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Integrated Practical Solutions

Revised Remediation Action Plan

Proposed School
Lot 100, DP1261496 Maitland Street, Muswellbrook

Prepared for
Pacific Brook Christian School

Project 91601.04
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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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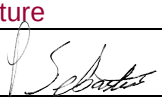
Author		23 July 2024
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Revised Remediation Action Plan
Proposed School
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1. Introduction

1.1 General

This Remediation Action Plan (RAP) has been prepared for a proposed school at Lot 100, DP1261496 Maitland Street, Muswellbrook. The work was commissioned in an email dated 5 November 2020 by Mark Smith on behalf of Pacific Brook Christian School and was undertaken with reference to Douglas Partners Pty Ltd (DP) email proposal dated 14 October 2020.

It is understood that the development of the site will comprise a school facility (primary and secondary school (K -12)). Localised site remediation will be conducted following demolition, as part of the Stage 1 development as indicated in Section 3 below.

This RAP specifically addresses the localised bonded asbestos containing materials (ACM) identified at the surface of the site adjacent to existing buildings. As a precautionary measure, localised asphalt materials containing elevated PAH concentrations (identified in the Supplementary Detailed Site Investigation (DP Report 91601.03.R.002.Rev4 dated May 2024)), will also be placed beneath the proposed carpark in conjunction with site remediation works.

This RAP has been developed based on the results of previous assessments undertaken at the site, including the Supplementary DSI by DP in Aug 2020, the DSI by DP in July 2019, (both updated May 2024) and a preliminary contamination assessment (PCA) by JK Environments (2019) (JK). The RAP has been prepared with reference to the NSW EPA 'Guidelines for Consultants Reporting on Contaminated Land' (2020) and NEPC (2013).

1.2 Objectives

The objective of the RAP is to remediate the site in an acceptable manner, with minimal environmental impact, to a condition suitable for the proposed school development.

This RAP provides the clean-up objectives, remediation acceptance criteria (RAC), principles, methods and procedures by which the remediation and validation of the site will be achieved. The action plan is not intended as a specification for contract.

2. Site Details

2.1 Site Identification

The site is triangular in shape, with a northwest/southeast alignment and has an area of 2.432 ha. The site is bound by Muswellbrook Golf Course along the north eastern boundary, Maitland Street along the south western boundary and residential properties to the south eastern boundary (see below – Figure 1). The site address is 72-74 Maitland Street and is legally described as Lot 100 in Deposited Plan (DP) 1261496 (see below – Site Context).

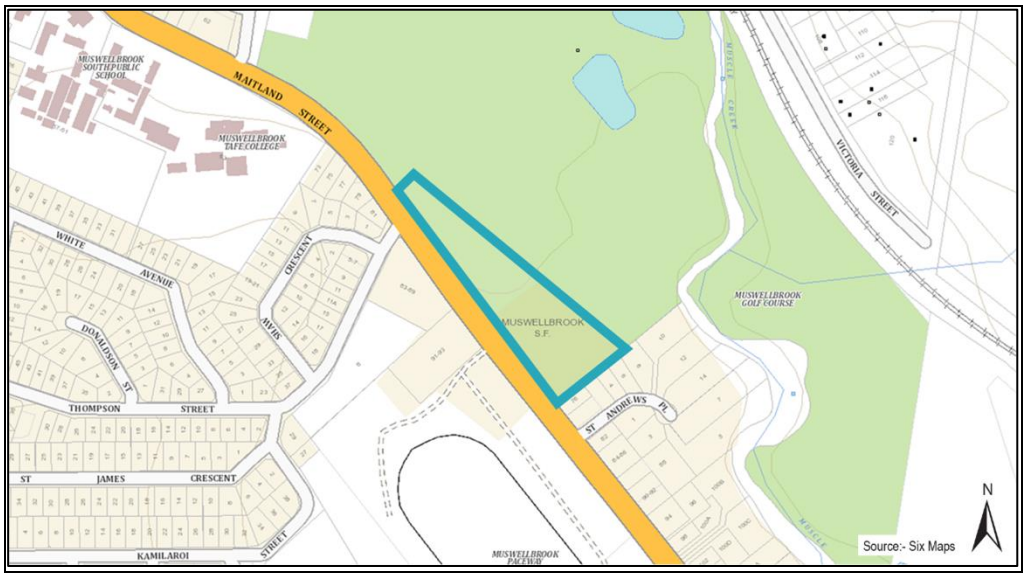
The site is generally level with a slight slope to a watercourse at the north west boundary. This watercourse flows northeast into the adjoining golf course and on to Muscle Creek via a series of dams on the golf course. Muscle Creek flows west into the Hunter River which at its closest is 1.3 km north-west of the site. Stormwater management on site is by overland flow.

72-74 Maitland Street was previously used for forestry plantation purposes and is mapped as Muswellbrook State Forest. The site is no longer used for this purpose and currently sits as an empty and underutilised site.

The main vehicular access to the site is from Maitland Street, as well as pedestrian access. Existing vehicular parking on site includes open air at grade parking spaces facing Maitland Street.

In terms of travel, Muswellbrook is approximately three (3) hours from Sydney, three hours (3) from Dubbo, two (2) hours from Tamworth and 90 minutes from Newcastle.

Figure 1: Aerial Image of Site Boundary



Site Context

At the time of the investigation the site was vacant and generally comprised several empty buildings in connection with the previous site use (plant nursery), gravel and asphalt paths, gravel garden beds and grass covering.
The site is bound by Maitland Street to the south west, residential developments immediately to the south east with a service station located further to the south east (approximately 60 m), a golf course to the north and north-east.

The site is zoned R1 General Residential and is within Muswellbrook Shire Council.

Refer to Drawing 1, Appendix B, for site features.

2.2 Background

The following investigations/reports have been conducted at the site:

- Preliminary Contamination Assessment (PCA) undertaken by JK in April 2019 (JK, 2019);
- Detailed Site Investigation (Contamination) (DSI) conducted by DP in July 2019 (DP, 2019);
- Sampling, Analysis and Quality Plan (SAQP) by DP in March 2020 (DP, 2020a, Auditor reviewed and approved);
- Supplementary Detailed Site Investigation (Contamination) by DP in August 2020 (DP 2020b, Auditor reviewed and approved).

The results of the indicated the following:

- General absence of gross contamination within the site;
- Presence of shallow fill within the majority of test pits / bores;

- Presence of ACM in two fibro fragments observed at the surface adjacent to Buildings 5 and 8 (samples F1/JRK and F2/JRK respectively). The minor ACM identified are likely to be associated with the poor condition of the adjacent buildings, and do not appear to be related to impacts within underlying soil/fill;
- General absence of asbestos within the surface soils surrounding fibro / weatherboard buildings based on 500mL asbestos testing;
- Presence of ash and coal reject within the upper fill materials within the access track footprint in the south east portion of the site;
- Presence of buried asphalt lenses (ie associated with a former pavement) in pits north-west of Building 5 (Pits 406, 407, 408, 409,106 and 106A). Refer to Logs in Appendix A;
- Although asphalt materials contained HIL exceedances for PAH and BaP TEQ and EIL exceedances for TRH and BaP, the exceedances can be attributed to the asphalt / bitumen wearing course which typically has low bioavailability and are relatively immobile. The elevated results were therefore not considered to be significant;
- Laboratory results indicated the absence of coal tar within the asphalt samples tested;
- Fill materials tested were within the criteria for classification as GSW based on total and leachable concentrations;
- Asphalt materials are pre-classified as GSW, with reference to the NSW EPA (2014);
- General absence of gross contamination within the stockpiled soils tested.

The approximate locations of identified ACM fragments at the surface are shown on Drawing 2 in Appendix B. Test locations and the estimated area of the PAH impacted asphalt lens are shown on Drawing 1 in Appendix B.

The following recommendations were made relating to site remediation:

- Remediation and validation of localised surficial ACM impacts;
- Placement of asphalt containing elevated PAH beneath the proposed car park area as a precautionary measure.

In addition to remediation recommendations, post-demolition surface inspections will be conducted over building footprints and the immediate surrounds to confirm site conditions following demolition activities as indicated in the SAQP (DP, 2020a).
The site was considered to be suitable for the proposed school development in relation to site contamination, subject to appropriate demolition of existing structures, clearance of hazardous building materials including minor surface ACM identified adjacent to Buildings 5 and 8, and placement of asphalt impacted materials beneath the proposed car park pavement.

Reference should be made to the previous reports for details.

2.3 Site Condition

The general site conditions observed during the previous investigations (April 2020) are summarised below:

- The site was not occupied and contained several site structures as follows:
  - A residential property in the central northern portion of the site;
  - Administration buildings in the south central portion of the site;
  - A glasshouse in the south eastern portion of the site;
  - Two Hazchem sheds in the south eastern portion of the site; and
  - Several awning and shed structures and a large water tank were also located across the site.
- The south eastern portion of the site was fenced and housed the majority of the buildings which were made of weatherboard cladding or metal sheeting along with metal sheet roofing. The south eastern areas also comprised several mature trees along and adjacent to the site boundaries and internal gravel paths and gravel areas covered in weed matting presumably used as display beds when the previous nursery was in operation, the undeveloped areas in the south eastern portion were grassed;
- The north western portion of the site was unfenced and appeared to be undeveloped comprising abundant mature trees and vegetative ground cover.

A sealed asphalt access track surrounded the site structures in the central eastern portion of the site and linked in with the driveway entrance and exit in the central southern and south eastern portion of the site respectively. The access track appeared to be buried in the vicinity north of Building 5 which was confirmed in the previous investigation by DP in 2019. Figures 4 to 7 in Appendix C show the general condition of the access track.

A number of localised stockpiles were present within the site. Figures 6 to 14 in Appendix C show the stockpiles 301, 301A and 302 to 307.

An inspection of the existing building surrounds was also conducted in the supplementary assessment by DP. Fibro fragments (generally in good condition) were observed at the surface adjacent to Buildings 5, 6, 8, 9 and 10, and at the surface in the south eastern portion of the site adjacent to the northern boundary. Testing confirmed the presence of ACM in two fibro fragments observed at the surface adjacent to Buildings 5 and 8 (samples F1/JRK and F2/JRK respectively). Approximate locations of fibro fragments and the confirmed ACM locations are presented on Drawing 2 in Appendix B.

The typical conditions surrounding each building and the fibro fragments are shown in Figures 15 to 34 in Appendix C.

Reference should be made to the previous reports for details.

3. Proposed Development

The proposed development of the site will comprise a school facility (primary and secondary school).

The Stage 1 development is presented in the following drawings in Appendix B:

- 19055-NBRS-DR-A-DA14Rev5 - Stage 1 Site Plan
- 19055-NBRS-DR-A-DA17 & 18Rev3 - Stage 1 Elevations
- 19055-NBRS-DR-A-DA19Rev3 – Stage 1 Sections

The proposed development is for the establishment of a new K-12 school (Pacific Brook Christian School) on the subject site. The proposed development will comprise site preparation and remediation, tree removal, construction of new school buildings, covered outdoor learning area, covered walkways, car parking, landscaping and associated works. The school will accommodate 140 students and 16 staff.

It is noted that the asphalt impacted materials are proposed to be placed beneath the Stage 1 carpark area.

4. Extent of Remediation

Remediation is required to address bonded ACM impacts identified at the surface of the site adjacent to existing buildings. In addition, asphalt materials will be placed beneath a proposed carpark based on aesthetic reasons and to limit dermal contact, rather than to mitigate an unacceptable risk to human health.

Asbestos Containing Materials (ACM):

A detailed inspection was conducted at the surface around existing buildings during the supplementary investigation by DP. Only two fibro fragments containing ACM were identified. The location of the two fibro fragments identified to contain ACM at the surface adjacent to Buildings 5 and 8 (samples F1/JRK and F2/JRK respectively) are shown on Drawing 3 in Appendix B.

As discussed, the minor ACM identified are likely to be associated with the poor condition of the adjacent buildings, and do not appear to be related to impacts within underlying soil/fill.

On this basis, the extent of near surface ACM impacts are not likely to be extensive, and further ACM (if present) is likely to be located at the surface.

The two identified locations of ACM will be removed and validated. Further validation inspections and possible testing will be conducted following demolition of site structures as discussed below.

Asphalt Lenses:

Although the asphalt materials contained elevated PAH, the elevated results can be attributed to the asphalt / bitumen wearing course which typically has low bioavailability and is relatively immobile. The elevated results are therefore not considered to be significant as presented in the supplementary investigation by DP.

As a precautionary measure, it was therefore proposed to place the asphalt impacted materials beneath the proposed carpark pavement. It is noted that placement of the materials within the carpark area does not constitute remediation nor attract long term management requirements.

The buried asphalt lenses (associated with a former pavement) were identified within pits north-west of Building 5 (Pits 406, 407, 408, 409,106 and 106A). The lenses varied in thickness from 20 mm to 100 mm and were generally located below clean granular soils. The lenses were observed from depths of 0.05/0.3 m to depths of 0.1/0.4 m. Refer to Logs in Appendix A for details.

Based on the results of the previous investigations, the estimated extent of asphalt impacted materials is shown on Drawing 3 in Appendix B. The depth and extent of asphalt materials is approximate only and should be confirmed during excavation/chasing based on visual assessment as indicated below.

Based on the estimated extent of the asphalt materials and discussions with a Remediation Contractor regarding practical excavation / segregation depths, an approximate volume of 70 to 100 m^3 should be considered for placement beneath the Stage 1 carpark area. This volume equates to a thickness of about 0.2 m within the Stage 1 carpark area. The actual thickness and volume of materials will be confirmed during excavation and chasing of the asphalt layer.

A typical photo of the asphalt lens is presented in Figure 37 in Appendix C.

5. Soil Remediation Strategy

A range of possible options were considered for the remediation of ACM impacts. These were:

- No Action;
- On-site management of contaminated soils;
- On-site treatment and re-use;
- Off-site disposal of contaminated material to a licensed landfill.

Each of the possible strategy options will have an associated cost and timing impact that will need to be carefully considered by the client.

The following is an overview of each strategy and how DP considers they may be applicable to the contamination identified at the site.

No Action

The 'No Action' option involves no active remediation response to the contamination identified on the subject site. This option was considered not appropriate as it does not actively address, remediate, alleviate, and/or manage the long and short-term human health and environmental risk of the contamination already identified on-site.

On-Site Management of Contaminated Soils

On-site management of contaminated soils involves placement / retention of the contaminated soils within the site area such that the proposed development is constructed over the contaminated soils, minimising the potential for access to the contaminated soils. The management of contaminated soils at the site requires the preparation and implementation of a long-term Environmental Management Plan (EMP) at the site, which outlines the procedures used to render the site suitable for the proposed development. The EMP also provides the procedures for managing contaminated soils should access to the soils be required following construction. On-site management of contaminated materials also requires that a notice be on the relevant Planning Certificate.

On-site management via capping would require additional investigation to assess the extent of impacts, together with leachability testing to confirm that the contaminants of concern can be appropriately managed and contained within the site. On-site capping would need to be integrated with the proposed

development, which would incur additional cost to the development during design and construction, including the installation of a marker layer and clean capping material in landscape areas (where required). On-site management would also require regulatory approval prior to development. Council are also likely to require a Statutory Site Audit due to the sensitive landuse and long term management requirements for remediation. It is noted that the identified contamination is likely to be localised.

On-site management of contaminated soils was not considered to be the most appropriate remediation strategy for the proposed development due to the localised extent of contamination (ie localised ACM at the surface), and the liability for long-term management via an EMP.

As discussed above, placement of the asphalt impacted materials beneath the carpark pavement is considered to be a precautionary measure and is not deemed to be remediation requiring long-term management.

On-Site Treatment of Contaminated Soils

On-site treatment of contaminated soils involves a physical or chemical process that would allow retention of remediated soils on site for beneficial re-use, or retention of contaminated soils combined with on-site management of soils. On-site treatment is not likely to be viable for ACM impacts.

Off-Site Disposal of Contaminated Material to a Licensed Landfill

Off-site disposal of ACM and possible ACM impacted soils is proposed as the preferred remediation strategy as it is expected to render the site suitable for the proposed development with minimal long term restrictions placed on the subject site, considering the localised nature of the identified impacts. This strategy will not require long-term management of site contamination nor notification on the Planning Certificate for the site.

6. Additional Assessment Following Demolition

The following sampling strategy will be conducted following the demolition of site buildings as indicated in the SAQP (DP, 2020a):

- **Soils beneath building footprints and underground concrete structures (if removed):**
  - Visual inspection within the general site area, and within and surrounding the footprint of all existing buildings following demolition (Buildings 1 to 10 – refer to Drawing 2 Appendix B);
  - Collection of near surface soil samples using hand tools where there is evidence of potential contamination (ie staining, odours, anthropogenic inclusions) or filling not previously encountered on site;
  - Sieving of representative 10L soil samples for asbestos identification as per the procedures presented in NEPC (2013). Collection of potential ACM fragments where observed;
  - Analysis of selected soil samples for TRH, BTEX, PAH, Phenol, metals, OCP, OPP, PCB, asbestos (500ml);
  - Analysis of possible ACM fragments for asbestos identification.

A brief report will be prepared presenting the results of post-demolition inspections, sampling and testing, with comments on requirements (if any) for remediation. Additional ACM remediation within and surrounding building footprints will be conducted in accordance with the procedure in Section 10 (if required) following demolition activities.

If the additional assessment following demolition identifies the requirement for remediation of contamination other than ACM, the remediation strategy will be reviewed, and an addendum to the RAP will be prepared.

Demolition of site structures should be conducted by a licensed contractor in accordance with statutory and regulatory requirements and include clearance for hazardous building materials by an appropriately qualified occupational hygienist.

7. General Remediation Procedure

The objective of the RAP is to provide procedures to remediate the site in an acceptable manner, with minimal environmental impact, to a condition suitable for the proposed school development.

The following general remediation procedure provides for off-site disposal of localised ACM and ACM impacted material:

- Inception meeting with the project manager and remediation contractor to discuss remediation requirements;
- ACM Impacts:
  - Removal/segregation and off-site disposal (to licensed landfill) of near-surface ACM and ACM impacted materials by an appropriately licensed contractor;
  - Waste classification for materials proposed to be disposed from the site;
  - Clearance / validation by a suitably qualified consultant following removal and disposal of ACM and ACM impacted materials.
- Asphalt Impacted Materials:
  - Preparation of carpark area for receipt of asphalt-impacted materials (ie stripping of overlying topsoil/fill);
  - Excavation and segregation of the overlying layer of ‘clean’ fill materials;
  - Excavation, segregation and chasing of the asphalt impacted lenses/materials based on visual inspection;
  - Validation of the stripped surface via inspection and testing for PAH;
  - Replacement of the upper layer of ‘clean’ fill materials following validation;
  - Placement and compaction of asphalt impacted soils within the Stage 1 Carpark footprint prior to carpark construction (ie beneath the carpark pavement).
- Inclusion of the results of remediation in the validation report for the site.

8. Remediation Goals and Acceptance Criteria

The proposed Remediation Acceptance Criteria (RAC) for soils remaining on-site with respect to the proposed landuse and identified contaminants are provided in Tables 1 to 3 below. On the basis of the findings of the previous investigation, the general contaminants of concern are asbestos (in the form of bonded asbestos containing materials – fibro), and PAH associated with asphalt materials.

It is considered that the validation analysis should focus on the identified areas of concern and their associated contaminants. In order to provide for contingency situations, however, RAC are also established for other contaminants. This should, however, only be used as and when required (ie if signs of such contaminants are observed, suspected or found).

The analytical results from validation testing will be assessed against relevant human health and ecological-based investigation/screening levels NEPC (2013).

Although the investigation levels are not intended to be used as clean up levels, they establish concentrations above which further appropriate investigation (eg Tier 2) should be undertaken. If the concentrations of contaminants in the remaining soils (ie following remediation) are within the investigation levels, it is considered that the site would be suitable for the intended landuse.

Table 1: RAC – HIL A / EIL A (Contaminant of Concern)

Analyte		HIL A	EIL A
PAH	Benzo(a)pyrene TEQ[1]	3	-
	Total PAH	300	-
	Naphthalene	-	170

Notes to Table 1:

1 Sum of carcinogenic PAH

Table 2: Soil Health Screening Levels for Asbestos in Soil

Form of Asbestos	Residential A (w/w)
Bonded ACM	0.01%
FA and AF (all landuses)	0.001%*
All forms	No visible asbestos for surface soil

Notes to Table 2:

FA - Fibrous Asbestos

AF – Asbestos Fines

* the screening level is not applicable to free fibres

Table 3: RAC for other contaminants, in mg/kg Unless Otherwise Indicated

Analyte		HIL A	EIL A
Heavy Metals	Arsenic	100	100
	Cadmium	20	-
	Chromium	100	410
	Copper	6000	110
	Lead	300	1100
	Mercury (inorganic)	40	-
	Nickel	400	35
	Zinc	7400	310
	Manganese	3800	-
OCP/ OPP	Aldrin + Dieldrin	6	-
	Chlordane	50	-
	DDT+DDE+DDD	240	180 (DDT only)
	Endosulfan	270	-
	Endrin	10	-
	Heptachlor	6	-
	Methoxychlor	300	-
	Chlorpyrifos	160	-
Phenol		3000	
PCBS[2]		1	-

Notes to Table 3:

1 Sum of carcinogenic PAH

2 Non dioxin-like PCBs only

In addition to the above analytical criteria, the soil should be assessed based on the basis of aesthetic considerations. The soil should be free from odours and deleterious materials. Odour will be assessed on the basis of olfactory observations made by the environmental consultant.

Conformance with the RAC will be attained when either all validation samples meet the specified RAC, or, as a minimum for chemical contamination, the 95% UCL mean concentration value of each contaminant in the materials remaining on-site (validation samples) are below the respective RAC level, and no individual exceedance is greater than 2.5 times the RAC.

In addition to the above, imported fill used to reinstate site excavations or raise site levels (if required) should be classified as Virgin Excavated Natural Material (VENM) or Excavated Natural material (ENM) or should be classified under a relevant resource recovery order (RRO / RRE) and should be accompanied by a certificate from the supplier, otherwise detailed assessment (including analysis of representative samples) will be required prior to use on-site.

Landfill disposal criteria for contaminants, in accordance with NSW EPA (2014), are presented in Tables 4 and 5 below.

Table 4: Landfill Disposal Criteria – Total Concentrations

CONTAMINANT THRESHOLD VALUES FOR CLASSIFYING WASTE BY CHEMICAL ASSESSMENT WITHOUT DOING THE LEACHING TEST [1]			
Contaminant	Maximum Values of *Total Concentration* for Classification without TCLP		CAS Registry Number
	General Solid Waste CT1 (mg/kg)	Restricted Solid Waste CT2 (mg/kg)	
Benzene	10	40	71-43-2
Toluene	288	1152	108-88-3
Ethyl Benzene	600	2400	100-41-4
Xylenes (total)	1000	4000	1330-20-7
C_6-C_9 petroleum hydrocarbons	650	2600	-
C_{10}-C_{36} petroleum hydrocarbons	10,000	40,000	-
Lead	100	400	-
Arsenic	100	400	-
Cadmium	20	80	-
Chromium (total)	100	400	-
Mercury	4	16	-
Nickel	40	160	-
Polycyclic Aromatic Hydrocarbons (total)	N/A	N/A	-
Benzo(a)pyrene	0.8	3.2	50-32-8
Organochlorine Pesticides [2]	<50	<50	
Organophosphorus Pesticides [3]	250	1000	

Notes to Table 4:

1 Adopted from Table 1 – NSWEPA 2014
2 Classified as part of Scheduled Chemicals group
3 Classified as part of 'Moderately Harmful Pesticides' group

N/A – Not Applicable (refer to Table 5)

Table 5: Landfill Disposal Criteria – Leachable and Total Concentrations

LEACHABLE CONCENTRATION (TCLP) AND TOTAL CONCENTRATION (SCC) FOR CLASSIFYING WASTE BY CHEMICAL ASSESSMENT [1]					
Contaminant	Maximum Values for *Leachable Concentration* and Total Concentration when used together				CAS Registry Number
	General Solid Waste		Restricted Solid Waste		
	Leachable Concentration TCLP1 (mg/L)	Total Concentration SCC1 (mg/kg)	Leachable Concentration TCLP2 (mg/L)	Total Concentration SCC2 (mg/kg)	
Benzene	0.5	18	2	72	71-43-2
Toluene	14.4	518	57.6	2073	108-88-3
Ethyl Benzene	30	1080	120	4320	100-41-4
Xylenes (total)	50	1800	200	7200	1330-20-7
C6-C9 petroleum hydrocarbons [2]	N/A [2]	650	N/A [2]	2600	-
C10-C36 petroleum hydrocarbons [2]	N/A [2]	10000	N/A [2]	40000	-
Lead	5	1500	20	6000	-
Arsenic	5	500	20	2000	-
Cadmium	1	100	4	400	-
Chromium (total)	5	1900	20	7600	-
Mercury	0.2	50	0.8	200	-
Nickel	2	1050	8	4200	-
Polycyclic Aromatic Hydrocarbons (total)	N/A	200	N/A	800	-
Benzo(a)pyrene	0.04	10	0.16	23	50-32-8
Organochlorine Pesticides [3]		<50		<50	
Organophosphorus Pesticides [4]		250		1000	

Notes to Table 5:

1 Adopted from Table 2 – NSW EPA 2014
2 Petroleum hydrocarbons are assessed only by total concentration (SCC1 or SCC2)
3 Classified as part of Scheduled Chemicals group
4 Classified as part of 'Moderately Harmful Pesticides' group

N/A – Not applicable

Based on the observations made and the results of previous laboratory testing, the materials tested were classified as 'General Solid Waste' based on total and leachable contaminant concentrations (ie SCC1 / TCLP1). These materials are suitable for off-site disposal at a facility licensed to accept GSW (TCLP1).

The majority of the samples with elevated PAH results were asphalt materials sampled from the asphalt wearing course or buried asphalt layer. Testing within this material also confirmed the absences of coal tar. The asphalt materials are therefore pre-classified as GSW, with reference to the NSW EPA (2014).

9. Remediation Roles and Responsibilities

In order to achieve the goals of the remediation/earthworks programme, the roles and tasks identified for the contractor and consultants are presented in Table 6.

Table 6: Remediation Roles and Responsibilities

Task	Description	Responsibility
1. Additional Investigation – Post Demolition		
(i) Additional Investigation	Additional assessment of building footprints following demolition (refer to Section 6)	Consultant
2. Preliminaries		
(i) Engage Remediation Contractor		Client
(ii) Inception Meeting	Meeting between relevant parties (project manager, remediation contractor, consultant) to discuss tasks and responsibilities	Client
(iii) Regulatory notification	Notification for removal/remediation of surficial ACM (non-friable).	Remediation Contractor
(iv) Preparation of Safety and Environmental Management Plans		Remediation Contractor
(v) Site Inductions	Safety and environmental induction for all site workers	Remediation Contractor
(vi) Set up environmental control measures		Remediation Contractor
3. Remediation of ACM Impacts		
(i) Mark out areas of identified contamination		Consultant
(ii) Remediation of ACM impacts	Sorting, picking and handling of ACM impacts. Inspection/stripping of near surface soils (if required) to facilitate remediation	Remediation Contractor
(iii) Inspection of remediation works	Full time inspection associated with segregation and disposal of ACM impacted materials	Consultant
(iv) Validation of remediated areas	Inspection and testing of remediated areas to validate the removal of contamination	Consultant
(v) Classification of soils for off-site disposal (if required)	Contamination sampling and testing for waste classification for disposal of soils to a licensed landfill (if additional classification is required)	Consultant
(vi) Disposal of contaminated materials	Disposal of ACM/impacted soils to an appropriately licensed landfill	Remediation Contractor
(vii) Classification of imported fill materials (where required)	Review of documentation, or assessment of materials via inspection and testing to confirm VENM or ENM status or RRO / RRE	Consultant/remediation contractor

Table 6: Remediation Roles and Responsibilities (continued)

Task	Description	Responsibility
4. Management of Asphalt Impacts		
4.1. Segregation of Asphalt Impacts		
(i) Mark out areas of asphalt impacts		Consultant
(ii) Set up stockpile area for upper layer of "clean" fill materials	Preparation of stockpiling area for temporary storage of 'clean' fill materials.	Remediation Contractor
(iii) Segregation of asphalt impacted soil	Stripping / segregation of asphalt-impacted soil/fill material to stockpile or direct placement within Stage 1 Car Park.	Remediation Contractor
(iv) Handling of fill materials	Excavations, stockpiles, segregation, placement, compaction, and disposal (if required).	Remediation Contractor
(v) Inspection of remediation works	Full-time inspection associated with excavation, segregation and placement of asphalt impacted soils	Consultant
(vi) Validation of remediated areas	Inspection and testing of stripped areas to validate the removal of asphalt materials	Consultant
(vii) Classification of soils for off-site disposal (if required)	Contamination sampling and testing for waste classification for disposal of soils to a licensed landfill (if additional classification is required)	Consultant
(viii) Disposal of excess materials to landfill (if required)	Disposal of excess soils/materials to an appropriately licensed landfill	Remediation Contractor
(ix) Classification of imported fill materials (if required)	Review of documentation, or assessment of materials via inspection and testing to confirm VENM or ENM status or RRO / RRE	Consultant/remediation contractor
4.2. Placement within Stage 1 Car Park		
(i) Mark out of Stage 1 car park area	Survey/mark out of carpark area	Contractor
(ii) Preparation of Stage 1 car park area	Stripping/stockpiling of upper soils to accommodate asphalt impacted soils beneath car park area. Survey the stripped surface and place geofabric marker layer.	Contractor
(iii) Place asphalt-impacted materials within Stage 1 carpark area	Place and compact the asphalt impacted soils in the carpark area. Place geofabric marker layer at the top of placed materials and survey.	Contractor
(iv) Inspection of remediation works	Inspection associated with excavation, segregation and placement of asphalt impacted soils, including compaction testing within carpark area.	Consultant
(v) Alternatively – future placement within the Stage 1 carpark area	Place asphalt impacted soils (as above) during carpark construction	Contractor
5. Reporting		
(i) Tracking information for reporting purposes	Submit tip dockets and tracking information for reporting purposes (where required)	Remediation Contractor
(ii) Validation report	Preparation of a validation report	Consultant

Prior to the commencement of remediation works, a site meeting between the project manager remediation contractor and DP should be held to confirm the above responsibilities and procedures in accordance with this remediation action plan.

Details of remediation methodologies are presented in the following sections.

10. Remediation

10.1 Remediation of ACM and ACM Impacted Soils

10.1.1 Methodology

The proposed remediation strategy is to identify and remove ACM and ACM impacted soils (if present) from the surface and near-surface soils. It is noted that limited ACM was observed at the surface adjacent to some buildings. No asbestos impacts were identified within soils at the perimeter of buildings. Further assessment will be conducted following the demolition of buildings to confirm the extent of remediation required.

The following procedures are suggested for the remediation and validation of ACM and asbestos-impacted soils:

- DP to identify and peg locations identified to contain asbestos fragments;
- Contractor to hen-peck ACM and rake areas associated with potential ACM impacts;
- Hen-pecking will comprise two passes on a 2 m transect made with 90 degree direction change between each and using a grid pattern;
- Soils identified to be impacted by asbestos materials (if any) should be progressively excavated under full-time inspection by DP;
- Contaminated material will be excavated/chased until visual evidence indicates the absence of such materials;
- DP to collect stockpile soil samples for waste classification purposes (where additional testing is required for classification);
- Licensed contractor to load classified materials directly into appropriate trucks for transport and disposal to a licensed facility (Note: waste classification is required prior to off-site disposal), or material to be appropriately stockpiled prior to removal;
- DP to inspect, observe and advise on the excavation/segregation of soils containing asbestos;
- DP to validate excavated area as discussed in Section 10.1.4.

10.1.2 Waste Classification of ACM Impacted Soils

Segregated asbestos-impacted stockpiles containing potentially contaminated materials must be classified with reference to the NSW EPA (2014) for disposal purposes.

For soils not classified as part of the previous site assessment, representative samples will be collected from the asbestos-impacted segregated fill stockpiles, and analysed for the potential chemical contaminants as discussed in Section 10.2.4. The frequency of samples will depend on the size and composition/characteristics of the stockpile. A minimum frequency of one sample per 25 m^3 should be initially considered.

The results of analysis and disposal options will be reported in a brief waste classification report to be prepared by DP.

10.1.3 Provision for Stockpiling of Asbestos-Affected Soils

The following procedure is recommended for stockpiling of segregated asbestos impacted materials (if required):

- DP to nominate designated stockpile area in consultation with the contractor;
- The proposed stockpile area should be inspected to confirm the absence of deleterious or potentially contaminated materials at the surface prior to the placement of materials;
- Stockpile areas should be demarcated by the remediation contractor (i.e. fence/pickets and hazard tape) to prevent access, and clearly delineate the stockpiles;
- Stockpiles that are observed to contain or potentially contain asbestos materials should be lightly conditioned by sprinkler and covered by plastic or similar to prevent dust blow (undertaken by the remediation contractor - refer to Section 14);
- Measures should be taken by the remediation contractor to prevent the migration of stockpile materials (i.e. perimeter bunds, hay bales, silt fences, etc.);
- A record of stockpile locations, dimensions, descriptions, environmental controls, etc. should be maintained by the contractor.

Excavation, handling, transport etc. of asbestos-impacted materials should be undertaken by the licensed contractor with reference to the appropriate regulatory guidelines.

It is noted that the results of previous investigations indicated that ACM impacts were minor only. Stockpiling of materials may therefore not be required during remediation. For budgeting purposes, it is suggested that 20 tonne of impacted soils are considered for remediation. The extent of asbestos impacted materials and remediation requirements will be confirmed following the additional assessment following the demolition of site structures.

10.1.4 Validation of Excavations/Stripped Surfaces

The following procedure is recommended for the validation of identified localised areas of asbestos contamination following stripping/removal:

- The stripped surface should be inspected by DP to confirm the absence of visible asbestos materials. The inspection will be conducted in two passes on 2 m transects made with 90 degree direction change between each using a grid pattern;
- Validation samples for asbestos testing will be collected by DP as follows:
    - From the surface following hen-pecking / removal of ACM fragments;
    - Where stripping of near surface soils is required - From a systematic grid (with a minimum density of 10 m by 10 m) over the stripped surface, with a minimum of two samples per stripped area;
    - A higher frequency of testing may be adopted by DP, subject to the abundance of bonded asbestos materials observed;

- Asbestos analysis will be conducted by a NATA registered laboratory on 500ml soil samples collected to validate the removal of materials containing asbestos.

- Validation samples are to be collected beneath former contaminated soil stockpile areas following soil removal (if stockpiling of impacted soils is conducted);
- Where excavations are terminated in fill materials or in non-cohesive natural soils, validation will include field screening of 10L soil samples as per NEPC (2013).

If validation results exceed the RAC, further removal (additional stripping/excavation) will be required, followed by additional validation sampling and analysis, until the RAC is met. It is noted that five to seven working days are required for laboratory analysis.

10.1.5 Loading and Transport of Contaminated Materials

Transport of contaminated material off the site should be via a clearly demarcated haul route and this route exclusively should be used for entry and egress of vehicles used to haul identified contaminated materials within and away from the site.

Removal of waste materials from the site should only be carried out by a licensed contractor holding appropriate licences, consents and approvals from NSW EPA and/or other Authorities to transport and dispose the waste materials according to the classification guidelines.

Details of all contaminated materials removed from the site should be documented by the contractor with copies of weighbridge slips, trip tickets and consignment disposal confirmation (where appropriate). Such information should be provided to DP for reporting purposes. A site log/tracking sheets should be maintained by the remediation contractor for stockpiles (numbered locations), to enable the tracking of disposed loads against on-site origin and location of the materials and corresponding (validation) sample numbers.

Measures should be implemented to minimise the potential for contaminated material to be spilled onto public roadways or tracked off-site on vehicle wheels. Such measures could include the deployment of a vehicle washing/cleaning facility, which should be placed at a location before the egress point of the site. The facility should be able to handle all vehicles and plant operating on site (if required). Residue from the cleaning facility will be deemed contaminated unless shown by validation to be below RAC criteria.

The proposed waste transport route should be notified to the local Council and truck dispatch should be logged and recorded by the contractor for each load leaving the site. The waste tracking procedure should be confirmed by DP.

10.2 Management of Asphalt Impacted Soils

10.2.1 Methodology

The agreed methodology for the management of asphalt impacted materials was removal and placement beneath the Stage 1 carpark within the site as a precautionary measure.

The following general procedures are recommended for the management of identified asphalt impacted soils:

- Contractor to progressively excavate non-impacted material from above the impacted asphalt layer under the full-time inspection by Douglas Partners (DP), and stockpile for future on-site use. The stockpile should be appropriately covered, and silt fenced. These materials should be visually assessed for evidence of contamination to confirm suitability for reuse prior to placement elsewhere on-site;
- Progressively excavate affected soils from affected areas under full-time inspection by DP;
- Impacted material will be excavated/chased until visual evidence indicates the absence of such materials;
- DP to validate excavated areas as discussed in Section 10.2.3;
- Remediation Contractor to either stockpile asphalt impacted soils for future placement beneath the Stage 1 carpark (during carpark construction) or place the materials beneath the carpark to allow future carpark construction.

Procedures for stockpiling of excavated soil/fill materials are discussed in Section 10.2 below.

The objective will be to minimise the volume of soils requiring excavation placement beneath the carpark. Based on the estimated extent of the asphalt materials and discussions with a Remediation Contractor, placement of a layer of about 0.2 m of asphalt impacted soils has been estimated for the Stage 1 carpark area. The actual thickness and volume of materials will be confirmed during excavation and chasing of the asphalt layer.

The following procedures are recommended for the placement of the asphalt impacted materials beneath the Stage 1 carpark pavement:

- Strip topsoil and upper fill from the carpark area (and stockpile on-site for future use) to expose natural soils (estimated to be about 200 mm deep – to be confirmed during stripping). These materials should be visually assessed for evidence of contamination to confirm suitability for reuse prior to placement elsewhere on-site;
- Strip natural soils to subgrade level to accommodate the asphalt impacted soils and the proposed carpark pavement thickness in order to achieve the required finished surface level (refer to the relevant geotechnical report and pavement thickness design including subgrade preparation measures);
- Proof roll the subgrade under geotechnical inspection and testing;
- Place geofabric over the stripped placement area within the Stage 1 carpark and survey;
- Place and compact the asphalt impacted material in the carpark area to the geotechnical specifications. Douglas Partners to complete geotechnical inspection and compaction testing as required;
- Place geofabric layer over placed asphalt in carpark and survey;
- Construct the carpark pavement over the placed asphalt impacted materials.

It is noted that the geofabric layer is not required for the management of asphalt materials with respect to contamination risks. The geofabric layer has been included at the request of the client to provide separation for asphalt materials. The purpose of the geofabric layer is to assist with future removal of asphalt materials should this be required in future. The key validation aspect will be to confirm that the extent of asphalt material placement falls within the extent of the carpark.

As discussed above, care should be taken to ensure that the asphalt materials are placed at minimal depth that will not impact on the construction of the carpark pavement.

10.2.2 Stockpiling of Asphalt Impacted Soils (if required)

Should temporary storage be required, impacted soil should be placed on site in a specified area, prepared by the contractor as follows:

- DP to nominate designated on-site stockpile area in consultation with the contractor;
- The proposed stockpile area should be inspected to confirm the absence of deleterious or potentially contaminated materials at the surface prior to the placement of materials;
- Stockpile areas should be demarcated by the remediation contractor (i.e. fence/pickets and hazard tape) to prevent access, and clearly delineate the stockpiles;
- Provision should be made to allow for expansion of the stockpile area should this be required during the course of the works;
- Measures should be taken by the remediation contractor to prevent the migration of stockpile materials (i.e. perimeter bunds, hay bales, silt fences, etc.);
- Stockpile asphalt impacted materials over plastic sheeting (where practical) in order to avoid further validation testing following stockpile removal;
- A record of stockpile locations, dimensions, descriptions, environmental controls, etc. should be maintained by the contractor.

10.2.3 Validation of Excavations/Stripped Surfaces

The following procedure is recommended for validation of identified areas of asphalt (PAH) impacted soils following stripping / removal:

- The stripped surface should be inspected by DP to confirm the visual absence of potentially impacted materials / soils;
- Validation samples for chemical testing will be collected by DP at 10 m intervals along the excavated gravel path, or at a sampling density of at least a 10 m x 10 m grid over the stripped area, with a minimum of two samples per stripped area;
- Chemical analysis will be conducted by DP at a NATA registered laboratory on samples collected to validate the removal of materials containing elevated PAH concentrations;
- If temporary stockpiles containing asphalt-impacted materials are utilised over the ground surface, validation samples should also be collected from the surface following removal of impacted soils.

The above analysis will be utilised to compare contaminant levels to the RAC in the validated areas.

If validation results exceed the RAC, further removal (additional scraping/excavation) will be required, followed by additional validation sampling and analysis, until the RAC are met. Note that five to seven working days are required for laboratory analysis. Excavation of impacted material will be limited to the extent of site boundaries.

10.2.4 Fill Stockpile Classification and Disposal

It is noted that off-site disposal of asphalt impacted materials is not proposed. If excess materials require off-site disposal, such materials should be classified in accordance with NSW EPA waste classification guidelines.

In the event that soils not already classified during previous assessment are to be disposed off-site, representative samples should be collected by DP from the segregated fill stockpiles, and analysed for the potential chemical contaminants as discussed in Section 11.2. The frequency of samples will depend on the size and composition/characteristics of the stockpile. A minimum frequency of one sample per 25 m^3 should be initially considered.

10.2.5 Loading and Transport of Contaminated Materials (if required)

Transport of contaminated material off the site should be via a clearly demarcated haul route and this route exclusively should be used for entry and egress of vehicles used to haul identified contaminated materials within and away from the site.

Removal of waste materials from the site should only be carried out by a licensed contractor holding appropriate licences, consents and approvals from NSW EPA and/or other Authorities to transport and dispose the waste materials according to the classification guidelines.

Details of all contaminated materials removed from the site should be documented by the contractor with copies of weighbridge slips, trip tickets and consignment disposal confirmation (where appropriate). Such information should be provided to DP for reporting purposes. A site log/tracking sheets should be maintained by the remediation contractor for stockpiles (numbered locations), to enable the tracking of disposed loads against on-site origin and location of the materials and corresponding (validation) sample numbers.

Measures should be implemented to minimise the potential for contaminated material to be spilled onto public roadways or tracked off-site on vehicle wheels. Such measures could include the deployment of a vehicle washing/cleaning facility, which should be placed at a location before the egress point of the site. The facility should be able to handle all vehicles and plant operating on site (if required). Residue from the cleaning facility will be deemed contaminated unless shown by validation to be below RAC criteria.

The proposed waste transport route should be notified to the local Council and truck dispatch should be logged and recorded by the contractor for each load leaving the site. The waste tracking procedure should be confirmed by DP.

11. Sample Collection and Analysis

Sampling will be directly from the exposed surface of excavation, or, in the case of stockpiles, from various depths between the surface and the base. Sampling data should be recorded to comply with routine Chain of Custody requirements.

The general sampling, handling, transport and tracking procedures comprises:

- The use of stainless steel sampling equipment;
- The use of disposable gloves for each sampling event;
- Washing of all sampling equipment in contact with the sample, in a 3% solution of phosphate free detergent (Decon 90) then rinsing with distilled water prior to each sample being collected;
- Transfer of the sample immediately into new glass jars;
- Collection of 10% replicate samples for QA/QC purposes;
- Collection of replicate soil samples in zip-lock plastic bags for PID screening;
- Labelling of the sample containers with individual and unique identification including Project Number and Sample Number;
- Placement of the containers into a chilled, enclosed and secure container for transport to the laboratory; and
- Use of chain of custody documentation so that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

11.1 Sample Holding Times

Maximum sample holding times are as follows:

- Asbestos – no maximum holding time;
- PAH - 14 days;
- Metals - 6 months (if required);
- TRH/BTEX - 7 days.

All samples must be collected in appropriate containers, and stored and transported at 4°C.

11.2 Validation Sample Analysis

Asbestos Contaminated Near Surface Soils:

Validation samples for excavated/stripped near surface asbestos impacted soils should be analysed for asbestos (500ml soil sample). Where excavations are terminated in fill materials or in non-cohesive natural soils, validation will include field screening of 10L soil samples as per NEPC (2013).

Asphalt Impacted Soils:

Validation of asphalt impacted soils should comprise PAH analysis (ie target contaminant).

Building Footprints and Surrounds

As indicated in Section 6, analysis of selected soil samples for TRH, BTEX, PAH, Phenol, metals, OCP, OPP, PCB, asbestos (500ml) and sieving of 10L soil samples will be conducted where there is evidence of potential contamination (ie staining, odours, anthropogenic inclusions) or filling not previously encountered on site. Where additional contamination is identified (if any) requiring localised remediation and validation, the stripped surface will undergo inspection, sampling and analysis for the identified contaminants of concern.

Waste Classification:

If additional waste classification testing of impacted soils is required for off-site disposal to a licensed landfill, the soils should be analysed for the following general suite:

- Total Recoverable hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Polychlorinated Biphenyls;
- Organochlorine and Organophosphorus Pesticides;
- Heavy Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc);
- Asbestos.

The analytical programme will be reviewed following excavation, segregation and sampling. Leachability (TCLP) analysis may be required for stockpile samples if total contaminant levels are found to exceed ‘General Solid Waste’ criteria.

Imported Fill:

Any materials which are imported onto the site (eg to backfill excavations) should be classified as VENM, ENM or conform with a relevant RRO / RRE, and an appropriate report must be made available to the environmental consultant prior to the importation of the material.

In the absence of confirming the source and suitability of imported fill for use on site, the VENM or ENM material should be assessed with reference to NSW EPA (2014b) and analysed for the following:

- Total Recoverable hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Organochlorine pesticides (OCP);
- Polychlorinated Biphenyls (PCB);

- Heavy Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Mercury, and Zinc);
- pH, Electrical Conductivity; and
- Rubber, plastic, bitumen, paper, cloth, paint and wood (NSW RTA Test Method T276).

Materials imported to site in accordance with a relevant resource recovery order should be assessed under the relevant order prior to importation.
Imported material should be inspected upon importation to confirm consistency with documentation and to also confirm the absence of visual evidence of contamination.

12. Quality Assurance Plan

12.1 Field Quality Assurance

Sampling accuracy and precision should be maintained through the analysis of 10% field duplicate / replicate samples for chemical contamination. It is noted that statistical procedures and replicate testing are not appropriate for asbestos.

Appropriate sampling procedures should be undertaken to minimise potential for cross contamination, for example:

- Standard operating procedures are followed;
- Site safety plans are developed prior to commencement of works;
- Replicate field samples are collected and analysed;
- Samples are stored under secure, temperature controlled conditions;
- Chain of custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory.

12.2 Laboratory Quality Assurance and Quality Control

DP's preferred laboratory routinely undertakes in-house QA/QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks;
- Statistical analysis of QC data.

12.3 Achievement of Data Quality Indicators

Based on the analysis of quality control samples, ie duplicates / replicates and in-house laboratory QA/QC procedures, the following data quality indicators will be required to be achieved:

- Conformance with specified holding times;
- Accuracy of spiked samples within the laboratory's acceptable range (typically 70% to 130% for inorganic contaminants and greater for some organic contaminants);
- Field and laboratory duplicates and replicates samples will have a precision average of +/- 50% relative percent difference (RPD). Elevated RPDs may be present due to heterogeneity of materials; and
- Field duplicates/replicates will be collected at a frequency of 10% of all samples.

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

12.4 Validation Reporting

A validation report will be prepared by DP with reference to NSW EPA (2020) and other appropriate guidance documentation, and be submitted to the client at the completion of the remediation works programme.

The validation report should include details of the total volume of contaminated materials removed from site, indicate the final disposal destination of the materials removed from site, present detailed analytical results, and provide comment on the suitability of the site for the intended landuse following remediation.

13. Work Health and Safety

13.1 Introduction

All site work must be undertaken in a controlled and safe manner with due regard to potential hazards, training and safe work practices. The work should comply with WHS policies specified by the relevant Authorities. It is recommended that the contractor prepare a project-specific environmental management and WHS plan to supplement the measures presented in this RAP.

13.2 Personnel and Responsibilities

Before undertaking works on site, all personnel will be advised of the officer responsible for implementing health and safety procedures. All personnel should read and understand the WHS Plan prior to commencing site works. Contractors employed at the site will be responsible for ensuring that their employees are aware of, and comply with the requirements of the safety plan.

The contractor is responsible for all on-site activities including handling of fill materials – excavation, stockpiling, segregation, placement of fill, etc.

13.3 Hazards at the Site

13.3.1 Chemical Hazards

Chemical compounds or substances that may be present on site include PAH/hydrocarbon contaminated soils and asbestos in the form of bonded fibro fragments.
The possible risks to site personnel associated with the above analytes include:

- Ingestion of contaminated soil or water;
- Dermal contact with contaminated soil or water;
- Inhalation of dusts or aerosols containing contaminants.

13.3.2 Physical Hazards

Potential hazards associated with the works may include but not limited to the following:

- Heat exposure;
- Excavations;
- Buried services;
- Noise;
- Dust;
- Electrical equipment;
- Heavy equipment and truck operation.

13.4 Safe Work Practices

Personnel will endeavour, wherever possible, to avoid direct contact with potentially contaminated material. Surface or groundwater should not be ingested or swallowed, and direct skin contact with soil and water should be avoided.

Subject to the site controller's requirements, all personnel on site will be required to wear the following protection at all times:

- Steel-capped boots and high visibility clothing;
- Safety glasses or safety goggles with side shields meeting AS 1337 requirements (as necessary);
- Hard hat meeting AS 1801 requirements;
- Hearing protection meeting AS 1270 requirements when working around machinery or plant equipment if noise levels exceed exposure standards.

13.5 Asbestos

In the event that personnel are required to work in areas of potential contact with asbestos containing materials, the following additional protection may be required subject to the prevailing conditions:

- Disposable coveralls to prevent contact with asbestos materials;
- Particulate respirator (Class P2) or equivalent.

Excavation, handling, stockpiling, transport etc of materials containing asbestos should be undertaken by a licensed contractor in accordance with relevant regulatory requirements.

13.6 Emergency Response Plan

An essential component of the WHS Plan will involve development of an Emergency Response Plan for all aspects of site works. This will include provisions for the safety of personnel working on site in the event of an emergency situation. Any emergency will be reported immediately to the site office and/or the Site Safety Officer, and the appropriate emergency assistance should be sought by telephoning 000.

The works contractor will be responsible for ensuring that site personnel are aware of the emergency services available and appropriate contact details. A Site Safety Officer must be available on-site during remediation works.

14. Environmental Management Plan

14.1 Introduction

The contractor should undertake the work with due regard to the minimisation of environmental effects and to meet regulatory and statutory requirements.

The contractor should have in place an Environmental Management Plan (EMP) so that work on the site complies with, but not limited to, the requirements of the following legislation:

- Protection of the Environment Operations Act;
- Contaminated Land Management Act;
- Dangerous Goods Act;
- Construction Safety Act;
- Work Health and Safety Act (WorkCover);
- Council Development Approval Conditions.

The contractor should also be responsible that the site works comply with the following conditions:

- Wastes generated at the site are disposed in an appropriate manner;
- Fugitive dust leaving the confines of the site is minimised;
- No water containing any suspended matter or contaminants leaves the site in a manner which could pollute the environment;
- Vehicles should be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas;

- Noise and vibration levels at the site boundaries comply with the legislative requirements.

In order to achieve a minimisation of environmental effects, the following measures are recommended, and should be adopted by the appointed contractor.

14.2 Traffic Management

All vehicular traffic should use only routes approved by Council, to and from the selected landfill where off-site disposal is undertaken. All loads should be tarpaulin covered and lightly wetted to minimise the potential for materials or dust to be dropped or deposited outside or within the site.

Each vehicle exiting the site should be inspected for cleanliness before being logged out as clean (wheels and chassis), or hosed down into a wheel wash or wash down bay until designated as clean.

Wheel wash silt residues should be collected periodically and either returned to the excavation area or included in the remediation stockpile. Such material will be treated as contaminated unless analysis proves otherwise.

14.3 Excavations

Records of all excavations and stockpile locations should be maintained. A site diary should also be maintained by the contractor to record daily progress, abnormal occurrences, incidents, and truck movements.

All excavations should be made with due regard to the stability of adjacent footings and structures. It will be the contractor's responsibility to provide adequate battering, shoring and/or underpinning to protect adjacent structures (if required).

No person should be permitted to enter an unsupported excavation where it is more than 1.5 m deep or where it is considered to be unstable, irrespective of depth.

14.4 Stormwater Management and Control

Appropriate measures should be taken to minimise the potential for potentially contaminated water to leave the site. Such measures could include:

- Appropriate construction of the remediation stockpile area (if required), with regular checks for integrity and repairs if/when required;
- Construction of diversion bunds to divert stormwater from contaminated areas and remediation stockpiles; and
- Provision of sediment traps including geotextiles or hay bales.

Discharge of any waters should meet the consent conditions from the appropriate authority. This should be verified by sampling and analyses undertaken by the contractor. For example, if excavations fill with water during validation works (ie due to rainfall), the water will require analysis to determine appropriate options for discharge (ie disposal to stormwater, sewer or collection by a licensed contractor).

14.5 Control of Dust and Odour

Control of dust and odour during the course of the remediation works should be maintained by the contractor and may include, but not necessarily be limited to, the following:

- The use of a water cart, as and when appropriate, to eliminate windblown dust;
- Use of sprays / sprinklers to prevent dust blow from stockpiles;
- Covering of stockpiles with plastic sheeting or geotextile membranes;
- Restriction of stockpile heights to 2 m above surrounding site level;
- Ceasing works during periods of inclement weather such as high winds or heavy rain;
- Regular checking of the fugitive dust and odour issues. Undertake immediate remediation measures to rectify any cases of excessive dust or odour.

14.6 Noise Control

Noise and vibration will be restricted to reasonable levels. All plant and machinery used on site should not breach statutory noise levels. Working hours will be restricted to those specified by Council.

14.7 Long-Term Site Management

Based on the proposed remediation methodology, it is noted that a long-term site management plan is not required following satisfactory completion of remediation of identified contamination and validation of the remediated locations.

15. Contingency Plan

As a contingency, if unexpected conditions with respect to contamination are encountered during site development (such as filling, presence of anthropogenic materials including building rubble, fragments of suspected ACM, buried structures or unexpected contaminated soil, contaminants, evidenced by staining, odours or free product), the following general approach should be adopted:

- Upon discovery of an unexpected find, works will cease in that area, the Site Manager is to be notified and the affected area will be demarcated (closed off);
- The location of the unexpected find should be surveyed;
- The Site Manager is to notify an appropriately qualified Environmental Consultant (ie DP);

- The environmental consultant will inspect the area and make an assessment of the significance of the find in terms of the potential impact to human health and the environment;
- Provision of advice from the environmental consultant regarding the recommended course of action (ie extent of impact and methods of remediation, as required);
- Implementation of the agreed management / remedial strategy in accordance with the relevant sections of the RAP.

Excavated asphalt materials will be placed beneath the carpark as proposed above. If the volume of excavated asphalt materials increases, then the base excavation level within the carpark could be increased to allow appropriate placement of the asphalt materials in order to achieve the required final carpark design surface level. Alternatively, if materials cannot be accommodated beneath the carpark, the materials should be classified for appropriate off-site disposal to a licenced landfill.

16. Conclusion

This RAP provides the clean-up objectives, remediation acceptance criteria (RAC), principles, methods and procedures by which the remediation and validation of the site will be achieved.

Following additional investigations recommended in Section 6 and prior to commencement of remediation and construction works, it is recommended that a site inception meeting is held between the developer, remediation contractor and consultant to discuss the remediation and validation process and to identify the tasks and responsibilities for the remediation of the site to a condition suitable for the intended school development.

17. References

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DP (2019), *Detailed Site Investigation (Contamination), Lot 62, Maitland Street, Muswellbrook, NSW, NSW*, Douglas Partners Pty Ltd, Report 91601.00.R.001.Rev6.

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NEPC (2013), *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013*, National Environment Protection Council.

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

NSW EPA (2014a), Waste Classification Guidelines, Part 1: Classifying Waste, NSW Environment Protection Authority.

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

18. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Lot 100, DP1261496 Maitland Street, Muswellbrook, NSW with reference to DP's proposal dated 14 October 2020 and acceptance received from Mark Smith on behalf of Pacific Brook Christian School dated 5 November 2020. The work was carried out under DP standard conditions of engagement. This report is provided for the exclusive use of Pacific Brook Christian 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.

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.

Although the sampling plan adopted for the previous investigations are 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 (ie due to concrete pavements).

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.

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

Douglas Partners Pty Ltd

Appendix A

About This Report
Sampling Methods
Soil Descriptions
Symbols and Abbreviations
Test Pit Logs (Asphalt Area –406, 407, 408, 409, 106 and 106A)

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.

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- 'Moist, dry of plastic limit' or 'w <PL' (i.e. hard and friable or powdery).
- 'Moist, near plastic limit' or 'w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- 'Moist, wet of plastic limit' or 'w >PL' (i.e. soils usually weakened and free water forms on the hands when handling).
- 'Wet' or 'w ≈LL' (i.e. near the liquid limit).
- 'Wet' or 'w >LL' (i.e. wet of the liquid limit).

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

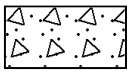
Symbols & Abbreviations

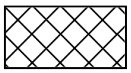
Graphic Symbols for Soil and Rock

General


Asphalt


Road base

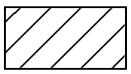

Concrete

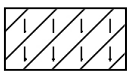

Filling

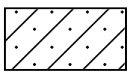
Soils


Topsoil

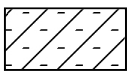

Peat

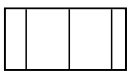

Clay

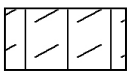

Silty clay

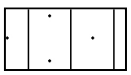

Sandy clay

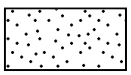

Gravelly clay

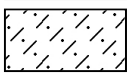

Shaly clay

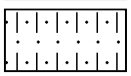

Silt


Clayey silt


Sandy silt

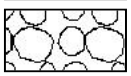

Sand

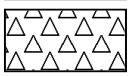

Clayey sand


Silty sand


Gravel

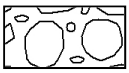

Sandy gravel


Cobbles, boulders

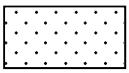

Talus

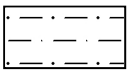
Sedimentary Rocks

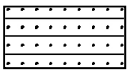

Boulder conglomerate

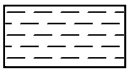

Conglomerate


Conglomeratic sandstone

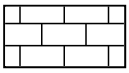

Sandstone


Siltstone

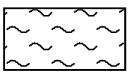

Laminite

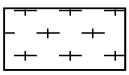

Mudstone, claystone, shale


Coal


Limestone

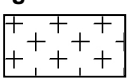
Metamorphic Rocks

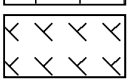

Slate, phyllite, schist

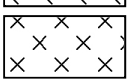

Gneiss

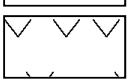

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

TEST PIT LOG

CLIENT: Pacific Coast Christian School Ltd
PROJECT: Preparation of SAQP, Proposed School
LOCATION: Lot 62 Maitland Street, Muswellbrook

SURFACE LEVEL: --
EASTING: 301987.1
NORTHING: 6426982.7

PIT No: 406
PROJECT No: 91601.03
DATE: 7/4/2020
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)
	0.3	FILL / SILTY SAND - Fine to medium grained, brown with gravel, clay and trace rootlets, moist							
	0.4	FILL - Dark grey, asphaltic lens		D	0.35	E	PID<1		
	0.7	SILTY CLAY - Pale brown, low plasticity, with some fine grained sand, M<WP							
	1	Pit discontinued at 0.7m, limit of investigation							
	2								
	3								
	4								

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

RIG: 6.5 Tonne Excavator with 450mm bucket (teeth)

LOGGED: Sebastian

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Pacific Coast Christian School Ltd
PROJECT: Preparation of SAQP, Proposed School
LOCATION: Lot 62 Maitland Street, Muswellbrook

SURFACE LEVEL: --
EASTING: 301998.5
NORTHING: 6426958.9

PIT No: 407
PROJECT No: 91601.03
DATE: 7/4/2020
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) 5 10 15 20
		FILL / SILTY SAND - Brown, fine to medium grained, brown with gravel, clay and trace rootlets, moist							
		From 0.25m to 0.3m, asphaltic lens, asphaltic lens only on northern pit wall		D	0.28	E	PID<1		
	0.37	SILTY CLAY - Pale brown, low plasticity, with some fine grained sand, M<WP							
	0.6	Pit discontinued at 0.6m, limit of investigation							
	1								1
	2								2
	3								3
	4								4

RIG: 6.5 Tonne Excavator with 450mm bucket (teeth)

LOGGED: Sebastian

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Pacific Coast Christian School Ltd
PROJECT: Preparation of SAQP, Proposed School
LOCATION: Lot 62 Maitland Street, Muswellbrook

SURFACE LEVEL: --
EASTING: 301986.1
NORTHING: 6426985.3

PIT No: 408
PROJECT No: 91601.03
DATE: 7/4/2020
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)
		FILL / SILTY SAND - fine to medium grained with gravel and clay, moist		D	0.21	E	PID<1		
		From 0.2m to 0.22m, trace asphaltic lens on south western corner of pit							
	0.3	SILTY CLAY - Pale brown, low plasticity, with some fine grained sand , M<WP							
	0.5	Pit discontinued at 0.5m, limit of investigation							

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

1, 2, 3, 4

RIG: 6.5 Tonne Excavator with 450mm bucket (teeth)

LOGGED: Sebastian

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Little sample recovery in 0.21m sample

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Pacific Coast Christian School Ltd
PROJECT: Preparation of SAQP, Proposed School
LOCATION: Lot 62 Maitland Street, Muswellbrook

SURFACE LEVEL: --
EASTING: 301976.2
NORTHING: 6426996.7

PIT No: 409
PROJECT No: 91601.03
DATE: 7/4/2020
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)
	0.05	FILL / SILTY SAND - FIne to coarse grained, brown, moist		D	0.08	E	PID<1		
	0.1								
	0.15	FILL - Dark grey, asphaltic lens		D	0.2	E	PID<1		
	0.3	FILL / GRAVELLY SAND - Generally comprising fine to medium grained brown, trace subrounded cobbles, moist							
	0.5	FILL / ASH - Fine to coarse grained, dark grey with fine gravel, and coal reject, moist							
		SILTY CLAY - Pale brown, low plasticity, with some fine grained sand, M<WP							
		Pit discontinued at 0.5m, limit of investigation							
	1								1
	2								2
	3								3
	4								4

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

RIG: 6.5 Tonne Excavator with 450mm bucket (teeth)

LOGGED: Sebastian

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Pacific Brook Christian School
PROJECT: Detailed Site Investigation
LOCATION: Lot 100 DP1261496, Maitland Street, Muswellbrook

SURFACE LEVEL: --
EASTING: 301930
NORTHING: 6426981

PIT No: 106
PROJECT No: 91601.00
DATE: 1/7/2019
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)
		FILLING - Generally comprising brown gravelly silty sand filling with clay, dry		D	0.1	E	PID<1		
		From 0.25m to 0.28m asphalt lens		D	0.26	E	PID<1		
		From 0.35m to 0.37m asphalt lens							
	0.4	CLAYEY SILT - Medium to low plasticity pale grey and brown w<PL		D	0.5	E	PID<1		
	0.6	SILTY CLAY - Medium plasticity, dark brown, w>PL							
	1								1
	1.2	Pit discontinued at 1.2m, limit of investigtion		D	1.2	E	PID<1		
	2								2

5 10 15 20

RIG: 6.5 tonne excavator with 450mm bucket teeth

LOGGED: Sebastian

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Pacific Coast Christian School Ltd
PROJECT: Preparation of SAQP, Proposed School
LOCATION: Lot 62 Maitland Street, Muswellbrook

SURFACE LEVEL: --
EASTING: 301930
NORTHING: 6426981

PIT No: 106A
PROJECT No: 91601.03
DATE: 7/4/2020
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)
	0.2	FILL / SILTY SAND - Fine to medium grained, brown, with gravel, clay and trace rootlets, moist							
	0.27	FILL - Dark grey, asphatic lens		D	0.25	E			
	0.3	FILL / GRAVELLY SAND - Generally comprising fine to medium grained brown, trace subrounded cobbles, moist		D	0.35	E			
	0.4			D	0.5	E			
	0.6	FILL / ASH - Fine to coarse grained, dark grey with fine gravel, and coal reject, moist							
		SILTY CLAY - Low plasticity, pale brown with fine grained sand, M<WP							
	1	Pit discontinued at 0.6m, limit of investigation							
	2								
	3								
	4								

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

RIG: 6.5 Tonne Excavator with 450mm bucket (teeth)

LOGGED: Sebastian

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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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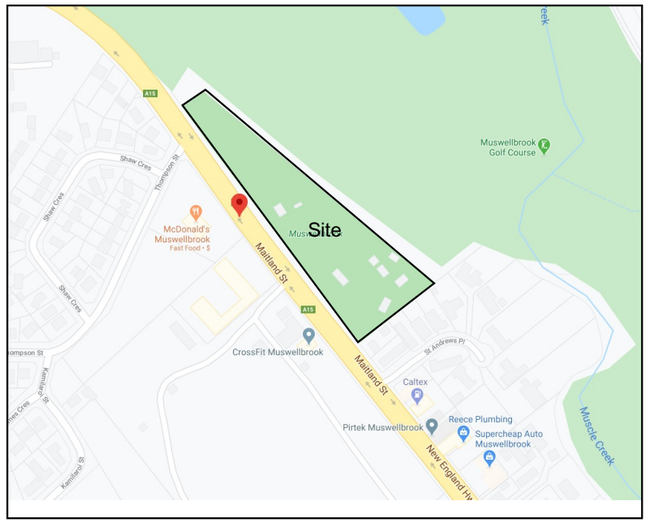
Appendix B

Drawing 1 – Test Location Plan
Drawing 2 – Test Location Plan (Surface and Stockpile Samples)
Drawing 3 – Revised Remediation Action Plan – ACM & PAH Impacts
Proposed Development Drawings:
19055-NBRS-DR-A-DA14Rev5 - Stage 1 Site Plan
19055-NBRS-DR-A-DA17 & 18Rev3 - Stage 1 Elevations
19055-NBRS-DR-A-DA19Rev3 – Stage 1 Sections

Drawing adapted from Nearmap Image dated 13.1.2019



Site Location

Legend

- Approx Location of Test Pits (current investigation)
- Approx Location of Geotechnical Test Pits (current investigation)
- Approx Location of Test Pits (previous investigation-DP,2019)
- Approx Location of Previous Boreholes & Wells (previous investigation-DP,2019)
- Site Boundary
- Approx Location of Previous Bore (JK Environment)
- Estimated Area of PAH Impact (approx only)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Pacific Brook Christian School Ltd		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:1250 @ A3	DATE: 19.November.2020	

TITLE: **Test Location Plan**
Supplementary Details Site Investigation (Contamination)
Lot 100, DP1261496, Maitland Street, Muswellbrook

PROJECT No:	91601.03
DRAWING No:	1
REVISION:	0

0 10 20 30 40 m

Drawing adapted from Nearmap Image dated 13.1.2019
(Base Drawing 91601.03, Dwg 2, Rev0)

Legend

- Approx. Location of Fibro Samples
- Approx. Location of Surface Samples (B1-B10)
- Approximate Stockpile Sampling Locations
- Approx. Stockpile Locations (301-307)
- Site Boundary
- Approx Location of Confirmed ACM on Surface

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Pacific Brook Christian School Ltd		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:750 @ A3	DATE: 20.November.2020	

TITLE: **Test Location Plan (Surface & Stockpile Samples)**
Supplementary Detailed Site Investigation (Contamination)
Lot 62 Maitland Street, Muswellbrook

N

PROJECT No:	91601.04
DRAWING No:	2
REVISION:	0

SITE LOCATION

Legend

- Estimated Area of PAH Impact (approx only)
- Site Boundary
- Approx ACM Location
- Stage 1 Car Park

0 10 20 30 40 50 m

NOTE:
1. Drawing projection in GDA94 / MGA zone 56, adapted from aerial imagery from MetroMap dated 12.2.2023 and plan by NBRS, Dwg Rev 19055-NBRS-DR-A-DA14, Rev 5 dated 21.06.2024.

Douglas PARTNERS

CLIENT: Pacific Coast Christian School Ltd		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:1500 @A3	DATE: 24.June.2024	

TITLE: **Revised Remediation Action Plan - ACM & PAH Impacts**
Lot 100 DP 1208238, Maitland Street,
Muswellbrook, NSW

N

PROJECT:	91601.07
DRAWING No:	1
REVISION:	0

DP.QGIS.A3LandscapeDrawingLayout.Rev3 - P:\91601.07 - MUSWELLBROOK, Lot 62 Maitland St\7.0 Drawings\7.2 Out\QGIS\91601.07.D.001.Mapping.qgz

LEGEND

- BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING STORMWATER
- EXISTING TEL COMMS
- FLOOD EASEMENT
- EXISTING TREES TO BE RETAINED
- EXISTING TREE PROTECTION ZONE (TPZ) (trees identified as significant & to be protected during works as per arborist report)
- EXISTING TREE PROTECTION ZONE (TPZ) (trees potentially impacted by works showing TPZ as noted by arborist)
- EXISTING TREES TO BE REMOVED (refer to arborist report)
- PROPOSED TREES (refer to landscape drawings)
- PROPOSED LOCATION FOR STORMWATER EASEMENT
- PROPOSED LOCATION FOR PEDESTRIAN FOOTPATH ON COUNCIL LAND
- PROPOSED LOCATION FOR PEDESTRIAN FOOTPATH WITHIN SCHOOL
- PEDESTRIAN ACCESS
- VEHICLE ENTRY/EXIT
- BUS STOP

ABBREVIATION

GLA	GENERAL LEARNING AREA
COLA	COVERED OUTDOAR LEARNING AREA
TAS	TECHNOLOGY AND APPLIED SCIENCE
LP	LIGHTING POLE

NBRS

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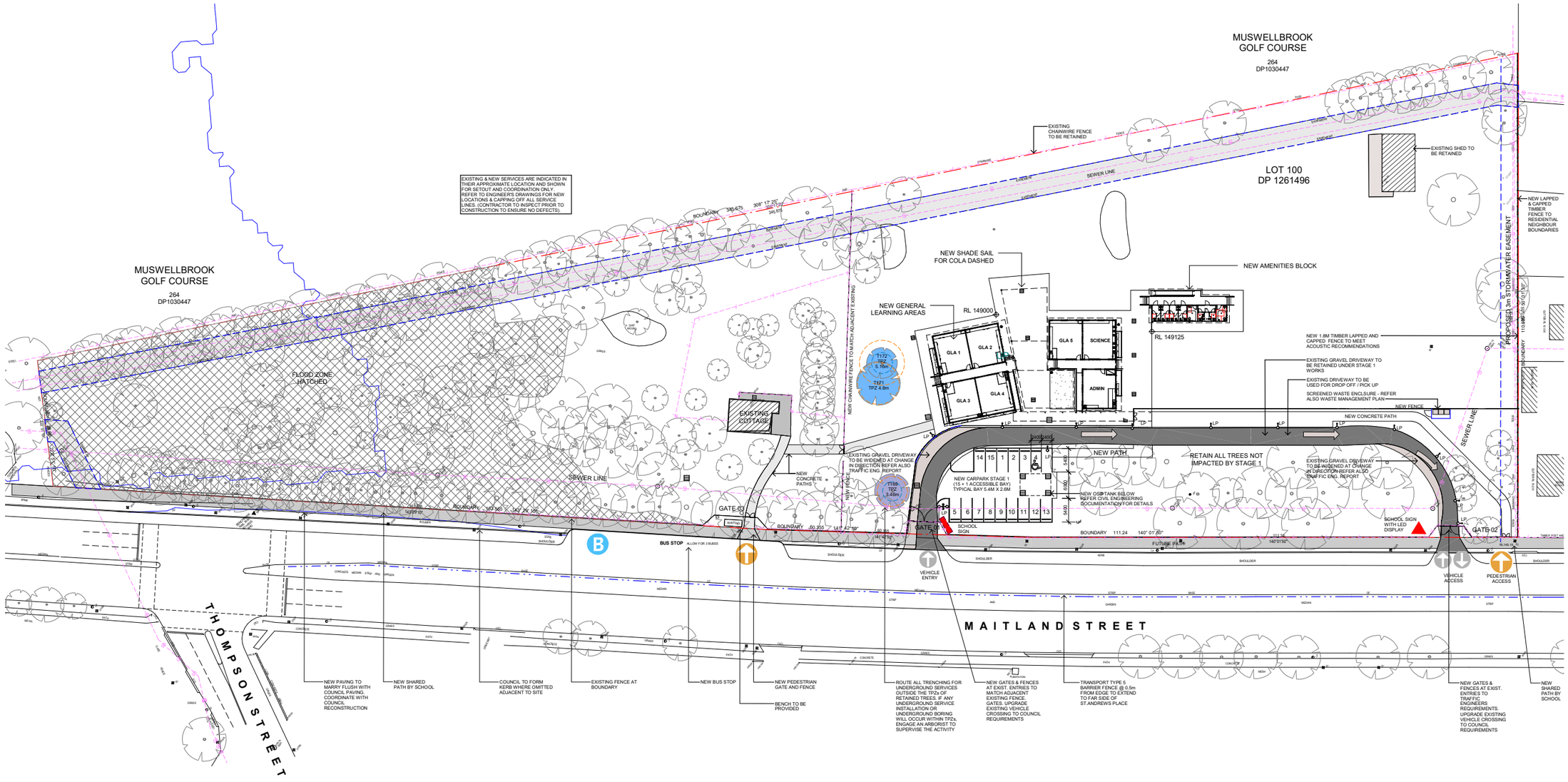

1 DA_STAGE 1 SITE PLAN
1 : 500

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Issue

No.	Date	Description	Chkd
1	09.04.2024	ISSUE FOR CLIENT APPROVAL TO PROCEED	NBRS
2	18.04.2024	ISSUE FOR CONSULTANT COORDINATION	NBRS
3	04.06.2024	ISSUE FOR CLIENT APPROVAL	
4	14.06.2024	DEVELOPMENT APPLICATION	NBRS
5	21.06.2024	DEVELOPMENT APPLICATION ST 1	NBRS

Architect
NBRS
Sydney
61 2 9922 2344 nbrsarchitecture.com

Nominated Architect:
Andrew Duffin NSW 5602
NBRS & Partners Pty Ltd VIC 51197

ABN 16 002 247 565

Project
Pacific Brook Christian School

at
Lot 100 DP1261496, 72-74 Maitland Street, Muswellbrook NSW
for
Pacific Brook Christian School Ltd

Drawing Title
STAGE 1 SITE PLAN

Date 21/06/2024 2:37:12 PM
Scale As indicated @ A1

Drawing Reference
19055-NBRS-DR-A-DA14

Revision
5

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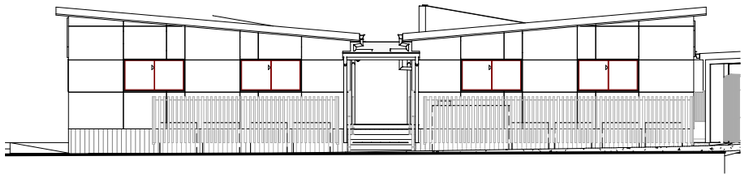
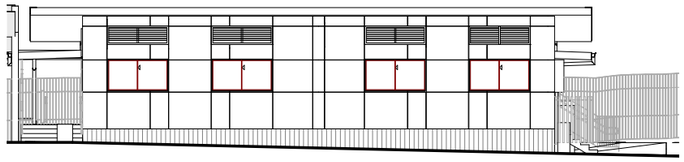
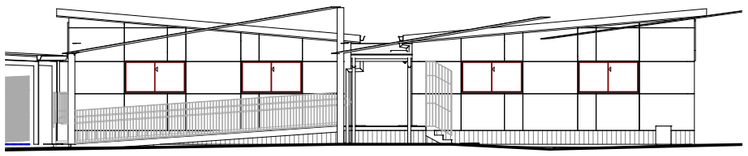


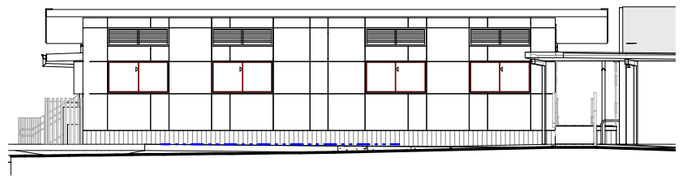
1 DA West Elevation Stage 1 - Building A
1 : 100



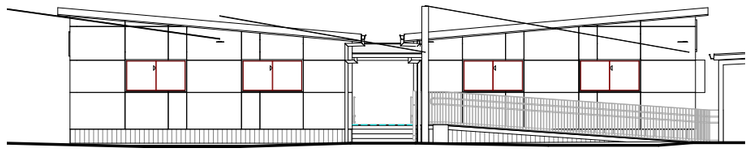
2 DA North Elevation Stage 1 - Building A
1 : 100



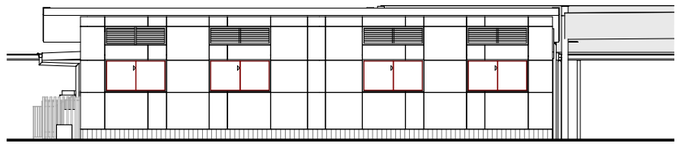
3 DA East Elevation Stage 1 - Building A
1 : 100



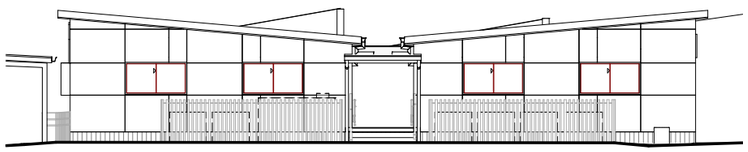
4 DA South Elevation Stage 1 - Building A
1 : 100



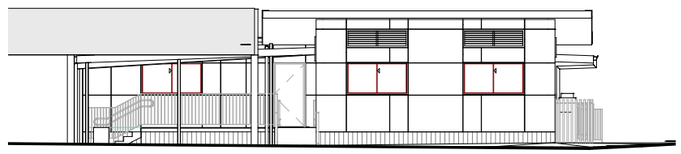
5 DA West Elevation Stage 1 - Building B
1 : 100



6 DA North Elevation Stage 1 - Building B
1 : 100



7 DA South Elevation Stage 1 - Building B
1 : 100



8 DA East Elevation Stage 1 - Building B
1 : 100

NBRS

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Issue

No.	Date	Description	Chkd
1	09.04.2024	ISSUE FOR CLIENT APPROVAL TO PROCEED	NBRS
2	18.04.2024	ISSUE FOR CONSULTANT COORDINATION	NBRS
3	14.06.2024	DEVELOPMENT APPLICATION	NBRS

Architect
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Nominated Architect:
Andrew Duffin NSW 5602

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Project
Pacific Brook Christian School

at
Lot 100 DP1261496, 72-74 Maitland Street, Muswellbrook NSW

for
Pacific Brook Christian School Ltd

Drawing Title
STAGE 1 - ELEVATIONS - SHEET 1

Date 21/06/2024 2:40:00 PM
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Drawing Reference
19055-NBRS-DR-A-DA17

Revision
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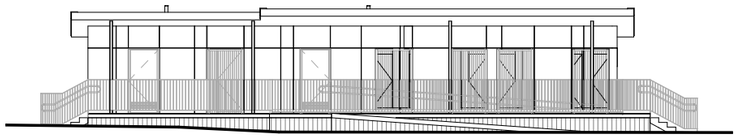

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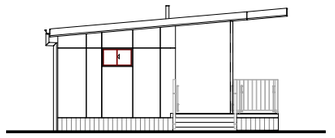

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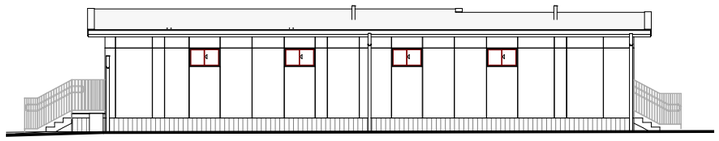

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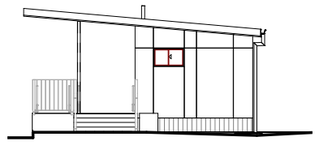

4 DA West Elevation Stage 1 Amenities
1 : 100

NBRS

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Drawing Title
STAGE 1 - ELEVATIONS - SHEET 2

Date 21/06/2024 2:40:15 PM
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Drawing Reference
19055-NBRS-DR-A-DA18

Revision
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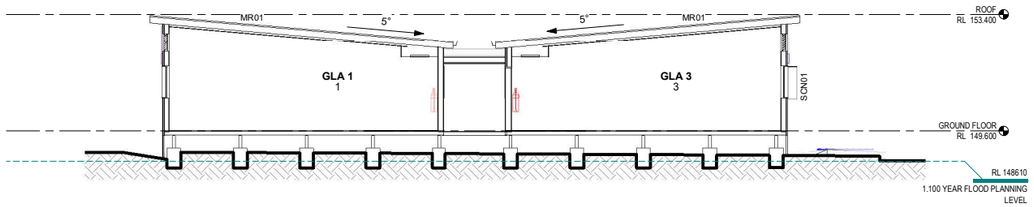

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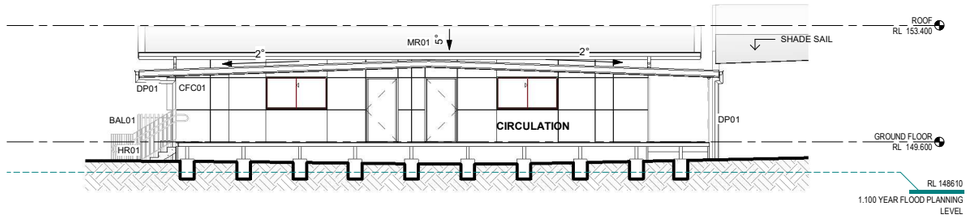

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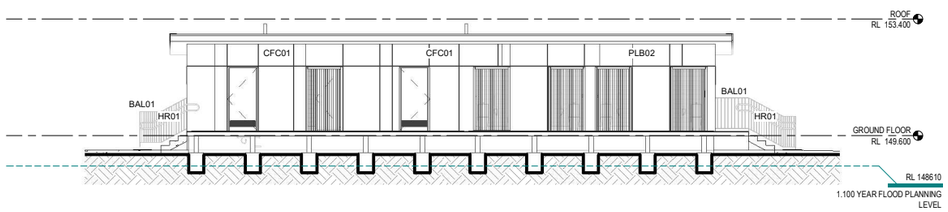

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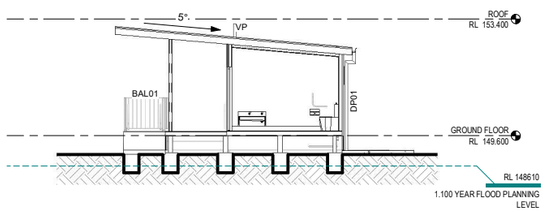

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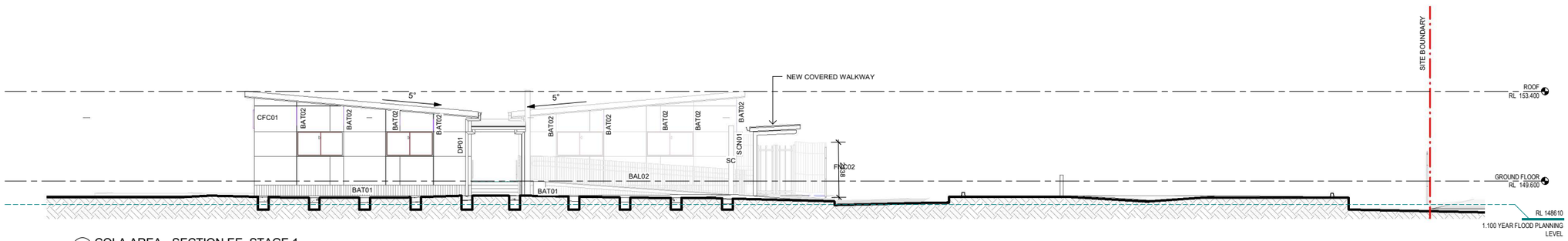

5 COLA AREA - SECTION EE STAGE 1
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Drawing Title
STAGE 1 SECTIONS

Date 21/06/2024 2:40:29 PM
Scale 1 : 100 @ A1

Drawing Reference
19055-NBRS-DR-A-DA19

Revision
3

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Appendix C

Photoplates

Figure 1: Residential backyard east of the eastern boundary, looking south.

Figure 2: Residential backyard east of the eastern boundary with small stockpiles of scrap metal looking south.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 1 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 3: Residential backyard east of the eastern boundary, comprising a metal sheet building looking south.

Figure 4: General condition of asphalt access track, south of the buildings, looking east.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 2 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 5: Area of buried asphalt access track, north of the Building 5, looking west.

Figure 6: Stockpile 301 located in the eastern portion of the site, generally comprising gravelly silty sand and abundant vegetation.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 3 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 7: Stockpile 301A located in the eastern portion of the site, generally comprising gravelly silty sand and abundant vegetation.

Figure 8: Stockpile 302 located in the northern portion of the site, generally comprising woodchip mulch (not sampled).

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 4 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 9: Stockpile 302 located in the northern portion of the site, generally comprising quarry gravel (not sampled).

Figure 10: Stockpile 303 located in the central northern portion of the site, generally comprising silty sand and gravel.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 5 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 11: Stockpile 304 located in the central northern portion of the site, generally comprising silty sand and gravel.

Figure 12: Stockpile 305 located in the central portion of the site, generally comprising silty woodchip mulch (not sampled).

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 6 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 13: Stockpile 306 located in the central northern portion of the site, generally comprising silty sand and gravel and intermixed clay with trace asphalt.

Figure 14: Stockpile 307 located in the western portion of the site, generally comprising silty sand and gravel.

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	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 13: Stockpile 306 located in the central northern portion of the site, generally comprising silty sand and gravel and intermixed clay with trace asphalt.

Figure 14: Stockpile 307 located in the western portion of the site, generally comprising silty sand and gravel.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 8 REV: 0
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Figure 15: Typical surface of Building 3

Figure 16: Typical surface area of Building 4.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 9 REV: 0
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Figure 17: Typical surface area along the north eastern side of Building 5.

Figure 18: Garden bed situated along the south western face of Building 5.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 10 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 19: Fragment F1/JRK identified on the concrete slab along the north western face of Building 5.

Figure 20: Typical surface area of Building 7.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 11 REV: 0
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Figure 21: Surface area found along the north eastern face of Building 8.

Figure 22: Garden bed running along the south western face of Building 8.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 12 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

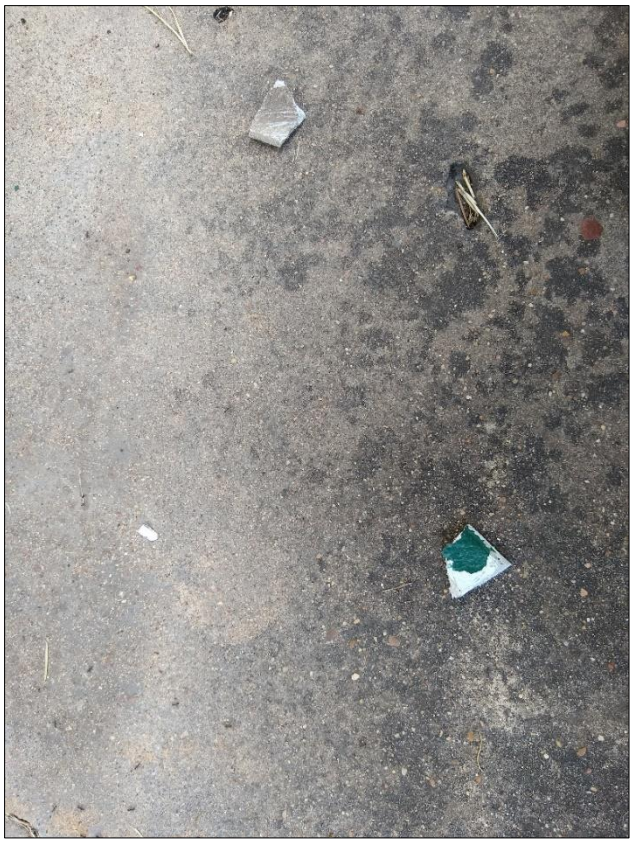

Figure 23: Fibro fragments F2/JRK identified on concrete pavement along the north eastern side of Building 8.

Figure 24: Concrete pavements located along the north western face of Building 9.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 13 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 25: Typical surface area around Building 9.

Figure 26: Fibro fragment F3/JRK found along the north eastern face of Building 9.

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	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 27: Typical surface area of Building 10.

Figure 28: Fibro fragment F4/JRK located along the southern side of Building 10.

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	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 29: Garden bed located along the western face of Building 6.

Figure 30: Typical surface area along north western face of Building 6.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 16 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 31: Fibro fragment F6/JRK located in the garden near the north western corner of Building 6.

Figure 32: Damaged external wall located along the southern face of Building 6. Sampling location for fibro sample F5/JRK.

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Figure 33: Typical surface area of Building 1.

Figure 34: Surface area along the eastern face of Building 1.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 18 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

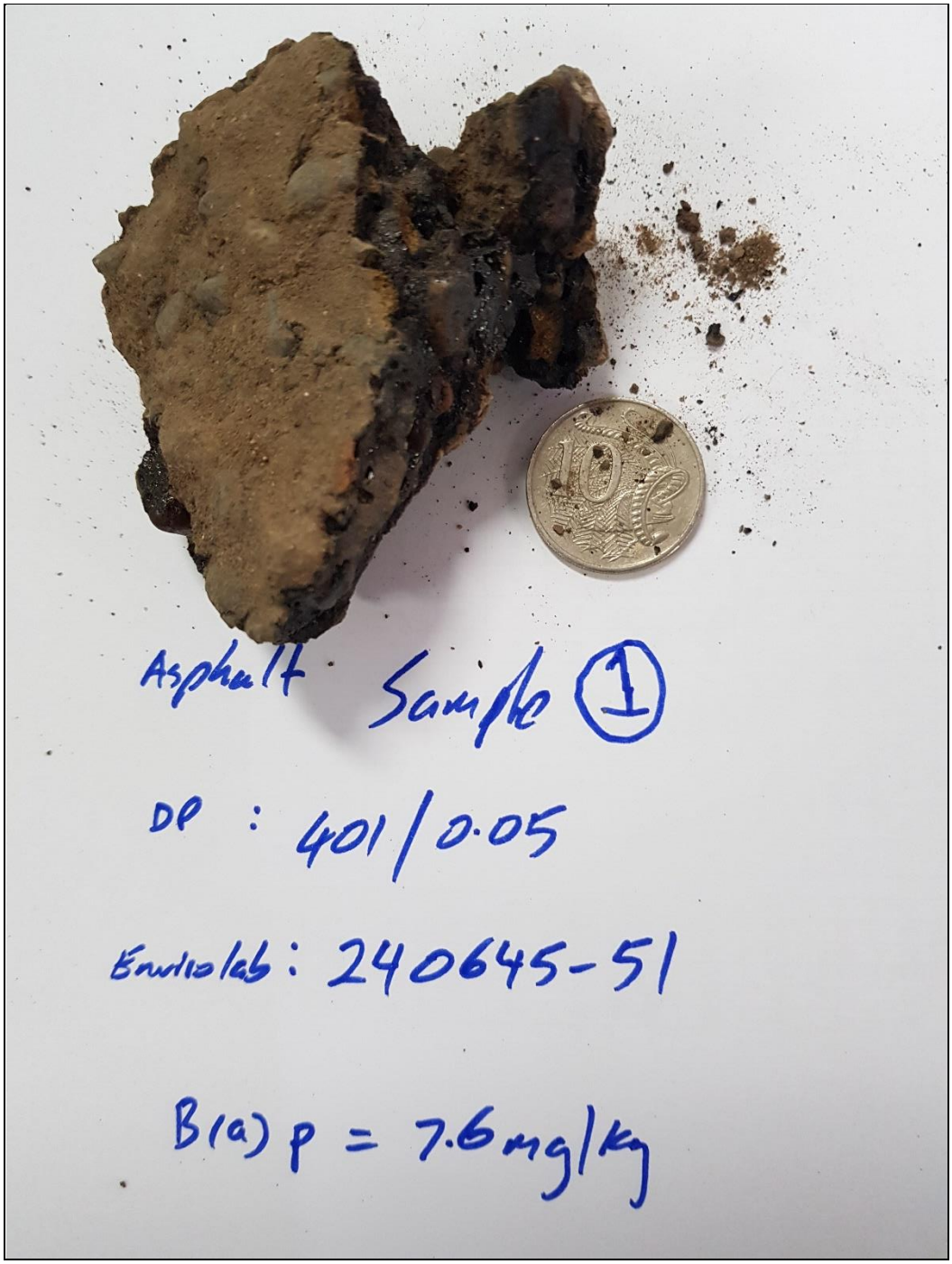

Figure 35: Photo of surface asphalt from test pit 401.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 19 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

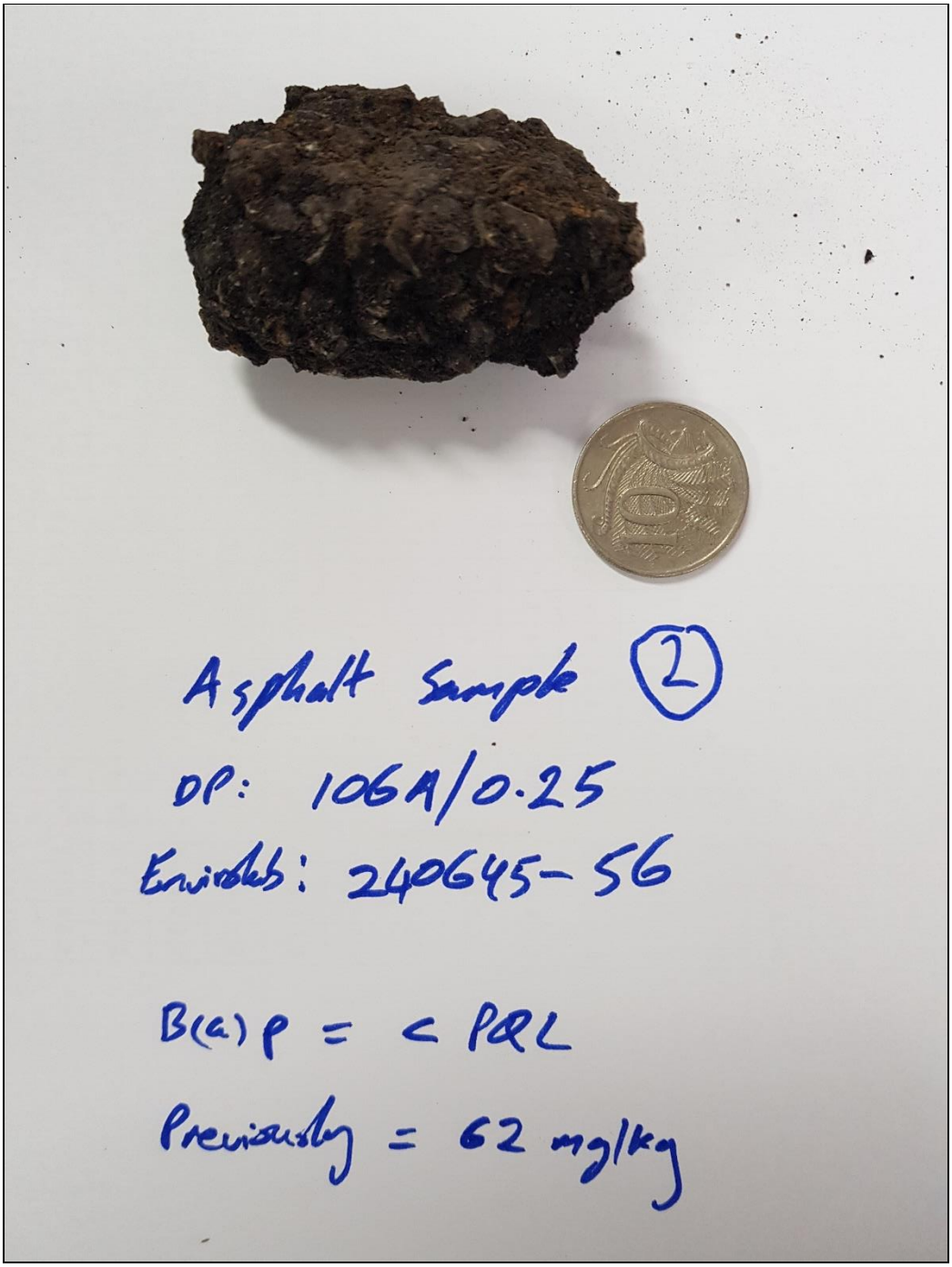

Figure 36: Photo of buried asphalt from test pit 106A.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 20 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

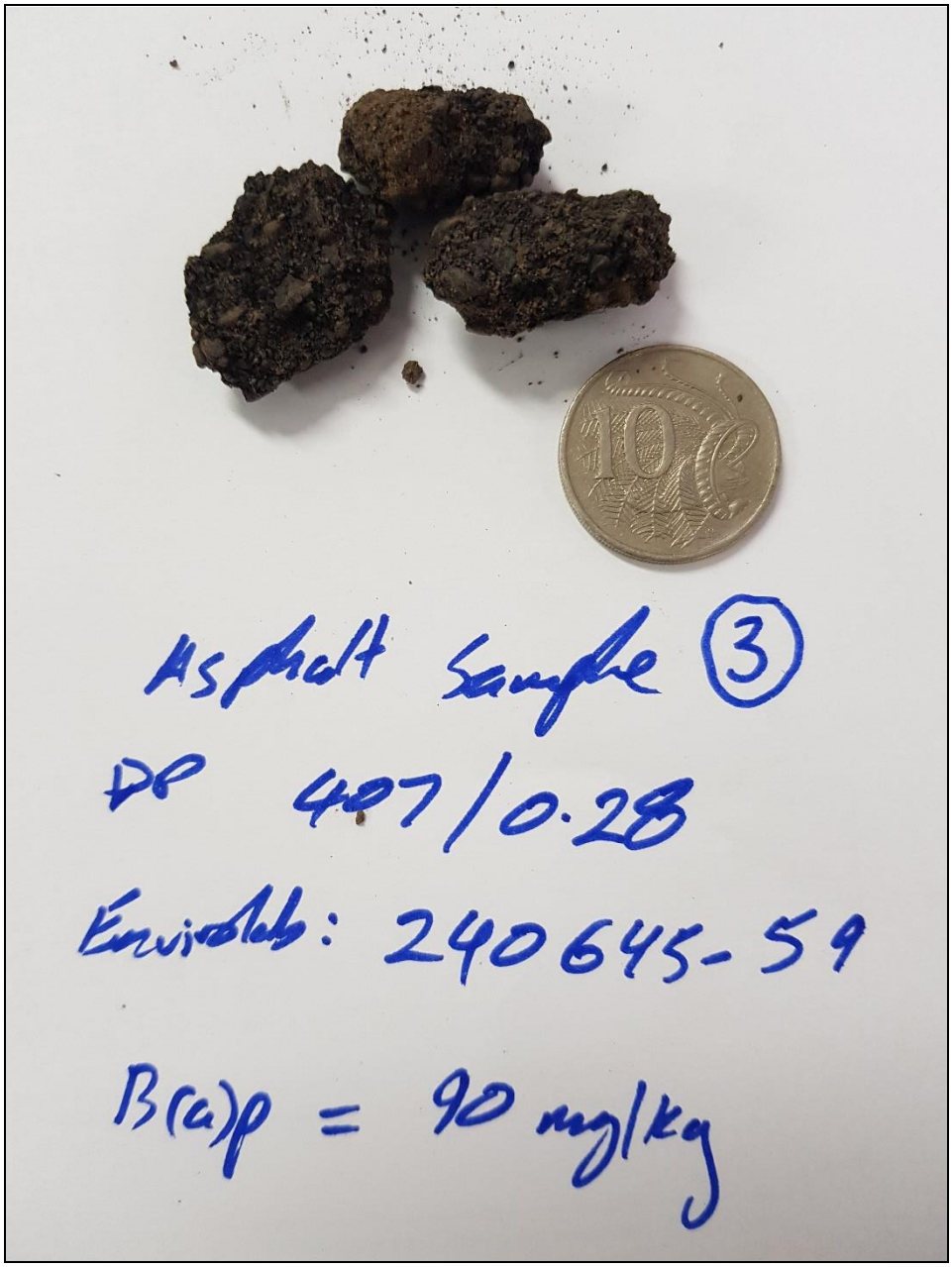

Figure 37: Photo of buried asphalt from test pit 407.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 21 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20

Figure 37: Photo of buried asphalt from test pit 106A (upper dark grey materials and ash filling (lower dark grey materials).

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Proposed School** **Lot 100 Maitland St, Muswellbrook**	PROJECT: 91601.03 PLATE No: 22 REV: 0
	CLIENT: Pacific Brook Christian School Ltd	DATE: 25-Aug-20