RAMBOLL

ENVIRONMENT
& HEALTH

16 September 2021

Pacific Brook Christian School
Pacific Group of Schools
9-15 Quarry Road
Dural, NSW 2158
Attn: Chris Baldry cc: Mark Smith

By email: cbaldry@pacifichills.net; msmith@pacificcoast.nsw.edu.au

Dear Chris,

Ramboll Australia Pty Ltd
Level 3, 100 Pacific Highway
PO Box 560
North Sydney NSW 2060

T +61 2 9954 8100
www.ramboll.com

Ref 318000858

Audit No. RS 113

RE: INTERIM AUDIT ADVICE LETTER NO. 1 - REMEDIATION ACTION PLAN, PROPOSED SCHOOL, MAITLAND STREET, MUSWELLBROOK

1. INTRODUCTION

As a NSW Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an Audit (RS 113) under the NSW *Contaminated Land Management Act 1997* (CLM Act) in relation to the subject site. This initial review has been undertaken to provide an independent review of the suitability and appropriateness of a Remediation Action Plan (RAP).

I was engaged as the Site Auditor in November 2019 by Pacific Brook Christian School. The site is currently vacant land and was formerly used as a plant nursery. It is proposed to develop the site as a school (primary and secondary).

Site investigations have been completed that identified contamination in the form of fragments of asbestos containing material (ACM) on the site surface and a localised area of asphaltic material that contained concentrations of polycyclic aromatic hydrocarbons (PAH) and benzo(a)pyrene (BaP) above adopted assessment criteria for the proposed land use. A remediation action plan (RAP) was developed to address the contamination.

This interim letter is based on a review of the documents listed below and observations made on a site visit by the Auditor's assistant Louise Walkden on 9 January 2020, as well as discussions with Pacific Brook Christian School (PBCS) and Douglas Partners Pty Ltd (DP) who undertook the recent investigations and completed the RAP.

The reports reviewed were:

- 'Preliminary Contamination Assessment for Proposed New School Development at Lot 62, Maitland Street, Muswellbrook, NSW' dated 14 August 2020, JK Environments Pty Ltd (JKE) *(the PCA)*.

Ramboll Australia Pty Ltd
ACN 095 437 442
ABN 49 095 437 442

- 'Report on Hazardous Building Materials (HBM) Survey, Lot 62 Maitland Street, Muswellbrook' dated 2 July 2019, DP (revised to reference Lot 100 DP1261496 dated 25 August 2020) *(the HBM Survey).*
- 'Report on Detailed Site Investigation (Contamination) Lot 62 Maitland Street, Muswellbrook' dated 23 July 2019, DP (revised to reference Lot 100 DP1261496 dated 25 August 2020) *(the DSI).*
- 'Letter for Forestry Corporation of NSW: Review of previous environmental investigation report – Lot 62 Maitland Street, Muswellbrook' dated 19 August 2019, Coffey Services Australia Pty Ltd (Coffey) *(Coffey, 2019)*.
- 'Remediation Action Plan, Proposed School, Lot 62 Maitland Street, Muswellbrook' dated 30 August 2019, DP (revised to reference Lot 100 DP1261496 dated 25 August 2020) *(DP, 2019a).*
- 'Letter to Pacific Brook Christian School: Remediation cost estimate, Proposed School, Lot 62 Maitland Street, Muswellbrook' dated 3 September 2019, DP (revised to reference Lot 100 DP1261496 dated 25 August 2020) *(DP, 2019b)*.
- 'Draft Sampling, Analysis and Quality Plan, Supplementary Contamination Assessment' dated 26 March 2020, DP (revised to reference Lot 100 DP1261496 dated 25 August 2020) *(the SAQP)*.
- 'Report on Supplementary Detailed Site Investigation (Contamination) Proposed School, Lot 62 Maitland Street, Muswellbrook' dated 10 June 2020 (and draft dated 12 May 2020), DP (revised to reference Lot 100 DP1261496 dated 25 August 2020) (*the Supplementary DSI*).
- 'Revised Remediation Action Plan, Proposed School, Lot 100 DP1261496 Maitland Street, Muswellbrook' dated 18 January 2021 (and draft dated November 2020), DP *(the RAP).*

2. SITE DETAILS

2.1 Location

The site details are as follows:

Street address:	72-74 Maitland Street, Muswellbrook, NSW 2333 (Attachment 1)
Identifier:	Lot 100 DP 1261496
Local Government:	Muswellbrook Shire Council
Owner:	Pacific Brook Christian School Ltd
Site Area:	2.432 ha
Zoning:	RU3 Forestry

The site is triangular in shape, with a northwest/southeast alignment. The boundaries of the south-eastern portion of the site are well defined by fencing, however, the north-western portion is not fenced and is accessible by the public.

2.2 Adjacent Uses

The site is located within an area of mixed residential and commercial land use. The surrounding site use includes:

North and northeast: Muswellbrook Golf Course

South and southeast: Residential with a service station and commercial site use further south

West and southwest: Maitland Street with commercial beyond (motel, showground)

The closest surface water receptor is Muscle Creek which flows through the golf course, approximately 100 metres to the east and northeast of the site.

2.3 Site Condition

The site is currently vacant and occupied by several buildings associated with previous site use as a plant nursery, gravel and asphalt paths, gravel garden beds and grass covering as shown in Attachments 1 and 2. DP summarise the site conditions encountered during site works in April 2020 in the RAP and note the following:

- The site is triangular with a frontage of approximately 300 m with Maitland Street.
- The south-eastern portion of the site is fenced and contains the majority of the buildings which were made of weatherboard cladding or metal sheeting along with metal sheet roofing. Buildings comprised:
  - Former 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
  - Several awning and shed structures.
- Fragments of fibre cement sheeting (FCF) (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.
- The south-eastern areas also contained 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 former residential property was present in the central-northern portion of the site constructed from fibre cement sheeting, including ACM.
- 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 exits on the boundary with Maitland Street.
- A large water tank was also noted on site.
- A number of localised stockpiles were present within the site.

The following was noted by the Auditor's assistant during the site visit on 9 January 2020:

- The site is relatively level with a slight slope to the north. There is a culvert just beyond northern site boundary that receives stormwater from the road and golf course to the east.
- The former plant nursery area of the site was fenced with gated access from two driveways on Maitland Street.
- The northern portion of the site was not fenced along Maitland Street. This area is open land with trees and shrubs. Some litter was noted in this area but there was no indication of illegal waste dumping.
- No sources of contamination or contaminating activities were present in the northern portion of the site. There were some signs of fire in the form of burnt tree trunks.

- All buildings on site were in a state of dilapidation and disrepair with signs of weathering on most buildings (peeling paint, fragments of weatherboard on ground surface around building footprint, broken guttering).
- Gravel beds were present, constructed with wooden frames (approx. 50-100 mm high) with grey gravel approximately 50-100 mm deep. It was unclear if the gravel beds were on a concrete slab or if the slab is poured around the beds to create walkway and drainage.
- The concrete slab in the centre of the nursery around gravel beds was in poor condition with multiple cracks.
- There were several soil stockpiles/earth mounds around the site, both in the nursery area and the northern portion which may have comprised topsoil or vegetation from the former nursery use.
- Two underground concrete tanks and a pump shed were present in the central portion of the site, presumably used for water storage.
- An above ground metal water tank in relatively good condition was also located in this area.
- A sewer main runs along the eastern boundary of the site and bisects the northern portion.

2.4 Hazardous Building Materials Survey

A HBM Survey was completed on the buildings and structures currently located on the site. The buildings with associated ID numbers are shown in Attachment 2. Non-friable asbestos (bonded ACM) was identified in four of the 10 buildings (buildings 1, 5, 6 and 8). Lead paint was identified on buildings 1, 5, 8 and 9 and lead dust in building 1. Synthetic mineral fibres (SMF) were identified in buildings 1, 2, 5, 6, 7, 8 and 9 and PCBs in buildings 5, 6, 8 and 9.

Friable asbestos (AF) was not identified in any building.

2.5 Proposed Development

The site is to be redeveloped as a school facility (primary and secondary school). The proposed Concept Masterplan by NBRS Architecture for the overall development is provided as Attachment 3a.

It is understood that site remediation will be conducted as part of the Stage 1 development. The Stage 1 development plan is included as Attachment 3b and is understood to include the following:

- Site remediation
- Removal of 7 trees
- Facilities for a maximum of 140 students and 16 staff, including:
  - One administration and staff building
  - One staff and student amenities block (including one end of trip facility)
  - Five General Learning Areas
  - One Science classroom
  - Covered Outdoor Learning Area (COLA)
- Internal pathways
- On-site parking (15 spaces, inclusive of 1 accessible) and bike parking
- Kiss and drop off areas and bus stop
- Bin storage and collection area
- Signage
- Infrastructure works

- Widening of existing vehicular access from Maitland Street.

For the purposes of this audit, the 'residential with soil access' land use scenario will be assumed.

3. SITE HISTORY

JKE provided a summary of the site history in the PCA based on aerial photographs, site photographs, NSW EPA records, Council records, SafeWork NSW dangerous goods records and Certificates of Title. The Auditor has provided a summary of the site history in Table 3.1.

Table 3.1: Site History

Date	Activity
Pre-1960	Crown Land used for public recreation purposes (park).
1960-mid 1970s	Title records indicated the site remained Crown Land and was used for a tree nursery and experimental plantings between 1963 and 2018. Historical aerial photographs indicate that construction of buildings in the south-eastern section of the site had occurred by 1964 with buildings in the central and northern portion constructed by 1974. JKE infer that buildings may have been associated with a tree nursery and experimental plantings operation as part of Muswellbrook State Forest (i.e. horticultural activities occurred on site).
1980s to 2018	Additional construction of buildings including greenhouse structures in the south-eastern section of the site occurred by mid 1980s. JKE note that the development in the mid-1980s appeared similar to the recent nursery layout. A Forestry Commission Nursery was registered at the site between 1982 and 1991, including garden supplies retail. Site ownership was reported to be transferred to the State of NSW in 2015.
2018 to present	Disused/vacant

The summary indicates that the site has historically been used for horticultural purposes including as a tree nursery and for garden supplies retail. There is the potential for contamination to have occurred as a result of this land use.

Surrounding land uses with the potential to have resulted in contamination include various commercial land uses to the southeast of the site since the 1950s, including a motor mechanics, motor painters and panel beaters and a service station.

3.1 Auditor's Opinion

In the Auditor's opinion, the site history provides an adequate indication of past activities. Previous site uses with the most significant potential to cause contamination include horticultural use as a plant nursery.

There is the potential for groundwater contamination to have occurred from off-site commercial / industrial land use in an inferred upgradient position to the southeast of the site, including a service station, and this has been considered in determining contaminants of concern.

4. CONTAMINANTS OF CONCERN

Following a review of the site history, JKE identified sources of contamination and areas of environmental concern (AECs) in the PCA and provided a list of the contaminants of concern associated with each source/area. These have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern

Source/Area	Potential Contaminants
Fill material – The north-eastern corner of the site appeared to be elevated from the Muswellbrook Golf Course level. It is possible that the site or parts of the site may have been filled. The fill may have been imported from various sources and could be contaminated. Potential ACM (fibre cement fragments) were identified on the ground surface in the northeast section of the site. It is unclear whether the potential ACM was associated within imported fill material or demolition of former structures onsite.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) Petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs) Benzene, toluene, ethylbenzene and xylene (BTEX) Polycyclic aromatic hydrocarbons (PAHs) Organochlorine pesticides (OCPs) Organophosphate pesticides (OPPs) Polychlorinated biphenyls (PCBs) Asbestos.
Fuel storage – One 200 L drum of possible diesel fuel was identified within the maintenance shed. Spillage could have occurred during refuelling activities.	TRH, BTEX and PAHs (naphthalene)
Historical agricultural use – The site appears to have been used for horticultural activities. This could have resulted in contamination across the site via use of machinery, application of pesticides and building/demolition of various structures. Irrigation pipes made from asbestos cement may also be associated with this AEC.	Heavy metals, TRH, PAHs, OCPs, PCBs and asbestos. JKE note that organic pesticides only became commercially available in the 1940s. Prior to this time pesticides were predominantly heavy metal compounds.
Use of pesticides – Pesticides may have been used beneath the buildings and/or around the site.	Heavy metals and OCPs
Hazardous Building Materials –may be present as a result of former building and demolition activities. These materials may also be present in the existing buildings/structures on site. The single-storey residential house in the central section of the site appeared to be cladded by fibre cement sheeting. Visible cracking and weathering of the exterior cement sheeting was evident. Date displayed on the electricity box (circa. 1968) mounted on the south side of the building suggested that the material used for construction of the building was likely to contain asbestos.	Asbestos, lead and PCBs
Off-site service station (and historical land uses), upgradient from the site – The site inspection indicated that an operational service station was located to the southeast and upgradient from the site. Other historical land uses including a mechanics/ panel beaters also occurred in this area. Spillage or leakage of fuel could have occurred from USTs and has the potential to migrate onto the site via stormwater pipework which runs through the south of the site.	Heavy metals (lead), TRH and BTEX

The potential contamination sources and contaminant list used by DP in investigations subsequent to the PCA was similar to that adopted by JKE.

4.1 Auditor's Opinion

The Auditor considers that the analyte list used by JKE and DP (outlined in Table 4.1) adequately reflects the site history and condition.

There has been no assessment by the consultants for the presence of per- and poly-fluoroalkyl substances, but in the Auditor's opinion there are no indications in the site history that they would be potential contaminants of concern.

5. STRATIGRAPHY AND HYDROGEOLOGY

5.1 Stratigraphy

JKE reviewed geological maps during the PCA and reported that the eastern portion of the site is underlain by undifferentiated alluvial deposits, which typically consist of sand, silt, clay and gravel; some residual and colluvial deposits including some channel, levee, lacustrine, floodplain and swamp deposits. The western portion of the site is underlain by Branxton Formation of the Maitland Group, which typically consists of conglomerate, sandstone and siltstone.

During the site investigations, 55 intrusive sampling locations were completed including 22 boreholes and 33 test pits. Investigation locations are shown on Attachments 1 and 4. The sub-surface profile of the site is summarised in Table 5.1.

Table 5.1: Stratigraphy

Depth (mbgl)	Subsurface Profile
0.0 – between 0.1 and 0.8	Fill: Encountered in majority of test pits and bores except for BH13, TP113, TP114 and TP115, BH201 and BH202, TP501-TP503. Fill material was generally present to depths of between 0.1 and 0.2 mbgl but was deeper in the area of the access road (maximum thickness of 0.8 m in BH9). Fill material was described by JKE as comprising "*clayey silt, silty clay, silty sandy clay, sandy clay, silty sand, silty gravelly sand, clayey sand, peaty sand, silty clayey sand, silty gravel and sandy gravel with inclusions of ash, slag, organic material, igneous and sandstone gravel, sub-rounded pebbles, asphaltic fragments brick and tile fragments and root fibres.*" DP describe the fill as comprising a sandy silty topsoil to 0.1 m to 0.2 m underlain by a gravelly sand subbase filling in TP105 -TP107. Deeper sand filling was encountered in TP108 and TP113 to 0.5 m. Ash was encountered in TP103, TP107 and TP111 along with asphalt lenses in TP106.
0.0 - 1.5	Silty CLAY: brown/yellow brown, encountered below the fill or from the surface in all investigation locations.
2.0 - 6.0	Sandy GRAVEL/Gravelly CLAY: encountered in several locations
1.5 – 10 (maximum investigation depth)	CLAY: stiff, pale grey mottled red brown.

mbgl – metres below ground level

Both JKE and DP reviewed the Acid Sulphate Soil Risk Map, prepared by the Department of Land and Water Conservation (DLWC) which indicates that the site is within an area with low probability of acid sulfate soils.

5.2 Hydrogeology

JKE undertook a search for registered bores in the PCA. The search indicated that there were several registered bores within 2 km of the site. One registered bore was located on-site and was registered for waste disposal purposes. The majority of the bores in the vicinity were also registered for waste disposal purposes and drillers log information from the closest registered bores typically identified clay soil to depths of 0-7.6m, underlain by river gravel. Standing water levels (SWLs) in the bores ranged from 2 mbgl to 10.2 mbgl.

DP installed two wells (BH201 and BH202) on the site during the DSI. Both wells were located on the southern site boundary and groundwater flow direction could not be confirmed. DP inferred from local topography that the regional groundwater flow regime is to the north and northwest towards Muscle Creek (located approximately 350 m north of the site).

The wells were screened in the natural clayey sand, sandy gravel and clay at depths of between 4.0 and 10.0 mbgl. Groundwater was not reported to be encountered during drilling. The SWL in the wells was measured on 8 July 2019 at approximately 7.0 mbgl in both wells.

5.3 Auditor's Opinion

The Auditor considers that the depth of fill and underlying stratigraphy have been adequately characterised, although it is noted that soil conditions under existing buildings have not yet been assessed. Further investigation to characterise fill material is not considered necessary prior to demolition.

The Auditor considers that the site stratigraphy and hydrogeology are sufficiently well known for the purpose of assessing site suitability and remediation requirements.

6. EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

The Auditor has assessed the overall quality of the investigation data by review of the information presented in the referenced reports, supplemented by field observations. The data sources are summarised in Table 6.1.

Table 6.1: Summary of Investigations

Investigations	Field Investigations	Analytical Data Obtained
Preliminary Contamination Assessment (JKE, April 2019)	20 boreholes (BH1-BH20) completed using a drill rig with push tube sampler. Most bores completed to 1.5 mbgl. BH1 completed to 3.8 mbgl and BH20 to 3.7 mbgl. Collection of 2 fibre cement fragments (FCF) for analysis for asbestos (HWF1 and HWF2) *Attachment 1*	Fill samples: 23 x Metals, 21 x TRH/BTEX, 22 x PAHs, 19 x OCP/OPPs, 19 x PCBs, 10 x asbestos (500 mL AF/FA % w/w), 3 x Cation Exchange Capacity (CEC) (%), 2 x TRH (silica gel). Natural Soil Samples: 6 x Metals, 8 x TRH/BTEX, 7 x PAHs, 1 x OCP/OPPs, 1 x PCBs. 2 x FCF
Detailed Site Investigation (DP, July 2019)	16 test pits (TP101-TP116) completed using a small excavator to depths of between 0.4 and 1.5 mbgl. 2 boreholes (BH201-BH202) converted to monitoring wells, both located on the upgradient, southern site boundary. *Attachment 1*	Fill samples: 17 x Metals, TRH/BTEX, PAHs, OCP/OPPs, PCBs, 1 x asbestos (presence/absence). Natural Soil Samples: 4 x Metals, TRH/BTEX, PAHs, OCP/OPPs, PCBs. Groundwater: 2 x lead, TRH/BTEX, PAHs. 1 x FCF
Supplementary DSI (DP, June 2020)	**Surface soils around buildings:** Collection of near surface soil samples from the perimeter of each existing building (1 sample per side at B1-B10) and analysis for OCP. Analysis was also completed for lead and asbestos from around buildings 1,5,6,8 and 9. Visual assessment for ACM. Toxicity characteristic leaching procedure (TCLP) testing on selected samples for waste classification purposes. *Attachment 4*	40 x OCP/OPP, 20 x lead and asbestos (500 mL AF/FA %w/w), 1 x TCLP (B8-2) for lead.
	Stockpiles/mounds: Visual assessment and sampling of 8 stockpiles/mounds (301, 301A, 302 – 307) through test pitting and grab samples at a rate of 1 sample per 25m^3. *Attachment 4*	10 x Metals, TRH/BTEX, PAHs, OCP/OPPs, phenols, PCBs and asbestos (500 mL AF/FA %w/w).
	Access track: Additional assessment of elevated PAH through excavation of 14 test pits (TP106A and TP401-TP413) to depths of between 0.5 and 2.8 mbgl and analysis of samples from 9 test pits (TP106A, TP401,	12 X TRH, PAH, 4 x coal tar. 1 x TCLP (TP413) for total PAH and BaP.

Investigations	Field Investigations	Analytical Data Obtained
	TP402, TP404, TP406, TP407, TP411, TP412, TP413) in vicinity of test pit TP106 and in access track to delineate and assess source of elevated PAH concentrations in previous soil samples. TCLP testing on selected samples. *Attachment 1*	
	Geotechnical test pits: TP501, 502 and 503 were excavated to depths of between 2.5 and 3.0 mbgl. No analysis completed in these locations. *Attachment 1*	NA

The Auditor's assessment of data quality assurance/quality control follows in Tables 6.2 and 6.3.

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQO) Both JKE and DP defined specific DQOs in accordance with the seven-step process outlined in Schedule B2 of NEPM 2013. The decision statements included by DP in the Supplementary DSI were: • What is the conceptual site model (i.e. sources, receptors, migration pathways, exposure)? • Do the existing fill materials and/or natural soils pose a potential risk to identified receptors? • Does the existing groundwater beneath the site pose a potential risk to identified receptors? • Does the existing soil gas/soil vapour beneath the site pose a potential risk (toxic, explosion or asphyxiation) to identified receptors? • Is the data sufficient to make a decision regarding the abovementioned risks, the compatibility of the site for the proposed development or are additional investigations required? • Are there any off-site migration issues that need to be considered? • What are the waste management requirements for excess soils associated with the development? • Is the data sufficient to enable the preparation of a Remediation Action Plan (RAP) and/or Environmental Management Plan (EMP) should the data suggest these are required?	The DQOs included in all investigation reports are considered appropriate for the investigations conducted.
Sampling pattern and locations *Soil:* The investigation locations completed during the PCA and DSI were placed using a combination of judgemental and systematic sampling locations to gain coverage of the majority of the site and target areas of concern. Sample locations completed during the Supplementary DSI were judgemental to target surface soils around buildings, stockpiles and mounds and the gravel/asphalt access track as described in Table 6.1. Fill and natural soils were sampled. *Groundwater:* Two monitoring wells were placed by JKE on the southern site boundary to assess for contaminated groundwater migrating onto the site from potential sources off-site to the southeast. No wells were placed down gradient of potential on-site sources of contamination.	In the Auditor's opinion these investigation locations adequately target the main areas of concern. The lack of down gradient groundwater wells is not considered to be a significant data gap given that elevated concentrations of potential leachable contaminants were not encountered in soils on the site (discussed in Section 8).
Sampling density and sample depths *Soil:* A total of 38 soil sampling locations were installed during the PCA and DSI, which exceeds the minimum of 35 sample locations recommended by EPA (1995) *Sampling Design Guidelines* for a 2.5 ha site. The coverage provides a 95% confidence of detecting a residual hot spot of approximately 29 m diameter. The Supplementary DSI provided additional coverage in areas of concern identified during the previous investigations.	In the Auditor's opinion the sampling density and depths was appropriate to characterise the primary material types present on site and assess remediation requirements.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Sample depths extended into natural soils at all locations. The majority of analysed soil samples were from shallow fill materials. Some analysis of natural soil samples was also completed. Surface samples were collected to assess for contaminants from weathering of buildings. Stockpile samples were reported to have been collected through test pitting, hence, samples would have been collected from below the stockpile surface. Samples were analysed for the identified contaminants of concern. *Groundwater*: Groundwater samples were collected from the two wells installed at the site.	
Well construction *Groundwater:* The monitoring wells BH201 and BH202 were installed to depths of 7.0 and 9.8 mbgl, with screen intervals of 3 m and 6 m respectively placed in natural sandy gravel and silty clay. Wells were constructed of 50 mm uPVC. A bentonite seal of 0.5-0.6 m thickness was placed above the screen and the well backfilled with soil cuttings or cement grout to the ground surface.	In the Auditor's opinion the well construction was acceptable.
Sample collection method *Soil*: Samples collected during the PCA were collected via a Geoprobe with PVC push tube samplers. Samples collected for asbestos were collected as 500ml samples in a zip lock bag for analysis for AF/FA in accordance with NEPM (2013). Samples collected during the DSI and the Supplementary DSI were through test pitting with samples collected directly from the excavator bucket or from the wall or base of the test pit using stainless steel hand tools and nitrile gloves. Samples analysed for asbestos during the DSI were not collected as outlined in NEPM (2013) (Schedule B1) and were assessed for presence/absence only. Samples collected for asbestos analysis during the PCA and Supplementary DSI were collected as 500 mL samples in a zip lock bag for analysis for AF/FA in accordance with NEPM (2013). *Groundwater*: Wells were installed by solid flight augers and developed and sampled with disposable HDPE bailers.	Overall the sample collection method was found to be acceptable.
Decontamination procedures *Soil:* Sampling equipment was cleaned with detergent, tap water and then de-ionised water prior to sampling and between sampling events to prevent cross contamination. New gloves were reportedly used for each new sample. *Groundwater*: Dedicated sampling equipment was used for each well. New gloves were reportedly used for each new sample.	Acceptable.
Sample handling and containers Samples were placed into prepared and preserved sampling containers provided by the laboratory and chilled during storage and subsequent transport to the labs. Samples for asbestos analysis were placed in plastic zip-lock bags.	Acceptable.
Chain of Custody (COC) Completed COC forms were provided in the reports.	Acceptable.
Detailed description of field screening protocols *Soil:* Field screening for volatiles was undertaken using a photoionisation detector (PID). Soil sub-samples were placed in ziplock plastic bags and the headspace measured for VOCs after allowing time for equilibration. *Groundwater:* Field parameters were measured during well sampling and development.	Acceptable.
Calibration of field equipment	Given the lack of volatile contamination identified at the site,

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
The reports indicated that calibration of the PIDs used for field screening had been undertaken prior to use. Calibration certificates from the equipment supplier were not provided.	the lack of calibration records is not considered significant.
Sampling logs Soil logs are provided within the reports, indicating sample depth, PID readings and lithology. Groundwater field sampling records were not provided, however, field observations including SWL, field parameters and sampling methodology were included in the body of the report.	Acceptable.

Table 6.3: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Field quality control samples Field quality control samples including trip blanks, trip spikes, field intra-laboratory and inter-laboratory duplicates were undertaken during the PCA and Supplementary DSI soil sampling events. Field intra-laboratory duplicates were undertaken during the soil and groundwater sampling completed by DP during the DSI, however inter-laboratory duplicates, rinsate blanks, trip blanks and trip spikes were not collected.	While trip blanks and spikes were not collected during the DSI, this is not considered to affect the usability of the data since there was no field evidence of significant volatile contamination and volatile compounds were not detected in the soil samples analysed. Rinsate blanks were not required as dedicated sampling equipment was used for each location.
Field quality control results The results of field quality control samples were generally within appropriate limits except for the following: PCA: A relative percent difference (RPD) non-conformance was reported for fluoranthene in the intra-laboratory duplicate during the PCA. The exceedance was attributed to sample heterogeneity and the difficulties associated with obtaining homogenous duplicate samples of heterogeneous fill matrices. The higher duplicate concentrations for PAHs were adopted in the data assessment. Supplementary DSI: Elevated RPD for TRH C10-C36 between the shallow fill sample from TP401 and the intra-laboratory duplicate. Elevated RPDs for some metals between the primary sample for stockpile 303 and the intra- and inter-laboratory duplicates. DP considered that the exceedances were not significant as: • The typically low actual differences in the concentrations of the replicate pairs where some RPD exceedances occurred. High RPD values reflect the small differences between two small numbers. • The number of replicate pairs being collected from fill soils which by its nature is heterogeneous. • Most of the recorded concentrations being relatively close to the limit of reporting. High RPD values reflect the low concentrations. • The majority of RPDs within a replicate pair being within the acceptable limits. • All other QA/QC parameters met the data quality indicators (DQIs).	Overall, in the context of the larger data set, the minor exceedances of RPDs for some analytes are not considered to impact on the conclusions drawn from the data. Where higher concentrations were reported in the duplicate sample, this concentration has been adopted in the data assessment as a conservative approach.
NATA registered laboratory and NATA endorsed methods Laboratories used included: Envirolab in Sydney was used as the primary laboratory for all three investigations. Envirolab in Victoria was used as the secondary laboratory during the PCA and ALS was used as the secondary laboratory during the Supplementary DSI. Laboratory certificates were NATA stamped.	Acceptable
Analytical methods Analytical methods were included in the laboratory test certificates. Both Envirolab and ALS provided brief method summaries of in-house NATA	The analytical methods are considered acceptable for the purposes of the site audit, noting that the AS4964-2004 is currently

Field and Lab QA/QC	Auditor's Opinion
accredited methods used based on USEPA and/or APHA methods (excluding asbestos) for extraction and analysis in accordance with the NEPM (2013). Asbestos identification was conducted by Envirolab using polarised light microscopy with dispersion staining by method AS4964-2004 *Method for the Qualitative Identification of Asbestos Bulk Samples*.	the only available method in Australia for analysing asbestos.
Holding times Review of the COCs and laboratory certificates indicate that the holding times had been met.	Acceptable.
Practical Quantitation Limits (PQLs) *Soil:* PQLs (except asbestos) were less than the threshold criteria for the contaminants of concern. *Asbestos:* The limit of detection for asbestos in soil during the DSI was 0.01% w/w. 500 mL samples analysed were reported to 0.001% w/w in accordance with NEPM (2013). *Groundwater:* PQLs were less than the threshold criteria for the contaminants of concern except for BaP where the drinking water criteria of 0.01 µg/L was less than the PQL of 0.1 µg/L.	*Soil (except asbestos):* Overall the soil PQLs are acceptable. *Asbestos:* In the absence of any other validated analytical method, the detection limit for asbestos is considered acceptable. A positive result would be considered to exceed the *"no asbestos detected in soil"* criteria. *Groundwater*: PAH were not detected above PQLs in either groundwater sample and the elevated PQL for BaP does not materially affect the outcome of the audit.
Laboratory quality control samples Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratories.	Acceptable.
Laboratory quality control results The results of laboratory quality control samples were generally within appropriate limits, with the following exceptions: PCA: Some surrogate recovery values for TRHs were not reported due to interference from these analytes in some samples. JKE conclude that the result did not impact the overall assessment of the data. DSI: Raised PQLs were reported for TRH, PAH, OCP and PCB in one soil sample from TP106 at a depth of 0.26 m due to high concentrations of analytes in the sample. Supplementary DSI: Raised PQL for selenium during supplementary DSI due to interferences from analytes (other than those being tested) in sample 240645-74. Some samples analysed for AF/FA during the supplementary DSI were noted by the laboratory as being below the minimum 500 mL sample volume required by NEPM (2013). DP noted that the samples tested did not contain indicators of potential asbestos impacts (i.e. general absence of building materials) and that a slightly reduced volume of sample tested is therefore not considered to be significant nor impact on the results of testing. An elevated RPD for PAH in soils during the supplementary DSI was accepted due to the non-homogenous nature of the sample.	In the context of the dataset reported, the elevated RPDs and raised PQLs are not considered significant and the laboratory quality control results are acceptable.
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy) Predetermined DQIs were set by JKE and DP for the field and laboratory programs including blanks, replicates, duplicates, laboratory control samples, matrix spikes, surrogate spikes and internal standards. These were discussed with regard to the five category areas in the PCA and the Supplementary DSI but not in the DSI. JKE concluded in the PCA that "*EIS [JKE] are of the opinion that the data are adequately precise, accurate, representative, comparable and complete to serve as a basis for interpretation to achieve the assessment objectives*."	An assessment of the data quality with respect to the five category areas has been undertaken by the Auditor and is summarised below.

Field and Lab QA/QC	Auditor's Opinion
DP concluded in the Supplementary DSI that "*An evaluation of field and laboratory QA/QC information against the stated DQOs has been undertaken. Overall, the SOPs [Standard Operating Procedures] were generally complied with in the field, and the laboratory quality control samples were generally within the laboratory acceptance criteria. The QC non-conformances, where they occurred, are not considered to have significantly impacted the quality of the results overall as they were generally minor in number compared to the overall QC data. On this basis, it is considered that an acceptable level of laboratory precision and consistency was achieved and that the laboratory data sets are reliable and useable for this assessment.*"	

6.1 Auditor's Opinion

In considering the data as a whole the Auditor concludes that:

- The data is likely to be representative of the overall conditions.
- The data is adequately complete.
- There is a high degree of confidence that data is comparable for each sampling and analytical event.
- The primary laboratory provided sufficient information to conclude that data is of sufficient precision.
- The data is likely to be accurate.

7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed the results against Tier 1 criteria from National Environmental Protection Council (NEPC) *National Environmental Protection (Assessment of Site Contamination) Measure 1999*, as Amended 2013 (NEPM, 2013). Other guidance has been adopted where NEPM (2013) is not applicable or criteria are not provided. Based on the proposed development (primary and secondary school), the human health criteria for 'residential with garden/accessible soils' and ecological criteria appropriate for 'urban residential and public open space' were adopted.

7.1 Soil Assessment Criteria

Human Health Assessment Criteria

The Auditor has adopted human health assessment criteria from the following sources:

- NEPM (2013) Health Investigation Levels (HILs) for 'Residential' (HIL-A) land use.
- NEPM (2013) Health Screening Levels (HSLs) for 'Low-High Density Residential' (HSL-A&B) land use. The HSLs assumed a sand soil type and depth to source of <1 m as an initial screen.
- NEPM (2013) Management Limits (MLs) for petroleum hydrocarbons for 'Residential and Open Space' land use and assuming coarse soil texture.
- NEPM (2013) HSLs for Asbestos Contamination in Soil for 'Residential A' (HSL-A) land use (AF/FA 0.001 %w/w) or presence/absence of asbestos where sampling not completed in accordance with NEPM (2013).

Ecological Assessment Criteria

The Auditor has adopted ecological soil assessment criteria from the following sources:

- NEPM (2013) Ecological Screening Levels (ESLs) for 'Urban Residential and Public Open Space' land use, assuming coarse soil.
- NEPM (2013) Ecological Investigation Levels (EILs) for 'Urban Residential and Public Open Space' land use. In the absence of site-specific soil data on pH, clay content, CEC and background

concentrations, the published range of the added contaminant limits have been applied as an initial screen.

- Canadian Council of Ministers of the Environment (CCME) (2010) *Canadian soil quality guidelines: carcinogenic and other polycyclic aromatic hydrocarbons (PAHs)* soil quality guideline (SQG) for BaP for 'Residential' land use. The SQG has been adopted in place of the NEPM (2013) ESL as it is based on a larger and more up-to-date toxicity database than the low reliability NEPM (2013) ESL.

Soil Aesthetic Considerations

The Auditor has considered the need for soil remediation based on 'aesthetic' contamination as outlined in *Section 3.6 Aesthetic Considerations* of NEPM (2013) Schedule B1, which acknowledges that there are no chemical-specific numerical aesthetic guidelines. Instead, site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

7.2 Groundwater Assessment Criteria

Human Health Assessment Criteria

The Auditor has adopted human health assessment criteria from the following sources:

- NEPM (2013) HSLs for 'Low-High Density Residential' (HSL-A&B) land use. The HSLs assumed a sand soil type and a depth to groundwater of 4 to <8 m.
- NHMRC (2011) *National Water Quality Management Strategy, Australian Drinking-Water Guidelines* (ADWG), Version 3.5 Updated August 2018 where HSLs are not applicable.

Ecological Assessment Criteria

The Auditor has adopted ecological groundwater assessment criteria from the following sources:

- ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (www.waterquality.gov.au/anz-guidelines). Criteria for freshwater and 95% level of protection were adopted.

7.3 Consultants Assessment Criteria

The environmental quality criteria referenced by the Auditor are consistent with those adopted by JKE and DP, with the exception of the following:

- DP adopted site specific EILs in the DSI and supplementary DSI for chromium III, copper, nickel and zinc based on assumed conservative concentrations of CEC, clay content and pH. No field measurements were obtained by DP although JKE undertook CEC analyses during the PCA.

Given the results obtained, the Auditor considers that these discrepancies do not affect the overall conclusions reached by DP and the Auditor.

8. EVALUATION OF SOIL RESULTS

8.1 Field Results

8.1.1 Fibre cement fragments (FCF)

JKE reported in the PCA that several FCF were observed on the ground surface within the north-eastern corner of the site, around the existing buildings (vicinity of BH3, BH6 and BH9). FCF can often be ACM. The majority of the FCF were visibly weathered. Two samples were collected and analysed for asbestos (HWF1 and HWF2) and were found not to contain asbestos. JKE report in the PCA that no FCF was observed within subsurface fill material during the borehole investigation.

DP also observed FCF on the ground surface during the DSI near test pit TP111 in the north-eastern portion of the site. A sample of the FCF was analysed in the laboratory (111/F) and found not to contain asbestos.

During the Supplementary DSI, DP observed FCF at the surface adjacent to Buildings 5, 6, 8, 9 and 10. Analysis was completed on six FCF (F1/JRK-F6/JRK) and asbestos comprising chrysotile, amosite and crocidolite was detected in two of the fragments collected near buildings 5 and 8. DP noted that testing of surface soils in these areas for AF/FA did not detect asbestos.

8.1.2 Field Observations

JKE report that no odours or staining were observed during soil sampling in the PCA. Fill was encountered in all boreholes except BH13 located in the central portion of the site, near the southern site boundary.

DP noted ash in test pits TP103, TP107 and TP111, located in the eastern portion of the site, near the northern site boundary, and asphalt in test pit TP106, located in the access road. Fill was observed in all test pit locations except for TP113, TP114 and TP115 located in the western portion of the site. DP noted in the DSI that no odours or staining were observed in the fill or natural materials during the investigation or within groundwater during drilling or during purging and sampling of groundwater wells.

During the Supplementary DSI, DP reported that asphaltic surface and subsurface asphalt lenses were encountered in test pits within the access road and that ash and coal rejects were noted in 10 of the 12 test pits advanced into the access road. Observations of potential contamination within the stockpiles included possible imported fill within all stockpiles and asphalt fragments within stockpile 306. In addition to FCF observed on the ground surface, possible paint fragments were identified around buildings 1, 5 and 8. DP noted in the Supplementary DSI that "*There were no obvious indications of gross contamination within the investigated soils (ie no gross staining / odours). There were no indications of building rubble or potential hazardous building materials at the surface or within test pits associated with the identified stockpiled soils.*"

8.1.3 Field screening for volatile organic compounds

Field screening using a PID was completed during all three soil sampling events. The highest result reported was during the PCA and was 16 ppm in a surface soil sample from BH1. The results of PID screening on soil samples during the DSI and Supplementary DSI were generally <1 ppm. The results indicate that low concentrations of PID-detectable volatile contaminants are present at the site.

8.2 Analytical Results

Soil samples were collected from fill material, natural soils, eight stockpiles and from within the access road to characterise potential contamination at the site. Samples were analysed for a variety of contaminants including petroleum hydrocarbons, PAHs, asbestos and heavy metals. The results relating to characterisation of each media (fill, natural soil, stockpiles and access road) have been assessed separately against the environmental quality criteria and are summarised below in Sections 8.2.1 to 8.2.5.

8.2.1 Analytical Results for Fill Material

The soil data collected for assessment of insitu fill material during the PCA and DSI is summarised in Table 8.1 along with surface soil samples collected from around buildings in the Supplementary DSI. Sample locations from the PCA and DSI are shown on Attachment 1 and surface sample locations from the Supplementary DSI are shown on Attachment 4.

Table 8.1: Evaluation of Soil Analytical Results for Fill – Summary Table (mg/kg)

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
AF/FA in soil	31	0	<PQL	0 above HSL 0.001%	-
Asbestos trace analysis	31	0	<PQL	-	-
Asbestos in FCF	9	2	chrysotile, amosite and crocidolite	-	-
BTEX	34	0	<PQL	0 above HSLs A&B 0-1 m, sand	0 above ESLs (urban residential) (coarse)
F1 (TRH C_6–C_{10} minus BTEX)	34	0	<25	0 above HSL A&B 0-1 m, sand 45 mg/kg	0 above ESL (urban residential) 180 mg/kg
F2 (TRH >C_{10}–C_{16} minus naphthalene)	34	5	**900**	**2 above HSL A&B 0-1 m, sand 110 mg/kg (BH17 at 0.1 mbgl, 900 mg/kg and BH19 at 0.1 mbgl, 190 mg/kg)**	**2 above ESL (urban residential) 120 mg/kg (BH17 at 0.1 mbgl, 900 mg/kg and BH19 at 0.1 mbgl, 190 mg/kg)**
TRH >C_{10}–C_{16}	34	5	900	0 above ML (urban residential, coarse soil) 1000 mg/kg	-
F3 (TRH >C_{16}-C_{34})	34	11	**3,700**	**1 above ML (urban residential) 2500 mg/kg (BH17 at 0.1 mbgl, 3,700 mg/kg)**	**6 above ESL (urban residential (coarse) 300 mg/kg (BH4, BH15, BH17, BH18, BH19, BH20)**
F4 (TRH >C_{34}-C_{40})	34	11	1,300	0 above ML (urban residential) 10,000 mg/kg	0 above ESL (urban residential (coarse) 2,800 mg/kg
Naphthalene	35	0	<PQL	0 above HSL A&B 0-1 m, sand 3 mg/kg	0 above EIL (urban residential) 170 mg/kg
BaP	35	9	**62**	-	**1 above CCME SQG (residential) 20 mg/kg (TP106 at 0.5 mbgl, 62 mg/kg)**
BaP TEQ	35	9	**80**	**2 above HIL A 3 mg/kg (BH2 at 0.2 mbgl, 3.5 mg/kg and TP106 at 0.5 mbgl, 80 mg/kg)**	-
Total PAHs	35	15	340	**1 above HIL A 300 mg/kg (TP106 at 0.5 m, 340 mg/kg)**	-
Arsenic	36	18	9	0 above HIL A 100 mg/kg	0 above EIL (urban residential) 100 mg/kg
Cadmium	34	0	<0.4	0 above HIL A 20 mg/kg	-
Chromium (total)	13	13	20	-	0 above most conservative ACL (urban residential) for Cr (III) 190 mg/kg
Chromium (VI)	21	21	22	0 above HIL A 100 mg/kg	-
Copper	34	34	42	0 above HIL A 6000 mg/kg	0 above most conservative ACL (urban residential) 60 mg/kg

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Lead	54	54	76	0 above HIL A 300 mg/kg	0 above generic ACL (urban residential) 1100 mg/kg
Mercury	34	0	<PQL	0 above HIL A 40 mg/kg	-
Nickel	34	34	**45**	0 above HIL A 400 mg/kg	**1 above most conservative ACL (urban residential) 30 mg/kg**
Zinc	34	34	**740**	0 above HIL A 7400 mg/kg	**7 above most conservative ACL (urban residential) 70 mg/kg**
PCB	32	0	<0.1	0 above HIL A 1 mg/kg	-
OCP	72	0	<PQL	0 above HIL A for dieldrin (6 mg/kg)	0 above EIL for DDT (180 mg/kg)

n number of samples
- No criteria available/used
NL Non-limiting
<PQL Less than the practical quantitation limit

In assessing the results, the Auditor makes the following observations:

- Two of the nine fragments of fibre cement analysed in the laboratory contained asbestos.
- Concentrations of TRH F2 were reported above the human health and ecological criteria during the PCA in surface soil samples from BH17 and BH19, both located in the undeveloped north-western portion of the site. It was observed that the source of the TRH was likely to be organic in nature and evidence of fire damage was present in the area. JKE completed additional analysis for TRH using silica gel clean up on both samples which reduced the concentrations of TRH in BH19 to below the HSL-A/B criterion. However, the concentrations of TRH F2 in BH17 remained above the HSL-A/B criterion. JKE concluded that, based on the weight of evidence approach, the vapour intrusion risks from TRHs in soil are likely to be low given that the source of TRHs is unlikely to be petroleum.
- The concentrations of TRH F2 and F3 reported above ecological criteria were also considered by JKE present a low risk to ecological receptors as the source was considered to be related to natural organic matter and not a petroleum source.
- Elevated concentrations of BaP and total PAH were reported above the human health and ecological criteria during the DSI in a sample from test pit TP106, located within the access track area. This elevated concentration was considered by DP to be associated with the asphalt lens encountered in this location at the depth of sampling.
- Concentrations of BaP slightly elevated above the HIL were also reported during the PCA for a surface soil sample from BH2 which is also located in the access road area.
- The elevated PAH related to the access road was assessed further during the Supplementary DSI as discussed in Section 8.2.3.
- Concentrations of lead and OCP in targeted surface soil sampling from around building footprints did not exceed assessment criteria.

8.2.2 Analytical Results for Natural Soils

During the PCA and DSI, 12 samples of natural soil were analysed for BTEX and TRH, 11 for PAH, 10 for metals and 5 for OCPs and PCBS. The analytical results for organic contaminants were below the

laboratory PQL for all samples and metal concentrations were within background levels and were below the adopted assessment criteria.

8.2.3 Analytical Results for the Access Road

An asphalt access road is present in the south-eastern portion of the site that was formerly used as a nursery. The road forms a loop with two access points along Maitland Street. The access road was reported by JKE to be in poor condition with visible cracks and damage. As discussed in Section 8.2.1, elevated concentrations of PAH were detected during the DSI in test pit TP106 in a sample collected from an asphalt lens present at a depth of approximately 0.5 mbgl in this area of the access road. The Supplementary DSI included further assessment of the materials in the access road to determine the source of the elevated PAH concentrations in TP106, delineate the extent of the contamination and assess the requirement for remediation.

To meet this objective, DP undertook excavation of an additional 14 test pits (TP106A and TP401-TP413) to depths of between 0.5 and 2.8 mbgl in the vicinity of test pit TP106 and other areas of the access track. Analyses were undertaken on samples from nine test pits for TRH and PAH and on one sample for TCLP total PAH and BaP. Sample locations are shown on Attachment 1.

Table 8.2: Evaluation of Soil Analytical Results for Access Road – Summary Table (mg/kg)

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
F1 (TRH C_6–C_{10} minus BTEX)	12	0	<25	0 above HSL A&B 0-1 m, sand 45 mg/kg	0 above ESL (urban residential) 180 mg/kg
F2 (TRH >C_{10}–C_{16} minus naphthalene)	12	4	**180**	**2 above HSL A&B 0-1 m, sand 110 mg/kg (TP401, TP407)**	0 above ESL (urban residential) 120 mg/kg
F3 (TRH >C_{16}-C_{34})	12	7	**5,300**	**1 above ML (urban residential) 2500 mg/kg (TP407)**	**4 above ESL (urban residential (coarse) 300 mg/kg (TP401 at 0.05, TP401 at 0.15, TP407 and TP111)**
F4 (TRH >C_{34}-C_{40})	12	7	2,300	0 above ML (urban residential) 10,000 mg/kg	0 above ESL (urban residential (coarse) 2,800 mg/kg
Naphthalene	12	2	1.4	0 above HSL A&B 0-1 m, sand 3 mg/kg	0 above EIL (urban residential) 170 mg/kg
BaP	12	8	**90**	**-**	**1 above CCME SQG (residential) 20 mg/kg (TP407)**
BaP TEQ	12	5	**120**	**4 above HIL A 3 mg/kg (TP401 at 0.05 m, TP407 at 0.28 m, TP411 at 0.01 m, TP413 at 0.15 m)**	-
Total PAHs	12	8	**710**	**1 above HIL A 300 mg/kg (TP407 at 0.28 m)**	-
Phenols	12	0	<PQL	0 above HIL A 100 mg/kg	-

n number of samples
- No criteria available/used
NL Non-limiting
<PQL Less than the practical quantitation limit

Several samples of materials from the access track contained concentrations of PAH above the assessment criteria. DP noted that all the samples exceeding the human health criteria generally

comprised the asphalt wearing course, associated with the current asphalt at the surface or the former pavement (i.e. buried asphalt wearing course - asphalt lens).

In addition, DP analysed four samples of asphalt material for coal tar (samples from TP401, TP106A, TP407 and TP411) which was not found to be present in any sample. DP also completed TCLP leachate testing on a sample of the asphalt subbase material from TP413 at 0.15 m that contained elevated total contaminant concentrations. The results indicated that the PAH within the materials tested had low leachability with concentrations of all PAH reported below the PQL in the leachate sample.

In assessing the elevated PAH and TRH concentrations associated with the asphalt materials observed within the access track, DP concluded that the concentrations did not pose a significant risk to receptors due to the following:

- *"Although elevated B(a)P was found, it can be attributed to the asphalt/bitumen wearing course (at the surface and buried) associated with current/former pavements/paths within the site;*
- *The asphalt/bitumen materials typically have a low bioavailability and are relatively immobile as evidenced by leachability testing (ie indicating a low propensity to leach);*
- *Results of testing and observations (visual and olfactory) within the asphalt materials indicated the absence of coal tar and phenols;*
- *The source of elevated PAH are likely to be due to asphalt/bitumen and charcoal/coal based on the Chromatographs;*
- *According to NEPM (2013), elevated levels of B(a)P in relatively immobile sources, such as bitumen fragments, do not represent a significant risk;*
- *The materials in question are associated with pavement materials within the site. The pavement materials generally conform with the NSW EPA Recovered Aggregate resource recovery order and as such are generally suitable for "application to land as a road making material, or in building, landscaping or construction works".*"

8.2.4 Analytical Results for Stockpiles

During the Supplementary DSI, DP completed sampling of 10 stockpiles of material to confirm suitability for the proposed land use. Analytical results for the stockpiles are summarised in Table 8.2. Stockpile locations are shown on Attachment 4.

Table 8.3: Evaluation of Soil Analytical Results for Stockpiles – Summary Table (mg/kg)

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
AF/FA in soil	10	0	<PQL	0 above HSL 0.001%	-
Asbestos trace analysis	10	0	<PQL	-	-
F1 (TRH C_6–C_{10} minus BTEX)	10	0	<25	0 above HSL A&B 0-1 m, sand 45 mg/kg	0 above ESL (urban residential) 180 mg/kg
F2 (TRH >C_{10}–C_{16} minus naphthalene)	10	1	69	0 above HSL A&B 0-1 m, sand 110 mg/kg	0 above ESL (urban residential) 120 mg/kg
F3 (TRH >C_{16}-C_{34})	10	5	260	0 above ML (urban residential) 2500 mg/kg	0 above ESL (urban residential (coarse) 300 mg/kg
F4 (TRH >C_{34}-C_{40})	10	4	230	0 above ML (urban residential) 10,000 mg/kg	0 above ESL (urban residential (coarse) 2,800 mg/kg
Naphthalene	10	0	<PQL	0 above HSL A&B 0-1 m, sand 3 mg/kg	0 above EIL (urban residential) 170 mg/kg

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
BaP	10	6	0.3	-	0 above CCME SQG (residential) 20 mg/kg
BaP TEQ	10	6	0.9	0 above HIL A 3 mg/kg	-
Total PAHs	10	6	4.1	0 above HIL A 300 mg/kg	-
Arsenic	10	7	22	0 above HIL A 100 mg/kg	0 above EIL (urban residential) 100 mg/kg
Cadmium	10	0	<0.4	0 above HIL A 20 mg/kg	-
Chromium (total)	10	10	38	-	0 above most conservative ACL (urban residential) for Cr (III) 190 mg/kg
Copper	10	10	57	0 above HIL A 6000 mg/kg	0 above most conservative ACL (urban residential) 60 mg/kg
Lead	10	10	16	0 above HIL A 300 mg/kg	0 above generic ACL (urban residential) 1100 mg/kg
Mercury	10	0	<PQL	0 above HIL A 40 mg/kg	-
Nickel	10	10	**40**	0 above HIL A 400 mg/kg	**2 above most conservative ACL (urban residential) 30 mg/kg**
Zinc	10	10	**290**	0 above HIL A 7400 mg/kg	**7 above most conservative ACL (urban residential) 70 mg/kg**
PCB	10	0	<0.1	0 above HIL A 1 mg/kg	-
OCP	10	0	<PQL	0 above HIL A for dieldrin (6 mg/kg)	0 above EIL for DDT (180 mg/kg)

n number of samples
- No criteria available/used
NL Non-limiting
<PQL Less than the practical quantitation limit

In assessing the results, the Auditor makes the following observations:

- Concentrations of contaminants of concern were below the adopted human health and ecological criteria with the exception of concentrations of zinc and nickel in some samples at concentrations above ecological criteria. DP noted that abundant vegetation growth was observed on several stockpiles and, given the small volume of material, did not consider the exceedances to impact on the suitability of the material for the proposed land use.
- DP noted that "*building materials such as fibro, brick, concrete, tile, ceramics, etc were not observed within the stockpiled materials. The results of 500 mL asbestos testing within the stockpiled soils indicated the absence of ACM within the samples tested*."

8.2.5 Overall Assessment of Analytical Results

During the Supplementary DSI, DP completed a review of all soil analytical data and concluded that the site was suitable for the proposed school development, subject to appropriate demolition of existing structures and clearance of HBM including minor surface ACM identified adjacent to Buildings 5 and 8.

DP concluded that the asphalt materials in the access road did not pose a significant risk to future site users but noted in the Supplementary DSI that the materials could be placed beneath the proposed carpark area for pavement construction as a precautionary measure. DP also recommended that the pavement materials containing asphalt/bitumen are not reused on-site at the site surface due to aesthetic considerations and to limit dermal contact.

8.3 Auditor's Opinion

In the Auditor's opinion, the soil analytical results are consistent with the site history and field observations. The results indicate that there is no widespread contamination at the site and that the general fill materials, natural soils, and stockpiled materials are suitable for the proposed future site use.

Asphalt materials that have been used to construct the access track contain elevated concentrations of PAH and TRH. However, the contaminants are associated with the asphalt/bitumen road construction materials and are considered to pose a low risk to human and ecological receptors.

Assessment for pesticides and lead from lead paint has been completed around the existing buildings and indicates that there is a low potential for these contaminants to be present in surface soils from maintenance practices or weathering of building materials.

ACM is still present at the site surface around some existing buildings (vicinity of building 5 and 8). The buildings currently remain on the site but are to be demolished during development. As noted in Section 2.4, several buildings contain HBM including asbestos. Confirmation of removal of all HBM and further assessment of soil conditions in the footprint of the buildings is required following demolition. The requirements for validation of surface soils following building demolition have been documented in a RAP discussed in Section 11 of this Interim Audit Advice. The Auditor is satisfied that no further investigations are needed prior to development works commencing.

9. EVALUATION OF GROUNDWATER RESULTS

9.1 Field Results

DP reported in the DSI that no observations of contamination were observed within groundwater during drilling or during purging and sampling of groundwater wells. Wells were gauged with an interface probe and no separate phase product was encountered.

9.2 Analytical Results

Groundwater samples were collected from the two wells BH201 and BH202 (Attachment 1) in July 2019 and analysed for TRH, BTEX, PAH and lead to assess for potential migration of contamination onto the site from upgradient sources. Contaminants of concern were reported below the laboratory PQL in both primary samples and the field duplicate sample.

9.3 Auditor's Opinion

The assessment of groundwater at the site has been limited with only two wells installed on the upgradient site boundary. The sampling of these wells was sufficient to confirm that a contaminant plume is not migrating onto site from off-site sources to the southeast. The low coverage of wells at the site is not considered to be a significant data gap given the low potential for soil contamination identified at site and low leachability of contaminants encountered in asphalt material (refer to Section 8). The Auditor is satisfied that further assessment of groundwater is not required at the site.

Groundwater has not been assessed for any beneficial re-use. Any future use of groundwater would require appropriate assessment and regulatory approvals from the NSW Office of Water.

10. EVALUATION OF CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a representation of the contaminant source, pathway and receptor linkages at a site. JKE and DP developed a CSM to inform the sampling, analysis and quality plan developed for the site assessments.

DP refined the CSM based on information obtained through the investigations and, following the Supplementary DSI, used it to determine remediation and site management requirements for development of the RAP.

Based on the results of the investigations, DP developed the CSM summarised below.

- *Source:* Bonded ACM from demolition of former structures or maintenance of buildings/structures
- *Pathway:* Inhalation of dust, ingestion *(Auditor note: inhalation is the only pathway for asbestos).*
- *Receptors:* Site workers, maintenance workers, consultants, trespassers
- *Actual Risk:* DP identified a low to moderate risk based on the results of previous investigations.

DP recommended post-demolition surface inspections over building footprints and the immediate surrounds to confirm site conditions following demolition activities and indicated that a report should be prepared presenting the results of post-demolition inspections, sampling and testing for clearance to address the minor ACM impacts identified.

10.1 Auditor's Opinion

Although not meeting the requirements of a full CSM, the Auditor is of the opinion that the CSM in the Supplementary DSI was a reasonable representation of the contamination at the site that requires further assessment/remediation, as discussed in Section 11 of this Interim Audit Advice.

It is noted that the asphalt materials in the access road, while chemically suitable to remain on site, were considered by DP to be aesthetically unsuitable and it was recommended that they be retained beneath the proposed carpark.

11. EVALUATION OF PROPOSED REMEDIATION

11.1 Remediation Required

Based on the investigations previously completed by JKE and DP, ACM at the site surface adjacent to existing buildings requires remediation. In addition, post-demolition surface inspections of building footprints and the immediate surrounding area is required following demolition activities to confirm site conditions. The methodology for validation beneath building footprints and other structures (concrete tanks) if removes, is described in the SAQP prepared for the Supplementary DSI but details are also included in the RAP.

DP also recommended that asphalt materials containing elevated concentrations of PAH be placed beneath the proposed carpark area as a precautionary measure and for aesthetic reasons. They note in the RAP that: "*It is noted that placement of the materials within the carpark area does not constitute remediation nor attract long term management requirements.*"

The areas and contaminants of concern that require remediation have been summarised in Table 11.1.

Table 11.1: Remediation Required and Preferred Options

Description	Extent of Remediation/Validation Required	Preferred Options
Surface ACM fragments	Lateral: Eastern portion of site around buildings. Vertical: Surface clearance and validation	Hand pick and off-site disposal

Description	Extent of Remediation/Validation Required	Preferred Options
Asphalt Material	Lateral: Extent of area shown on Attachment 5 as "estimated area of PAH impact" but may increase due to lateral chase out. Vertical: Up to approximately 0.4 mbgl	Placement under carpark area (Attachment 5)
Building footprints and surrounding areas and beneath concrete structures (if removed)	Lateral: Extent of building or structure footprint and immediate surrounds Vertical: Surface validation	Validation through visual inspection for ACM and hand picking and off-site disposal. Analysis of soil samples for TRH, BTEX, PAH, phenols, metals, OCP, OPP, PCB and asbestos (AF/FA).

11.2 Evaluation of RAP

The Auditor has assessed the RAP by comparison with the checklist included in NSW EPA (2020) *Contaminated Land Guidelines: Consultants Reporting on Contaminated Land*. The RAP was found to address the required information, as detailed in Table 11.2 below.

Table 11.2: Evaluation of Remedial Action Plan

Remedial Action Plan	Auditor Comments
Remedial Goal It is stated in the RAP that "*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.*"	In the Auditor's opinion, this goal is considered appropriate.
Discussion of the Extent of Remediation Required Remediation required for each area was discussed within the RAP (see Table 11.1 above)	Acceptable
Remedial Options Remedial options were assessed and included no action, on-site management, on-site treatment and off-site disposal of ACM.	The Auditor considers that an appropriate range of options were considered.
Selected Preferred Option and Rationale Preferred option was discussed within the RAP (see Table 11.1 above). Off-site disposal of ACM was preferred based on the small volume of ACM encountered and to avoid requirement for long-term management of contamination.	The Auditor considers the preferred option to be appropriate.
Description of Remediation to be Undertaken ACM Impacted Areas: – DP to identify and peg locations identified to contain asbestos fragments – Contractor to hand pick ACM and rake areas associated with potential ACM impacts – Hand picking 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	The proposed remediation activities are appropriate.

Remedial Action Plan	Auditor Comments
– 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. of the RAP. Asphalt Impacted Materials: – Preparation of carpark area for receipt of asphalt-impacted materials (i.e. 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 (i.e. beneath the carpark pavement).	
Proposed Validation Criteria Remediation acceptance criteria (RAC) are provided for contaminants of concern from NEPM (2013) for protection of human health and ecological receptors. Aesthetic criteria are also included. Imported material must either be virgin excavated natural material (VENM), excavated natural material (ENM) or be classified under a Resource Recovery Exemption (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.	RAC are consistent with the environmental quality criteria discussed in Section 7 and are acceptable
Proposed Validation Testing ACM Impacted Areas: Surface to be visually inspected by DP 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 from the surface following hand picking / removal of ACM fragments and where stripping of near surface soils is required on a systematic grid (with a minimum density of 10 m by 10 m) over the stripped surface, with a minimum of two 500 mL samples per stripped area. A higher frequency of testing may be adopted by DP, subject to the abundance of bonded ACM observed. Where excavations are terminated in fill materials or in non-cohesive natural soils, validation will include field screening of 10 L soil samples as per NEPM (2013). Stockpiles of ACM impacted soils to be classified for off-site disposal are to be sampled at a density of 1 per 25 m^3 for contaminants of concern. Validation samples are to be collected beneath former contaminated soil stockpile areas following soil removal. Asphalt Impacted Areas: The stripped surface to be inspected by DP to confirm the visual absence of potentially impacted materials / soils and 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. If temporary stockpiles containing asphalt-impacted materials are utilised over the ground surface, validation samples will be collected from the surface following removal of impacted soils. Samples to be analysed for PAH. Building Footprints and Surrounds: Analysis of selected soil samples for TRH, BTEX, PAH, Phenols, metals, OCP, OPP, PCB, asbestos (500 mL) and sieving of 10 L soil samples where there is evidence of potential contamination (i.e. staining, odours, anthropogenic	In the Auditor's opinion, the validation testing proposed is appropriate. The Auditor notes that imported material must either be VENM, ENM or be classified under a RRE. The density of testing would need to be commensurate with the documentation provided and the consistency of the results. Specific validation activities to verify placement of asphalt material beneath the carpark area are not detailed and are not critical for site validation, however, for completeness, the Auditor expects evidence of this will be provided.

Remedial Action Plan	Auditor Comments
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 on a 10 x 10 m grid. Imported Material: Any materials which are imported onto the site (e.g. to backfill excavations) are to 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. Materials imported to site in accordance with a relevant RRO should be assessed under the relevant order prior to importation. Imported material to be inspected upon importation to confirm consistency with documentation and to also confirm the absence of visual evidence of contamination. Detailed assessment (including analysis of representative samples) will be undertaken prior to use on-site if documentation is not sufficient to confirm suitability.	
Contingency Plan if Selected Remedial Strategy Fails If validation results exceed the RAC, further removal (additional scraping/excavation) is proposed followed by additional validation sampling and analysis, until the RAC are met. Should the volume of excavated asphalt material exceed that anticipated, it is noted that the base excavation level within the carpark could be increased or, alternatively, if materials cannot be accommodated beneath the carpark, the materials will be classified for appropriate off-site disposal to a licenced landfill.	In the Auditor's opinion, the contingencies provided are appropriate. The remedial strategy has a low risk of failure, as validation failure would lead to further excavation and off-site disposal.
Interim Site Management Plan (before remediation) The former nursery portion of the site where the surface ACM is located is currently fenced and is not accessible to the public and no interim management is required.	Acceptable.
Site Management Plan (operation phase) including stormwater, soil, noise, dust, odour and OH&S The RAP outlines work health and safety and environmental management requirements, including asbestos management, stockpile management, dust and odour control and noise control.	Acceptable. It is noted that the asbestos removal works are to be completed by an appropriately licensed contractor for removal of bonded (non friable) ACM.
Remediation Schedule and Hours of Operation Indicative project duration was not provided. Working hours are to be limited to those specified by Council.	It is anticipated that the demolition, remediation and installation of the carpark will be completed prior to any above ground construction and that validation will be provided following completion of remediation and placement of the material below the carpark.
Contingency Plans to Respond to Site Incidents An emergency response plan is to be developed for the remediation works. Contingency procedures are provided for unexpected finds.	The Auditor notes that the RAP provides management and contingency plans that are directly applicable for the proposed works. The procedure for handling unexpected finds, which includes stopping work and identification of materials is appropriate and practical and can be implemented within the proposed remediation strategy.

Remedial Action Plan	Auditor Comments
Licence and Approvals The RAP does not provide details of the regulatory requirements and approvals (e.g. SEPP55). The RAP does require asbestos removal works to be completed by an appropriately licensed contractor for removal of bonded (non-friable) ACM. Notification of asbestos-related works to SafeWork NSW is to be undertaken by the remediation contractor. Any off-site disposal of waste is to be disposed to an appropriately licensed landfill and the material tracked from the site to the landfill.	The RAP does not specify what category the remediation is under SEPP 55. It is understood that a State Significant Development (SSD) application is being submitted for the development, including remediation. The works would be category 2 works under SEPP 55, works that do not require Council consent but require notification to Council 30 days prior to commencing remediation.
Contacts/Community Relations Contacts not provided but responsibilities for tasks are outlined. The remediation contractor is responsible for display of contact details during remediation works. Community consultation is not addressed in the RAP.	Consultation requirements will be addressed by development application and approval process.
Long Term Environmental Management Plan No long-term management is proposed.	The remediation will not require implementation of a long-term EMP.
Waste Management Waste classification requirements are outlined in the RAP as well as the requirement for waste tracking and disposal to a licensed facility.	Acceptable.

11.3 Auditor's Opinion

In the Auditors' opinion, the proposed remediation works are appropriate. If adequately implemented, the RAP should be able to ensure that the site is suitable for the proposed school use through the removal of ACM and validation of soils beneath building footprints. Successful validation will be required to confirm this.

12. CONCLUSIONS AND RECOMMENDATIONS

Based on the information presented in the JKE and DP reports and observations made on site, the Auditor considers that the site has been assessed in general accordance with NSW EPA guidelines. The RAP has been prepared in general accordance with SEPP 55 requirements and NSW EPA guidelines. Remediation is proposed by removal of ACM and validation of soils beneath building footprints. Asphalt materials containing elevated concentrations of PAH are proposed to be placed beneath the proposed carpark area as a precautionary measure and for aesthetic reasons.

The Auditor considers that the RAP is adequate to ensure the site can be made suitable for the proposed school use if competently implemented, subject to preparation of a Site Audit Statement certifying suitability for the proposed use, at the completion of remediation and validation.

The Auditor considers that the required remediation works can be undertaken in conjunction with the development of the site, however, the remediation should be completed prior to bulk earth works.

13. LIMITATIONS

This interim audit advice was conducted on the behalf of PBCS for the purpose of assessing the suitability and appropriateness of a remedial action plan. This summary report may not be suitable for other uses.

The Auditor has relied on the documents referenced in Section 1 in preparing the Auditors' opinion. The consultants included limitations in their reports. This interim audit advice must also be subject to those limitations. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which the Auditor had some control or is reasonably able to check. If the Auditor is unable to rely on any of those documents, the conclusions of this interim audit advice could change.

It is not possible to present all data which could be of interest to all readers of this interim audit advice. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

* * *

Consistent with the NSW EPA requirement for staged 'signoff' of sites that are the subject of progressive assessment, remediation and validation, I advise that:

- This advice letter does not constitute a Site Audit Report or Site Audit Statement.
- At the completion of the remediation and validation I will provide a Site Audit Statement and supporting documentation.
- This interim advice will be documented in the Site Audit Report.

Yours sincerely
Ramboll Australia Pty Ltd

Rowena Salmon
EPA Accredited Site Auditor 1002

Attachments: 1 Site Layout and Sample Location Plan

2 Building Locations and Identifiers

3a Development Concept Master Plan

3b Development Concept Master Plan – Stage 1

4 Stockpile and Building Validation Sample Location Plan

5 Extent of Removal of Asphalt Material and Proposed Carpark Location

0 10 20 30 40 50 m

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)

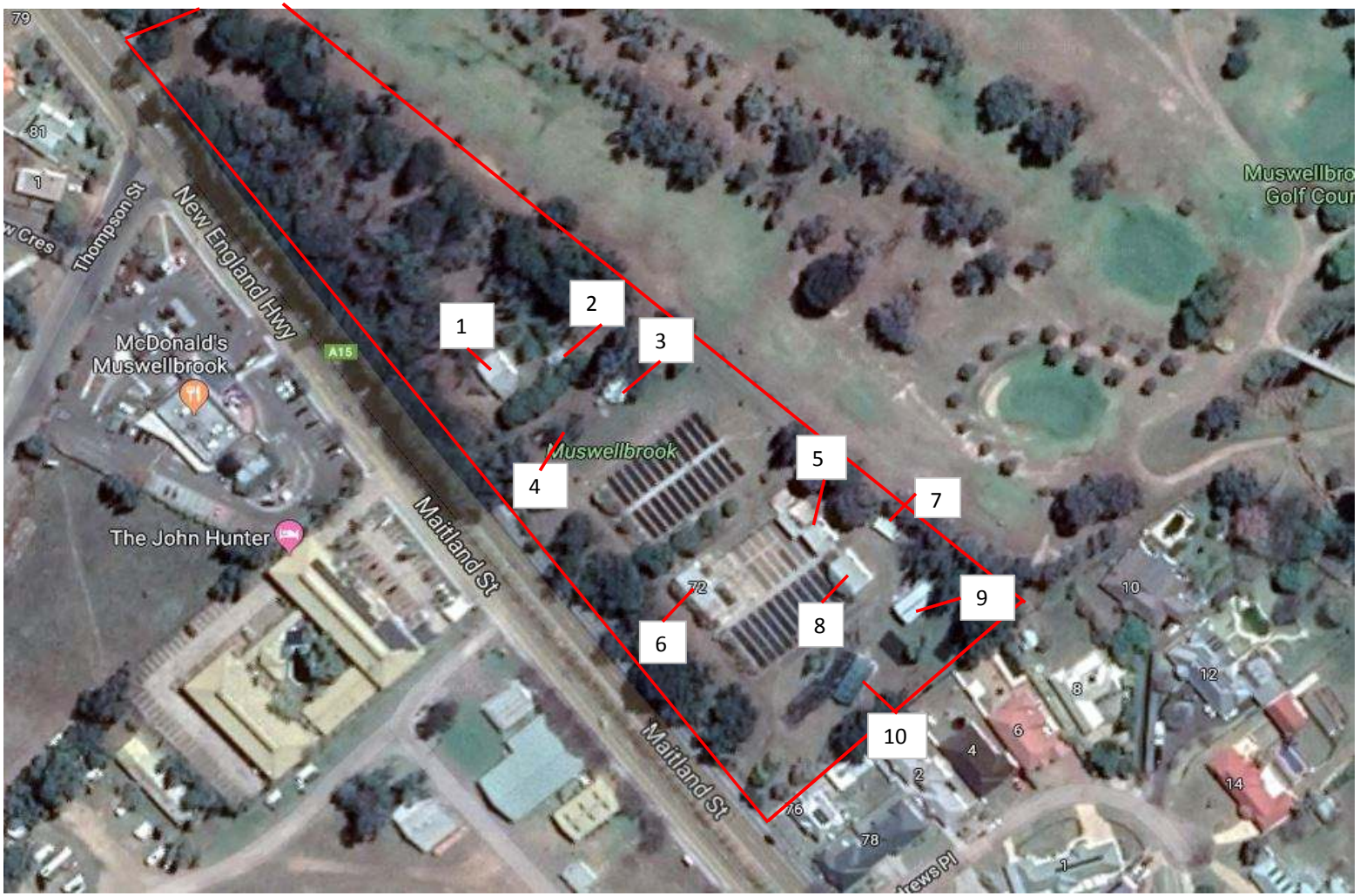
Douglas Partners
Geotechnics / Environment / Groundwater

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

N

PROJECT No:	91601.03
DRAWING No:	1
REVISION:	0



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Pacific Brook Christian School	**Site Locations**	PROJECT No: 91601.01
	OFFICE: Sydney	**Lot 62 Maitland Street**	DWG No: 1
	DATE: 28 Jun 2019	**Muswellbrook NSW**	REVISION: 0

Attachment 3a: Development Concept Master Plan

NBRSARCHITECTURE.

BUILDING LEGEND

- MIDDLE SCHOOL ZONE
- ADMIN / LIBRARY
- JUNIOR SCHOOL ZONE
- SENIOR SCHOOL ZONE
- HOPE SCHOOL ZONE
- SPORTS ZONE
- MAINTENANCE
- LIFT

PLANTING & PAVING LEGEND

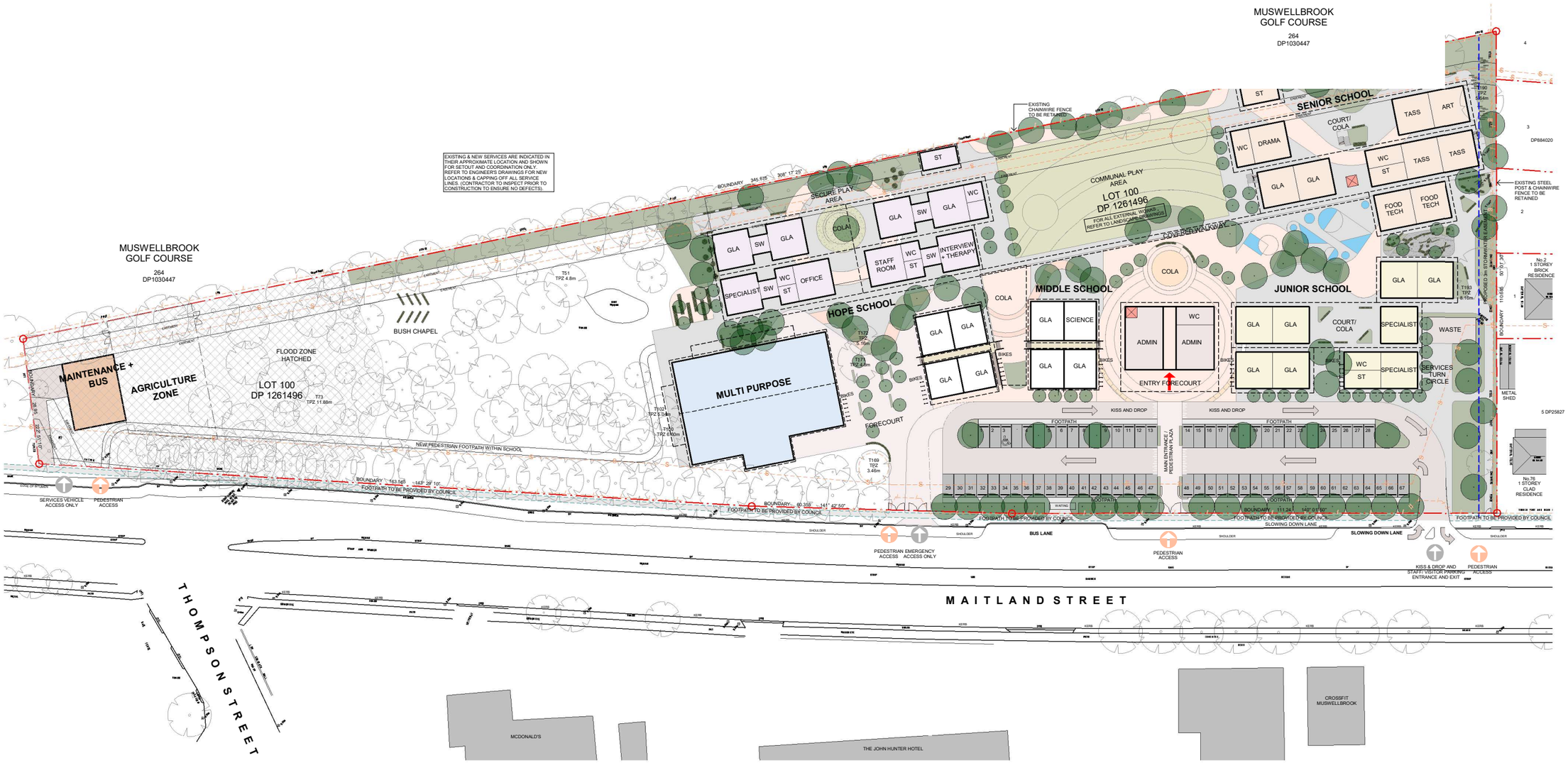
- PLANTING ZONE
- SYNTHETIC TURF
- ASPHALT SURFACE
- CONCRETE SURFACE
- DECORATIVE PAVING
- PARKING ZONE

LEGEND

- BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING STORMWATER
- EXISTING TEL COMMS
- EXISTING TREES TO BE RETAINED
- EXISTING TREE PROTECTION ZONE (TPZ) (refer to arborist report)
- EXISTING TREES TO BE REMOVED (refer to arborist report)
- PROPOSED TREES (refer to landscape drawings)
- PEDESTRIAN ACCESS
- VEHICLE ENTRY/EXIT
- PROPOSED LOCATION FOR STORMWATER EASEMENT
- PROPOSED LOCATION FOR PEDESTRIAN FOOTPATH ON COUNCIL LAND
- PROPOSED LOCATION FOR PEDESTRIAN FOOTPATH WITHIN SCHOOL

ABBREVIATION

WC	TOILET BLOCK
ST	STORE
SW	SHARED WITHDRAWAL
GLA	GENERAL LEARNING AREA
COLA	COVERED OUTDOAR LEARNING AREA



Planner
DFP Planning Pty Ltd
Natasha Bartley
11 Dartford Road, Thornleigh NSW 2120
P: 02 9980 6933
E: nbartley@dfpplanning.com.au

Ecological Consultant
Abel Ecology
Dr Danny Wotherspoon
Unit 2, 10-11 Ferguson Road, Springwood NSW 2777
P: 02 4751 9487
E: info@abelecology.com.au

Traffic Engineer
PTC Consultants
Kasia Balsam
Suite 502, 1 James Place, North Sydney NSW 2060
P: 02 8920 0800
E: kasia.balsam@ptcconsultants.co

Geotech Engineer
Douglas Partners
Chris Bozinovski
15 Callistemon Close, Warabrook NSW 2304
P: 02 4960 9600
E: Chris.Bozinovski@douglaspartners.com.au

Structural and Civil Engineer
Birzulis
Michael Grogan
583 Darling Street, Rozelle NSW 2039
P: 02 9555 7230
E: mgrogan@birzulisassociates.com

Services Engineers
ACOR Consultants
Warwick Meadows
Suite 2, Level 1, 33 Herbert Street, St Leonards NSW 2065
P: 02 9438 5098
E: Wmeadows@acor.com.au

Issue

No.	Date	Description	Chkd
4	28.04.2021	Issued for BGA	NBRS
5	12.05.2021	Issued for Consultant Coordination	NBRS
6	16.06.2021	Issued for Consultant Coordination	NBRS
7	30.06.2021	SSDA	NBRS
8	09.07.2021	ISSUED FOR REVIEW	NBRS
9	22.02.2021	Issued for Consultant Coordination	NBRS
10	25.08.2021	Issue for Information	NBRS
11	30.08.2021	Issue for Coordination	NBRS

Architect
NBRSARCHITECTURE.
Sydney
61 2 9922 2344 nbrsarchitecture.com

Nominated Architect:
Andrew Duffin NSW 5602 © 2019
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
Ground Floor Concept Masterplan

PRELIMINARY

Date 31/08/2021 3:01:49 PM
Scale 1:500 @ A1

Drawing Reference 19055-NBRS-DR-A-SSDA-1000
Revision 11

0 5m 10m 15m 20m 25m 30m 35m 40m 1:500

Attachment 3b: Development Concept Master Plan Stage 1

NBRSARCHITECTURE.

LEGEND (STAGE 1)

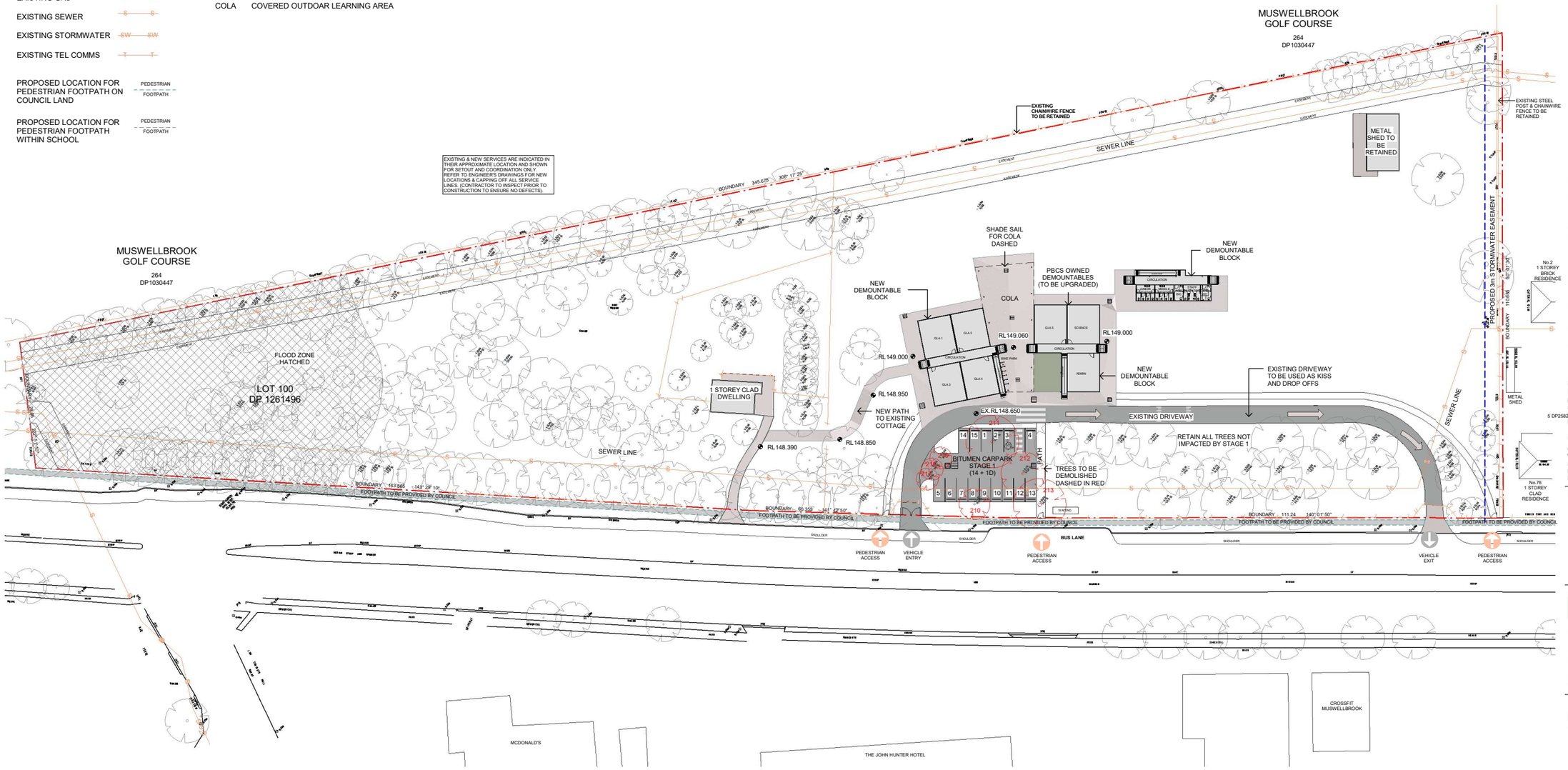
- EXISTING TREES TO BE RETAINED
- EXISTING TREES TO BE REMOVED (refer to arborist report)
- PEDESTRIAN ACCESS
- VEHICLE ENTRY/EXIT
- BOUNDARY
- EXISTING FENCE
- EXISTING ELECTRIC
- EXISTING GAS
- EXISTING SEWER
- EXISTING STORMWATER
- EXISTING TEL COMMS
- PROPOSED LOCATION FOR PEDESTRIAN FOOTPATH ON COUNCIL LAND (PEDESTRIAN FOOTPATH)
- PROPOSED LOCATION FOR PEDESTRIAN FOOTPATH WITHIN SCHOOL (PEDESTRIAN FOOTPATH)

PLANTING & PAVING LEGEND

- SYNTHETIC TURF
- CONCRETE SURFACE
- PARKING ZONE
- DRIVEWAY ZONE

ABBREVIATION

WC	TOILET BLOCK
ST	STORE
SW	SHARED WITHDRAWAL
GLA	GENERAL LEARNING AREA
COLA	COVERED OUTDOOR LEARNING AREA



1 STAGE 1 - SITE PLAN
1 : 500

Planner
DFP Planning Pty Ltd
Natasha Bartley
11 Dartford Road, Thornleigh NSW 2120
P: 02 9980 6933
E: nbartley@dfpplanning.com.au

Ecological Consultant
Abel Ecology
Dr Danny Wotherspoon
Unit 2, 10-11 Ferguson Road, Springwood NSW 2777
P: 02 4751 9487
E: info@abelecology.com.au

Traffic Engineer
PTC Consultants
Kasia Balsam
Suite 502, 1 James Place, North Sydney NSW 2060
P: 02 8920 0800
E: kasia.balsam@ptcconsultants.co

Geotech Engineer
Douglas Partners
Chris Bozinovski
15 Callistemon Close, Warabrook NSW 2304
P: 02 4960 9600
E: Chris.Bozinovski@douglaspartners.com.au

Structural and Civil Engineer
Birzulis
Michael Grogan
583 Darling Street, Rozelle NSW 2039
P: 02 9555 7230
E: mgrogan@birzulisassociates.com

Services Engineers
ACOR Consultants
Warwick Meadows
Suite 2, Level 1, 33 Herbert Street, St Leonards NSW 2065
P: 02 9438 5098
E: Wmeadows@acor.com.au

Issue

No.	Date	Description	Chkd
6	23.04.2021	Revised Stage 1 amenities	NBRS
7	28.04.2021	Issued for BGA	NBRS
8	29.04.2021	Issued for BGA	NBRS
9	12.05.2021	Issued for Consultant Coordination	NBRS
10	16.06.2021	Issued for Consultant Coordination	NBRS
11	30.06.2021	SSDA	NBRS
12	09.07.2021	ISSUED FOR REVIEW	NBRS
13	30.08.2021	Issue for Coordination	NBRS

Architect
NBRSARCHITECTURE.
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

PRELIMINARY

Date 31/08/2021 3:02:01 PM
Scale As indicated @ A1

Drawing Reference 19055-NBRS-DR-A-SSDA-2000
Revision 13

0 10 20 30 40 50 60 70 80 90 100

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

Legend

- Estimated Area of PAH Impact (approx only)
- Site Boundary
- Approx ACM Location

0 10 20 30 40 m

Drawing adapted from plan by NBRS Architecture, Ref 19055-NBRS-DR-A-SSDA-2000 Rev 2 dated 17.11.2020, and Nearmap Image dated 21.01.2020.

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Pacific Coast Christian School Ltd	TITLE:	**Revised Remediation Action Plan - ACM & PAH Impacts**
OFFICE:	Newcastle	DRAWN BY:	PLH		**Lot 100 DP 1208238, Maitland Street,**
SCALE:	1:1500 @ A3	DATE:	20.November.2020		**Muswellbrook**

N

PROJECT No:	91601.04
DRAWING No:	3
REVISION:	0