Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (AS:4964) has been adopted for this investigation / assessment as an initial screen.

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 EILs, derived using the interactive (excel) calculation spreadsheet on the NEPM toolbox website are shown in Table 5, with inputs into their derivation shown in Table 4.

Table 4: Inputs to the Derivation of the Ecological Investigation Levels

Variable	Input	Rationale
Age of contaminants	"Aged" (>2 years)	Based on site history review
pH	7.7	Average of laboratory results (Appendix F)
CEC	22.5 $cmol_c/kg$	
Clay content	35%	Based on predominate soil types of clay, sandy clay and silty clay mixtures containing > 35% clay fines
Traffic volumes	high	Site locality
State / Territory	NSW	

Table 5: Ecological Investigation Levels (mg/kg)

Contaminant	EIL-A-B-C
Metals	
Arsenic	100
Copper	240
Nickel	290
Chromium III	200
Lead	1100
Zinc	880
PAH	
Naphthalene	170

Contaminant	EIL-A-B-C
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 6.

Table 6: Ecological Screening Levels (mg/kg)

Contaminant	Soil Type	EIL-A-B-C
Benzene	Fine	65
Toluene	Fine	105
Ethylbenzene	Fine	125
Xylenes	Fine	45
TRH F1	Coarse/ Fine	180*
TRH F2	Coarse/ Fine	120*
TRH F3	Fine	1300
TRH F4	Fine	5600
B(a)P	Fine	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
EIL-A-B-C urban residential and public open space

D3.0 Site Specific Target Levels

In addition to the Tier 1 SAC outlined above additional consideration has been given to site specific conditions for the assessment of PAH contamination.

Screening levels for PAH as outlined in NEPC (2013) are derived by using benzo(a)pyrene (B(a)P) as an example / marker contaminant given the relatively large amount of data available for the compound as compared to other PAH species. The risk from other species is then expressed relative to that of BaP (i.e., as a relative fraction), with the sum of the individual adjusted components comprising the calculated B(a)P TEQ which comprised a total equivalent risk of the contaminants relative to that of B(a)P. Therefore, the derived screening level for B(a)P is then applied for the summed B(a)P TEQ.

Screening levels for total PAH is then expressed as a factor (100 times) the B(a)P screening level as per Appendix B7[A] NEPC (2013).

Site specific target levels for B(a)P have been calculated by using the NEPC (2013) HIL spreadsheet accessed via the ASC NEPM Toolbox[1]. The following site-specific inputs have been considered based upon the results of DP (2022).

- Suitability of the data to characterise the PAH contamination: based on previous and more recent (2022) intrusive investigation results have indicated a similar magnitude of results (i.e., up to 40-50 mg/kg as B(a)P TEQ). Whilst parts of the current site haven't been sampled (due to existing structures) the total sampling density to date is considered adequate considering the similar results in other parts of the larger school campus and the likely source of the contamination (incinerator ash / charcoal used as fill).
- Nature of the PAH contamination:
  - Aged: based on site history review and potential sources (i.e., incinerator ash / charcoal);
  - Leachability: low, based on toxicity characteristic leaching procedure (TCLP) results indicating low mobility associated with the contamination source in a bound matrix;
  - Source: considered associated with ash / charcoal based on site history and a PAH fingerprint analysis; and
  - Soil type: predominately fine grained, clayey soils (fill and natural).
- Site usage: whilst a residential A scenario is considered applicable for potential access to soils and potential sensitive receptors (young children), a school deviates from this default scenario particularly for time spent on site (including time outdoors) as compared to a residential usage.

D3.1 Deviation of Default HIL Assumptions

NEPC (2013) Schedule B7 and Appendix A2 outline the calculations and underlying assumptions used in the derivation of the generic HIL for the different land-use scenarios for PAH. In the derivation of site-specific levels for B(a)P TEQ the following deviations have been considered as compared to the standard assumptions:

- Oral Bioavailability: 65% (*compared to 100%).*

The generic oral bioavailability adopted in NEPC (2013) defaults to a conservative value of 100% in the absence of site-specific assessments. Schedule B7 (NEPC, 2013) cites studies for bioavailability ranging from 1440% and for relative absorption factors for PAH of 28%. In addition, Schedule B7 notes that that B(a)P contamination (and PAH) present in fixed matrices, is largely immobile and therefore generally has low bioavailability. A study cited in CRC CARE (2017) notes bioavailability to range from 22 to 63% as conducted for in swine models (noted as being the most accurate for human bioavailability), except for in very sandy soils where availability ranged up to 100%.

[1] http://nepc.gov.au/nepms/assessment-site-contamination/toolbox, accessed May 2022

Based on the previously encountered fill, inclusions of ash have been identified which are considered the likely source of PAH detected in fill. TCLP analysis for previous and current results have resulted in leachable concentrations of PAH below the laboratory quantification limit and are therefore considered to be immobile in the observed ash or other materials, and in conjunction with the source of the PAH is considered additional evidence of the likely low bioavailability of the contaminants. It is therefore considered that the B(a)P (and PAH) present within the fill is relatively immobile.

Generally, Schedule B7 of NEPC (2013) and CRC CARE (2017) also note that bioavailability will vary based on the nature of the contaminant and the composition of the soil matrix, with fine grained soils (e.g. clay and silts) and the presence of organic carbon content generally resulting in lower availability of the contaminants.

Accordingly, a less conservative bioavailability of 65% has been considered, as rounded up from the study cited in CRC CARE (2017).

- Dermal Absorption Factor (DAF) 2.6% (*compared to 6%).*

The generic value of 6% adopted within Schedule B7 (NEPC 2103) is based on data for freshly spiked soil, as a worst-case scenario. Based on the site history, the fill across the site is considered to be aged in nature and therefore the relatively less conservative value of 2.6% has been adopted as per Schedule B7 for the arithmetic mean based on data for aged soils. This approach is also noted as being applicable in MfE (2011).

- Oral Slope Factor (TRV_0) 0.23 mg/kg/day (default 0.5 mg/kg/day.)

It is noted that a non-threshold slope factor adopted within Schedule B7 was adopted based on WHO (2011) documentation used in the derivation of drinking water guidelines.

A review by MfE (2011) as cited in NEPC (2013) considered the geometric mean of multiple studies resulting in a slope factor of 0.23 mg/kg/day, this calculated value is also noted to be consistent with another study (RIVM, 2011) cited within Schedule B7[A2] (NEPC 2013) and is noted be more recent and comprehensive than the data previously considered by WHO (2011). The MfE (2011) study is referenced in NEPC (2013) to have been in draft at time of publication (and has subsequently been published) and is likely a factor in it not being adopted as the default assumption.

Dermal slope factors in the derivation of the HIL are based upon the oral slope factor as the default approach, although separate dermal slope factor approaches are considered in NEPC (2013) these are noted to likely be applicable for select scenarios such as in the consideration of direct contact with coal tar. Therefore, the dermal slope factor has been based upon the considered oral slope factor as per NEPC (2013).

- Exposure Frequency 240 days/year (default 365 days/year)

The default assumptions in the derivation of HIL A assumes an exposure frequency of 365 days per year. Given the HIL has been adopted for the more sensitive receptors, i.e., school children rather than workers which would otherwise be more applicable to a commercial land-use scenario, a reduced frequency has been considered based on a conservative school term length of 12 weeks, and four school terms per year, for a total of 240 days per year. This is noted to be consistent with the exposure frequency of HIL D (i.e., commercial / industrial workers) and overall is considered to be conservative for the high risk receptors (students).

It is noted that further assessment of time spent indoors / outdoors is not required as it has no impact on the calculated non-threshold HILs (i.e., for B(a)P).

- Early Life Effects.

Given the sites usage as a school it is considered that site users will include children and therefore early-life effects as outlined in NEPC (2013) have been adopted for the current assessment and will override less conservative calculated HIL which does not consider early-life effects.

D1.1 Calculated Site-Specific Health Investigation Levels

Table D1 attached is a summary output calculation table based upon the HIL spreadsheet in the NEPM Toolbox (NEPC, 2021) for the changes in the assumptions outlined above. Table 2 below outlines the calculated HIL for given changes in assumptions. As per NEPC (2013) the calculated HIL is rounded to either one or two significant figures, in this case results have been rounded to two significant figures.

Table 7: Calculated SSHIL A

Contaminant	Bioavailability 65% DAF 2.6% TRV_0 0.23 mg/kg/day	Bioavailability 100% DAF 2.6% TRV_0 0.23 mg/kg/day
Benzo(a)pyrene	16 mg/kg	12 mg/kg
Total PAH	1600 mg/kg	1200 mg/kg

Given the potential uncertainty regarding bioavailability a conservative range for the SSTL has been given of 12 to 16 mg/kg for B(a)P, representing the potential variation due to uncertainty of the bioavailability of the contamination.

D4.0 References

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.

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene.* Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

MfE. (2011). *Toxicological intake values for priority contaminants in soil. .* Wellington, New Zealand: New Zealand Ministry for 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.

NEPC. (2021, November). *ASC NEPM Toolbox.* Retrieved from NEPM: http://nepc.gov.au/nepms/assessment-site-contamination/toolbox

RIVM. (2011). *Re-evaluation of the human-toxicological Maximum Permissible Risk Levels. .* Bilhoven, Netherlands: National Institude of Public Health and the Environment.

WHO. (2011). *Guidelines for drinking-water quanity, 4th edn.* Geneva: World Health Organisation.

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Derivation of Investigation Levels
HIL A - Low Density Residential

Summary of Exposure Parameters		Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate	- Young children (0-5 years)	IR_{SC}	mg/day	100	Schedule B7, Table 5
	- Adults	IR_{SA}	mg/day	50	Schedule B7, Table 5
Surface Area of Skin	- Young children (0-5 years)	SA_C	cm^2/day	2700	Schedule B7, Table 5
	- Adults	SA_A	cm^2/day	6300	Schedule B7, Table 5
Soil-to-Skin Adherence Factor		AF	mg/cm^2/day	0.5	Schedule B7, Table 5
Time Spent Outdoors		ETo	hours	4	Schedule B7, Table 5
Time Spent Indoors		ETi	hours	20	Schedule B7, Table 5
Lung Retention Factor		RF	-	0.375	Schedule B7, Table 5
Particulate Emission Factor		PEFo	(m^3/kg)	2.9E+10	Calculated for scenario, refer to Equations 19 and 20 and assumptions in Schedule B7
Indoor Air Dust Factor		PEFi	(m^3/kg)	2.6E+07	As per Equation 21 based assumptions presented in Schedule B7
Fraction of indoor dust comprised of outdoor soil		TF	-	0.5	Assume 50% soil concentration present in dust as noted in Schedule B7
Indoor Air-to-Soil Gas Attenuation Factor		α	-	0.1	Value adopted as discussed in Section 5.5 of Schedule B7
Body weight	- Young children (0-5 years)	BW_C	kg	15	Schedule B7, Table 5
	- Adults	BW_A	kg	70	Schedule B7, Table 5
Exposure Frequency		EF	days/year	**240**	**Conservative school term length of 12 weeks, 4 terms per year**
Exposure Duration	- Young children (0-5 years)	ED_C	years	6	Schedule B7, Table 5
	- Adults	ED_A	years	29	Schedule B7, Table 5
Averaging Time (non-carcinogenic)		AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)		AT_{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Non-Threshold Effects - Lifetime Exposures [young child and adult]

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)$^{-1}$	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SFd) (mg/kg/day)$^{-1}$	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)$^{-1}$		Target Risk (TR)	Plant Uptake Factor (incl % intake) Adults (kg/day) (eqn 16)	Plant Uptake Factor (incl % intake) Children (kg/day) (eqn 16)	Pathway Specific HILs (mg/kg)				Soil Vapour HIL (mg/m^3) (eqns 13 and 14)	Derived Interim Soil Gas IL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
												Soil Ingestion (eqns 4 and 5)	Home-grown produce (eqns 17 and 18)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)				
TCE							0.004		1E-05			NA	NA	NA	NA	9.1E-02	**0.09**			
vinyl chloride							0.00880		1E-05			NA	NA	NA	NA	4.1E-02	**0.04**			
benzo(a)pyrene	0.23	1	0.23	**65%**	**0.026**		6.57E-02		1E-05			1.2E+02		9.6E+01	7.6E+04			52.9	**53**	2
benzo(a)pyrene (Early-Life)	0.23	1	0.23	**65%**	**0.026**		6.57E-02		1E-05			2.9E+01		3.5E+01	3.2E+04			15.76	**16**	2

Note:

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

2 Refer to Appendix A for discussion on different calculations conducted for benzo(a)pyrene and basis for HIL adopted

Derivation of Investigation Levels
HIL B - High Density Residential

Summary of Exposure Parameters		Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate	- Young children (0-5 years)	IR_{SC}	mg/day	25	25% of HIL A assumption, Schedule B7, Table 5
	- Adults	IR_{SA}	mg/day	12.5	25% of HIL A assumption, Schedule B7, Table 5
Surface Area of Skin	- Young children (0-5 years)	SA_C	cm^2/day	2700	Schedule B7, Table 5
	- Adults	SA_A	cm^2/day	6300	Schedule B7, Table 5
Soil-to-Skin Adherence Factor		AF	mg/cm^2/day	0.5	Schedule B7, Table 5
Time Spent Outdoors		ETo	hours	1	Schedule B7, Table 5
Time Spent Indoors		ETi	hours	20	Schedule B7, Table 5
Lung Retention Factor		RF	-	0.375	Schedule B7, Table 5
Particulate Emission Factor		PEFo	(m^3/kg)	7.3E+10	Calculated for scenario, refer to Equations 19 and 20 and assumptions in Schedule B7
Indoor Air Dust Factor		PEFi	(m^3/kg)	2.6E+07	As per Equation 21 based assumptions presented in Schedule B7
Fraction of indoor dust comprised of outdoor soil		TF	-	0.5	Assume 50% soil concentration present in dust as noted in Schedule B7
Indoor Air-to-Soil Gas Attenuation Factor		α	-	0.1	Value adopted as discussed in Section 5.5 of Schedule B7
Body weight	- Young children (0-5 years)	BW_C	kg	15	Schedule B7, Table 5
	- Adults	BW_A	kg	70	Schedule B7, Table 5
Exposure Frequency		EF	days/year	365	Schedule B7, Table 5
Exposure Duration	- Young children (0-5 years)	ED_C	years	6	Schedule B7, Table 5
	- Adults	ED_A	years	29	Schedule B7, Table 5
Averaging Time (non-carcinogenic)		AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)		AT_{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Young Child Aged 2-3 years

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqn 12)	Derived Interim Soil Gas HIL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqn 3)	Dermal (eqn 6)	Dust (eqn 9)					
arsenic	0.002	1	0.002	100%	0.005	50%	0.001	0%		6.0E+02	2.2E+03	1.6E+05			471	**500**	
beryllium	0.002	0.007	0.000014	100%	0.001	30%	0.000020	0%		8.4E+02	1.1E+02	3.3E+03			94	**90**	
boron	0.2			100%		65%	0.7	65%		4.2E+04	NA	4.0E+07			41956	**40000**	
cadmium	0.0008			100%		60%	0.000005	20%		1.9E+02	NA	6.6E+02			149	**150**	
chromium (VI)	0.001			100%		10%	0.0001	0%		5.4E+02	NA	1.6E+04			523	**500**	
cobalt	0.001	1	0.0014	100%	0.001	20%	0.0001	0%		6.7E+02	1.2E+04	1.6E+04			614	**600**	
copper	0.14			100%		60%	0.49	60%		3.4E+04	NA	3.2E+07			33565	**30000**	
manganese	0.16			100%		50%	0.00015	20%		4.8E+04	NA	2.0E+04			13963	**14000**	
methyl mercury	0.00023	1	0.00023	100%	0.001	80%	0.000805	80%		2.8E+01	5.1E+02	2.6E+04			26	**30**	
mercury (inorganic)	0.0006	0.07	0.000042	100%	0.001	40%	0.0002	10%		2.2E+02	2.8E+02	3.0E+04			121	**120**	
nickel	0.012	1	0.012	100%	0.005	60%	0.00002	20%		2.9E+03	1.1E+04	2.6E+03			1217	**1200**	
selenium	0.006			100%		60%	0.021	60%		1.4E+03	NA	1.4E+06			1438	**1400**	
zinc	0.5	1	0.5	100%	0.001	80%	1.75	80%		6.0E+04	1.1E+06	5.7E+07			56870	**60000**	
cyanide (free) (no VI)	0.006	1	0.006	100%	0.1	50%	0.0008	0%		1.8E+03	3.3E+02	1.3E+05			281	**300**	
TCE							0.002	10%		NA	NA	NA	2.2E-02	**0.02**			
1,1,1-TCA							5	0%		NA	NA	NA	6.0E+01	**60**			
PCE							0.2	10%		NA	NA	NA	2.2E+00	**2**			
cis-1,2-dichloroethene							0.007	0%		NA	NA	NA	8.4E-02	**0.08**			
phenol	0.7	1	0.7	100%	0.1	30%	0.035	30%		2.9E+05	5.4E+04	4.0E+06			45419	**45000**	
pentachlorophenol	0.003	1	0.003	100%	0.24	0%	0.0105	0%		1.8E+03	1.4E+02	1.7E+06			129	**130**	
cresols	0.1	1	0.1	100%	0.1	50%	0.35	50%		3.0E+04	5.6E+03	2.9E+07			4687	**4700**	
DDX	0.002	1	0.002	100%	0.018	0%	0.007	0%		1.2E+03	1.2E+03	1.1E+06			608	**600**	
aldrin and dieldrin	0.0001	1	0.0001	100%	0.1	10%	0.00035	10%		5.4E+01	1.0E+01	5.2E+04			8.4	**10**	
chlordane	0.0005	1	0.0005	100%	0.04	0%	0.00175	0%		3.0E+02	1.4E+02	2.9E+05			95	**90**	
endosulfan	0.006	1	0.006	100%	0.1	30%	0.021	30%		2.5E+03	4.7E+02	2.4E+06			394	**400**	
endrin	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		1.2E+02	2.2E+01	1.1E+05			19	**20**	
heptachlor	0.0001	1	0.0001	100%	0.1	0%	0.00035	0%		6.0E+01	1.1E+01	5.7E+04			9.4	**10**	
HCB	0.00016	1	0.00016	100%	0.1	0%	0.00056	0%		9.6E+01	1.8E+01	9.2E+04			15	**15**	
methoxychlor	0.005	1	0.005	100%	0.1	0%	0.0175	0%		3.0E+03	5.6E+02	2.9E+06			469	**500**	
mirex	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		1.2E+02	2.2E+01	1.1E+05			19	**20**	
toxaphene	0.00035	1	0.00035	100%	0.1	10%	0.001225	10%		1.9E+02	3.5E+01	1.8E+05			30	**30**	
2,4,5-T	0.01	1	0.01	100%	0.1	0%	0.035	0%		6.0E+03	1.1E+03	5.7E+06			937	**900**	
2,4-D	0.01	1	0.01	100%	0.05	0%	0.035	0%		6.0E+03	2.2E+03	5.7E+06			1621	**1600**	
MCPA	0.01	1	0.01	100%	0.1	0%	0.035	0%		6.0E+03	1.1E+03	5.7E+06			937	**900**	
MCPB	0.01	1	0.01	100%	0.1	0%	0.035	0%		6.0E+03	1.1E+03	5.7E+06			937	**900**	
mecoprop	0.01	1	0.01	100%	0.1	0%	0.035	0%		6.0E+03	1.1E+03	5.7E+06			937	**900**	
picloram	0.07	1	0.07	100%	0.1	0%	0.245	0%		4.2E+04	7.8E+03	4.0E+07			6561	**6600**	
atrazine	0.005	1	0.005	100%	0.1	0%	0.0175	0%		3.0E+03	5.6E+02	2.9E+06			469	**470**	
chlorpyrifos	0.003	1	0.003	100%	0.03	50%	0.0105	50%		9.0E+02	5.6E+02	8.6E+05			343	**340**	
bifenthrin	0.01	1	0.01	100%	0.1	10%	0.035	10%		5.4E+03	1.0E+03	5.2E+06			844	**840**	
PCBs	0.00002	1	0.00002	100%	0.14	0%	0.00007	0%		1.2E+01	1.6E+00	1.1E+04			1.4	**1**	
PBDE Flame Retardants (Br1-Br9)	0.0001	1	0.0001	100%	0.1	80%	0.00035	80%		1.2E+01	2.2E+00	1.1E+04			1.9	**2**	

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

Non-Threshold Effects - Lifetime Exposures [young child and adult]

Compound	Toxicity Reference Value Oral (TRV_O) $(mg/kg/day)^{-1}$	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SFd) $(mg/kg/day)^{-1}$	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV_I) $(mg/m^3)^{-1}$ [1]		Target Risk (TR)	Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqns 13 and 14)	Derived Interim Soil Gas IL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqns 4 and 5)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)					
TCE							0.004		1E-05	NA	NA	NA	6.0E-02	**0.06**			
vinyl chloride							0.0088		1E-05	NA	NA	NA	2.7E-02	**0.03**			
benzo(a)pyrene	0.5	1	0.5	100%	0.06		1.43E-01		1E-05	9.2E+01	1.3E+01	2.3E+04			11	**10**	1
benzo(a)pyrene (Early-Life)	0.5	1	0.5	100%	0.06		1.43E-01		1E-05	2.3E+01	4.6E+00	8.5E+03			3.8	**4**	1

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

1 Refer to Appendix A for discussion on different calculations conducted for benzo(a)pyrene and basis for HIL adopted

Derivation of Investigation Levels
HIL C - Recreational

Summary of Exposure Parameters		Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate	- Young children (0-5 years)	IR_{SC}	mg/day	50	50% of HIL A assumption, Schedule B7, Table 5
	- Adults	IR_{SA}	mg/day	25	50% of HIL A assumption, Schedule B7, Table 5
Surface Area of Skin	- Young children (0-5 years)	SA_C	cm^2/day	2700	As per enHealth (2012)
	- Adults	SA_A	cm^2/day	6300	As per enHealth (2012) for male and female combined
Soil-to-Skin Adherence Factor		AF	mg/cm^2/day	0.5	Schedule B7, Table 5
Time Spent Outdoors		ETo	hours	2	Schedule B7, Table 5
Time Spent Indoors		ETi	hours	0	Schedule B7, Table 5
Lung Retention Factor		RF	-	0.375	Schedule B7, Table 5
Particulate Emission Factor		PEFo	(m^3/kg)	2.6E+07	As per Equation 21 based assumptions presented in Schedule B7
Outdoor Air-to-Soil Gas Attenuation Factor		α	-	0.05	Value adopted as discussed in Section 5.5 of Schedule B7
Body weight	- Young children (0-5 years)	BW_C	kg	15	Schedule B7, Table 5
	- Adults	BW_A	kg	70	Schedule B7, Table 5
Exposure Frequency		EF	days/year	365	Schedule B7, Table 5
Exposure Duration	- Young children (0-5 years)	ED_C	years	6	Schedule B7, Table 5
	- Adults	ED_A	years	29	Schedule B7, Table 5
Averaging Time (non-carcinogenic)		AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)		AT_{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Young Child Aged 2-3 years

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqn 12)	Derived Interim Soil Gas HIL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqn 3)	Dermal (eqn 6)	Dust (eqn 9)					
arsenic	0.002	1	0.002	100%	0.005	50%	0.001	0%		3.0E+02	2.2E+03	8.2E+05			264	**300**	
beryllium	0.002	0.007	0.000014	100%	0.001	30%	0.000020	0%		4.2E+02	1.1E+02	1.6E+04			86	**90**	
boron	0.2			100%		65%	0.7	65%		2.1E+04	NA	2.0E+08			20998	**20000**	
cadmium	0.0008			100%		60%	0.000005	20%		9.6E+01	NA	3.3E+03			93	**90**	
chromium (VI)	0.001			100%		10%	0.0001	0%		2.7E+02	NA	8.2E+04			269	**300**	
cobalt	0.001	1	0.0014	100%	0.001	20%	0.0001	0%		3.4E+02	1.2E+04	8.2E+04			326	**300**	
copper	0.14			100%		60%	0.49	60%		1.7E+04	NA	1.6E+08			16798	**17000**	
manganese	0.16			100%		50%	0.00015	20%		2.4E+04	NA	9.8E+04			19296	**19000**	
methyl mercury	0.00023	1	0.00023	100%	0.001	80%	0.000805	80%		1.4E+01	5.1E+02	1.3E+05			13	**13**	
mercury (inorganic)	0.0006	0.07	0.000042	100%	0.001	40%	0.0002	10%		1.1E+02	2.8E+02	1.5E+05			78	**80**	
nickel	0.012	1	0.012	100%	0.005	60%	0.00002	20%		1.4E+03	1.1E+04	1.3E+04			1157	**1200**	
selenium	0.006			100%		60%	0.021	60%		7.2E+02	NA	6.9E+06			720	**700**	
zinc	0.5	1	0.5	100%	0.001	80%	1.75	80%		3.0E+04	1.1E+06	2.9E+08			29208	**30000**	
cyanide (free) (no VI)	0.006	1	0.006	100%	0.1	50%	0.0008	0%		9.0E+02	3.3E+02	6.6E+05			243	**240**	
TCE							0.002	10%		NA	NA	NA	4.3E-01	**0.4**			
1,1,1-TCA							5	0%		NA	NA	NA	1.2E+03	**1200**			
PCE							0.2	10%		NA	NA	NA	4.3E+01	**40**			
cis-1,2-dichloroethene							0.007	0%		NA	NA	NA	1.7E+00	**2**			
phenol	0.7	1	0.7	100%	0.1	30%	0.035	30%		1.5E+05	5.4E+04	2.0E+07			39651	**40000**	
pentachlorophenol	0.003	1	0.003	100%	0.24	0%	0.0105	0%		9.0E+02	1.4E+02	8.6E+06			120	**120**	
cresols	0.1	1	0.1	100%	0.1	50%	0.35	50%		1.5E+04	5.6E+03	1.4E+08			4054	**4000**	
DDX	0.002	1	0.002	100%	0.018	0%	0.007	0%		6.0E+02	1.2E+03	5.7E+06			404	**400**	
aldrin and dieldrin	0.0001	1	0.0001	100%	0.1	10%	0.00035	10%		2.7E+01	1.0E+01	2.6E+05			7.3	**10**	
chlordane	0.0005	1	0.0005	100%	0.04	0%	0.00175	0%		1.5E+02	1.4E+02	1.4E+06			72	**70**	
endosulfan	0.006	1	0.006	100%	0.1	30%	0.021	30%		1.3E+03	4.7E+02	1.2E+07			341	**340**	
endrin	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		6.0E+01	2.2E+01	5.7E+05			16	**20**	
heptachlor	0.0001	1	0.0001	100%	0.1	0%	0.00035	0%		3.0E+01	1.1E+01	2.9E+05			8.1	**10**	
HCB	0.00016	1	0.00016	100%	0.1	0%	0.00056	0%		4.8E+01	1.8E+01	4.6E+05			13	**10**	
methoxychlor	0.005	1	0.005	100%	0.1	0%	0.0175	0%		1.5E+03	5.6E+02	1.4E+07			405	**400**	
mirex	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		6.0E+01	2.2E+01	5.7E+05			16	**20**	
toxaphene	0.00035	1	0.00035	100%	0.1	10%	0.001225	10%		9.5E+01	3.5E+01	9.0E+05			26	**30**	
2,4,5-T	0.01	1	0.01	100%	0.1	0%	0.035	0%		3.0E+03	1.1E+03	2.9E+07			811	**800**	
2,4-D	0.01	1	0.01	100%	0.05	0%	0.035	0%		3.0E+03	2.2E+03	2.9E+07			1277	**1300**	
MCPA	0.01	1	0.01	100%	0.1	0%	0.035	0%		3.0E+03	1.1E+03	2.9E+07			811	**800**	
MCPB	0.01	1	0.01	100%	0.1	0%	0.035	0%		3.0E+03	1.1E+03	2.9E+07			811	**800**	
mecoprop	0.01	1	0.01	100%	0.1	0%	0.035	0%		3.0E+03	1.1E+03	2.9E+07			811	**800**	
picloram	0.07	1	0.07	100%	0.1	0%	0.245	0%		2.1E+04	7.8E+03	2.0E+08			5676	**5700**	
atrazine	0.005	1	0.005	100%	0.1	0%	0.0175	0%		1.5E+03	5.6E+02	1.4E+07			405	**400**	
chlorpyrifos	0.003	1	0.003	100%	0.03	50%	0.0105	50%		4.5E+02	5.6E+02	4.3E+06			249	**250**	
bifenthrin	0.01	1	0.01	100%	0.1	10%	0.035	10%		2.7E+03	1.0E+03	2.6E+07			730	**730**	
PCBs	0.00002	1	0.00002	100%	0.14	0%	0.00007	0%		6.0E+00	1.6E+00	5.7E+04			1.3	**1**	
PBDE Flame Retardants (Br1-Br9)	0.0001	1	0.0001	100%	0.1	80%	0.00035	80%		6.0E+00	2.2E+00	5.7E+04			1.6	**2**	

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

Non-Threshold Effects - Lifetime Exposures [young child and adult]

Compound	Toxicity Reference Value Oral (TRV_O) $(mg/kg/day)^{-1}$	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SFd) $(mg/kg/day)^{-1}$	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV_I) $(mg/m^3)^{-1}$		Target Risk (TR)	Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqns 13 and 14)	Derived Interim Soil Gas IL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqns 4 and 5)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)					
TCE							0.004		1E-05	NA	NA	NA	1.2E+00	**1**			
vinyl chloride							0.0088		1E-05	NA	NA	NA	5.5E-01	**0.5**			
benzo(a)pyrene	0.5	1	0.5	100%	0.06		1.43E-01		1E-05	4.6E+01	1.3E+01	1.1E+05			9.9	**10**	1
benzo(a)pyrene (Early-Life)	0.5	1	0.5	100%	0.06		1.43E-01		1E-05	1.1E+01	4.6E+00	4.3E+04			3.3	**3**	1

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

1 Refer to Appendix A for discussion on different calculations conducted for benzo(a)pyrene and basis for HIL adopted

Derivation of Investigation Levels
HIL D - Commercial/Industrial

Summary of Exposure Parameters	Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate - Adults	IR_{SA}	mg/day	25	50% of HIL A assumption, Schedule B7, Table 5
Surface Area of Skin - Adults	SA_A	cm^2/day	3800	Based on 19% total skin area of 20000 cm^2 exposed (Schedule B7, Table 5)
Soil-to-Skin Adherence Factor	AF	mg/cm^2/day	0.5	Schedule B7, Table 5
Time Spent Outdoors	ETo	hours	1	Schedule B7, Table 5
Time Spent Indoors	ETi	hours	8	Schedule B7, Table 5
Lung Retention Factor	RF	-	0.375	Schedule B7, Table 5
Particulate Emission Factor	PEFo	(m^3/kg)	3.7E+10	Calculated for scenario, refer to Equations 19 and 20 and assumptions in Schedule B7
Indoor Air Dust Factor	PEFi	(m^3/kg)	2.6E+07	As per Equation 21 based assumptions presented in Schedule B7
Fraction of indoor dust comprised of outdoor soil	TF	-	0.5	Assume 50% soil concentration present in dust as noted in Schedule B7
Indoor Air-to-Soil Gas Attenuation Factor	α	-	0.1	Value adopted as discussed in Section 5.5 of Schedule B7
Body weight - Adults	BW_C	kg	70	Schedule B7, Table 5
Exposure Frequency	EF	days/year	240	Schedule B7, Table 5
Exposure Duration - Adults	ED_C	years	30	Schedule B7, Table 5
Averaging Time (non-carcinogenic)	AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)	AT_{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Adult Worker

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqn 12)	Derived Interim Soil Gas HIL - Threshold (to 1 or 2 s.f.) (mg/m^3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)
										Soil Ingestion (eqn 3)	Dermal (eqn 6)	Dust (eqn 9)				
arsenic	0.002	1	0.002	100%	0.005	50%	0.001	0%		4.3E+03	1.1E+04	6.2E+05			3071	**3000**
beryllium	0.002	0.007	0.000014	100%	0.001	30%	0.000020	0%		6.0E+03	5.5E+02	1.2E+04			483	**500**
boron	0.2			100%		65%	0.7	65%		3.0E+05	NA	1.5E+08			297503	**300000**
cadmium	0.0008			100%		60%	0.000005	20%		1.4E+03	NA	2.5E+03			881	**900**
chromium (VI)	0.001			100%		10%	0.0001	0%		3.8E+03	NA	6.2E+04			3611	**3600**
cobalt	0.001	1	0.0014	100%	0.001	20%	0.0001	0%		4.8E+03	6.3E+04	6.2E+04			4138	**4000**
copper	0.14			100%		60%	0.49	60%		2.4E+05	NA	1.2E+08			238002	**240000**
manganese	0.16			100%		50%	0.00015	20%		3.4E+05	NA	7.5E+04			61373	**60000**
methyl mercury	0.00023	1	0.00023	100%	0.001	80%	0.000805	80%		2.0E+02	2.6E+03	1.0E+05			182	**180**
mercury (inorganic)	0.0006	0.07	0.000042	100%	0.001	40%	0.0002	10%		1.5E+03	1.4E+03	1.1E+05			730	**730**
nickel	0.012	1	0.012	100%	0.005	60%	0.00002	20%		2.0E+04	5.4E+04	1.0E+04			5963	**6000**
selenium	0.006			100%		60%	0.021	60%		1.0E+04	NA	5.2E+06			10200	**10000**
zinc	0.5	1	0.5	100%	0.001	80%	1.75	80%		4.3E+05	5.6E+06	2.2E+08			395040	**400000**
cyanide (free) (no VI)	0.006	1	0.006	100%	0.1	50%	0.0008	0%		1.3E+04	1.7E+03	5.0E+05			1481	**1500**
TCE							0.002	10%		NA	NA	NA	8.2E-02	**0.08**		
1,1,1-TCA							5	0%		NA	NA	NA	2.3E+02	**230**		
PCE							0.2	10%		NA	NA	NA	8.2E+00	**8**		
cis-1,2-dichloroethene							0.007	0%		NA	NA	NA	3.2E-01	**0.3**		
phenol	0.7	1	0.7	100%	0.1	30%	0.035	30%		2.1E+06	2.7E+05	1.5E+07			238835	**240000**
pentachlorophenol	0.003	1	0.003	100%	0.24	0%	0.0105	0%		1.3E+04	7.0E+02	6.6E+06			664	**660**
cresols	0.1	1	0.1	100%	0.1	50%	0.35	50%		2.1E+05	2.8E+04	1.1E+08			24752	**25000**
DDX	0.002	1	0.002	100%	0.018	0%	0.007	0%		8.5E+03	6.2E+03	4.4E+06			3594	**3600**
aldrin and dieldrin	0.0001	1	0.0001	100%	0.1	10%	0.00035	10%		3.8E+02	5.0E+01	2.0E+05			44.6	**45**
chlordane	0.0005	1	0.0005	100%	0.04	0%	0.00175	0%		2.1E+03	7.0E+02	1.1E+06			527	**530**
endosulfan	0.006	1	0.006	100%	0.1	30%	0.021	30%		1.8E+04	2.4E+03	9.2E+06			2079	**2000**
endrin	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		8.5E+02	1.1E+02	4.4E+05			99	**100**
heptachlor	0.0001	1	0.0001	100%	0.1	0%	0.00035	0%		4.3E+02	5.6E+01	2.2E+05			49.5	**50**
HCB	0.00016	1	0.00016	100%	0.1	0%	0.00056	0%		6.8E+02	9.0E+01	3.5E+05			79	**80**
methoxychlor	0.005	1	0.005	100%	0.1	0%	0.0175	0%		2.1E+04	2.8E+03	1.1E+07			2475	**2500**
mirex	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		8.5E+02	1.1E+02	4.4E+05			99	**100**
toxaphene	0.00035	1	0.00035	100%	0.1	10%	0.001225	10%		1.3E+03	1.8E+02	6.9E+05			156	**160**
2,4,5-T	0.01	1	0.01	100%	0.1	0%	0.035	0%		4.3E+04	5.6E+03	2.2E+07			4950	**5000**
2,4-D	0.01	1	0.01	100%	0.05	0%	0.035	0%		4.3E+04	1.1E+04	2.2E+07			8868	**9000**
MCPA	0.01	1	0.01	100%	0.1	0%	0.035	0%		4.3E+04	5.6E+03	2.2E+07			4950	**5000**
MCPB	0.01	1	0.01	100%	0.1	0%	0.035	0%		4.3E+04	5.6E+03	2.2E+07			4950	**5000**
mecoprop	0.01	1	0.01	100%	0.1	0%	0.035	0%		4.3E+04	5.6E+03	2.2E+07			4950	**5000**
picloram	0.07	1	0.07	100%	0.1	0%	0.245	0%		3.0E+05	3.9E+04	1.5E+08			34653	**35000**
atrazine	0.005	1	0.005	100%	0.1	0%	0.0175	0%		2.1E+04	2.8E+03	1.1E+07			2475	**2500**
chlorpyrifos	0.003	1	0.003	100%	0.03	50%	0.0105	50%		6.4E+03	2.8E+03	3.3E+06			1946	**2000**
bifenthrin	0.01	1	0.01	100%	0.1	10%	0.035	10%		3.8E+04	5.0E+03	2.0E+07			4455	**4500**
PCBs	0.00002	1	0.00002	100%	0.14	0%	0.00007	0%		8.5E+01	8.0E+00	4.4E+04			7.3	**7**
PBDE Flame Retardants (Br1-Br9)	0.0001	1	0.0001	100%	0.1	80%	0.00035	80%		8.5E+01	1.1E+01	4.4E+04			9.9	**10**

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

Non-Threshold Effects - Lifetime Exposures [adult]

Compound	Toxicity Reference Value Oral (TRV_O) $(mg/kg/day)^{-1}$	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SFd) $(mg/kg/day)^{-1}$	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV_I) $(mg/m^3)^{-1}$		Target Risk (TR)	Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqns 13 and 14)	Derived Interim Soil Gas IL - Threshold (to 1 or 2 s.f.) (mg/m^3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)
										Soil Ingestion (eqns 4 and 5)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)				
TCE							0.004		1E-05	NA	NA	NA	2.7E-01	**0.3**		
vinyl chloride							0.00880		1E-05	NA	NA	NA	1.2E-01	**0.1**		
benzo(a)pyrene	0.5	1	0.5	100%	0.06		1.43E-01		1E-05	2.0E+02	4.4E+01	1.0E+05			35.7	**40**

Appendix E

Contingency Plan and Unexpected Finds Protocol

Appendix E
Contingency and Unexpected Finds Plan

E1.0 General

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 (and inform the Site Auditor, if subject to audit). Where necessary the Environmental Consultant will prepare an addendum to, or revision of, this RAP.

E2.0 Contingency Plan

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 preferred remediation strategy, (Section 10) is encountered during the remediation works. Any such finds shall be surveyed and the location documented.

This section also outlines alternate contingencies to the preferred remediation strategy.

E2.1 Contingency Capping Strategy

Where fill exceeding the RAC is planned to be retained on site the following general strategy will be adopted. It is noted that if considered, further detail will be required depending upon other inputs to the capping design which may include geotechnical, structural and landscaping considerations. Generally, it is considered that the RAP will require revision if adopted.

For a 'borrow pit' capping strategy:

- Excavate the area where materials are planned to be encapsulated;
- Inspection of the excavation by the Environmental Consultant;
- Survey the extent and depth of the excavation;
- Lining the base and walls of the excavation with geofabric (or other suitable material);
- Placement of fill within the excavation, allowing for an appropriate thickness of capping layer for the final levels (refer point below);
- Placement of geofabric marker layer on top of the fill;
- Survey the level of the marker layer;
- Placement of a capping layer comprising VENM and inspection by the Environmental Consultant. Generally, the capping layer would need to be a minimum of 0.5 m thick for landscaped areas, or 0.2 m thick for hardstand covered areas;

- Survey the level of the capping layer; and
- Completion of final landform and inspection by the Environmental Consultant.

For areas where fill is left *in situ*:

- Excavate the area allowing for an appropriate thickness of capping layer for the final levels (refer point below).
- Placement of geofabric marker layer on top of the retained fill;
- Survey the level of the marker layer;
- Placement of a capping layer comprising VENM and inspection by the Environmental Consultant. Generally, the capping layer would need to be a minimum of 0.5 m thick for landscaped areas or 0.2 m thick where covered in hardstand;
- Survey the level of the capping layer; and
- Completion of final landform and inspection by the Environmental Consultant.

Adoption of the capping strategy will require documentation within the validation report, and development of a long-term environmental management plan (EMP).

E2.2 Contingency - Removal of all Fill

As an alternative to the preferred remediation strategy it is considered that all fill within the site may be excavated and disposed of off-site rather than undertaking additional data gap analysis or further assessment.

If undertaken all fill will be currently presumed to contain potential asbestos materials in soil.

The following sequence would then apply:

- Excavate all fill within the site;
- Off-site disposal under the assigned in situ classification of General Solid Waste (non-putrescible) - Special Waste (asbestos). Alternatively, fill may be stockpiled and subject to further testing and classification as per Section 13;
- Upon reaching natural soils, inspection and testing by the Environmental Consultant as per the requirements of Section 12; and
- Further excavation and off-site disposal of natural soils.

E2.3 General Contingency

Although the site has been subject to previous investigations 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., evidence of asbestos containing material (ACM), 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 the 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) and Site Auditor (if subject to audit);
- 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.

E3.0 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 and made aware of 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 in accordance with a Communications Plan.

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.

E4.0 References

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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Appendix F

Data Quality Objectives

Appendix F
Data Quality Objectives

F1.0 Introduction

The objective of the validation plan is to assess whether the capping layer has been constructed in accordance with the RAP, assess the resultant 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.

F2.0 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 educational 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; • PAH; and • Asbestos The validation sampling results will be compared against the RAC. The preferred remediation strategy as outlined in the RAP is the excavation and disposal of contaminated soils and further assessment of soils outside of bulk excavation areas. 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. If the contingency capping strategy is undertaken the following will also be included: • Inspections of the maker layer prior to capping works; • Assessments of aggregates, soil, etc imported as part of the capping; • Inspections of the capping; • Review of the survey of the installed capping; • An enforceable long term environmental management plan (LTEMP) has been prepared for implementation during use of the land for educational purposes; and • Details of the proposed development.
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%; 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.

Step	Summary
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; • 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. If the contingency capping strategy is undertaken: • Visual inspections of the cap construction by the Environmental Consultant in accordance with Appendix E; and • Registered survey of the capping layer in accordance with Appendix E.

F3.0 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 G

Site Management Plan

Appendix G
Site Management Plan

1. 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.

2. Roles and Responsibilities

2.1 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.

2.2 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.

2.3 Surveyor

If the contingency capping strategy is undertaken the project surveyor will be a registered surveyor engaged by the Contractor to undertake surveying works as required by this RAP.

2.4 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 the potential to include both friable and bonded asbestos, and that holding a Class A licence may reduce any potential delays.

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

2.5 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.

2.6 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.

2.7 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.

2.8 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)).

3. Stormwater Management

3.1 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.

3.2 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.

4. Soil Management Plan

4.1 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.

4.2 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.

5. 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.

6. 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.

7. 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.

8. Work Health and Safety Plan

8.1 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.

8.2 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).

8.3 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.

8.4 Chemical Contamination Hazards

Chemical compounds or substances that may be present in the soils at the site include the key CoPC metals, PAH and, given the presence of fill, asbestos. There is also a lower probability of other contaminants being present.

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.

If asbestos is encountered in fill, this risk evaluation should be revised.

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.

8.5 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.

8.6 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, in accordance with (but not limited to) the following codes of practice:

- SafeWork NSW *Code of Practice, How to Manage and Control Asbestos in the Workplace* (SafeWork NSW, 2019a)
- SafeWork *NSW Code of Practice, How to Safely Remove Asbestos* (SafeWork NSW, 2019b);
- WorkCover NSW *Managing Asbestos in or on Soil* (WorkCover NSW, 2014);
- NOHSC *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Ed* (NOHSC, 2005).

9. Remediation Schedule and Hours of Operation

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

10. 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

11. 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.

Douglas Partners Pty Ltd

Appendix H

Laboratory Documentation

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 321639

Client Details

Client	Douglas Partners Pty Ltd
Attention	Joel Hall
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**204585.03, Strathfield**
Number of Samples	13 Soil, 4 Material
Date samples received	24/04/2023
Date completed instructions received	24/04/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	02/05/2023
Date of Issue	02/05/2023

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Asbestos Approved By
Analysed by Asbestos Approved Analyst: Nyovan Moonean, Anthony Clark
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Hannah Nguyen, Metals Supervisor
Kyle Gavrily, Senior Chemist
Lucy Zhu, Asbestos Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		321639-1	321639-2	321639-3	321639-4	321639-5
Your Reference	UNITS	BH11	BH12	BH13	BH13	BH14
Depth		0.3-0.5	0-0.2	0-0.2	0.3-0.5	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	99	106	102	107	108

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		321639-6	321639-7	321639-8	321639-9	321639-10
Your Reference	UNITS	BH14	BH15	BH15	BH16	BH17
Depth		0.4-0.6	0-0.2	1.3-1.5	0-0.2	0.4-0.6
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	21/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	105	103	94	103	99

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		321639-11	321639-13
Your Reference	UNITS	BH18	BD1/2004
Depth		0-0.2	-
Date Sampled		21/04/2023	20/04/2023
Type of sample		Soil	Soil
Date extracted	-	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
Naphthalene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<1	<1
Surrogate aaa-Trifluorotoluene	%	100	102

svTRH (C10-C40) in Soil						
Our Reference		321639-1	321639-2	321639-3	321639-4	321639-5
Your Reference	UNITS	BH11	BH12	BH13	BH13	BH14
Depth		0.3-0.5	0-0.2	0-0.2	0.3-0.5	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	100	<100	340	110	100
TRH C_{29} - C_{36}	mg/kg	<100	<100	190	<100	<100
Total +ve TRH (C10-C36)	mg/kg	100	<50	520	110	100
TRH >C_{10} -C_{16}	mg/kg	<50	53	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	53	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	120	<100	460	170	160
TRH >C_{34} -C_{40}	mg/kg	<100	<100	110	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	120	50	570	170	160
Surrogate o-Terphenyl	%	111	110	137	112	112

svTRH (C10-C40) in Soil						
Our Reference		321639-6	321639-7	321639-8	321639-9	321639-10
Your Reference	UNITS	BH14	BH15	BH15	BH16	BH17
Depth		0.4-0.6	0-0.2	1.3-1.5	0-0.2	0.4-0.6
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	21/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	110	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	110	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	220	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	110	<100	<100	180	120
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	110	<50	<50	180	120
Surrogate o-Terphenyl	%	110	106	107	112	111

svTRH (C10-C40) in Soil			
Our Reference		321639-11	321639-13
Your Reference	UNITS	BH18	BD1/2004
Depth		0-0.2	-
Date Sampled		21/04/2023	20/04/2023
Type of sample		Soil	Soil
Date extracted	-	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	100	<100
TRH C_{29} - C_{36}	mg/kg	140	<100
Total +ve TRH (C10-C36)	mg/kg	250	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	200	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	200	<50
Surrogate o-Terphenyl	%	110	106

PAHs in Soil						
Our Reference		321639-1	321639-2	321639-3	321639-4	321639-5
Your Reference	UNITS	BH11	BH12	BH13	BH13	BH14
Depth		0.3-0.5	0-0.2	0-0.2	0.3-0.5	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Naphthalene	mg/kg	<0.1	<0.1	1.2	<0.1	<0.1
Acenaphthylene	mg/kg	0.2	0.1	2.0	0.4	0.4
Acenaphthene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	0.9	0.1	0.1
Phenanthrene	mg/kg	0.7	0.7	15	1.8	1.9
Anthracene	mg/kg	0.2	0.2	4.3	0.6	0.6
Fluoranthene	mg/kg	1.8	1.1	19	3.9	3.6
Pyrene	mg/kg	1.8	1	17	4.0	3.5
Benzo(a)anthracene	mg/kg	1.0	0.5	10	2.3	2.0
Chrysene	mg/kg	1.1	0.6	7.2	2.3	1.9
Benzo(b,j+k)fluoranthene	mg/kg	2	0.8	11	3.7	3.0
Benzo(a)pyrene	mg/kg	1.4	0.62	7.7	3.0	2.3
Indeno(1,2,3-c,d)pyrene	mg/kg	0.7	0.3	2.8	1.4	1.0
Dibenzo(a,h)anthracene	mg/kg	0.2	<0.1	1.0	0.4	0.3
Benzo(g,h,i)perylene	mg/kg	0.8	0.3	4.0	1.5	1.1
Total +ve PAH's	mg/kg	12	6.3	100	25	22
Benzo(a)pyrene TEQ calc (zero)	mg/kg	2.0	0.8	11	4.1	3.3
Benzo(a)pyrene TEQ calc(half)	mg/kg	2.0	0.8	11	4.1	3.3
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	2.0	0.9	11	4.1	3.3
Surrogate p-Terphenyl-d14	%	126	126	116	126	128

PAHs in Soil						
Our Reference		321639-6	321639-7	321639-8	321639-9	321639-10
Your Reference	UNITS	BH14	BH15	BH15	BH16	BH17
Depth		0.4-0.6	0-0.2	1.3-1.5	0-0.2	0.4-0.6
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	21/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	0.1	0.3	0.3
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	0.1	0.1
Phenanthrene	mg/kg	0.8	0.3	0.7	1.8	1.9
Anthracene	mg/kg	0.2	<0.1	0.2	0.5	0.5
Fluoranthene	mg/kg	1.4	0.6	1.5	2.8	2.9
Pyrene	mg/kg	1.3	0.6	1.6	2.7	2.8
Benzo(a)anthracene	mg/kg	0.7	0.3	0.8	1.4	1.5
Chrysene	mg/kg	0.7	0.3	0.9	1.4	1.4
Benzo(b,j+k)fluoranthene	mg/kg	1	0.5	1	2	2.1
Benzo(a)pyrene	mg/kg	0.79	0.4	1.1	1.5	1.6
Indeno(1,2,3-c,d)pyrene	mg/kg	0.4	0.2	0.5	0.6	0.7
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	0.2	0.2	0.2
Benzo(g,h,i)perylene	mg/kg	0.4	0.2	0.6	0.6	0.8
Total +ve PAH's	mg/kg	8.0	3.2	9.4	16	17
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.1	<0.5	1.5	2.2	2.3
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.1	0.5	1.5	2.2	2.3
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.1	0.6	1.5	2.2	2.3
Surrogate p-Terphenyl-d14	%	127	124	123	122	123

PAHs in Soil					
Our Reference		321639-11	321639-12	321639-13	321639-18
Your Reference	UNITS	BH18	BH18	BD1/2004	BH18 - [TRIPLICATE]
Depth		0-0.2	0.3-0.5	-	0.3-0.5
Date Sampled		21/04/2023	21/04/2023	20/04/2023	21/04/2023
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023	27/04/2023	02/05/2023
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	0.2
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.2	0.1	0.3	0.9
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.3
Fluoranthene	mg/kg	0.5	0.3	0.7	1.0
Pyrene	mg/kg	0.5	0.3	0.6	1.3
Benzo(a)anthracene	mg/kg	0.2	0.1	0.4	0.6
Chrysene	mg/kg	0.3	0.2	0.4	0.7
Benzo(b,j+k)fluoranthene	mg/kg	0.5	0.2	0.6	1
Benzo(a)pyrene	mg/kg	0.3	0.2	0.4	0.60
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	<0.1	0.2	0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2	<0.1	0.2	0.3
Total +ve PAH's	mg/kg	2.8	1.5	3.8	7.4
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	0.6	0.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	0.6	0.9
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	<0.5	0.7	0.9
Surrogate p-Terphenyl-d14	%	125	128	125	81

Organochlorine Pesticides in soil						
Our Reference		321639-2	321639-3	321639-4	321639-5	321639-7
Your Reference	UNITS	BH12	BH13	BH13	BH14	BH15
Depth		0-0.2	0-0.2	0.3-0.5	0-0.2	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	117	114	117	117	113

Organochlorine Pesticides in soil			
Our Reference		321639-9	321639-13
Your Reference	UNITS	BH16	BD1/2004
Depth		0-0.2	-
Date Sampled		20/04/2023	20/04/2023
Type of sample		Soil	Soil
Date extracted	-	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023
alpha-BHC	mg/kg	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	115	113

Organophosphorus Pesticides in Soil						
Our Reference		321639-2	321639-3	321639-4	321639-5	321639-7
Your Reference	UNITS	BH12	BH13	BH13	BH14	BH15
Depth		0-0.2	0-0.2	0.3-0.5	0-0.2	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	117	114	117	117	113

Organophosphorus Pesticides in Soil			
Our Reference		321639-9	321639-13
Your Reference	UNITS	BH16	BD1/2004
Depth		0-0.2	-
Date Sampled		20/04/2023	20/04/2023
Type of sample		Soil	Soil
Date extracted	-	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023
Dichlorvos	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Surrogate TCMX	%	115	113

PCBs in Soil						
Our Reference		321639-2	321639-3	321639-4	321639-5	321639-7
Your Reference	UNITS	BH12	BH13	BH13	BH14	BH15
Depth		0-0.2	0-0.2	0.3-0.5	0-0.2	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	117	114	117	117	113

PCBs in Soil			
Our Reference		321639-9	321639-13
Your Reference	UNITS	BH16	BD1/2004
Depth		0-0.2	-
Date Sampled		20/04/2023	20/04/2023
Type of sample		Soil	Soil
Date extracted	-	27/04/2023	27/04/2023
Date analysed	-	27/04/2023	27/04/2023
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCMX	%	115	113

Acid Extractable metals in soil						
Our Reference		321639-1	321639-2	321639-3	321639-4	321639-5
Your Reference	UNITS	BH11	BH12	BH13	BH13	BH14
Depth		0.3-0.5	0-0.2	0-0.2	0.3-0.5	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Arsenic	mg/kg	13	10	10	16	9
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	15	14	15	25	12
Copper	mg/kg	26	17	16	32	30
Lead	mg/kg	180	150	220	360	940
Mercury	mg/kg	0.2	0.2	0.2	0.4	0.2
Nickel	mg/kg	4	3	3	5	2
Zinc	mg/kg	110	76	100	110	120

Acid Extractable metals in soil						
Our Reference		321639-6	321639-7	321639-8	321639-9	321639-10
Your Reference	UNITS	BH14	BH15	BH15	BH16	BH17
Depth		0.4-0.6	0-0.2	1.3-1.5	0-0.2	0.4-0.6
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	21/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Arsenic	mg/kg	10	9	8	5	10
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	17	15	17	7	20
Copper	mg/kg	38	22	12	18	22
Lead	mg/kg	110	130	130	55	63
Mercury	mg/kg	0.2	0.2	0.1	<0.1	<0.1
Nickel	mg/kg	2	2	3	5	15
Zinc	mg/kg	69	130	61	65	66

Acid Extractable metals in soil					
Our Reference		321639-11	321639-12	321639-13	321639-19
Your Reference	UNITS	BH18	BH18	BD1/2004	BD1/2004 - [TRIPLICATE]
Depth		0-0.2	0.3-0.5	-	-
Date Sampled		21/04/2023	21/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Arsenic	mg/kg	4	<4	8	8
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	10	7	15	13
Copper	mg/kg	32	23	20	16
Lead	mg/kg	39	140	180	110
Mercury	mg/kg	<0.1	0.3	0.2	0.2
Nickel	mg/kg	5	5	3	3
Zinc	mg/kg	110	65	76	72

Moisture						
Our Reference		321639-1	321639-2	321639-3	321639-4	321639-5
Your Reference	UNITS	BH11	BH12	BH13	BH13	BH14
Depth		0.3-0.5	0-0.2	0-0.2	0.3-0.5	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Moisture	%	17	14	27	32	7.2

Moisture						
Our Reference		321639-6	321639-7	321639-8	321639-9	321639-10
Your Reference	UNITS	BH14	BH15	BH15	BH16	BH17
Depth		0.4-0.6	0-0.2	1.3-1.5	0-0.2	0.4-0.6
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	21/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Moisture	%	15	7.6	15	11	8.9

Moisture				
Our Reference		321639-11	321639-12	321639-13
Your Reference	UNITS	BH18	BH18	BD1/2004
Depth		0-0.2	0.3-0.5	-
Date Sampled		21/04/2023	21/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	27/04/2023	27/04/2023	27/04/2023
Date analysed	-	28/04/2023	28/04/2023	28/04/2023
Moisture	%	27	31	3.5

Misc Soil - Inorg						
Our Reference		321639-2	321639-3	321639-4	321639-5	321639-7
Your Reference	UNITS	BH12	BH13	BH13	BH14	BH15
Depth		0-0.2	0-0.2	0.3-0.5	0-0.2	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	26/04/2023	26/04/2023	26/04/2023	26/04/2023	26/04/2023
Date analysed	-	27/04/2023	27/04/2023	27/04/2023	27/04/2023	27/04/2023
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg			
Our Reference		321639-9	321639-13
Your Reference	UNITS	BH16	BD1/2004
Depth		0-0.2	-
Date Sampled		20/04/2023	20/04/2023
Type of sample		Soil	Soil
Date prepared	-	26/04/2023	26/04/2023
Date analysed	-	27/04/2023	27/04/2023
Total Phenolics (as Phenol)	mg/kg	<5	<5

Asbestos ID - soils						
Our Reference		321639-1	321639-6	321639-8	321639-10	321639-11
Your Reference	UNITS	BH11	BH14	BH15	BH17	BH18
Depth		0.3-0.5	0.4-0.6	1.3-1.5	0.4-0.6	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	21/04/2023	21/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
Sample mass tested	g	Approx. 65g	Approx. 70g	Approx. 70g	Approx. 60g	Approx. 55g
Sample Description	-	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils NEPM						
Our Reference		321639-2	321639-3	321639-4	321639-5	321639-7
Your Reference	UNITS	BH12	BH13	BH13	BH14	BH15
Depth		0-0.2	0-0.2	0.3-0.5	0-0.2	0-0.2
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	02/05/2023	02/05/2023	02/05/2023	02/05/2023	02/05/2023
Sample mass tested	g	583.53	540.61	434.05	587.41	545.93
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	Chrysotile asbestos detected Amosite asbestos detected Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	4.7584
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	Chrysotile	Chrysotile	No visible asbestos detected	See Above
ACM >7mm Estimation*	g	–	–	–	–	2.5978
FA and AF Estimation*	g	–	0.0034	0.0001	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM		
Our Reference		321639-9
Your Reference	UNITS	BH16
Depth		0-0.2
Date Sampled		20/04/2023
Type of sample		Soil
Date analysed	-	02/05/2023
Sample mass tested	g	402.25
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1
Asbestos ID in soil <0.1g/kg*	-	Amosite
ACM >7mm Estimation*	g	–
FA and AF Estimation*	g	0.0001
FA and AF Estimation*#2	%(w/w)	<0.001

Asbestos ID - materials					
Our Reference		321639-14	321639-15	321639-16	321639-17
Your Reference	UNITS	BH14	BH14	BH15	BH15
Depth		0-0.4	0.4-0.8	0-0.5	0.5-1
Date Sampled		20/04/2023	20/04/2023	20/04/2023	20/04/2023
Type of sample		Material	Material	Material	Material
Date analysed	-	01/05/2023	01/05/2023	01/05/2023	01/05/2023
Mass / Dimension of Sample	-	30.38g	48.11g	214.92g	125.96g
Sample Description	-	Brown fibre cement material	Assorted fibre cement material	Assorted fibre cement material	Assorted fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected	Chrysotile asbestos detected Amosite asbestos detected	Chrysotile asbestos detected Amosite asbestos detected
Trace Analysis	-	[NT]	[NT]	[NT]	[NT]

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	321639-3
Date extracted	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Date analysed	-			28/04/2023	2	28/04/2023	28/04/2023		28/04/2023	28/04/2023
TRH C_6 - C_9	mg/kg	25	Org-023	<25	2	<25	<25	0	113	113
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	2	<25	<25	0	113	113
Benzene	mg/kg	0.2	Org-023	<0.2	2	<0.2	<0.2	0	109	108
Toluene	mg/kg	0.5	Org-023	<0.5	2	<0.5	<0.5	0	111	111
Ethylbenzene	mg/kg	1	Org-023	<1	2	<1	<1	0	111	109
m+p-xylene	mg/kg	2	Org-023	<2	2	<2	<2	0	117	117
o-Xylene	mg/kg	1	Org-023	<1	2	<1	<1	0	123	120
Naphthalene	mg/kg	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	101	2	106	100	6	99	99

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Date analysed	-			[NT]	13	28/04/2023	28/04/2023		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	13	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	13	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	13	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	13	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	13	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	13	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	13	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	13	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	13	102	102	0	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	321639-3
Date extracted	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Date analysed	-			28/04/2023	2	28/04/2023	28/04/2023		28/04/2023	28/04/2023
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	2	<50	51	2	113	109
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	2	<100	<100	0	104	109
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	2	<100	<100	0	86	118
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	2	53	58	9	113	109
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	2	<100	<100	0	104	109
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	2	<100	<100	0	86	118
Surrogate o-Terphenyl	%		Org-020	104	2	110	111	1	98	109

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Date analysed	-			[NT]	13	28/04/2023	28/04/2023		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	13	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	13	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	13	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	13	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	13	<100	100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	13	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	13	106	108	2	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	321639-3
Date extracted	-			28/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Date analysed	-			29/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	86	#
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	2	0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	93	88
Fluorene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	86	#
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	2	0.7	0.5	33	86	#
Anthracene	mg/kg	0.1	Org-022/025	<0.1	2	0.2	0.2	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	2	1.1	0.8	32	90	#
Pyrene	mg/kg	0.1	Org-022/025	<0.1	2	1	0.7	35	89	#
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	2	0.5	0.4	22	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	2	0.6	0.4	40	95	#
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	2	0.8	0.6	29	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	2	0.62	0.5	21	102	#
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	2	0.3	0.2	40	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	2	0.3	0.2	40	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	98	2	126	127	1	102	108

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Date analysed	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	13	0.3	0.5	50	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	0.2	67	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	13	0.7	1.3	60	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	13	0.6	1.5	86	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	13	0.4	0.8	67	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	13	0.4	1	86	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	13	0.6	2	108	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	13	0.4	1.2	100	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	13	0.2	0.6	100	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	0.2	67	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	13	0.2	0.6	100	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	13	125	122	2	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	321639-3
Date extracted	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Date analysed	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	90	98
HCB	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	98	114
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	111	133
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	81	95
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	94	118
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	92	109
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	114	122
Endrin	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	102	123
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	96	117
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	89	117
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	115	2	117	115	2	98	102

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Date analysed	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	13	113	112	1	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	321639-3
Date extracted	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Date analysed	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	107	123
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	93	106
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	113	114
Malathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	114	124
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	102	126
Parathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	109	117
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	98	117
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	115	2	117	115	2	98	102

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Date analysed	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	13	113	112	1	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	321639-3
Date extracted	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Date analysed	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	2	<0.1	<0.1	0	80	80
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	115	2	117	115	2	98	102

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Date analysed	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	13	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	13	113	112	1	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	321639-3
Date prepared	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Date analysed	-			28/04/2023	2	28/04/2023	28/04/2023		28/04/2023	28/04/2023
Arsenic	mg/kg	4	Metals-020	<4	2	10	9	11	104	74
Cadmium	mg/kg	0.4	Metals-020	<0.4	2	<0.4	<0.4	0	101	76
Chromium	mg/kg	1	Metals-020	<1	2	14	11	24	105	86
Copper	mg/kg	1	Metals-020	<1	2	17	14	19	103	90
Lead	mg/kg	1	Metals-020	<1	2	150	130	14	108	##
Mercury	mg/kg	0.1	Metals-021	<0.1	2	0.2	0.1	67	97	112
Nickel	mg/kg	1	Metals-020	<1	2	3	3	0	107	74
Zinc	mg/kg	1	Metals-020	<1	2	76	71	7	108	#

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	13	27/04/2023	27/04/2023		[NT]	[NT]
Date analysed	-			[NT]	13	28/04/2023	28/04/2023		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	13	8	7	13	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	13	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	13	15	14	7	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	13	20	16	22	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	13	180	120	40	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	13	0.2	0.2	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	13	3	2	40	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	13	76	71	7	[NT]	[NT]

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	321639-3
Date prepared	-			26/04/2023	2	26/04/2023	26/04/2023		26/04/2023	26/04/2023
Date analysed	-			27/04/2023	2	27/04/2023	27/04/2023		27/04/2023	27/04/2023
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	2	<5	<5	0	100	100

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

PAHs in Soil:
- # Percent recovery for the matrix spike is not possible to report as the high concentration of analytes in samples 321639-3ms have caused interference.
- The laboratory RPD acceptance criteria has been exceeded for 321639-13. Therefore a triplicate result has been issued as laboratory sample number 321639-18.

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Factual description of asbestos identified in the soil samples: NEPM
Sample 321639-3; Chrysotile asbestos identified in 0.0042g of fibrous matted material
Sample 321639-4; Chrysotile asbestos identified in 0.0001g of loose fibre bundles
Sample 321639-7; Chrysotile & Amosite asbestos identified in 17.3184g of fibre cement material >7mm
Sample 321639-9; Amosite asbestos identified in 0.0001g of loose fibre bundles

Note: All samples analysed as received. However, samples 321639-7,9 are below the minimum recommended 500mL sample volume as per National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos according to ASB-001 asbestos subsampling procedure. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab/MPL recommends supplying 40-60g or 500ml of sample in its own container.
Note: Samples 321639-1,6,8,10,11 were sub-sampled from bags provided by the client.

Acid Extractable Metals in Soil:
- The laboratory RPD acceptance criteria has been exceeded for 321639-13 for Pb. Therefore a triplicate result has been issued as laboratory sample number 321639-19.
- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
-## Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	204585.03	**Suburb:**	Strathfield	**To:**	Lab name
Project Manager:	Joel James-Hall	**Order Number:**		**Sampler:** SAF	Lab address
Email:	joel.james-hall@douglaspartners.com.au			**Attn:**	Name
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				Lab phone Lab email
Prior Storage:	☑ Fridge ☐ Freezer ☑ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☐ No ☑ Yes	(If YES, then handle, transport and store in accordance with FPM HAZID)	

Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Combo 3a	Combo 8	AF/FA	Asbestos	PAH	Heavy Metals						Notes/ Preservation/ Additional Requirements
1	BH11	0.3	0.5	20/04/23	S	G/P	X											
2	BH12	0	0.2	20/04/23	S	G/P		X	X									
3	BH13	0	0.2	20/04/23	S	G/P		X	X									
4	BH13	0.3	0.5	20/04/23	S	G/P		X	X									
5	BH14	0	0.2	20/04/23	S	G/P		X	X									
6	BH14	0.4	0.6	20/04/23	S	G/P	X											
7	BH15	0	0.2	20/04/23	S	G/P		X	X									
8	BH15	1.3	1.5	20/04/23	S	G/P	X											
9	BH16	0	0.2	20/04/23	S	G/P		X	X									
10	BH17	0.4	0.6	21/04/23	S	G/P	X											
11	BH18	0	0.2	21/04/23	S	G/P	X											
12	BH18	0.3	0.5	21/04/23	S	G/P					X	X						
13	BD1/2004			20/04/23	S	G		X										
14	BH14	0	0.4	20/04/23	M	P				X								

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 321639
Date Received: 24/4/23
Time Received: 1610
Received By: DL
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse:		**LAB RECEIPT**	
Number of samples in container:	**Transported to laboratory by:**	**Lab Ref. No:**	321639
Send results to:	Douglas Partners Pty Ltd	**Received by:**	24/4/23
Address:	**Phone:**	**Date & Time:**	1610 24/4/23
Relinquished by:	ECS SYD **Date:** 24/4/23 **Signed:**	**Signed:**	

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	204585.03.	**Suburb:** Strathfield	**To:** Lab name
Project Manager:	Joel James-Hall		**Dispatch date:**

Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water M -	Container Type: G - glass P - plastic	Analytes: Combo 3a	Combo 8	AF/FA	Asbestos	PAH	Heavy Metals						Notes/ Preservation/ Additional Requirements
15	BH14	0.4	0.8	20/04/23	M	P				X								
16	BH15	0	0.5	20/04/23	M	P				X								
17	BH15	0.5	1	20/04/23	M	P				X								

3 21639 24/4/23 @ 16h

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADV ICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Joel Hall

Sample Login Details

Your reference	204585.03, Strathfield
Envirolab Reference	321639
Date Sample Received	24/04/2023
Date Instructions Received	24/04/2023
Date Results Expected to be Reported	02/05/2023

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	13 Soil, 4 Material
Turnaround Time Requested	Standard
Temperature on Receipt (° C)	12
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

No asb bag received for BH13 0.3-0.5

Please direct any queries to:

Aileen Hie	J acinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: j hurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBs in Soil	Acid Extractable metalsin soil	Misc Soil - Inorg	Asbestos ID - soils	Asbestos ID - soils NEPM	Asbestos ID - materials
BH11-0.3-0.5	✓	✓	✓				✓		✓		
BH12-0-0.2	✓	✓	✓	✓	✓	✓	✓	✓		✓	
BH13-0-0.2	✓	✓	✓	✓	✓	✓	✓	✓		✓	
BH13-0.3-0.5	✓	✓	✓	✓	✓	✓	✓	✓			
BH14-0-0.2	✓	✓	✓	✓	✓	✓	✓	✓		✓	
BH14-0.4-0.6	✓	✓	✓				✓		✓		
BH15-0-0.2	✓	✓	✓	✓	✓	✓	✓	✓		✓	
BH15-1.3-1.5	✓	✓	✓				✓		✓		
BH16-0-0.2	✓	✓	✓	✓	✓	✓	✓	✓		✓	
BH17-0.4-0.6	✓	✓	✓				✓		✓		
BH18-0-0.2	✓	✓	✓				✓		✓		
BH18-0.3-0.5			✓				✓				
BD1/2004	✓	✓	✓	✓	✓	✓	✓	✓			
BH14-0-0.4											✓
BH14-0.4-0.8											✓
BH15-0-0.5											✓
BH15-0.5-1											✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESU LTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.