aurecon

Bringing ideas to life

The Forest High School – Allambie Road, Allambie Heights, NSW 2100

Remedial Action Plan

NSW Department of Education

Reference: P520739

Revision: 3

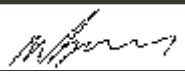
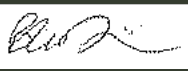
27 October 2022

Document control record

Document prepared by:

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 5, 116 Military Road
Neutral Bay NSW 2089
PO Box 538
Neutral Bay NSW 2089
Australia
T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

Document control						aurecon
Report title		Remedial Action Plan				
Document code		-	**Project number**		P520739	
Client		NSW Department of Education				
Client contact		-	**Client reference**		-	
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
0	22/02/2022	Draft	BD	-	-	BD
1	25/08/2022	Final (incorporating revised school designs from draft)	BD	-	-	BD
2	28/09/2022	Final (incorporating revisions based on site auditor comments)	BD	-	-	BD
3	27/10/2022	Final (incorporating revisions based on town planner comments)	BD	-	-	BD
Current revision		**3**				

Approval			
Author signature		Approver signature	
Name	Blake Dickson & Mai Barnes	Name	Blake Dickson
Title	Senior Environmental Consultant	Title	NSW Manager, Contaminated Land Management (CEnvP-SC40937)

Executive summary

Background

Aurecon Australasia Pty Ltd was commissioned by NSW Department of Education to prepare this Remedial Action Plan (RAP) to be implemented prior to and during construction works for the proposed The Forest High School (TFHS), located at Allambie Road, Allambie Heights NSW 2100. The project includes construction and operation of new government high school with the relocation of TFHS from its current site to a new site on Allambie Road.

The legal descriptors for the site include:

Current Lot and DP as at 27/10/2022:

- Lot 750 DP 1271174
- Lot 751 DP 1271174
- Lot 6 DP 1280781
- Lot 7 DP 1280781

Lot and DP prior to transfer and registration of Title:

- Lot 750 DP 1271174
- Lot 751 DP 1271174
- Lot 13 DP 1112906
- Part Lot 11 DP 1194177

Lot and DP after transfer and registration of Title:

- Lot 4 DP 1280781
- Lot 5 DP 1280781
- Lot 6 DP 1280781
- Lot 7 DP 1280781

The site has had recent (2020 and 2021) contamination investigations undertaken to inform the proposed development of TFHS. Based on these assessments, the site was primarily vacant bushland prior to the 1940s with extractive industries on parts and surrounding the site from the 1940s to 1970s. Construction works and new building structures with associated carparks (presumed part of the existing buildings) occurred since 1956 and underwent different alterations / demolition and landscaping works through the years.

Fill of unknown origin may have been utilised for levelling purposes for the construction of site buildings and backfill of historically observed ground extractive activities onsite and on the surrounding areas.

The recent (2020 and 2021) contamination investigations have identified uncontrolled filling in portions of the site that will require management via remediation prior to and during construction of TFHS. The main contaminant types are those associated with uncontrolled historical filling such as asbestos, heavy metals, polycyclic aromatic hydrocarbons (PAHs) and buried construction and demolition wastes.

Demolition of the existing McLeod House and surrounding structures may cause localised near surface contamination from the removal of known asbestos building fabric and external, poor condition lead paints, immediately around the demolition building footprint and removal of demolition wastes. The demolition work and management of surface soils 10 m around the building footprint will be undertaken as part of a separate planning approval and is therefore, not considered further within this RAP.

In terms of the broad concept design for TFHS and earthworks, the majority of excavation into current

ground levels on the site includes the proposed parking and loading under the suspended games courts and playing field in the south west of the site and buildings A to G where footings for lower ground (LG) levels will be excavated. Additionally, the majority of the site will have stripping and grubbing of topsoil's and unsuitable materials and stockpiling for either beneficial reuse on site or off-site disposal.

This RAP outlines steps, reporting and regulatory requirements, quality assurance and quality control measures required to be employed during materials management and waste classification of fill materials at the site.

TFHS design aspects of the development are in an iterative phase and much of the information is at concept design only. Detailed design drawings for many of the proposed development aspects are not available nor have been considered at that level of detail in preparation of this RAP. The architectural, engineering, civil and landscaping drawings and plans issued to Aurecon relied on for formulate this RAP are attached in appendices.

Remedial strategy

The remedial strategy includes placement of contaminant impacted fill materials within capped and contained layers in the northern portion of the proposed sports field and sports courts in the western portion of the site. The excavated materials will come from contaminant impacted fill within the site. This will allow for excavated materials to be reused as an engineering fill on site, compacted, marker layer of bidim to be installed and capped with clean site won or imported materials. A long-term environmental management plan (EMP) will be prepared to manage operational stages of the development and ensure that the capping layers and playing fields are suitably maintained to exclude access to the capped materials. Any remaining 'cut' materials that are contaminated in nature and cannot be reused or capped on the site, will be transported to a licensed waste facility for disposal.

Conclusions

The strategy presented in this RAP is considered to be the most effective method to:

- Meet NSW EPA endorsed guidelines for contaminated land and DPIE development consent conditions requirements / Secretary's environmental assessment requirements (SEARs)
- Minimise human health and environmental risks to future site occupiers, users and during construction and development activities
- Manage the asbestos impacted fill materials and other contaminants across the site during construction and provide a validation report that outlines the operational phase management requirements to minimise potential for exposure to future site users, workers and incidental visitors
- Render the site suitable for the proposed concept development plans for The Forest High School, higher education land use setting and provision of an updated EMP (post remediation / earthworks and development)

Site investigation data gaps

The following key data gaps exist that require further development and understanding, including site investigation works, prior to construction of the new school infrastructure:

- **Data gap 1:** Contamination site investigation data gaps exist in several areas of the site where steep terrain or dense bushland is present. These include areas in the western portion adjacent to Doe Road and Aquatic Drive as well as treed areas of the site north of the Arranounbi School. Additionally, areas under the building footprint of McLeod House have not been investigated. These areas require contamination site investigation when access is available.
- **Data gap 2:** No leaching tests have been undertaken on soil samples to understand their potential leachability for containment and capping on the site. This does not apply to asbestos, however it does apply to heavy metals and PAH compounds such as benzo(a)pyrene. Further assessment of contaminant leachability potential should be undertaken during any future contamination site investigations.

- **Data gap 3:** Quality of fill materials for the loading and parking zone where known poor quality fill is present and the deepest site excavations will occur. These areas require contamination site investigation when access is available to assess fill quality, landfill gas concentrations and updated CS rating, groundwater levels and quality.
- **Data gap 4:** The potential for landfill gases to emanate from the fill within the western portion of the site and parts of the central portion require additional monitoring to understand the site CS rating. Only limited monitoring has been undertaken to date and was based on previous school designs that have changed and now include a larger volume of uncontrolled fill to be disturbed, along with the suspended car parking adjacent to the known uncontrolled fill materials.
- **Data gap 5:** A review of the final school designs to assess if any confined spaces may be present or subsurface gas migration pathways (if a higher CS rating is identified through additional monitoring) is possible and assessment of any passive or active gas venting designs need to be implemented. This will be dependent on the CS rating which, based on current data for the site is CS2 – low risk.
- **Data gap 6:** Updated RAP for the site after consideration of the data gaps above, more specifically, if landfill gas risks are higher (based on additional monitoring) and require design integration to the buildings or parking and loading zone structure, the RAP will require updates to reflect these design integrations to minimise risks to future site occupiers and users.

These data gaps must be addressed as part of the future development. The RAP provides a series of hold points and summary information on how the data gaps can be addressed.

General Abbreviations

Asbestos specific terms

Asbestos	Asbestos means the asbestiform varieties of mineral silicates belonging to the serpentine or amphibole groups of rock forming minerals including the following: (a) actinolite asbestos (b) grunerite (or amosite) asbestos (brown) (c) anthophyllite asbestos (d) chrysotile asbestos (white) (e) crocidolite asbestos (blue) (f) tremolite asbestos
ACM	Asbestos Containing Material, means any material or thing that, as part of its design, contains asbestos
ACD	Asbestos-contaminated dust or debris means dust or debris that has settled within a workplace and is, or is assumed to be, contaminated with asbestos
Asbestos license	Asbestos removal licence means a Class A asbestos removal licence or a Class B asbestos removal licence
Non-friable asbestos	Means material containing asbestos that is not friable asbestos, including material containing asbestos fibres reinforced with a bonding compound
Friable asbestos	Means material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contains asbestos
Respirable asbestos fibre	means an asbestos fibre that: (a) is less than 3 micrometres wide (b) more than 5 micrometres long (c) has a length to width ratio of more than 3:1

General terms

BGL	Below ground level
BTEX	Benzene, Toluene, Ethyl benzene, Xylenes
BTOC	Below top of casing (well casing)
CoC	Chain of Custody
CoPC	Contaminant of Potential Concern
DP	Deposited Plan
DQO	Data Quality Objective
DQI	Data Quality Indicator
DSI	Detailed Site Investigation
EIL	Ecological Investigation Level (NEPM 2013)
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
GIL	Groundwater Investigation Level (NEPM 2013)
HIL	Health Investigation Level (NEPM 2013)

L	Litre
LOR	Limit of Reporting
mg/kg	milligrams per kilogram (generally equivalent to parts per million)
mg/L	milligrams per litre (generally equivalent to parts per million)
µg/L	micrograms per litre (generally equivalent to parts per billion)
NATA	National Association of Testing Authorities of Australia
ND	not detected (above laboratory PQL)
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013)
OEH	Office of Environment and Heritage
PAH	Polycyclic Aromatic Hydrocarbon
PID	Photoionisation Detector
ppm	parts per million
PQL	Practical Quantitation Limit
QA	Quality Assurance
QC	Quality Control
RAP	Remedial Action Plan
RPD	Relative Percent Difference
SAQP	Sampling Analysis Quality Plan
SEARs	Secretary's environmental assessment requirements
SSD	State significant development
SWL	Standing (or Static) Water Level
TCLP	Toxicity Characteristics Leaching Procedure
TFHS	The Forest High School
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Limit
VOC	Volatile Organic Compounds
WBZ	Water bearing zone (groundwater)

Contents

Tables

Appendices

1 Introduction

1.1 General

Aurecon Australasia Pty Ltd was commissioned by NSW Department of Education to prepare this Remedial Action Plan (RAP) to be implemented prior to and during construction works for the proposed The Forest High School (TFHS), located at Allambie Road, Allambie Heights NSW 2100. Figure 1, **Appendix A** provides an overview of the site and lot and deposited plan information.

The project includes construction and operation of a new government high school with the relocation of The Forest High School from its current site to a new site on Allambie Road. The relocation and construction of The Forest High School, includes the following items:

- Block A in the northern portion of the site, a two storey building comprising administration, staff study and general learning units.
- Block B in the eastern portion of the site, a two storey building comprising general learning units, staff study and school sports unit.
- Block C in the south eastern portion of the site, a two storey building comprising library and general learning units.
- Block D in the southern portion of the site, a two storey building comprising science, general learning units and staff study.
- Block E in the southern portion of the site, a two storey building comprising a food and textiles hub, wood and metal and staff study.
- Block F in the southern and central portion of the site, a two storey building comprising a gymnasium and amenities.
- Block G in the northern portion of the site, a two storey building comprising general learning units, staff study, lecture learning and a canteen.
- Sporting facilities, including new sporting field and games courts
- Car parking, including at-grade and basement parking areas
- Associated earthworks, tree removal, landscaping, stormwater works, service upgrades and supporting infrastructure

Figure 2, **Appendix A** provides an overview of the site and proposed development and key features.

The development will be a State Significant Development (SSD) under Part 4 of the NSW Environmental Planning & Assessment Act 1979.

This RAP has been prepared in general accordance with guidelines made or endorsed by the NSW EPA including the *Guidelines for Consultants Reporting on Contaminated* Land (NSW EPA, 2020) and *Guidelines for the NSW Site Auditor Scheme (3rd edition)* (NSW EPA October 2017).

Review of site investigation and remedial design data gaps as discussed in Section 3.8 of this RAP should be considered for the proposed site development and the further works required to close those gaps.

1.2 Background

The site has had recent (2020 and 2021) contamination investigations undertaken to inform the proposed development of TFHS. Based on these assessments (which are summarised in later sections of this RAP), the site was primarily vacant forestland prior to the 1940s with extractive industries on parts and surrounding the site from the 1940s to 1970s. Construction works and new building structures with associated carparks (presumed part of the existing buildings) were observed since 1956 and underwent different alterations / demolition and landscaping works through the years.

Fill of unknown origin may have been utilised for levelling purposes for the construction of site buildings and backfill of historically observed ground extractive activities onsite and on the surrounding areas. Asbestos may have been present in current and demolished on-site building structures as prior to the time in which asbestos was banned in Australia in 2003. Surrounding land has been primarily commercial, industrial and residential. The history provides a good indication of past activities on the site and the potential contaminants of concern that could have impacted soils.

The recent (2020 and 2021) contamination investigations have identified uncontrolled filling in portions of the site that will require management via remediation prior to and during construction of TFHS. The main contaminant types are those associated with uncontrolled historical filling such as asbestos, heavy metals, polycyclic aromatic hydrocarbons (PAHs) and buried construction and demolition waste. Low level gases such as carbon dioxide and methane may also emanate from the fill materials within the subsurface.

Demolition of the existing McLeod House and surrounding structures may cause localised near surface contamination from the removal of known asbestos building fabric and external lead paints (in poor condition), immediately around the demolition building footprint and removal of demolition wastes. The demolition work and management of surface soils 10 m around the building footprint will be undertaken as part of a separate planning approval and is therefore, not considered further within this RAP, refer to Section 1.2.1 for further details.

In terms of the broad concept design for TFHS and earthworks, the majority of excavation into current ground levels on the site includes the proposed parking and loading under the suspended games courts and playing field in the south west of the site and buildings A to G where footings for lower ground (LG) levels will be excavated.

Additionally, the majority of the site will have stripping and grubbing of topsoil's and unsuitable materials and stockpiling for either beneficial reuse on site or off-site disposal. These materials may include topsoil's, vegetation, trees and tree roots, gutters, hardstand asphalt and concrete paths.

This RAP outlines steps, reporting and regulatory requirements, quality assurance and quality control measures required to be employed during materials management and waste classification of fill materials at the site.

1.2.1 Demolition of McLeod House DA2014/1328

Demolition of McLeod House, surrounding structures and management of surface soils 10 m outside of the building and structure footprints is not part of this RAP and approval for demolition and associated works is part of an approved development application (DA2014/1328) with Northern Beaches Council. Demolition works are to begin in late 2022 or 2023.

1.2.2 TFHS Design progress informing RAP

TFHS design aspects of the development are in an iterative phase and much of the information is at concept design only. Detailed design drawings for many of the proposed development aspects are not available nor have been considered at that level of detail in preparation of this RAP. The key architectural, engineering, civil and landscaping drawings and plans issued to Aurecon relied on for formulate this RAP are attached in appendices.

1.3 Structure of RAP

The structure of the RAP presented herein is developed in accordance with the *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020) and consists of the following key sections:

- Section 1 – Introduction and site background
- Section 2 – Site details and proposed development
- Section 3 – Previous investigations
- Section 4 – Remediation action plan

- Section 5 – Regulatory compliance requirements
- Section 6 – Scope of remediation
- Section 7 – Data quality objectives
- Section 8 – Work health and safety framework
- Section 9 – Environmental management framework
- Section 10 – Contacts during remediation
- Section 11 – Contingency measures
- Section 12 – Conclusions

1.4 Purpose and objectives of RAP

The purpose of the RAP is to provide remedial strategy and methodologies to render the site suitable for the proposed use. Specifically, this RAP is to provide details of the remediation strategy, current data set and conceptual site model (CSM) of contamination, capping and / or exclusion barrier approaches for contaminant impacted soils and site validation approach to render the site suitable for the development of TFHS and future use as a high school.

The remediation strategy aims to manage earthworks and construction risks associated with subsurface fill containing asbestos and other contaminants such as lead, PAHs and benzo(a)pyrene in specific areas of the site based on prior site investigations and sampling data.

The key objectives of the RAP are as follows:

- Provide a remedial strategy to render the site suitable for the proposed use and existing concept designs.
- Document the methodology required to reduce potential risks to construction workers during earthworks for the proposed development and future site users, workers and visitors as a High School.
- Outline the steps required to characterise the fill materials and their reuse onsite or offsite disposal and handling requirements
- Identify the requirements and options for installing and maintaining capping and exclusion layers above and around in-situ asbestos and contaminant impacted fill within the built form / playing field.

The site will require an environmental management plan (EMP) where contaminant impacted fill is to remain within the site under playing fields or sports courts. It will be the responsibility of NSW Department of Education (or the site owner entity) to administer the EMP to ensure that asbestos and contaminant impacted fill remaining at the site is managed appropriately to prevent exposure risks to future site users, workers and incidental visitors.

1.5 Scope of work

This RAP documents the proposed remediation and validation works associated with the site development / earthworks including:

- A site description, a summary of the site history, site conditions and surrounding environment.
- A description of the soil contamination that has been identified at the site and the extent of remediation and earthworks required.
- Discussion on earthworks, concept designs for ovals and courts and preparation of a EMP after construction and development works have been completed.
- Identification of regulatory compliance requirements and classification of the remediation works (as 'Category 2') in accordance with *State Environmental Planning Policy 55 – Remediation of Land* (SEPP 55, 1998). However, as the proposal is being assessed under an SSD application, SEPP55 is not considered to be applicable and the SEARs and conditions of consent will form the regulatory compliance requirements.
- Establishing remediation objectives and criteria for the site.

- Documenting the nominated remediation approaches for asbestos and contaminant impacted uncontrolled fill in portions of the site.
- Identifying suitable soil characterisation, validation and capping / exclusion recording protocols considering the asbestos and contaminant impacted uncontrolled fill remaining on the site post development.

1.6 Limitations

Aurecon performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental profession. No warranties express or implied, are made. It should be noted that some information provided in this report is reliant on information provided by third parties such as NSW Department of Education and various NSW State government departments. Aurecon takes no responsibility for the quality/accuracy of information provided by third parties.

The outcome of this report is limited to information supplied for the activities associated with the scope of works only. It is intended that this assessment provides a description of the identified contaminants, sources, pathways and receptors and recommendations on how to address and manage any issues at the location in question.

Soil and rock formations are often variable, resulting in heterogeneous distribution of contaminants across a site. Contaminant concentrations may be estimated at chosen sample locations, however, conditions between sample sites can only be inferred on a basis of geological and hydrological conditions and the nature and the extent of the contaminants. Boundaries between zones of variable contaminant concentrations are often indistinct, and therefore interpretation is based on available information and the application of professional judgement. Aurecon uses best judgement acquired from working on similar sites and makes recommendations based solely on the results obtained.

We note that this report has been prepared for the use of NSW Department of Education only and is based on information provided by NSW Department of Education. Aurecon takes no responsibility and disclaims all liability whatsoever for any loss or damage that Equinix Australia Pty Ltd may suffer as a result of using or relying on any such information or recommendations contained in this report, except to the extent Aurecon expressly indicates in this report that it has verified the information to its satisfaction. This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein.

Should further information become available regarding the conditions at the site, including previously unknown likely sources of contaminants, migration pathways or receptors, Aurecon reserves the right to review the report in the context of the additional information.

The findings, observations and conclusions expressed by Aurecon are not, and should not be considered as an opinion concerning the commercial feasibility of the property or asset. The report may contain various remarks about and observations on legal documents and arrangements such as contracts, supply arrangements, leases, licences, permits and authorities. A consulting scientist/engineer can make remarks and observations about the technical aspects and implications of those documents and general remarks and observations of a non-legal nature about the context of those documents. However, as consulting scientists/engineers, Aurecon is not qualified, cannot express and should not be taken as in any way expressing any opinion or conclusion about the legal status, validity, enforceability, effect, completeness or effectiveness of those arrangements or documents or whether what is provided for is effectively provided for. They are matters or legal advice.

2 Site details

2.1 Site identification and settings

The site locality is presented in **Figure 1, Appendix A** and the site details are summarised in **Table 1.**

Table 1 Site identification, location and setting

Item	Details
Current owner	NSW Government
Street address	Allambie Road, Allambie Heights, NSW 2100.
Suburb, state, postcode	Allambie Heights, NSW 2100
Legal description and area	Current Lot and DP as at 27/10/2022: ■ Lot 750 DP 1271174 ■ Lot 751 DP 1271174 ■ Lot 6 DP 1280781 ■ Lot 7 DP 1280781 Lot and DP prior to transfer and registration of Title: ■ Lot 750 DP 1271174 ■ Lot 751 DP 1271174 ■ Lot 13 DP 1112906 ■ Part Lot 11 DP 1194177 Lot and DP after transfer and registration of Title: ■ Lot 4 DP 1280781 ■ Lot 5 DP 1280781 ■ Lot 6 DP 1280781 ■ Lot 7 DP 1280781
Council and current zoning	Northern Beaches Council SP1: Special Activities
Site area	The site is approximately 4.2 hectares (approx.).
Road frontages	Allambie Road and Aquatic Drive.
LEP	Warringah Local Environment Plan 2011.
Current land use	The site has been historically used as a state-owned health services facility, with the former buildings and carparks remaining onsite.
Proposed land use	Construction and operation of new government high school. Relocation of The Forest High School from its current site to the site on Allambie Road, Allambie Heights.

Item	Details
Current buildings or structures	The site comprises the existing McLeod House within the north-eastern portion of the site, which is fenced off and appears abandoned and derelict. The building comprises a main structure that is crescent in shape and three attached wings. Evidence of a fourth wing to the north was observed which has since been demolished. Smaller structures around McLeod House included: ■ An access driveway to the east of the building and raised garden beds to the east and south. ■ A small brick enclosure adjoining to the west of the building, comprising a boiler / furnace and fibro chimney ■ A metal building frame to the north west, inferred to be a frame for a former pergola / outdoor covered area. ■ A small swimming pool to the west, surfaced with tiles and observed to be empty. ■ A derelict greenhouse comprising timber / steel and shade cloth construction to the west. ■ An old corrugated iron shed building to the west (outside the fenced off area).
Surrounding land use	■ Allambie Road is located immediately to the north east and Aquatic Drive immediately to the north west followed by commercial properties such as Anytime Fitness, Packforce (assembly and packaging services) and Solarpro (Power systems and batteries), CS Cavity Sliders (manufacturer of cavity sliding door systems). ■ The Cerebral Palsy Alliance: Disability Support & National Disability Insurance Scheme (NDIS) Service Providers building and associated carpark is located immediately south east followed by the Sunnyfield Disability Services building. Arranounbai School is located south west of the site. ■ Allambie Road followed by residential properties are located to the east. ■ Arranounbai School entry driveway is located immediately to the west, followed by vacant land and a few residential structures possible part of a retirement village to the north west. Allambie Heights Bed and Breakfast followed by the Aquatic Reserve Baseball ground and aquatic centre is observed to the south west.
Topography	Topographically, the site slopes slightly from circa 154 m above Australian height datum (m AHD), on the northern portion to circa 152 m AHD on the southern portion of the site.
Hydrology	The nearest surface watercourse to the site is Manly Creek located circa 740 m south west, draining into Manly Reservoir 1.4 km south. An unnamed tributary of Brookvale Creek is located 658 m south east. Brookvale Creek then drains into Manly Creek 3.2 km to the south east of the site.
Acid sulfate soils	Low likelihood / not present
Geology	According to the *Sydney 1:100 000 Geological Series Sheet 9130* (Herbert, 1983) the major portion of the site is underlain by shale and laminate (Rhs) and a very small portion to the south east by Hawkesbury Sandstone (Rh) comprising medium to coarse-grained quartz, sandstone, very minor shale and laminate lenses.
Hydrogeology	The Groundwater in New South Wales, Assessment of Pollution Risk Map (NSW Department of Water Resources, 1987) indicates that the site is likely to be underlain by sandstone and other sedimentary basins with a low to medium potential for groundwater movement and low levels of groundwater salinity (0-1000 mg/L).

2.2 Site inspection

Aurecon carried out a site inspection on 13/10/2021 and 25/10/2021 to determine the current status of the site and undertake landfill gas and groundwater monitoring (as reported in Aurecon 2022). The inspection noted the following:

- The site was largely as described by Tetra tech Coffey 2021 (DSI), therefore only limited further details are provided here.
- Filled ground was observed in the western portion of the site which was vegetated. The central fill mounds in the northern central portion of the site was observed with some brick and tile fragments noted on the ground surface.
- The site inspection on 13/10/2021 was impacted by heavy rainfall thereby only open areas (not bushland or densely vegetated areas were walked over for observation. The later site inspection on 25/11/2021 was clear weather.
- No visual or olfactory indicators of contamination such as staining, malodorous soils or asbestos containing materials (ACM) and construction and demolition wastes were noted to occur on the site surface during the walkover.

2.3 Proposed development and earthworks

A review of the schematic design report (Architectus 2022) indicates that TFHS will comprise:

- Demolition of the existing site structures including McLeod House in the eastern portion of the site *(note that this will take place under a separate planning approval).*
- Stripping and grubbing across proposed developable areas of the site for buildings, paths, roads, playing field and courts.
- Construction of several building structures across the site as discussed in Section 1.1.
- Construction of a concrete suspended slab with synthetic turf playing field within the central portion of the site, with a lower carpark and loading zone situated below the southern portion of the playing field.
- Construction of up to six games courts within the western portion of the site (sealed with asphalt, acrylic or similar material), with a lower carpark situated below the southern portion of the games courts.
- Construction of a sealed parking and loading access road into the lower ground carpark from Doe Road to the west.

The following sets of drawings and information are appended to this RAP (prepared by others) that outline the latest understanding and concept designs for TFHS:

- **Appendix B** – existing site survey and demolition plans indicating indicative topography of the site and structures to be demolished as part of an existing DA for the site, including McLeod's House and adjacent small structures (Architectus 2022).
- **Appendix C** – bulk earthworks plan outlining proposed cut and fill levels across the development. A set of cross sections showing the 150 mm concrete suspended slab for the playing field (item PV9 on drawing).
- **Appendix D** – schematic design outlining site context plans, site elevations and site sections (Architectus 2022).
- **Appendix E** – utilities plans for stormwater drainage (Enstruct 2022). Note that electrical and mechanical drawings were issued to Aurecon, however their detail for concept design did not indicate levels of trenching or utilities alignment within the proposed development.
- **Appendix F** – landscaping plans outlining landscaping general arrangements for the development including hardstand outdoor areas and vegetation and sports playing fields (Oculus 2022).

The RAP has derived concept design level information from the documents listed above and appended to this RAP.

2.3.1 Bulk excavation

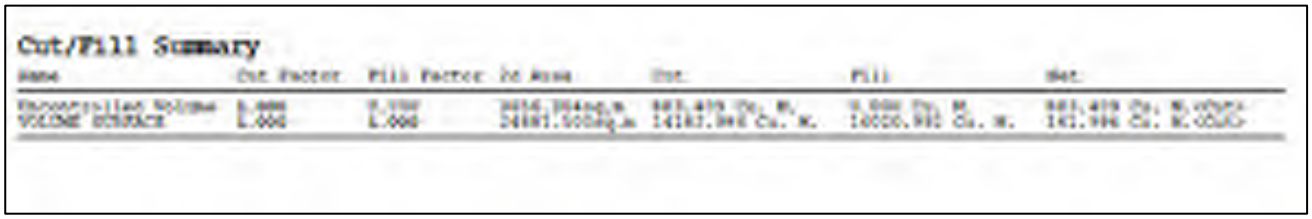
In terms of the broad concept design for TFHS and earthworks, the majority of excavation into current ground levels on the site includes the proposed parking and loading under the suspended games courts and playing field in the south west of the site and buildings A to G where footings for lower ground (LG) levels will be excavated.

Additionally, the majority of the site will have stripping and grubbing of topsoil's and unsuitable materials and stockpiling for either beneficial reuse on site or off-site disposal. These materials may include topsoil's, vegetation, trees and tree roots, gutters, hardstand asphalt and concrete paths. Refer to **Appendix C** for drawing details.

Detailed bulk earthworks methodology, including staging, has been summarised on drawing CV-0200_Option 2-E, **Appendix C**. This methodology outlines the staging, excavation areas, stockpiling on site, uncontrolled fill sieving and removal of wastes and reuse of controlled fill under sports field and courts as well as any asbestos impacted fill under the sports field and courts.

2.4 Cut and fill earthworks balance

Review of the bulk earthworks plan (Enstruct 2022) presented in **Appendix C** indicates the following balance:


Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Uncontrolled Volume	1.000	1.000	3856.384sq.m	883.419 Cu. M.	0.000 Cu. M.	883.419 Cu. M. (Cut)
VOLUME ESTRACT	1.000	1.000	24881.500sq.m	14167.998 Cu. M.	10000.991 Cu. M.	141.996 Cu. M. (Cut)

The cut balance will remove soil materials and stockpile on site during construction. Any asbestos or contaminant impacted fill will be stockpiled separately to clean natural soils excavated to minimise cross contamination and subsequent potential for higher volumes of cut materials needing removal from the site.

There will be two options for asbestos or contaminant impacted fill or as part of construction for all aspects of the site:

- Disposed offsite to a licensed waste facility in accordance with the NSW EPA *Waste Classification Guidelines* (2014) while keeping detailed records of waste classification, volumes, transporters and landfill site (cradle to grave), or
- Reused on site under appropriate conditions such as underneath a capping / exclusion layer within the site.

No asbestos or contaminant impacted fill will be reused on the site at the final surface for capping, garden beds, landscaping, playing fields, courts or within remnant vegetation areas in the western portion of the site.

3 Previous investigations

The following reports were available to Aurecon for review in preparing this RAP. The sections below provide a review summary of key findings relevant to this RAP.

3.1 Preliminary site investigation, GHD, September 2020

A Preliminary Site Investigation (PSI) report was prepared for the site by GHD in 2020, which included a desktop study, site history review and site walkover. The PSI report made the following conclusions:

- The site comprised vacant land with vegetation / forest land cover since at least 1943. Ground extractive activities were observed since 1943 on the north western boundary and since 1951 on the southern boundary of the site, until 1978 when extractive locations appeared to have been backfilled.
- Construction works and new structure buildings with associated carparks presumed part of the Cerebral Palsy Alliance (formerly referred to as the Spastic Centre) were observed since 1956 and underwent various alterations / demolition and landscaping works through the years. Surrounding land has primarily comprised commercial, industrial and residential developments over time.
- A waste management / transfer, treatment and recycling facility was reported approximately 142 m north east of the site, located at 6/15 Rodborough Road, Frenchs Forest, which provides environmental services and waste treatment of precious metal bearing wastes. Topographical information indicates that this facility is located at an elevation of approximately 148m AHD, slightly lower than the Site.
- Based on the desktop contamination review, the PSI identified a number of potential contamination sources onsite, including:
  - Fill material of unknown origin.
  - Hazardous materials potentially contained in onsite structures.
  - Storage and use of chemicals.
  - Potential spillages from oils, fuels solvents.
  - Potential runoff from commercial and industrial properties.
  - Potential migration of ground gases from onsite and offsite sources.

Based on findings presented of the PSI assessment, GHD concluded that potentially complete linkages may exist between on-site contamination and future receptors. Given the high sensitivity of the proposed future use of the site (i.e. a high school), a DSI was recommended to further assess the contamination status of the site, and a Hazardous Materials Survey of onsite structures and buildings, to identify potentially hazardous building products which may have impacted site soils historically, or may be released during demolition.

3.2 Detailed site investigation, Tetra Tech Coffey, June 2021

A detailed site investigation (DSI) was prepared by Tetra Tech Coffey which included a review of existing information and further site investigation, sampling and analysis of soils and groundwater. The DSI report made the following conclusions:

- Subsurface conditions across the site comprised variable thickness of topsoil / fill material in various boreholes, underlain by residual clay / sandy clay and sandstone to the limit of the investigation. Fill material was identified to be generally deeper in the western portion of the site and in test pits adjacent to McLeod House.
- Visual or olfactory contamination was not apparent at the surface during site walkover, however anthropogenic materials were observed in subsurface fill materials broadly across the site, generally

including bricks, tile fragments, clay pipes, scrap steel and PVC. Slight sewage odours also were noted in subsurface soils in borehole BH08 (residual soil >3 m bgl) and test pit TP01 (fill material >1.4 m bgl).

- Asbestos was not observed in subsurface soils across the site, however confirmed Asbestos containing material (ACM) was identified in pipe lagging (ACM01) at the toe of the fill embankment in the western portion of the site, while the Tetra Tech Coffey (2021b) HAZMAT survey also noted fragments of confirmed ACM in localised areas surrounding McLeod House. Additional unexpected finds of ACM may be present at the site in surface and subsurface soils.
- ACM and carcinogenic polycyclic aromatic hydrocarbons (PAH) (BaP TEQ) have been detected locally within the site and have the potential to pose health risks to construction workers during site development, and users of the school following development where such materials remain exposed in surface soil.
- Fill material contains various contaminants of potential concern (COPC) that pose potential risks to landscaping established in this material as part of the development of the site.
- Ground gases were assessed to comprise Characteristic Situation 2 (CS2), which correlates to a low risk. According to the recommendations outlined within the *Hazardous Ground Gas Guidelines* (NSW EPA, 2020), CS2 triggers the need for gas protection measures to be considered or incorporated into the proposed development.
- Based on the above, Coffey concludes that the site can be made suitable for the proposed development as per the requirements of *State Environmental Planning Policy No. 55 – Remediation of Land*. Tetra Tech Coffey recommended the following actions to manage potential issues around subsurface contamination at the site:
  - A Remedial Action Plan (RAP) should be prepared developed for the site which illustrates how the identified risks will be mitigated during site development, and how unexpected finds of contamination will be managed.
  - The assessment of ground gas conditions at the site is based on two separate monitoring events. Given the outcome of this assessment, it is recommended that allowances are made to conduct further monitoring and assessment to determine the need for gas protection measures.
  - Prior to the commencement of earthworks and site redevelopment, an appropriate Construction Environmental Management Plan (CEMP) is prepared by the principal contractor to manage environmental risk posed to construction workers, neighbouring site users and to the surrounding environment.

3.3 Geotechnical investigation report, Tetra Tech Coffey, May 2021a

A geotechnical investigation was undertaken concurrently with the Tetra tech Coffey DSI (2021), to provide geotechnical information on the site for design of the proposed development. The geotechnical investigation identified variable thickness of topsoil, fill and pavement materials, underlain by residual soil (clay, sandy clay, and clayey sand) to depths of up to 11.2 m below ground level (bgl). Underlying bedrock was identified to comprise fine to coarse grained sandstone with some interbedded siltstone.

The report also characterised the area into two distinct areas (Area A – in the eastern portion of the site, and Area B – in the western portion of the site), with extensive filling (up to 4.5 m thick) observed in the western portion of the site (Area B). Groundwater was reported at depths ranging from 3.7 m bgl up to 9 m bgl, with the range in depth of groundwater inflows attributed to topography and variable soil / rock composition and permeability.

The findings of the geotechnical investigation were reported separately (ref: 754-SYDGE284698- AB, dated 31 May 2021) which provides further discussion on ground conditions encountered during the concurrent geotechnical investigation and contamination DSI fieldworks.

3.4 Asbestos and hazardous materials pre demolition report, Tetra Tech Coffey, May 2021b

An Asbestos and Hazardous Materials Pre-Demolition Assessment was undertaken on McLeod House by Tetra Tech Coffey in 2021. The purpose of the asbestos and hazardous materials (hazmat) pre-demolition assessment was to identify and assess the health risk posed by hazmat, including asbestos containing materials (ACM) which may be encountered during future demolition/refurbishment works of the building.

The hazmat survey identified the following:

- Confirmed asbestos-containing materials (ACM) observed in McLeod House, internal and external building materials, including:
  - Bonded ACM fragments and corrugated fibro sheeting throughout subfloor areas and external debris adjacent to ground level Wing 2.
  - Fibre cement sheeting in throughout building perimeter awnings and interior ceiling panels.
  - Bituminous material throughout electrical backing boards.
  - Tiles and vinyl sheeting throughout interior floor coverings.
  - A moulded cement pipe in the External Ground Level Wing 3 Boiler Room
- Assumed ACM dust in the internal ground level throughout ceiling spaces (however these spaces were inaccessible during the survey).
- Lead-containing paint in various internal and external building surfaces.
- Suspected synthetic mineral fibres in insulation material behind wall linings and throughout the building.
- Ozone depleting substances in internal air-conditioning units.
- Suspected polychlorinated biphenyls (PCBs) within light fittings throughout the building.

3.5 Landfill gas and groundwater monitoring report, Aurecon, February 2022

Aurecon undertook landfill gas and groundwater monitoring on 13/10/2021 and 25/10/2021 at TFHS site. The report summarised measurements recorded and made as summarised below:

- Landfill gases were of a similar magnitude of concentrations to the previous Tetra Tech Coffey results from May and June 2021, with the exception of slightly higher methane concentrations at GW02 (deeper well screen) which was not monitored by Tetra Tech Coffey.
- The slightly higher methane concentration reason is unknown, however, GW02a has a screened interval wholly within logged fill materials while the deeper GW02 intersects both fill and weathered rock, whereby the base of the fill also coincides with the measured ground water level. Conceptually, the fill materials on the transition zone of fill/weathered rock and groundwater may produce, contain or transmit slightly more methane than fill materials closer to the ground surface in the vadose zone.
- A site walkover of known filled areas in the western and central portions of the site was undertaken on 25/10/2021. The walkover used a calibrated SEM5000 methane detector that can detect methane concentrations to <1 ppm. Results indicated 0 ppm for all areas assessed.
- The gas screening value (GSV) calculated for the site by Aurecon for October 2021 monitoring rounds was 0.2596 L/hr. This equates to a characteristic situation (CS) value of CS2 which represents a low risk.
- Recommendations and conclusions included:
  - Detectable concentrations of methane and carbon dioxide were recorded in subsurface gas wells onsite, with level 2 LFG risk assessment indicating a low risk of hazardous ground gases being

present onsite. Fill material logged by Tetra Tech Coffey 2021 was generally limited to building and demolition waste. As such, the exposure risk of hazardous ground gases at the site is considered to be low.

- While dissolved methane gas was not analysed in groundwater samples as part of this assessment or the prior work by Tetra Tech Coffey 2021, laboratory analysis reported TRH and VOC concentrations below the limit of reporting (LOR) for all samples collected by Tetra Tech Coffey, indicating a low likelihood for hazardous gases being present in groundwater.
- The CSM for the site provides a weight of evidence approach indicating that ground gases, although present in the subsurface in the western portion of the site, are considered a low risk and ground gas mitigation measures are not considered to be required based on the CS low risk, logged fill material types and proposed concept design in the western portion of the site (no school buildings, only surface playing fields and existing remnant forest).
- Monitoring of groundwater levels, quality and ground gas (wells) must be undertaken during initial earthworks and construction in the western portion of the site (west of the proposed car park/playing field) and include BH09 and GW02a and GW02. Monitoring should be as outlined in the RAP and inclusive of field parameters, level and gas readings using a GA5000 or similar.
- If proposed engineering design changes to include any buildings or structures or subsurface installation (that would be accessible for maintenance) in the western portion of the site, an updated assessment of ground gas risk and mitigation must be undertaken.
- Earthworks and remedial works must adhere to the requirements of the project RAP including any unexpected finds, which is inclusive of any elevated ground gas readings greater than those identified in the monitoring data from 2021.

3.6 Summary of site history

Based on the historical summary of GHD 2021, review of aerial photographs indicated the site was primarily vacant forestland prior to the ground extractive activities were observed since 1943 on the north western boundary and since1951 on the southern boundary of the site. Extractive locations appeared to have been backfilled by 1978. Construction works and new building structures with associated carparks presumed part of the existing buildings were observed since 1956 and underwent different alterations / demolition and landscaping works through the years.

Industrial / commercial building structures to the south east of the site were built in 1961 and then demolished for the construction of a carpark in 2014. Fill of unknown origin may have been utilised for levelling purposes for the construction of site buildings and backfill of historically observed ground extractive activities onsite and on the surrounding area. Asbestos may have been present on current and demolished on-site building structures as prior to the time in which asbestos was banned in Australia in 2003. Surrounding land has been primarily commercial, industrial and residential.

The history provides a good indication of past activities on the site and the potential contaminants of concern that could have impacted soils and groundwater.

3.7 Site surface and subsurface characterisation

Previous site investigations are presented in Figure 3, **Appendix A** along with Figure 4 and Figure 5, **Appendix A** outlining uncontrolled fill areas and specific test pits, boreholes and sampling locations containing uncontrolled fill descriptors in their log sheets (Tetra Tech Coffey, 2021).

Currently the site can be characterised as follows based on the historical information and reports listed in this Section and the site inspection undertaken by Aurecon on 13/10/2021 and 25/10/2021 at TFHS site:

- **Ground surface:** The current ground surface has minimal indicators of surface contamination with the exception of sporadic asbestos containing material (ACM) within and around portions of McLeod House and on the fill embankment in the western portion of the site (ACM01 location, Tetra Tech Coffey 2021).

- **Ground surface and existing structures/buildings:** Hazardous building materials are confirmed to exist in McLeod's House with confirmed asbestos-containing materials (ACM) observed, internal and external building materials, lead-containing paint in various internal and external building surfaces, suspected synthetic mineral fibres in insulation material behind wall linings and suspected polychlorinated biphenyls (PCBs) within light fittings throughout the building. Demolition activity to be undertaken prior to site remedial activity may introduce potential for lead paint and ACM to become airborne (even with appropriate levels of site management), around the building footprint of McLeod's House. All demolition and management of surface soils post demolition around the building footprint will be undertaken under a separate planning approval.
- **Subsurface:** Uncontrolled filling in the subsurface is apparent in the western and central portions of the site and adjacent to several areas of McLeod House. Generally including bricks, tile fragments, clay pipes, scrap steel and PVC. Additional unexpected finds of ACM may be present at the site in surface and subsurface soils.
- **Subsurface:** Several elevated soil results for PAHs and benzo(a) pyrene were detected by Tetra Tech Coffey 2021 in their DSI. Several of these area within current hardstand/asphalt areas which could be one source for the PAHs within shallow soils and fill. No leachability data was provided in the DSI therefore, leaching characteristics and risk to human health and the environment is difficult to quantify without further testing and characterisation.
- **Subsurface:** Groundwater appears to not be impacted by contamination that may act as a constraint to the proposed development and land use, based on existing information reviewed.
- **Subsurface:** Landfill gas monitoring over several events in 2021 indicates a site characteristic situation (CS) value of CS2 which represents a low risk. The CSM for the site provides a weight of evidence approach indicating that ground gases, although present in the subsurface in the western portion of the site, are considered a low risk and ground gas mitigation measures are not considered to be required based on the CS low risk.

In terms of the broad concept design for TFHS and earthworks, the majority of excavation into current ground levels on the site includes the proposed parking and loading zone under the suspended courts and sport field and several areas of each buildings (A to G) footings for lower ground (LG) levels.

Additionally, the majority of the site will have stripping and grubbing of topsoil's and unsuitable materials and stockpiling for either beneficial reuse on site or off-site disposal. These materials may include topsoil's, vegetation, trees and tree roots, gutters, hardstand asphalt and concrete paths.

Refer to bulk earthworks 'cut and fill' planning in **Appendix C** that provides a colouration map for the site with development overlays.

3.8 Site investigation data gaps

The following key data gaps exist that require further development and understanding, including site investigation works, prior to construction of the new school infrastructure:

- **Data gap 1:** Contamination site investigation data gaps exist in several areas of the site where steep terrain or dense bushland is present. These include areas in the western portion adjacent to Doe Road and Aquatic Drive as well as treed areas of the site north of the Arranounbi School. Additionally, areas under the building footprint of McLeod House have not been investigated. These areas require contamination site investigation when access is available.
- **Data gap 2:** No leaching tests have been undertaken on soil samples to understand their potential leachability for containment and capping on the site. This does not apply to asbestos, however it does apply to heavy metals and PAH compounds such as benzo(a)pyrene. Further assessment of contaminant leachability potential should be undertaken during any future contamination site investigations.
- **Data gap 3:** Quality of fill materials for the loading and parking zone where known poor quality fill is present and the deepest site excavations will occur. These areas require contamination site investigation when access is available to assess fill quality, landfill gas concentrations and updated CS rating, groundwater levels and quality.
- **Data gap 4:** The potential for landfill gases to emanate from the fill within the western portion of the site and parts of the central portion require additional monitoring to understand the site CS rating. Only limited

monitoring has been undertaken to date and was based on previous school designs that have changed and now include a larger volume of uncontrolled fill to be disturbed, along with the suspended car parking adjacent to the known uncontrolled fill materials.

- **Data gap 5:** A review of the final school designs to assess if any confined spaces may be present or subsurface gas migration pathways (if a higher CS rating is identified through additional monitoring) is possible and assessment of any passive or active gas venting designs need to be implemented. This will be dependent on the CS rating which, based on current data for the site is CS2 – low risk.
- **Data gap 6:** Updated RAP for the site after consideration of the data gaps above, more specifically, if landfill gas risks are higher (based on additional monitoring) and require design integration to the buildings or parking and loading zone structure, the RAP will require updates to reflect these design integrations to minimise risks to future site occupiers and users.

These data gaps must be addressed as part of the future development including validation of the bushland areas and after demolition of McLeod House. Refer to Section 3.10 for a detailed summary of tasks and milestones to close out the data gaps and to make the site suitable for the proposed development.

3.9 Conceptual site model

A conceptual site model (CSM) provides an assessment of each identified potential source, pathway receptor (SPR) linkage occurring and the foreseeable consequence of the exposure of COPCs relative to site specific, subsurface conditions with regard to their potential risk to human health and the environment. The CSM takes into account site-specific factors including:

- Source(s) of contamination.
- Identification of COPCs associated with past (and present) activities undertaken on and off site.
- Vertical, lateral and temporal distribution of COPCs.
- Actual or potential receptors considering both current and future land use for both the site and adjacent properties, and any sensitive ecological receptors.
- The culmination of the CSM is to establish source to pathway to receptor linkages.

The DSI (Tetra Tech Coffey 2021) for the site established the following areas of environmental concern (AECs):

- **AEC 1** – Fill material of unknown origin, CoPC - TRH, PAH, metals and asbestos with a **High likelihood** of soil contamination.
- **AEC 2** – Hazardous materials used in site structures, CoPC - Asbestos, lead and PCB with a **High likelihood** of soil contamination. *(Note that demolition and soil management after demolition of McLeods House is part of an existing planning approval).*
- **AEC 3** – Storage and use of chemicals including pesticides, herbicides and insecticides at the site, CoPC - TRH, BTEX, PAHs, phenols, heavy metals, OCPs and OPPs with a **Low to moderate likelihood** of soil contamination
- **AEC 4** – Oil staining / leaks, fuel leaks from vehicles parked onsite, CoPC - TRH, PAHs and heavy metals with a **moderate likelihood** of soil contamination
- **AEC 5** – Offsite commercial / industrial activities, CoPC - TRH, BTEX, PAHs, phenols, heavy metals and asbestos with a **moderate likelihood** of soil contamination

The following potential receptors were identified with consideration to the proposed site use:

- Construction workers during site development
- Future site users, including
  - Students and staff during ongoing school operation
  - Maintenance workers

- Terrestrial ecological receptors onsite
- Aquatic ecological receptors offsite (including in the Manly Reservoir).

A tier 1 risk assessment identified the following key issues identified during the investigation pose potentially unacceptable risks to human health and environment:

- ACM and carcinogenic PAH (BaP TEQ) has been detected locally within the site and has the potential to pose health risks to construction workers during site development, and users of the school following development where such materials remain exposed in surface soil.
- Fill material contains various CoPC that pose potential risks to landscaping established in this material as part of the development of the site.
- Ground gases were assessed to comprise Characteristic Situation 2 (CS2), which correlates to a low risk.

The CSM identifies the key aspects relating to fill materials containing contaminants above tier 1 screening levels for the proposed development, including ACM. Therefore, remediation to make the site suitable is required in addition to assessing the data gaps present outlined in Section 3.8. Detailed strategies to close the current data gaps, along with contingency measures, have been summarised in Section 3.10.

3.10 Data gap hold points and required tasks

The following hold points and tasks listed in **Table 2** must occur prior to remediation, to ensure that remedial effort is efficient, safe and has a clearer pathway for site development.

Table 2 Summary of data gap hold points that require undertaking prior to remediation

Task ID	Task description	Task **summary**	Hold Point
1	Supplementary DSI	Undertake a supplementary DSI in accordance with the NSW EPA sampling design guidelines, part 1 and part 2 (2022) for the site area. For a site of 4.5 hectares, this equates to a minimum of 52 locations on a systematic grid sampling pattern. The existing DSI (Tetra Tech Coffey 2021) completed 29 locations (refer to **Appendix A** for locations). Therefore, a minimum of 23 additional sampling locations are required to be undertaken. In addition, where there is evidence of localised or known contamination, a higher degree of site investigation should be carried out to fully characterise the materials. An SAQP must be prepared and endorsed by the site auditor prior to undertaking DSI investigations. Where plant and machinery are not able to enter vegetated areas, hand sampling using hand tools must be undertaken. A site walkover in all to be remaining vegetated areas by an experienced contaminated land consultant or occupational hygienist must be undertaken to assess for any potential ACM on the ground surface or within thick vegetation areas. A clearance certificate or report must be provided with findings for ACM within the vegetated areas and any recommendations or limitations for the development.	HP1 – confirmation that the supplementary DSI has been undertaken, reviewed and finalised. Site auditor to review and endorse the SAQP. Site auditor to review and comment on DSI report. Release hold point when site auditor advice indicates DSI is acceptable and covers all site data gaps.

Task ID	Task description	Task **summary**	Hold Point
2	Landfill Gas Monitoring	As a minimum: 1. Install 4 x LFG wells to approx. 3.0-5.0m depth at appropriate locations. Install PVC casing and screen above groundwater. 2. Install 1 hand auger shallow LFG well to maximum 2.0 m depth, in the slope that is inaccessible to plant and machinery. This well is dependent on loose enough soil and no fill inclusions that stop hand augering (such as concrete or bricks in fill). Install PVC LFG well in same way as drilled holes. 3. Undertake at least 2 rounds of LFG monitoring of the wells (including wells previously installed by Tetra Tech Coffey 2021), aiming for low barometric pressure weather. Use a continuous monitoring methodology where appropriate. 4. Log fill quality and natural soils for the 5 x locations noted above. 5. Collection of soils samples within fill and directly under fill within natural from the 5 x locations. Analyse for a suite of laboratory tests similar to the existing site data set, assessing fill quality. 6. Prepare a technical memo with all factual information obtained, GIS maps, bore logs, summary tables and findings of the work including review and updating of the gas characteristic situation for the site and revised school design.	HP2 – Confirmation of CS risk rating for the site based on additional monitoring rounds. Site auditor to review and comment on LFG report. Release hold point when site auditor advice indicates LFG report is acceptable and covers all LFG data gaps.
3	Review detailed designs for development	Review revised bulk excavation plans, landscaping and drawings that indicate final ground design and planning. A review of the final school designs to assess if any confined spaces may be present or subsurface gas migration pathways (if a higher CS rating is identified through additional monitoring) is possible and assessment of any passive or active gas venting designs need to be implemented.	HP3 – Environmental consultant to confirm detailed design has been reviewed and checked. Confirmation via memo or email from environmental consultant that all drawings have been reviewed and considered.
4	Update RAP	Update RAP for the site after consideration of the additional site investigation and monitoring, specifically, if landfill gas risks are higher (based on additional monitoring) and require design integration to the buildings or parking and loading zone structure, the RAP will require updates to reflect these design integrations to minimise risks to future site occupiers and users. Update contamination extents and volumes of soil to be capped and contained based on the final designs.	HP4 – Site auditor to review and comment on RAP report. Release hold point when site auditor advice indicates RAP is acceptable and covers all site data gaps and any changes in design.

4 Remedial strategy

4.1 Remediation goal

The remediation goals are:

- Provide a remedial strategy to render the site suitable for the proposed use.
- Mitigate any potential contamination risks for human health and the environment from the proposed development.
- To manage and remediate the asbestos and contaminant impacted uncontrolled fill that requires excavation as part of development.
- Ensure all final ground surfaces are cleared of potential contamination such as asbestos fragments, fines or other contaminants above guideline levels for the proposed land use (high school).
- Meet regulatory guidelines with regard to management of site contamination in soil, waste classification and offsite disposal or onsite reuse under a capping / exclusion layer.

4.2 Extent of contamination

The extent of contamination on the site comprises those items listed in Section 3.7 and Section 3.9. The main subsurface contamination exists in those areas where uncontrolled filling is present (refer to Figure 3, Figure 4 and Figure 5, **Appendix A**).

Further supplementary DSI work along with work required to close data gaps, as described in Section 3.10 provides further clarity on the extent of contamination and volumes of material to be managed.

4.3 Soil remediation options

Possible soil remediation options were considered against the NSW EPA waste management hierarchy (*Waste Avoidance and Resource Recovery Act 2001*) and in accordance with the remediation objectives.

Due to the known development and earthworks program the following three options were considered for the site:

1. **Do nothing:** No remedial action is taken using this approach. The advantage of this option is that no remedial costs are incurred. The disadvantages of this option are that it is does not render the site suitable for the proposed development. This is an unacceptable approach and is not considered to be an option.
2. **Excavation and offsite disposal:** This process would involve the excavation, removal and offsite disposal of contaminant impacted fill from across the site. The advantages of this option are that it is a proven method for removal of fill soils impacted with asbestos and contamination. It is likely that the site levels can accommodate some excavation without the need to import any suitable backfilling materials. This is an acceptable and preferred approach where considered necessary to fit in with proposed site design elements.
3. **Excavation and reuse within the site boundary with exclusion from exposure:** This process would involve the excavation and reuse within the site boundary. The advantages of this option are that it is a method for keeping contaminant impacted fill materials within the site instead of incurring waste disposal costs and transport handling issues. The need for longer term management via a site-specific environmental management plan (EMP) would be required. This is an acceptable and preferred approach.

4.4 Extent of remediation / capping of excavated contaminant impacted fill

The extent of remediation is the contaminant impacted uncontrolled fill encountered during civil earthworks in areas that are ‘cut’ or extend into the fill layer. The capping and containment is within the proposed sports field and sports court with further detail provided in Section 6.11.

The remediation extent includes ensuring that that minimum cover and exclusion barriers (orange bidim geofabric or geogrid) are placed over uncontrolled fill with contaminant impacted soils as marker layers. The marker layers act as an indicator if further maintenance, incidental excavation or erosion were to occur.

Figure 1, **Appendix A** shows the cadastral boundary of the site along with the land survey in **Appendix B.** Typically, the remediation vertical extent is 0.5 – 4.0 m below ground level based on the known depth of the uncontrolled and contaminant impacted fill, concept design and bulk earthworks plans issued (refer to plans in **Appendix C**).

The management of contaminant impacted fill and any near surface contamination includes:

- Excavation and placement of contaminant impacted fill within an engineered pad underneath the proposed northern portion of the playing field and under the sports courts in the west of the site.
- Where contaminant impacted fill cannot be contained on site, they will be classified as a waste and removed off site to a suitable licensed waste facility, in accordance with their respective waste classification.

Further details of the management actions associated with containment or offsite disposal as a waste are provided in Section 6.

4.4.1 Sports field and sports courts volume capacity for capped materials

Based on calculations by Enstruct (21/09/2022), the available capacity under the sports field and sports courts for capping impacted materials is 7,968m^3. This volume excludes any 'capping' layers. For the sports field, the permanent concrete slab will act as a cap while for the sports courts, the 40 mm acrylic hardstand and 100 mm DGB20 plus 200 mm of DGS will act as a cap (340 mm total thickness) along with orange geogrid mesh covering any impacted fill.

Reference to drawing CV-0405-D in **Appendix C** shows the pavement detail for fields and courts and is supplemented with sketches within Section 6.11 of this RAP.

4.5 Remediation criteria

4.5.1 ASC NEPM 2013

The *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)* (ASC NEPM 2013) derives human and ecological investigation levels for a range of contaminants across several land use settings and exposure scenarios (Schedule B1). These guidelines are considered conservative Tier 1 screening criteria for chronic occupational exposure and are protective of onsite users and workers in this land use setting. Schedule B1 of the ASC NEPM 2013 indicates that land use setting 'C' applies to secondary schools such as the proposed development of TFHS.

The NEPM (2013) provides an overview of the assessment of known and suspected asbestos contamination in soil and addresses both friable and non-friable forms. The NEPM (2013) deals largely with site assessment but is also closely linked to remediation, management and protection of human health. The NEPM (2013) references the Western Australia Department of Health Guidelines (WA DoH) (2009) for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia and provides further recommendations for management measures for occurrences of bonded asbestos containing material (ACM).

Aurecon proposes to adopt the following remediation criteria for the capping and containment of site materials from excavations and site surface soils within the northern portion of the playing field and games court areas:

- A surveyed plan of the elements (sports field and courts) to show an 'as built' capping over any contaminant impacted fill materials, in accordance with this RAP. The land survey provided in **Appendix B** (or a more detailed version) can be used as the initial pre remediation / civil earthworks land survey for comparison. The survey must show the depth of contaminant impacted fill placed, marker layers, clean capping and any surface treatment such as turf, artificial turf or court acrylic surfacing.

- A visible soil / colour contrasting exclusion barrier (i.e. bidim geofabric in orange) must be used over any containment of contaminant impacted fill materials.
- A photographic record must be provided in the validation report showing placement of materials and any containment areas over time.
- Any contaminant impacted fill materials to be capped must be shown to be non-leachable prior to placement and compaction. This applies to chemicals such as heavy metals and PAH compounds, not asbestos. Results must be included in the validation report.

The following remediation criteria will be used for soils in landscaping and open space areas as validation based on the site investigations undertaken:

- Lead in soil: 600 mg/kg (ASC NEPM 2013 – Recreational C, secondary schools).
- Total PAH in soil: 300 mg/kg (ASC NEPM 2013 – Recreational C, secondary schools).
- Benzo(a)pyrene (as BaP TEQ) in soil: 3 mg/kg (ASC NEPM 2013 – Recreational C, secondary schools).
- Bonded asbestos containing materials: 0.02 % w/w (ASC NEPM 2013 – Recreational C, secondary schools).
- Friable asbestos (asbestos fines and fibrous asbestos): 0.001 % w/w.
- No respirable asbestos fibres to be present in any validation samples.
- No visible ACM fragments on the site surface (top 10 cm of soil) after development.

It should be noted that only limited site investigation work has been undertaken (Tetra Tech Coffey 2021), and additional contaminants such as heavy metals or others may exist in un assessed areas of the site. The environmental consultant undertaking site validation must consider both the contaminants listed in this section and potential for other contaminant presence as the development and construction is undertaken. The validation report must outline any further contaminants identified and remediation criteria used to validate.

Assessment of ecological risk (EILs / ESLs) for soil is considered required based on the current site status and proposed deeper landscaping aspects and existing vegetated areas that will be retained. Comparison of results to the ASC NEPM contaminant tier 1 screening criteria for soil (EIL/ESL for urban residential/public open space) will be undertaken. Limited to the upper 2.0 m depth of soils only.

Management limits criteria for hydrocarbons and volatile contaminants is not considered required based on the site investigations undertaken in 2021, conceptual site model (CSM) and proposed development plans.

4.5.2 NSW waste classification criteria (2014)

Where the proposed development and remediation works generate waste streams, principally comprising excavated soil materials, wastes will require classification for disposal in accordance with the NSW EPA *Waste Classification Guidelines – Part 1: Classifying Waste and Addendum* (2014) inclusive of Part 4 – Acid Sulfate Soils.

The excavated soil/fill expected to be generated on the site will fall into one of the following classifications defined in the Waste Guidelines:

- Virgin excavated natural materials (VENM) as defined in the *Protection of the Environment Operations (POEO) Act 1997*
- Special Waste (Asbestos). This is waste (such as surplus excavated fill/soil) that contains asbestos (fibres or asbestos containing materials (e.g. cement fragments)). It is noted that soils containing asbestos waste also need to be assessed for other potential contaminants, such that they can be classified as either GSW, RSW or HW in accordance with the Waste Guidelines.
- General Solid Waste Non-Putrescible (GSW). GSW is waste (such as surplus excavated soil) which contains contaminant (i.e. site COPC) concentrations less than or equal to the GSW contaminant threshold values (CT1) or contains specific contaminant concentrations (SCC) and toxicity characteristics leaching procedure (TCLP) test concentrations less than or equal to the respective SCC1 and TCLP1 threshold values.

- Restricted Solid Waste (RSW). RSW is waste (such as surplus excavated fill/soil) which contains contaminant concentrations greater than the GSW criteria, however less than or equal to the RSW contaminant threshold values CT2 or contains SCC and TCLP test concentrations less than or equal to the respective SCC2 and TCLP2 threshold values.
- Hazardous Waste (HW). HW is waste (such as surplus excavated fill/soil) which contains contaminant concentrations greater than the RSW criteria.

4.5.3 Imported materials criteria

Importation of suitable backfill soils may or may not be required pending final excavation levels, engineering designs and construction timing. It is likely that the site levels can accommodate some excavation without the need to import any suitable backfilling materials. If importation of soils is considered to be required for engineering fill (not including in ground service trench backfill), the soils may only be certified Virgin Excavated Natural Materials (VENM) or Excavated Natural Materials (ENM) in accordance with the NSW EPA general resource recovery exemptions for ENM (The Excavated Natural Material Exemption and Order, 2014) and re-landscaped.

Engineering subgrades such as DGB and DGS materials can be imported with records kept of supplier, approximate volumes and placement areas for the project.

The backfill material shall be compatible with previous and adjacent soil characteristics for site drainage purposes (sandy and courser grained soils derived from quartz). No sulfidic soils such as acid sulfate soils (ASS) shall be imported to the site no materials containing asbestos.

4.5.4 Rationale for selection criteria

Rationale for the selection of criteria, including assumptions and limitations of the criteria and any deviations from the approved guidelines must be justified in a validation report.

4.5.5 Aesthetics

ASC NEPM 2013 requires that aesthetic quality of accessible soils be considered even if testing suggests that the concentrations of contaminants of concern are within acceptable ranges.

No specific numerical guidelines have been assigned for aesthetics. However, ASC NEPM 2013 indicates that professional judgement with regard to quantity, type and distribution of foreign materials and/or odours in relation to the specific land use and its sensitivity will be undertaken.

The following circumstances are considered likely to trigger further aesthetic assessment:

- Highly malodourous soils .
- Hydrocarbon sheens on surface water.
- Discolored chemical deposits or soil staining with chemical waste other than a very minor nature.
- Large monolithic deposits of otherwise low risk material i.e. gypsum as powder or plasterboard, cement kiln dust.
- Presence of putrescible refuse including material that may generate hazardous levels of methane.
- Soils containing residues from animal burials.

In arriving at a balanced assessment, the presence of small quantities of non-hazardous inert material and low odour residue (for example, weak petroleum odours), that will decrease over time, should not be a cause of concern of limit the use of a site in most circumstances. Similarly, sites with large quantities of well covered known inert materials that present no health hazards such as brick fragments and cement wastes are usually of low concern for both non-sensitive and sensitive land uses.

4.5.6 Site specific risk assessment

Rationale for any site-specific remediation criteria developed through a site-specific risk assessment. Refer to ASC NEPM Schedules B4, B5a, B5b, B5c, B6 and B7

5 Regulatory compliance requirements

5.1 Contaminated Land Management Act 1997

In NSW, the management of contaminated land is shared by the NSW EPA, the NSW Department of Planning, Industry & Environment (NSW DPIE) and planning consent authorities (usually local councils).

Under the *Contaminated Land Management Act (CLM Act) 1997,* the NSW EPA regulates contaminated sites where the contamination is Significant Enough to Warrant Regulation (SEWR). Contaminated sites that are not regulated by the NSW EPA are managed by local councils through land use planning processes (such as change of land use, or some remediation works).

State significant development (SSD) is managed by NSW DPIE through the EIS process (which applies to this project).

The NSW EPA also administers the NSW Site Auditor scheme under Part 4 of the CLM Act. The NSW EPA accredits individuals under the Act as Site Auditors to provide independent review of work conducted by contaminated site consultants. The NSW EPA also makes or approves guidelines for use in the assessment and remediation of contaminated sites and administers a public record of regulated sites under the CLM Act.

5.2 State Environmental Planning Policy (Resilience and Hazards) 2021

The *State Environmental Planning Policy (Resilience and Hazards) 2021* under the Environmental Planning and Assessment Act (EP&A Act) 1979 provides a state-wide planning approach for the remediation of contaminated land. In particular, the SEPP provides for Category 1 and Category 2 remediation. Projects classified as Category 1 require development consent, while projects classified as Category 2 do not require development consent.

A review of Chapters 4.8 and 4.11 of the SEPP indicates that the proposed remediation is classified as Category 2 works. In accordance with the requirements of SEPP, Northern Beaches Council must be notified of validation within one month of completion of soil remediation work / or completion of the validation report.

5.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act* 1997 (NSW*) (POEO Act)* is the key piece of environment protection legislation administered by the NSW EPA.

The POEO Act provides a single integrated licensing arrangement to control the air, noise, water and waste impacts of an activity. The NSW EPA is the regulatory authority for the licensing of activities specified under Schedule 1 of the *POEO Act* (scheduled activities) and in most cases councils are the regulatory authority for non-scheduled activities. Licenses can also be issued to regulate water pollution from activities that are not in Schedule 1. Such licenses can provide protection against prosecution for water pollution if the licence conditions are complied with.

The *POEO Act* also provides the key mechanisms (including the issuing of three types of environment protection notices including: clean-up, prevention and prohibition notices) for protecting the environment. It also provides the regulatory regime for waste management under the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation).

All remediation works completed at the site will be conducted in compliance with the relevant requirements of the *POEO Act 1997*.

5.4 Protection of the Environment Operations (Waste) Regulation 2014

The following outlines the required documentation and approvals required for the handling, off site transport and disposal of waste during the remediation works in accordance with the *Protection of the Environment Operations (POEO) (Waste) Regulation 2014* and the *POEO Act 1997.*

5.4.1 Waste transporter requirements

Under Schedule 1, Part 2 of the *POEO Act 1997* the transport of several classifications of waste in loads exceeding 200 kilograms is declared to be a scheduled activity for which a licence is required. As such the proposed transport of the selected wastes from the site to off-site disposal facilities will require the use of licensed transporters.

5.4.2 Waste tracking requirements

The *POEO (Waste) Regulation 2014* specifies requirements for the tracking of waste both within NSW and interstate. The wastes that must be tracked are listed in the Schedule 1 of the Regulation (this Schedule includes soil contaminated with waste oil/ water, hydrocarbons/ water mixtures or emulsions).

Wastes that need to be tracked need to be characterised in accordance with the NSW EPA, 2014 *Waste Classification Guidelines, Part 1: Classifying Waste and Addendum (PFAS) and Part 4 Acid Sulfate Soils.*

The following characteristics of the waste must be determined:

- The form of the waste (the physical state e.g. solid).
- The waste code.
- The waste description.
- The Dangerous Goods properties (if applicable).

A NSW EPA on line tracking system is available to track waste that is transported within NSW or into NSW from other states or territories.

5.4.3 Waste disposal facilities

Before wastes are transported from the site, it is necessary to confirm that the facility (e.g. landfill/ recycling facility) where the waste is being transported to is legally able (licensed) to accept the waste type.

5.4.4 Waste records

If not using an approved on line tracking system records must be maintained of the waste transport certificates for at least four years. The use of the NSW EPA on line tracking system removes the requirement to maintain these records.

5.5 Asbestos removal regulations and codes of practice

The removal and disposal of asbestos will be managed in accordance with the *How to Safely Remove Asbestos: Code of Practice* (Safe Work NSW, 2016), NSW Government Managing Asbestos in or on soil, March 2014, NSW Work Health and Safety Act 2011 and Regulations 2014, NSW Safe Work Australia Guidelines and the NSW EPA *Waste Classification Guidelines*.

Excavation and removal of asbestos contaminated soils are required to be conducted by a Class A licensed contractor (where friable asbestos is present or has the potential to be generated by the works).

Where confirmed friable asbestos is present only a licensed asbestos assessor may undertake air monitoring, risk assessments and issue clearance certificates for remediation work.

Before starting the works, the appointed contractor is required to obtain a site-specific permit approving the asbestos works from Safework NSW. A permit will not be granted without a current licence and the permit application must be made at least seven (7) days before the work is due to commence.

5.6 Planning secretary's environmental assessment requirements – schools (November 2021)

The guidance provides information on issue and assessment requirements for SSD applications. Any Environmental Impact Statement (EIS) must meet the minimum form and content requirements as prescribed by Schedule 2 of the *Environmental Planning and Assessment Regulation 2000 (EP&A Regulation)* and the *State Significant Development Guidelines*. The following items are listed under No. 16 – Contamination and remediation:

- In accordance with SEPP 55, assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable (or will be suitable, after remediation) for the development.
- Documentation required:
  - Preliminary Site Investigation
  - If required, provide: Detailed Site Investigation, Remedial Action Plan and Preliminary Long-term Environmental Management Plan.

5.7 Warringah Local Environmental Plan 2011

The Warringah Local Environmental Plan (LEP) 2011 applies to a portion of the Northern Beaches local area and is made up of a written instrument and maps. It aims to make local environmental planning provisions for land in portions of the Northern Beaches LGA in accordance with the relevant standard environmental instrument under section 33A of the Act.

As the project will be assessed under NSW DPIE SSD conditions, this information is provided for information only.

5.8 Warringah Development Control Plan 2011

The Warringah Development Control Plans is a non-legal document that supports the Local Environmental Plan (LEP) with more detailed planning and design guidelines. The Warringah DCP 2011 applies to most of the Northern Beaches local area. The DCP provides a procedural framework for the integration of contaminated land management into the planning and development processes within the Northern Beaches Council area (subset of Warringah).

As the project will be assessed under NSW DPIE SSD conditions, this information is provided for information only.

5.9 Preparation of a site EMP

After completion of remediation / development, an EMP must be prepared that summarises the 'as built' site status and requirements for the operational phase of the site to minimise risks of exposure to capped and contained contaminant impacted fill and any other areas of the site that may require long term environmental management.

Implementation responsibility of the EMP for capped and contained materials will be the NSW Department of Education.

6 Scope of remediation

6.1 Preliminaries

Project planning and licensing will be first to occur as part of preliminary activities. The areas where contaminant impacted fill is excavated will be defined and secured to ensure that safety and environment controls are implemented.

Signs indicating where various types of work are being carried out should be erected (such as 'Asbestos in soil handling in progress').

All underground services beneath, and in the environs of, the remediation extent will be mapped and documented. This is required to avoid intercepting services during remediation works. This will be done using:

- Available information from the site owner
- Dial Before You Dig underground service locations services
- A suitably qualified service location provider
- Current survey plans of services available for the development

6.2 Notifications

A minimum of five days' notice to Safe Work NSW for asbestos management works (associated with asbestos in soil excavation) is required. This must be undertaken by the contractor and a copy of correspondence submitted to NSW Department of Education or the Principal and the appointed environmental consultant. Asbestos licensed contractors in NSW can lodge the notification electronically using Safe Work NSW Asbestos and demolition online notification system or complete the notification form available on the Safe Work NSW website.

In accordance with the requirements of State Environmental Planning Policy No 55 – Remediation of Land (SEPP55, 1998), the soil remediation works are considered Category 2 remediation works. Therefore, a development application is not required to be submitted to Northern Beaches Council. In accordance with clause 16 (2a) of SEPP 55, 30 days notification must be provided to City of Sydney Council before the commencement of remediation works at the site. The notification document must be in accordance with the provisions of SEPP 55.

Confirmation of the Northern Beaches Council permitting requirements must be completed by the chosen remediation contractor and a copy of correspondence submitted to NSW Department of Education or the Principal and the appointed environmental consultant.

6.3 Asbestos fibre air monitoring

It is considered good practice for asbestos air monitoring to be undertaken during stripping and grubbing and bulk excavation works, and then an assessment of risk should be determined for any further monitoring.

Air monitoring set up and reporting should be undertaken by a licensed asbestos assessor (LAA).

A minimum of eight sampling pumps with cowls should be set up and air quality sampled over an eight hour period (1 day) concurrently with construction hours. The pump locations should be nominated by the LAA. An additional asbestos air monitoring cowl should be placed near one of the pumps to act as a 'control'. The cowls shall be analysed by a NATA accredited laboratory in accordance with the membrane filtration method and the National Institute for Occupational Safety and Health (NIOSH), 2005. *Guidance Notes on Membrane Filter Method on estimating air borne asbestos fibres- Second Edition – NOHSC – 3003*.

The recommended exposure level for airborne asbestos fibres (8 hour Time Weighted Average) is 0.01 fibres/ml.

6.4 Removal and handling of asbestos contaminated fill

A surface inspection by an appropriately qualified person should be completed to assess for ACM following building and structure demolition in the north-east of the site and prior to removal of topsoil and vegetation to mitigate the potential for stockpiles of ACM impacted soils to be generated.

The handling of asbestos contaminated fill as part of the civil earthworks will be undertaken by an asbestos removal contractor who holds the appropriate class of Asbestos Licence, issued by the Safe Work NSW. There are two types of licenses: Class A (can remove any amount of FA, ACM, non-friable asbestos and asbestos contaminated dust or debris) and Class B (can remove any amount of non-friable asbestos, ACM, asbestos contaminated dust or debris associated with the removal of non-friable asbestos or ACM). Due to the presence of bonded ACM and some AF/FA, a Class A licensed asbestos removalist must be engaged for the remediation work that deals with asbestos contaminated fill.

The engaged contractor will ensure that risk assessments and control measures are implemented in accordance with the Work Health Safety Act 2011 Code of Practice titled: *How to Safely Remove Asbestos* and any other guidance notes required for work within NSW. Prior to the commencement of the remediation works, the contractor must notify the regulator in writing at least five days before the licensed asbestos removal work commences and develop an asbestos removal control plan. Subject to SSD conditions of consent and project SEARs, notifications to the Council and the owners/occupants of the neighbouring premises may also be required.

All asbestos containing materials will be disposed off-site at a suitably licensed landfill (unless they can be capped and contained as per this RAP).

Detailed bulk earthworks methodology, including staging, has been summarised on drawing CV-0200_Option 2-E, **Appendix C**. This methodology outlines the staging, excavation areas, stockpiling on site, uncontrolled fill sieving and removal of wastes and reuse of controlled fill under sports field and courts as well as any asbestos impacted fill under the sports field and courts.

6.5 Excavation and materials management

Excavation is to occur in areas proposed for inground services trenching, lower ground levels, plant rooms or any other works expected to intercept the contaminant impacted fill.

Stockpiles of asbestos contaminated fill will be managed in accordance with Section 6.7.7 of this RAP.

A water spray bowser must be available on the site to suppress any potential airborne dusts released during the excavation and during the loading of trucks.

6.6 Groundwater remediation

No groundwater contamination specific remediation is proposed for the site.

Where groundwater is required to be pumped from excavations or minor dewatering, the groundwater should be managed in the following ways depending on the water quality, site aspects and construction requirements:

- Minimise contact with groundwater across the site
- Do not use for dust suppression unless water quality sampling has been undertaken and confirmed that groundwater quality is suitable for application to surface soils on the site.
- Excavate a soak away pit for groundwater into the same shallow unconfined sandy aquifer that will dissipate down gradient of the excavation, ensuring that no significant contamination is present in the groundwater via sampling to characterise.
- If groundwater requires discharge off the site to sewer (Sydney Water trade waste agreement) or Council stormwater systems, the appropriate permission from the authority for that discharge must be granted prior to discharge occurring. This will likely require sampling of groundwater to determine quality parameters.

- Discharging to sewer or stormwater would likely require a treatment system to be established that removes suspended solids and potentially contaminants.
- Engage a licensed liquid waste contractor to dispose of groundwater to an appropriate facility.

6.7 Remediation validation criteria and recording of information

Aurecon proposes to adopt the following validation criteria for final development surfaces across the site after civil earthworks is completed:

- A surveyed plan of the elements (sports field and courts) to show an 'as built' capping over any contaminant impacted fill materials, in accordance with this RAP. The land survey provided in **Appendix B** (or a more detailed version) can be used as the initial pre remediation / civil earthworks land survey for comparison. The survey must show the depth of contaminant impacted fill placed, marker layers, clean capping and any surface treatment such as artificial turf or court acrylic surfacing.
- A visible soil / colour contrasting exclusion barrier (i.e. bidim geofabric in orange) must be used over any containment of contaminant impacted fill materials.
- A photographic record must be provided in the validation report showing placement of materials and any containment areas over time.
- Any contaminant impacted fill materials to be capped must be shown to be non-leachable prior to placement and compaction. This applies to chemicals such as heavy metals and PAH compounds, not asbestos. Results must be included in the validation report.
- No visible ACM fragments on the site surface (top 10 cm of soil) after development.
- Review of the supplementary DSI work proposed across the remainder of the site and comparison of results to the ASC NEPM contaminant tier 1 screening criteria applicable to the proposed use (soil HIL/HSL C for secondary schools). This is to include surface soils, filling to remain in situ (if appropriate) and deeper natural soils.
- Review of the supplementary DSI work proposed across the existing vegetation remaining on the site and comparison of results to the ASC NEPM contaminant tier 1 screening criteria for soil (EIL/ESL for urban residential/public open space). Limited to the upper 2.0m depth of soils only.

Refer to Section 4.5 for further details.

6.7.1 Validation soil sampling procedure

The general methodology for collection of soil validation samples is as follows:

- Soil samples will be collected by an experienced environmental consultant (trained and experienced in the identification of asbestos) with the aid of an excavator or hand tools as appropriate. The excavator will remove soil to a depth approximately 0-5 cm and then scrape a small bucket full of soil from the targeted sampling depth
- Samples will be collected by hand or with the use of a clean trowel from the centre of the excavator bucket or from the material excavated on the ground surface that is representative of the validation surface. Material in contact with the sides of the bucket and thus susceptible to contamination will not be sampled
- Soil samples will be placed into laboratory prepared sampling containers. All samples will be labelled with a unique identifier consisting of the sample location and date and time of sampling. Samples will be placed directly into an ice filled cooler box following collection and transported to a laboratory under Chain of Custody (CoC) protocols
- Soil logs will be prepared for each location showing soil description, sampling depths and sampling intervals. Where possible, photographic records will also be maintained
- The decontamination of personnel, PPE and sampling equipment (if used) will be in accordance with Aurecon's standard operating procedures to minimise risks to health and safety and cross contamination

In addition to primary samples, field duplicate and field triplicate samples will be collected at a frequency of

one per 20 primary samples as per ASC NEPM (2013).

No rinsate / trip blank or spiked samples will be required as it is envisaged only dedicated sampling equipment will be used in the field and validation analysis for asbestos only.

6.7.2 Validation sampling design

Full excavation of contaminant impacted fill

Where full excavation of the contaminant impacted fill occurs into natural soils or extremely weather rock, the following validation sampling design will be undertaken:

- The validation sampling design will be grid based across the full excavation area base that removes all contaminant impacted fill
- The sampling design will include collection of 1 soil sample on a 20 x 20 m grid across the base of the excavation. For any smaller areas of excavation that removes all contaminant impacted fill, a smaller grid will be used based on professional judgement by the environmental consultant and justification provided in the remedial validation report
- As the walls of excavations are considered likely to contain contaminant impacted fill, sampling design will include collection of 1 soil sample per 0.5 m depth across the wall excavation vertically and every 20 m horizontally.
- The validation samples will be a 500 ml soil sample in accordance with the WA Guidelines (2009) and ASC NEPM 2013 for asbestos and a 250 ml laboratory prepared glass jar for other soil analysis requirements such as TRH, PAHs and heavy metals.

Capping layer and exclusions barrier validation

The capping layer materials (soils) must be select engineering materials (i.e., DGB or DGS), clean imported material or natural soils (excavated from site) that has been validated (by visual observation and chemical testing) prior to use.

Reuse of site won natural soils must be validated for reuse above any exclusion layer to ensure that no asbestos or elevated contaminants are present or placed above the exclusion layer. The validation process must include:

- Written clearance / validation from a suitably qualified and experienced consultant that no visible asbestos is present in the material to be reused
- No visible wastes are within the material such as broken tiles, bricks, demolition wastes or other anthropogenic wastes that investigations have shown at the site are indicative of asbestos presence
- No visible asbestos is present on the capping layer surface once placed and no anthropogenic wastes
- Analytical testing for asbestos in soil is not considered necessary where the above points have been implemented and the obvious visual differences between natural soils and contaminant impacted fill. However, for construction due diligence purposes, limited confirmatory testing of ‘batches’ of site won natural soils must be completed in addition to the above points. This ‘batch’ testing should be completed at a rate of 1 sample per 25 m^3 of site won natural soils and analysis for asbestos in soil and a suite of chemical contaminants including heavy metals, PAHs, OCPs, TRH, BTEXN.

The surveyed plan comparison noted above (Section 6.7) for capping thickness confirmation and site walkover by a suitably qualified and experienced environmental consultant will form another step in the validation process. This is to ensure that the final surface has no observable asbestos within the site boundary.

6.7.3 Validation of imported fill (soils)

It is currently not expected that a large volume of fill material will require importation to the site for the proposed development (refer to cut and fill balances in Section 2.4 and **Appendix C** earthworks plan).

If excavated areas need to be backfilled, imported fill must meet the remediation criteria in Section 4.5.3. The following procedures, consistent with NSW EPA (2011), should be undertaken:

- Verify sources and confirm that:
  - The site history indicates that the site uncontaminated
  - The soil being excavated is visually clean and undisturbed
- Checking of material as it enters to the site to confirm it is consistent with the approved materials
- Sampling of material if required (i.e. the quarry from which the material is sourced may provide VENM certification, in which case this may not be required)
- For this RAP, it is proposed that imported material (from the same source site) to be sampled at a minimum rate of one per 25 cubic metres (m^3) for heterogenous small batch or volume materials (<250 m^3) and maximum of one sample per 100 cubic metres (m^3) for homogenous materials. The soil samples will be submitted to laboratory for analysis of heavy metals (arsenic, cadmium, chromium, copper, lead mercury, nickel and zinc), TPH, PAHs, Phenols, OCPs, OPPs and asbestos (in line with NEPC (2013). Justification by the environmental consultant for the sampling rates used must be documented in a technical memo or report for the imported materials.

Wastes to be removed from the site will be classified in accordance with NSW EPA (2014).

6.7.4 Virgin Excavated Natural Material

Fill to be imported to the site as VENM will meet the definition of VENM as specified in the *Protection of the Environment Operations Act* 1997, which is:

- 'natural material (such as clay, gravel, sand, rock, soil or rock fines) that:
  - has been excavated or quarried from areas that are not contaminated with manufactured chemicals or process residues, as a result of industrial, commercial, mining or agricultural activities; and
  - that does not contain any sulfidic ores or soils or any other waste

When assessing if material classifies as VENM and is suitable for importing to the site, consideration will also be given to the following:

- The concentrations of contaminants assessed in the material do not exceed the relevant HILs presented in Table 1A(1) of NEPC (1999), or the relevant HSLs presented in Table B4 of Friebel, E & Nadebaum, P (2011)
- The concentrations of metals assessed in the material are within background ranges published in Australia (e.g. Table 5-A in Schedule B1 of the National Environment Protection (Assessment of Site Contamination) Measure, which are Berkman DA 1989, 'Field Geologist's Manual, Third Edition' published by the Australasian Institute of Mining and Metallurgy)
- The material does not contain asbestos
- The concentrations of organic contaminants assessed in the material are less than the relevant laboratory limits of reporting

6.7.5 Excavated Natural Material

The chemical and other material property requirements in:

- The excavated natural material exemption made under the Protection of the Environment Operations (Waste) Regulation 2014 – General Exemption Under Part 9, Clause 93 are adopted as ENM assessment criteria.

6.7.6 Other Filling Material

The chemical and other material property requirements in the relevant NSW EPA resource recovery exemption may be adopted as fill material assessment criteria.

When assessing if material complies with the relevant resource recover exemption and is suitable for importing to the site, consideration will also be given to the following:

- The concentrations of contaminants assessed in the material do not exceed the relevant HILs presented in Table 1A(1) of NEPC (1999), or the relevant HSLs presented in Table B4 of Friebel, E & Nadebaum, P (2011)

- The concentrations of metals assessed in the material are within background ranges published in Australia (e.g. Table 5-A in Schedule B1 of the National Environment Protection (Assessment of Site Contamination) Measure, which are Berkman DA 1989, 'Field Geologist's Manual, Third Edition' published by the Australasian Institute of Mining and Metallurgy)
- The material does not contain asbestos
- The concentrations of organic contaminants assessed in the material are less than the relevant laboratory limits of reporting

6.7.7 Soil stockpiles

Stockpiles of soil including asbestos impacted fill or other materials will be managed to avoid contamination of underlying material and generation of windblown dusts / particulates:

- Will be compacted to a form that minimises dust generation and no greater than 3.5 m height in final compaction with an excavator bucket
- Will be covered with HDPE covers (or similar) and wet down where asbestos is present, covers will be weighed down and kept in place until reuse is known
- Any asbestos contaminated stockpiles will be labelled as such and a record made of their location and reuse across the site under a capping / exclusion barrier
- Will not be placed on footpaths or nature strips
- Will be placed away from drainage lines, gutters, stormwater pits or inlets
- Will be stored in a secure area and be covered if remaining on site for more than 24 hours
- Will be separated from natural ground by a geosynthetic / plastic membrane and validated following the removal of the stockpile as described for validation of materials in Section 6.7.1
- Will be placed on a level area as a low elongated mound.

6.7.8 Site won reuse of soils (at or near surface)

Soils excavated from the site that are to be reused on or near the ground surface must be confirmed to be appropriate for on site reuse. Review of existing data sets must be undertaken and/or additional characterisation sampling undertaken, testing for PCoC. All soils must meet the ASC NEPM contaminant tier 1 screening criteria applicable to the proposed use (soil HIL/HSL C for secondary schools).

Records of soil characterisation data must be kept and attached to the project validation report.

6.7.9 Site wide validation (supplementary DSI data)

Site wide validation will include the supplementary DSI work that is required to be undertaken as part of future works, this includes:

- Review of the supplementary DSI work across the remainder of the site and comparison of results to the ASC NEPM contaminant tier 1 screening criteria applicable to the proposed use (soil HIL/HSL C for secondary schools). This is to include surface soils, filling to remain in situ (if appropriate) and deeper natural soils.
- An SAQP prepared in accordance with the NSW EPA *Consultants Reporting on Contaminated Land* (2020) guideline must be prepared for the supplementary DSI work and any remaining validation across the site for areas to remain in situ or areas not assessed as part of the supplementary DSI work.
- Specifically, surface soil sampling must be undertaken across all areas of soils, ground and treed areas that will remain in situ to confirm that they are appropriate to remain for the proposed development. These areas may not be able to be access with plant and machinery and hand tools should be used to assess the surface and up to 0.5m depth (minimum) for land use suitability.
- The sampling density must be in accordance with NSW EPA sampling design guidelines, part 1 and part 2 (2022) and in areas to remain in situ, a systemic grid sampling pattern must be used. Consideration of existing data sets should be undertaken for any SAQP.

- Final site walkovers either in sections or across the site in full by an experienced contaminated land consultant or occupational hygienist to confirm no ACM is present on the ground surface. Clearance certificates to be issued and signed by the consultant and recorded for any section or site wide walkover.

6.7.10 Site wide validation (vegetation remaining in situ)

Site wide validation will include the supplementary DSI work that is required to be undertaken as part of future works, this includes, specifically for vegetated areas that remain in situ, typically in the western portion of the site:

- Review of the supplementary DSI work proposed across the existing vegetation remaining on the site and comparison of results to the ASC NEPM contaminant tier 1 screening criteria for soil (EIL/ESL for urban residential/public open space). Limited to the upper 2.0m depth of soils only.
- The sampling density must be in accordance with NSW EPA sampling design guidelines, part 1 and part 2 (2022) and in areas to remain in situ, a systemic grid sampling pattern must be used.

6.7.11 Validation of groundwater remediation

No groundwater remediation is proposed for the site and validation is outside the scope for this RAP.

6.8 Waste classification and disposal offsite (if required)

The proposed remediation works may potentially generate solid waste, principally comprising excavated materials likely to contain asbestos and potential other elevated contaminants such as heavy metals, asbestos and PAHs. Solid (soil/fill) wastes will require classification for disposal in accordance with the NSW EPA *Waste Classification Guidelines: Part 1 Classifying Wastes and Addendum* (NSW EPA, 2014).

Classification of wastes will include existing data sets where applicable (Tetra Tech Coffey 2021) and any further characterisation sampling during remediation and development works. The end classification will be in accordance with the NSW EPA *Waste Guidelines*.

The excavated soil/fill is expected to be generated on the site will potentially fall into one of the following classifications defined in the Waste Guidelines:

- **General Solid Waste Non-Putrescible (GSW).** GSW is waste (such as surplus excavated soil) which contains contaminant (i.e. site COPC) concentrations less than or equal to the GSW contaminant threshold values (CT1[1]) or contains specific contaminant concentrations (SCC) and toxicity characteristics leaching procedure (TCLP) test concentrations less than or equal to the respective SCC1[2] and TCLP1 threshold values.
- **Special Waste (Asbestos).** This is waste (such as surplus excavated fill/soil) that contains asbestos (fibres or ACM).

It is noted that soils containing asbestos waste also need to be assessed for other potential contaminants, such that they can be classified as either GSW, restrict solid waste (RSW) or hazardous waste (HW) in accordance with the *Waste Guidelines*.

All waste will be transported by a contractor licensed to transport the material and will have notified the licensed receiving landfill of the type and quantity of each load of material being received. The majority of the materials will be bulk excavated into trucks for off-site disposal with minimal requirement for double handling and therefore stockpiling. If required, any stockpiles will be placed in a secured area as a low elongated mound, away from drainage infrastructure. The stockpiles shall also be covered to prevent from generating airborne dusts. Site management plans will make provision for stockpiling (in the event it is required).

The *POEO (Waste) Regulation* (2014) requires transporters of asbestos to record information about the movement of loads of asbestos waste from the site of generation to the final disposal point. In addition, the

[1] NSW DECCW 2014 Table 1 Contaminant Threshold Values (CT1 and CT2) for classifying waste by chemical assessment without the leaching (TCLP) test

[2] NSW DECCW 2014 Table 2 Leachable concentration (TCLP) and Specific Contaminant Concentration (SCC) values for classifying waste by chemical assessment

EPA has developed an online system called 'Waste Locate' to ensure asbestos waste is disposed of lawfully in NSW and to assist transporters of these materials to fulfil their legal obligations.

6.9 Waste classification soil sampling procedure

The ex-situ waste classification sampling procedure outlined in the ASC NEPM, Schedule B2 Section 7.5 for stockpiles will be undertaken and analysis of a suite of contaminants of concern likely to be encountered at the site based on the site history, along with leaching testing (TCLP). Ex-situ stockpile waste classification sampling is summarised as follows:

- Estimate volume of stockpile and record shape and dimensions along with observed homogeneity
- Record physical appearance and ensure samples are collected from the near centre of the stockpile. Ensure all samples are at least 300 mm inside the stockpile surface to minimise risk of weathering and grain size grading errors
- Waste classification samples will be collected from the stockpiles generated during the construction works at a rate of one per 25 m^3 using a 3-dimensional systematic grid sampling pattern to account for spatial variability. Surface sampling (only) from the stockpile will not be sufficient to categorise its contents and is not appropriate where volatile contaminants are present. Sampling should be uniformly distributed throughout the stockpile, including sampling at depth
- Soil samples will be collected by hand or with the use of a clean trowel from the centre of the excavator bucket. Material in contact with the sides of the bucket and thus susceptible to contamination will not be sampled
- Soil samples will be placed into laboratory prepared sampling containers. All samples will be labelled with a unique identifier consisting of the sample location and date and time of sampling. Samples will be placed directly into an ice filled cooler box following collection and transported to a NATA accredited laboratory under chain of custody (CoC) protocols
- Collected samples will be analysed for heavy metals (arsenic, cadmium, chromium, copper, lead mercury, nickel and zinc), TPH/BTEX, PAH, OCPS, asbestos (as per NEPC (2013) and Toxicity characteristic leaching potential (TCLP) tests (if required)
- Previous investigation results should also be reviewed and assessment of the chemical results for waste classification
- As per the ASC NEPM, 2013 further guidance on stockpile sampling may be obtained from EPA Victoria's *Industrial waste resource guidelines* (2010)

6.10 Capping and exclusion barriers for contaminant impacted fill

6.10.1 Playing field and sports courts

The placement and compaction of the impacted material will be in accordance with geotechnical and compaction advice provided by others. The marker layer (laid directly over contaminant impacted fill) will be laid by and secured by the remediation contractor.

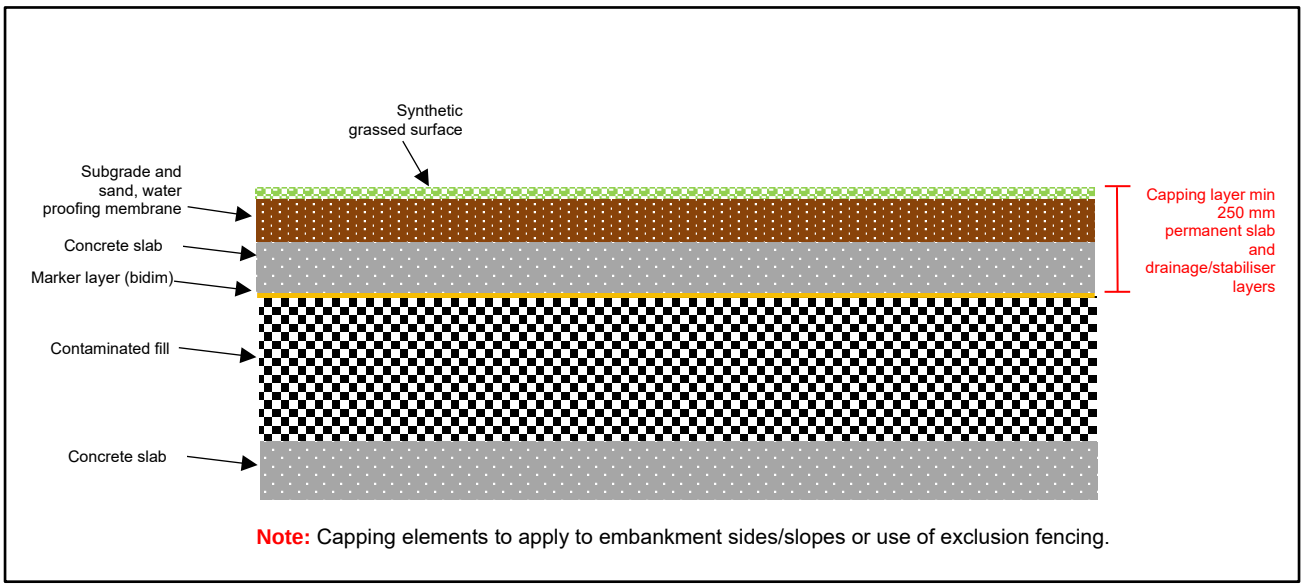
Placement of contaminant impacted materials, and the installation of the marker layer, will be conducted under the supervision and direction of the environmental consultant and/or project hygienist and the Class A licensed asbestos removal contractor, under friable asbestos removal conditions (where asbestos is within the soil matrix). However, the project hygienist may issue an asbestos clearance certificate following the installation of the marker layer, such that the surveying and the capping works could be undertaken under standard conditions (i.e. not considered asbestos removal works).

The placement of the contaminant impacted fill materials will be observed and documented by the environmental consultant for inclusion in the validation report. The work will be validated as specified in Section 6.12 of this RAP.

Cross sections of the capping elements specific to the northern playing field and games courts (drawing CV-0405-D provided in **Appendix C**), are provided in Section 6.11 on the following page.

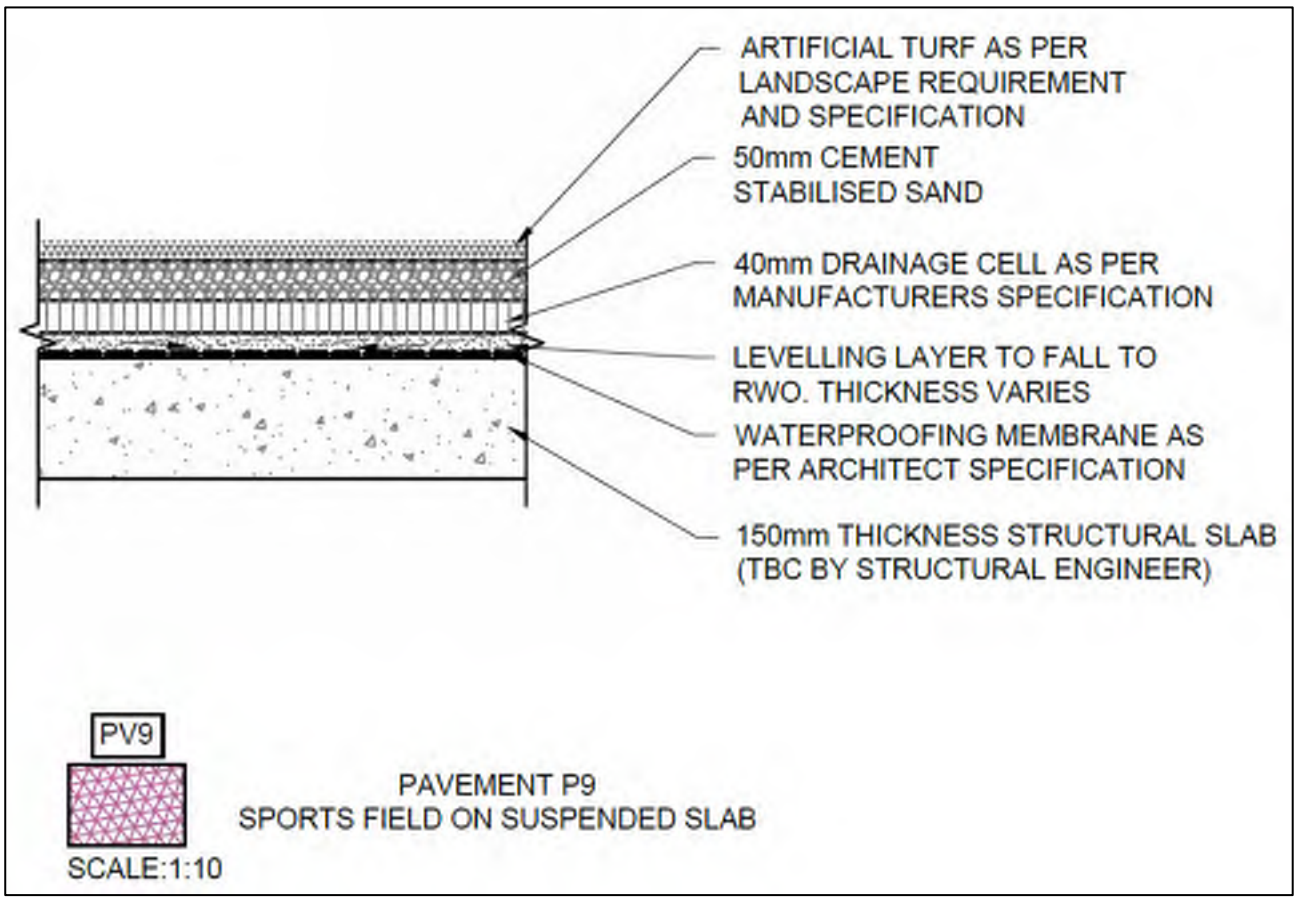
6.11 Cross sections of capping elements

Sports field (northern portion) with suspended concrete slab and synthetic turf:

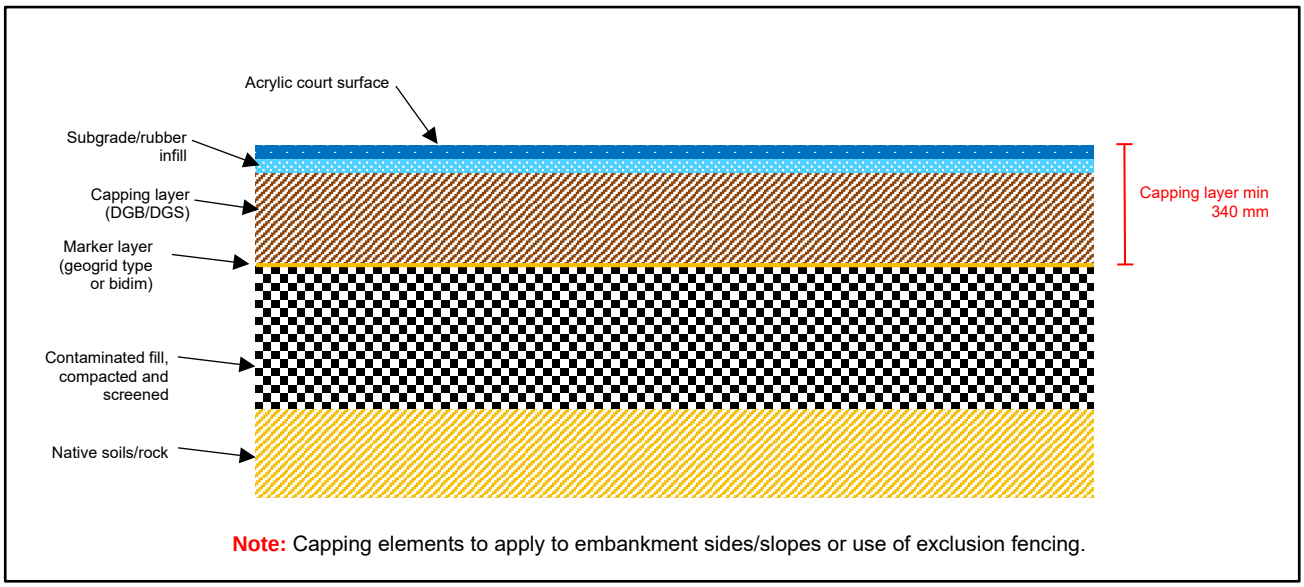


Note: Capping elements to apply to embankment sides/slopes or use of exclusion fencing.

As per drawing CV-0405-D **Appendix C**, pavement P9:

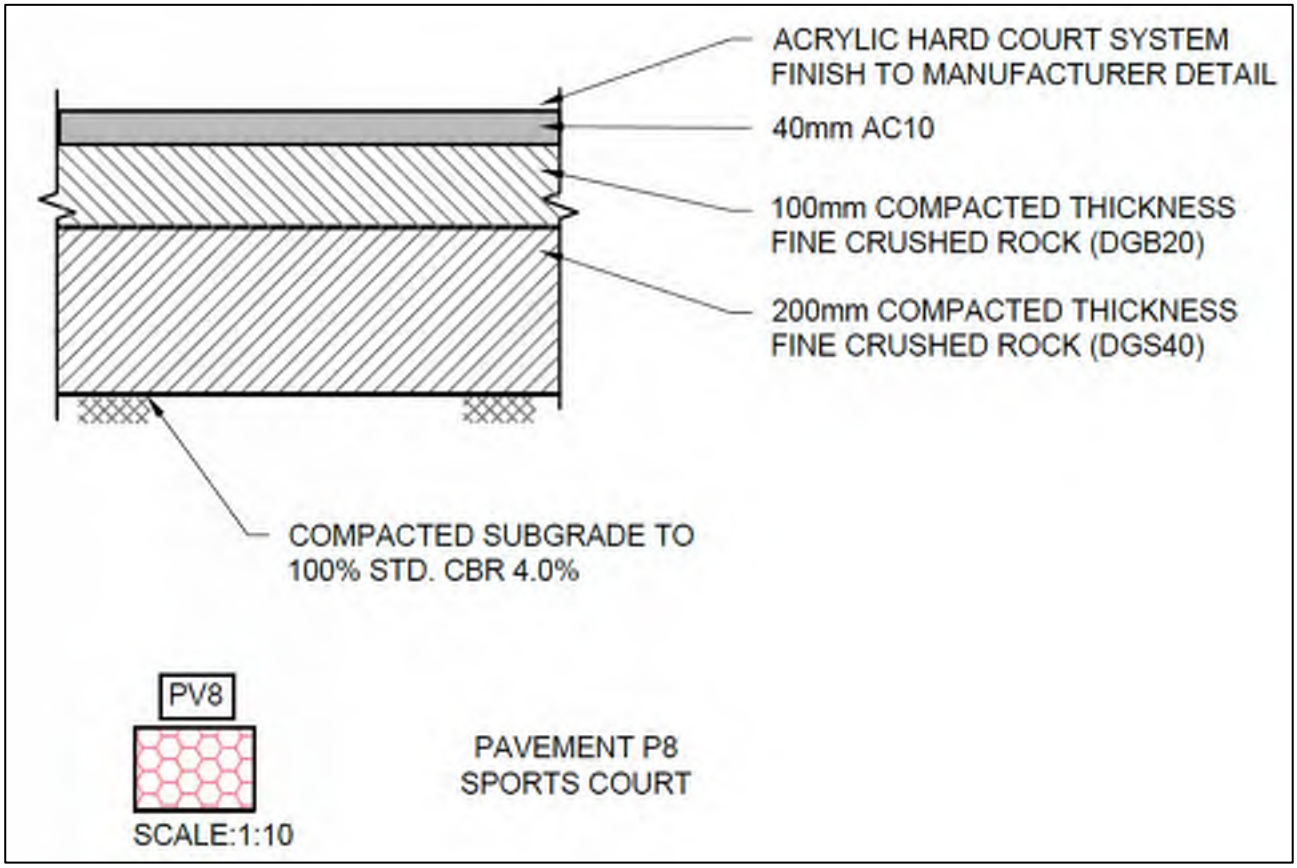


Sports courts with acrylic surface and compacted subgrade (minimum 340 mm thickness):



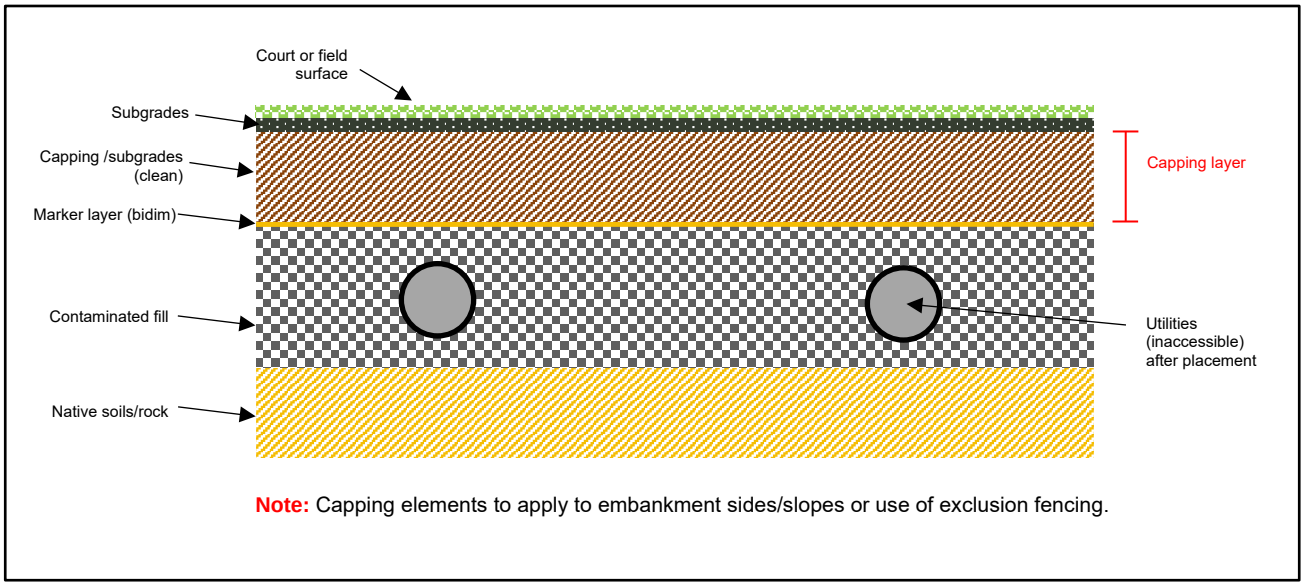
Note: Capping elements to apply to embankment sides/slopes or use of exclusion fencing.

As per drawing CV-0405-D **Appendix C**, pavement P8:



The below only applies where utilities such as electricity or drainage are required to be installed (new) within the sports field and sports court areas. Preference should be given to placing utilities outside of contaminated and capped fill. Where this is not achievable for grade or engineering reasons, utilities placement should occur prior to placement of contaminated fill. The placement of contaminated fill should be supervised to ensure no damage to utilities.

Minor inaccessible service/utilities trenches within and around the capped and contained elements:



6.11.1 Landscaped areas (lawns, garden beds, low maintenance surfaces such as gravels)

No capping and containment proposed.

6.11.2 Landscaped areas (Trees and shrubs)

No capping and containment proposed.

6.11.3 Roads, pavements, hardstand and footpaths

No capping and containment proposed.

6.11.4 Open drainage swales

No capping and containment proposed.

6.11.5 Boundaries of the capped areas

- The exclusion barrier placed over the contaminant impacted fill to the edge of playing and sports courts.
- As per Section 6.11 drawings and / or exclusion fencing.

- **Junctions of the capping and exclusion barriers**
  - Dovetailing via industrial staples into the adjoining exclusion barrier will be undertaken to keep the exclusion barrier in a continual form.
  - Tucking in of exclusion barrier to adjoining layer with an overlap minimum of 300 mm.
  - Where possible, tying in the exclusion barrier to boundary elements such as fences, retaining walls and infrastructure.

6.11.6 Repair to capping and exclusion barriers

In the event that repairs are required to the capping layer thickness and exclusion barrier (such as Bidim geotextile) during construction, the layer should be reinstated as follows:

- **General erosion:** if this capping material is eroded or damaged, it will be reinstated to ensure the minimum thickness requirements are maintained as per Section 6.11. The replacement material must be validated in accordance with the RAP prior to importation to the site.
- **Topsoil's:** as above, the replacement material must be validated in accordance with the RAP prior to importation to the site.
- **Playing field and court surfaces:** replace like for like such as topsoil / sands for turf playing field and re-seed, replace broken acrylic courts seals on courts.

6.11.7 Exclusion barrier / marker layer minimum requirements

The following exclusion barrier minimum requirements must be adhered to:

- The colour of the barrier material must be contrasting to the contaminant impacted fill. Preference should be given to orange as a first choice as it acts as a warning mechanism during excavations to assess the situation. White will discolour over time and should not be used.
- Preference for a high bi-dimensional strength so that it has similar strength properties and braking points in each direction when penetrated.
- Examples include nonwoven geotextile bidim and mastaTEX which are both readily available in Australia for civil engineering projects.

6.12 Remediation validation reporting

A remediation validation report will be prepared at the completion of the remediation works concurrently with an updated EMP document with 'as built' information. The validation report will be prepared in general accordance with NSW EPA *Guidelines for Consultants reporting on Contaminated Land* (2020), specifically Table 2.6 of the guideline. All field information, recorded information and data will be presented in the report.

The validation report will include:

- Any significant variations to the RAP methodology undertaken during the implementation of the remedial works and justification of change by the environmental consultant
- Results of all soil validation undertaken (if undertaken) during the course of the remedial works, including visual assessment and sampling and analysis
- Areas where full excavation of contaminant impacted fill occurred during earthworks
- Land surveys and photos to show capping thickness and exclusion barrier placement to m AHD levels
- Exclusion barrier installation (such as Bidim geotextile) must be demonstrated in the validation report with adequate photos of each respective infrastructure element (such as games courts, inground services and landscaping)
- Validation information for any imported soils from off site for the final capping layers to show it is suitable for the proposed land use (High School)
- QA/QC and data acceptance evaluation (if required for any analytical results)
- Waste tracking documentation including the volume of soil excavated and disposed of offsite evidenced by waste disposal dockets, tracking information and waste classification documentation as required by the NSW EPA
- Landfill licenses for the receiving waste facility
- Details of any imported fill materials such as VENM and ENM certificates / reports / data
- Any asbestos air monitoring records and results and clearance certificates issued during construction
- Details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents
- Other information as appropriate

7 Data quality objectives

The Data Quality Objectives (DQO) process is used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site. The DQO process provides a systematic approach for defining the criteria that a data collection design should satisfy, including when, where and how to collect samples or measurements; determination of tolerable decision error rates; and number of samples or measurements that should be collected.

The seven step data quality objectives (DQO) data quality indicator (DQI) planning approach provided in Appendix B of Schedule B2 of the NEPM (NSW EPA, 2013) and its application to the site remediation is outlined below.

7.1 Step 1: state the problem

The problem under consideration is that the site contains variable locations of uncontrolled fill which contains asbestos and other contaminants which presents a potential risk to human health for the proposed development (high school) and during construction and future operation as a high school. There is potential for landfill gas to be present in the subsurface, albeit, based on existing data, at low levels and risk to the proposed development.

For site development to occur, these risks need to be managed appropriately.

7.2 Step 2: identify the decisions

The decision is ‘what is the most appropriate way to manage the identified contamination to render the site suitable for its intended purpose?’.

Requirements of the remediation works must include:

- No unacceptable on or off-site impacts during and after remedial works
- No potential for hazards to human health from uncontrolled fill at the design development ground surface and subsurface.
- Provisions to verify that the remedial actions are adequate and will not result in on or offsite impacts (i.e. validation)

7.3 Step 3: identify inputs to the decision

The inputs to the decision are as follows:

- Investigation data gathered for the site to date (refer to Section 3 of this RAP) reported asbestos in fill material at concentrations which may present a risk to human health when exposed / disturbed via inhalation along with potential for PAHs and benzo(a)pyrene in fill.
- An assessment of the remedial action options has been conducted to adopt the most appropriate remedial action and methodology for the site
- Validation data (soil sampling and analysis for CoPC, visual observations of the site surface and land survey comparison for pre and post remediation earthworks and capping thickness) obtained during the remediation works program.
- Occupational hygienist walkover of entire site at various milestones during site development to ensure asbestos is not present at the ground surface, prior to an occupation certificate (or equivalent).
- Additional landfill gas monitoring.

7.4 Step 4: define the study boundaries

The remediation works are limited to the site boundaries (refer to Land Survey within **Appendix B** and Figure 1, **Appendix A**).

The vertical extent of the remediation is removal of soils until the required depth for construction of the TFHS car park, LG levels for buildings, inground service trench installations and ground level for which the depths are varied across the site. Typically, the remediation vertical extent is 0.5 – 4.0 m below ground level based on the known depth of the uncontrolled and contaminant impacted fill, concept design and bulk earthworks plans issued (refer to plans in **Appendix C**).

7.5 Step 5: develop a decision rule

The purpose of this step is to define the parameters of interest, specify action levels and combine the outputs of the previous DQO steps to develop a series of options if certain trigger events occur.

A decision on the acceptance of the data for interpretative purposes will be made on the basis of the DQI. The results of site land survey data will be compared with the remediation validation criteria upon the basis of which a decision will made on the validity of the final validation and potential for exposure of future site users, workers and incidental visitors.

The decision rule will take into account sampling and analysis of validation data collected, photographic records, daily/weekly site records, waste classification and material characterisation reports, visual inspection of the final site surfaces and comparison of capping thickness / exclusion barriers in areas with asbestos and non-leachable contaminant impacted fill materials (playing field capped area).

7.6 Step 6: specify limits of decision errors

Given the primary basis for evaluation of the project objectives shall be an assessment of the analytical data, the key specific limits for the project shall be the project adopted DQIs.

The following sections outline the QA/QC measures to be applied.

7.6.1 Data quality indicators

- ***Precision***: A quantitative measure of the variability (or reproducibility) of data
- ***Accuracy***: A quantitative measure of the closeness of reported data to the “true” value
- ***Representativeness***: The confidence (expressed qualitatively) that data are representative of the media present on-site
- ***Completeness***: A measure of the amount of useable data from a data collection activity
- ***Comparability***: The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event

The quantitative and qualitative measures/criteria employed to enable application of these parameters are described in the following sections.

Precision

Suitable criteria and/or performance indicators for assessment of precision include:

- Record keeping and precision during construction of all building elements
- Quality of land survey data presented and recorded throughout the development to compare to validation requirements for the site
- Where soil sampling occurs, performance of **intra-laboratory** and **inter-laboratory duplicate** sample sets through calculation of relative percentage differences (RPD)
- Where soil sampling occurs, performance of **blind field duplicate** sample sets, through calculation of RPDs
- Where soil sampling occurs, the RPDs will be assessed as acceptable if less than 30%. RPD that exceed this range may be considered where:
  - Results are less than 10 times the LOR or
  - Results are less than 20 times the LOR and the RPD is less than 50%.

- Note, duplicate testing is not appropriate for asbestos analysis.

Accuracy (Bias)

The closeness of the reported data to the *"true"* value is assessed through review of performance of:

- Where soil sampling occurs, method blanks, which are analysed for the analytes targeted in the primary samples

Representativeness

To ensure the data produced by the laboratory is representative of conditions encountered in the field, the following steps are taken by the laboratory and will subsequently be reviewed by the environmental consultant:

- Where soil sampling occurs, review of RPD values for field and laboratory duplicates to provide an indication that the samples are generally homogeneous, with no unacceptable instances of significant sample matrix heterogeneities
- The appropriateness of collection methodologies, recording of information, handling, storage and preservation techniques will be assessed to ensure/confirm there was minimal opportunity for sample interference or degradation (i.e. volatile loss during transport due to incorrect preservation / transport methods)

Completeness

In validating the degree of completeness of the data sets acquired during construction, the following is considered:

- Whether the data has been collected by experienced specialist personnel in accordance with standard industry technical procedures or suitable sub-contractors
- Where sampling occurs, copies of CoC documentation are reviewed and presented

It can therefore be considered whether the proportion of "useable data" generated in the data collection activities is sufficient for the purposes of the contamination site validation.

Comparability

Given the investigation data set may be comprised of separately collected data sets (different days of land survey and validation sampling), issues of comparability between data sets would be reduced through adherence to the same data collection techniques.

7.7 Step 7: optimise design for obtaining data

7.7.1 Field quality assurance

The sampling / recording fieldwork will be completed in accordance with industry standard operating procedures (SOPs). Surface and sub-surface characteristics and field observations will be fully documented, including photographic records.

7.7.2 Field quality control

QC samples for the proposed soil remediation programs will include duplicate samples. Duplicate samples consist of media collected at the same place and time and split into two samples. The following duplicate samples will be collected:

- ***Inter-laboratory duplicates***: Individual samples are split into two sub portions in the field and placed into two separate containers. One sample is sent to the primary project laboratory and the other sample to an independent, secondary, check laboratory. The purpose of the inter-laboratory duplicates is to assess the analytical accuracy of the primary project laboratory and other factors including sampling methodology

and the heterogeneity of the sample medium. Inter-laboratory samples will be collected and analysed at a rate of no less than one in 20 of total samples analysed.

- ***Intra-laboratory duplicates:*** Individual samples are split into two sub portions in the field and placed into two separate containers. Both samples are forwarded to the primary project laboratory with no communication on the relationship between the duplicate and the primary sample. The purpose of the intra-laboratory duplicates is to assess the analytical accuracy of the laboratory process and other factors including sampling methodology and the heterogeneity of the sample medium. Intra-laboratory soil and soil vapour samples should be collected and analysed at a rate of no less than one in 20 of total samples analysed.

7.7.3 Laboratory quality control

Laboratory quality control procedures typically include analysis of the following:

- ***Laboratory duplicate samples:*** The laboratory collects duplicate sub-samples from a sample submitted for analysis. Analysis of these duplicate pairs is completed at a rate of one sample per 20 samples submitted for analysis, or one sample per batch. The purpose of the laboratory duplicate is to assess the analytical precision (repeatability) of the test result.
- ***Spiked samples:*** Samples submitted to the laboratory are spiked by adding a volume of known concentration of the target analyte prior to extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques.
- ***Surrogate spikes:*** Samples submitted to the laboratory are spiked with an organic compound, which is similar to the analyte of interest in terms of chemical composition and extractability. These organic compounds are not normally found in environmental samples. The surrogates spiked samples are used to assess if any gross error has occurred during a particular stage of the test method.

7.7.4 Assessment of quality control

The validity of all analytical data will be performed in general accordance with:

- USEPA (June 2008). *USEPA Contract Laboratory Program National Functional Guidelines for Organic Methods Data Review, EPA-540-R-08-01*.

Accuracy and precision measurements from the appropriate QC check samples will be compared with the analytical Data Quality Objectives (DQOs) to assess the quality of the analytical data. Should data be found to fall outside acceptable limits of precision and accuracy, appropriate corrective actions will be implemented.

7.7.5 Field QC

An assessment of field quality control samples is completed by calculating the relative percent difference of duplicate samples.

The relative percent difference (RPD) of each duplicate set is calculated to assess overall precision, where:

$$\mathrm{RPD} = (C1 - C2)/((C1 + C2)/2)) \times 100\%$$

where; C1 = primary sample concentration C2 = duplicate sample concentration

An acceptable RPD limit is 30%, however, this can be expected to be higher for concentrations near the PQL. A result exceeding this guideline does not necessarily mean that the data is invalid, but rather the effect of the difference needs to be considered.

7.7.6 Laboratory QC

Assessment of laboratory QC is undertaken internally by the laboratory. Laboratory QC includes:

- Relative Percent Differences – assessed as described above, but between internal laboratory duplicate pairs;
- Percent Recovery (PR) is used to assess the accuracy, where:

$$\mathrm{PR} = \frac{CS - C}{S} \times 100\%$$

where; CS = spiked sample result C = sample result S = spike added.

7.7.7 Field methods

Sample Labelling

The sample labels will include the sample identification number, place of collection, date of collection and initials of the sampling personnel. Each sample will be labelled with a unique sample identification number that will facilitate tracking and cross referencing of sample information.

Field Logs

A summary of activities performed at the site will be recorded in a field log book. Entries for each day will commence on a new page, which will be dated. Corrections will be made by marking through the error with a single line, to remain legible, and initialing this action followed by writing the correction.

The following types of information will be recorded for each sample collected:

- Unique sample identification number;
- Date of sample collection;
- Initials of the sampling personnel;
- Type of sample and sampling method;
- Analyses to be performed on sample; and
- Any other relevant comments (odour, colour, sheen, etc).

Chain of Custody Records

CoC records will be used to track samples from the time of collection to the arrival of samples at the laboratory. Each sample container being shipped to the laboratory will contain a CoC form. The laboratory, upon receiving the samples, will complete the remaining sample receipt fields and will return a completed CoC to Aurecon along with the data deliverables package.

Sample Containers and Handling

Samples will be placed in appropriate sample containers, labelled and properly sealed. Samples will be cushioned within the shipping coolers by the use of bubble pack wrapping. Samples will be kept cool by the use of sealed plastic bags of ice or similar means (not required for asbestos samples).

Samples will be shipped to the project laboratory by commercial courier or delivered by hand. The ice coolers will be sealed, stored in a secure location, and then picked up by the courier or hand delivered on the same or next business day. A security seal will be placed over the lid on the front and back of each shipping cooler. The seal will secure the lid and provide evidence that the samples have not been tampered with en-route to the contracted laboratory.

Upon receipt of the sample containers by the laboratories, the designated custodian will inspect the samples. The sample custodian will note the condition of the samples and seal on the CoC form. The sample custodian will then check the contents against the information noted on the CoC form. If damage or discrepancies are observed, the discrepancies will be duly recorded in the remark's column of the CoC form. The form will then be signed and dated.

All samples will be analysed within analytical holding times.

8 Work health and safety framework

A site-specific work health & safety plan (WH&SP) will be developed by the construction / remediation contractor prior to the commencement of remedial works in order to protect the health and safety of contractor staff and site visitors.

The plan will include (as a minimum but not limited to):

- Emergency phone numbers
- Definition of Roles and Responsibilities for construction and remediation tasks personnel
- Hazard identification and control
- Material Safety Data Sheets (MSDS) for known contaminants at the site (if required)
- Handling procedures for contaminated material
- Use of Personal Protective Equipment (PPE)
- Decontamination procedures
- Incident reporting

All staff will be made aware of the site specific WH&SP and an onsite briefing will be carried out prior to the commencement of earthworks and any specific remediation activities.

Site specific hazards which require identification and control are likely to include:

- Working with loose, bonded and possible friable asbestos products within in situ fill soils (relevant controls should be developed in accordance with Safe Work NSW guidance documents including works area delineation, PPE and asbestos fibre air monitoring)
- Hazardous dusts (asbestos fibre release) – ingestion, inhalation, direct contact
- Open excavations (noting excavations are expected to be shallow across the majority of the site, main excavations in the central, northern and eastern portions of the site)
- Hazards from dermal contact with lead, hydrocarbons and benzo(a)pyrene within fill soils
- Slips, trips and falls
- Manual handling hazards – associated with the use of hand tools
- Below ground services

The following section outlines a framework for development of site-specific management plan(s) to be adopted for protection of the environment both on-site and immediately surrounding the site during construction and earthworks.

Based on the nature of soils to be removed, the controls will aim to protect surface water, air quality, potential for cross contamination, noise and vibration levels by preventing the release of dusts and contaminated soils to the extent practicable.

9 Site environmental management framework

9.1 Site responsibilities

The nominated construction / remediation contractor will be responsible for the finalisation and implementation of the site environmental management framework / remedial works and will be required to comply with the relevant legislative requirements outlined in Section 5 of this RAP.

The final site environmental management framework must ensure that the remedial works comply with relevant requirements of DPIE and the local Council.

9.2 Environmental aspects

Elements of the proposed works that can interact with the environment are termed ‘environmental aspects. For the proposed works, these are identified as broadly including the following:

- Surface water discharge
- Dust emissions
- Noise emission and vibration
- Waste haulage
- Spillage of contaminated materials during transit

9.3 Environmental controls

9.3.1 Site access

During remediation and earthworks, perimeter fencing will be installed which will restrict access to the to the site. Only authorised persons will be able to enter the site. Vehicular access to the site shall be stabilised to prevent the tracking of materials from the site and the adjoining driveway/access point to the road will be cleaned as needed.

9.3.2 Surface water, erosion and sedimentation

The nearest surface watercourse to the site is Manly Creek located circa 740 m south west, draining into Manly Reservoir 1.4 km south. An unnamed tributary of Brookvale Creek is located 658 m south east. Brookvale Creek then drains into Manly Creek 3.2 km to the south east of the site. Potential impacts from the remediation works to local surface water are considered to be low.

The potential for increased sediment load or pollutant load from site run-off will be managed by erosion and sediment controls. The erosion and sediment control will be implemented by the appointed contractor.

Possible mitigation measures include:

- Establishment of erosion and sediment measures prior to works commencing on the site and regular inspection and maintenance to confirm measures are in a functional condition throughout the works
- Disturbance of site surface cover will be minimised where possible to reduce the potential for off-site tracking of sediment and soil
- A sediment fence will be erected on the down gradient perimeter of the remediation or earthworks areas. The controls will ensure all run-off is sediment-free

9.3.3 Stockpiles

- Appropriate stockpile management practices will be put in place and stockpiled material will be stored within appropriate environmental controls (i.e. covered where practical) and outside of drainage lines
- Maintenance on all stockpile control measures will be carried out on a daily basis, and during and following major storm events. Maintenance will be logged

- No stockpiles of soil or other materials shall be placed on footpaths or nature strips unless prior Council approval has been obtained
- All stockpiles of soil or other materials shall be placed away from drainage lines, gutters or stormwater pits or inlets
- All stockpiles of soil or other materials likely to generate dust or odours shall be covered
- All stockpiles of contaminated soil shall be stored in a secure area and be covered if remaining more than 24 hours
- Place on HDPE liner or validate the former stockpile surface for contaminants of concern via laboratory analysis.

9.3.4 Air quality

During any disturbance of asbestos containing contaminated soils, air monitoring will be conducted at each of the site boundaries or as directed by the environmental consultant / occupational hygienist.

If only bonded and non-friable asbestos containing contaminated soils are being handled, an assessment of nearby sensitive receptors and a risk assessment should be provided by a suitably qualified and experienced environmental consultant / occupational hygienist with a justification and rationale for not undertaking air monitoring.

9.3.5 Dust and particulates

Due to the nature of the work and quality of any exposed impacted soil material, the potential for dust generation should be controlled and be kept to a minimum. Potential mitigation measures associated with dust management include:

- Trucks and construction plant entering the site should be well maintained in accordance with the manufacturer's specification. Vehicles with smoky exhausts (more than 10 seconds) shall be stood down for maintenance
- Unnecessary idling for trucks and plant shall be avoided with engines turned off during periods of inactivity
- All equipment shall be maintained in good working order
- Dust retardant/ water spray will be used to prevent dust lift-off where necessary
- Minimisation of number of 'working' stockpiles
- Stockpiles of soil (if required) will require to be covered if remaining on-site for more than 24 hours
- All dust generating loads will be covered except during loading and unloading activities

9.3.6 Noise

The remediation works are likely to cause an increase in noise during the period of work, particularly to surrounding businesses. Potential noise mitigation measures are:

- Where possible, the distance between noisy machinery and sensitive receptors will be maximised and noisy equipment/machinery will be oriented away from sensitive areas
- Equipment will be well maintained
- Unnecessary idling for trucks and plant shall be avoided with engines turned off during periods of inactivity (e.g. during loading)

9.3.7 Waste

The engaged contractor shall be responsible for safely handling and (if required) temporarily stockpiling wastes on the site. The proposed waste management approach is as follows:

- Wastes will be characterised and properly disposed of too licensed facilities approved to accept the waste types

- Disposal of all contaminated soils is to be tracked by the contractor and correlated with the waste disposal site operator's landfill records and/or haulage dockets. This information will be provided to the project environmental consultant and the site owner for inclusion in the validation report.

9.3.8 Waste material transporting

The construction / remediation contractor shall ensure that there is no material tracked onto the street and that the load is securely covered. All road rules shall be observed.

The transporter of any waste must:

- Before transporting the waste, certify that any part of the waste transport certificate for the waste that is required to be removed by the transporter has been completed accurately
- Before transporting the waste, ensure that there is a consignment authorisation that authorises the transport of the waste
- Carry in the vehicle transporting the waste the waste transport certificate for the waste

A record of truck movements shall be kept in order to enable the waste to be tracked to the receiving location. The receiving location shall issue disposal dockets and these shall be reconciled against the truck movement records to ensure accountability for all materials transported from the site.

9.3.9 Hazardous building materials controls

McLeod House and associated buildings in the eastern portion of the site will be demolished under an existing DA, which is outside the scope of this RAP (for demolition and management of surface soils within 10 m of the building footprint). Therefore, all hazardous buildings materials controls will be undertaken under the demolition contractors management plans.

9.3.10 Underground services

The construction / remediation contractor shall be responsible for the location and protection of underground services which have the potential to be impacted by the remedial works.

9.3.11 Tree and vegetation preservation

All mature trees shall be protected for the duration of the remedial works. Where vegetation clearing, tree pruning or removal is required to facilitate successful completion of the works, approval from DPIE or Council is required. Refer to conditions of consent and SEARs.

9.4 Environmental control performance monitoring

9.4.1 Site inspection program

Regular site inspections will provide quantification of the effectiveness of the safeguards recommended. It will also enable auditing of the safeguard measures to ensure they achieve their objectives and to facilitate modification where necessary.

Site inspection will be undertaken during remediation in the following areas:

- Inspection of trucks used for transporting materials from the site to ensure that soil adhering to the wheels or undercarriage is minimised. Any accumulation of soil will be removed prior to departure from the site
- Sedimentation control measures will be inspected weekly or after heavy rain. This will involve checking the sedimentation control structures are operating effectively, with no silt being discharged to stormwater. Corrective action will be instituted where necessary and a follow up inspection will be undertaken to verify the outcome of the corrective action
- Observation of site activities to assess the extent of dust generation from the work site

Should routine site inspections and/or external parties identify a potential issue relating to the remediation works, potential issues will be logged, validated and where required, rectified.

9.5 Contingency planning

9.5.1 Emergency response plan

An emergency response plan will be prepared prior to the commencement of the remediation works. The purpose of the plan will be to identify possible emergency situations and to define procedures that would be used to ensure the safety of both on- and off-site personnel in the event of an emergency.

Emergency events may include but are not limited to:

- Oil or other contaminant spillage
- Fire
- Failure of any control structures
- Industrial accident

In order to ensure that the environmental impact of such events is minimised, emergency procedures are to be followed. These may include:

- The first priority is the safety of any persons either workers or others involved in the events. Whatever reasonable actions necessary to protect the safety of potentially affected persons will be taken. The site-specific Health and Safety Plan (HASP) will outline actions to be taken in relation to safety of persons if these circumstances eventuate.
- The second priority is to quickly minimise the environmental damage. All emergency action should take place as soon as possible after the event. Actions to be taken may include:
  - The containment of pollution by booms, silt fences or other means
  - The temporary re-establishment of the control structure
  - The taking of appropriate samples to assess the extent of the problem

In the event of an emergency arising, Aurecon site representatives will be contacted immediately after all persons are accounted for and all possible immediate actions to control the pollution have been taken.

9.5.2 Contingency management plan

Table 3 below summarises conditions that can reasonably be expected and the resulting problems they may cause, and how these problems may be resolved within the context of the works.

Table 3 Issue identification and corrective actions

Anticipated problem	Corrective action by contractor
Further contamination identified	Stop work, adjust the remediation actions in accordance with remediation objectives and strategy outlined in RAP. Refer to **Appendix G** – unexpected finds management plan (UFMP).
Excessive rain/drainage	Cover exposed surfaces with plastic; or stop work until run-off is more manageable. Inspect and maintain sediment controls.
Excessive dust	Use of local and perimeter sprays, soaking of excavation areas, mobile sprays, covering with geofabric, monitoring of weather conditions or ceasing activity.
Equipment failures	Maintain spare equipment or parts; or maintain alternate rental options; or shut down affected operations until repairs are made.
Release of fuel/oil from machinery	Remove source, use spill kit to remove oil and make any repairs as required.
Silt fence fails	Stop work and repair fence to specifications.
Excessive noise	Identify source and review noise attenuation equipment and as necessary provide silencers on noisy equipment. Change work hours.

9.5.3 Site stormwater management plan

The remedial contractor must prepare a stormwater management plan during remedial works and as part of the project CEMP. The stormwater management plan must indicate site specific background information, compliance requirements, regulatory requirements, incident management, monitoring, review, responsibilities and document control.

9.5.4 Noise control plan

The remedial contractor must prepare a noise control plan during remedial works and as part of the project CEMP. The odour control plan must indicate site specific background information, compliance requirements, regulatory requirements, noise types and sources, incident management, monitoring, review, responsibilities and document control.

9.5.5 Odour control plan

The remedial contractor must prepare an odour control plan when excavating fill materials and as part of the project CEMP. The odour control plan must indicate site specific background information, compliance requirements, regulatory requirements, odour types and sources, incident management, monitoring, review, responsibilities and document control.

9.5.6 Remediation schedule

The remedial contractor must prepare a remediation program that outlines key milestones and timelines for remedial activity. The schedule must consider detailed designs at the time and earthworks programming.

9.6 Construction and remediation working hours

Standard approved construction hours are from:

- 7.00am–5.00pm, Mondays to Fridays
- 7.00am–5.00pm, on Saturdays (Environmental Planning and Assessment (*COVID-19 Development – Construction Work Days) Order (No.2) 2021*).
- Project specific approvals and conditions of consent will take precedence over construction hours listed above.

Note that Saturday working hours could be reduced pending Government orders, which were typically 3:30pm Saturdays.

Site workers can be on site outside of these hours. For example, to use site sheds and offices. When needed, development proponents and contractors can get approval to work outside normal construction hours by making a request to Council or DPIE.

9.7 Complaints reporting and resolution

Any complaints from adjoining sites or the general public directed to the construction / remediation contractor and supervisors will be answered in accordance with agreed Q&A protocols between the NSW Department of Education and the principal contractor.

10 Contacts during remediation and construction

The following provisional contact names and numbers for project personnel are provided for the duration of the project development and specifically for the early earthworks, remediation and construction program.

Table 4 below should be updated either within this RAP document or within the onsite construction staff register when changes occur or updates are required.

Table 4 Project personnel contact details

Role / person	Company	Contact details
Construction Project Manager *To be advised*	*To be advised*	*To be advised*
Construction site manager / superintendent *To be advised*	*To be advised*	*To be advised*
Construction environmental / safety manager *To be advised*	*To be advised*	*To be advised*
Design technical director *To be advised*	*To be advised*	*To be advised*
Planning and approvals manager *To be advised*	*To be advised*	*To be advised*
Contaminated land manager *To be advised*	*To be advised*	*To be advised*
Specialised remediation contractor *To be advised*	*To be advised* (if required)	*To be advised*
NSW EPA Accredited Site Auditor (accredited under the *Contaminated Land Management Act 1997*) Louise Walkden	Ramboll Australia Pty Ltd	Phone: 02 9954 8100 Email: Lwalkden@ramboll.com

11 Contingency measures

11.1 Remediation contingency plan

The selected remediation approach will adopt routine methodologies and has been implemented extensively across similar sites in Sydney and NSW over a number of years. It is considered highly unlikely the methodology will not be successful in achieving the remediation objectives.

In the event that the proposed excavation, capping, exclusion barriers and validation approach proves unable to meet the remediation objectives or leaves asbestos impacted fill at the site surface, contingency would involve an alternative approach.

Any alternative approach that deviates significantly from this RAP must be communicated and endorsed by the appointed NSW EPA Site Auditor (Ramboll) and consent authority (NSW DPIE or local Council) informed, refer to Section 10 for contact details.

Due to the continued use of a revised and updated EMP after development and earthworks have finished for the site, this will form the main contingency for residual impacted fill materials that remain within the site and minimise potential for exposure for future workers, site users and incidental users.

11.2 Unexpected finds (remediation work or construction)

Previous site investigations has been completed across most of the site, characterising soil and groundwater quality (GHD 2021, Tetra Tech Coffey 2021, Tetra Tech Coffey 2021a and Aurecon, 2022).

As with any site investigation program, it is acknowledged that ground conditions between sampling points may vary and isolated contaminant impacts may arise from unexpected sources and/or in unexpected locations. Given the sampling frequency achieved by previous site investigations, it is considered such finds (if any) would be isolated and generally detectable through visual means and subsequently manageable through routine measures, most likely comprising excavation and placing of capping / exclusion barriers over the materials and recording locations via land survey.

An unexpected finds management plan (UFMP), is considered to be a relatively conservative, but an appropriate precautionary measure and will be developed and implemented by the construction contractor within their project CEMP. A site specific UFMP based on the known concept designs and site investigation outcome is provided in **Appendix G.**

12 Conclusions

The strategy presented in this RAP is considered to be the most effective method to:

- Meet NSW EPA endorsed guidelines for contaminated land and DPIE development consent conditions requirements / Secretary's environmental assessment requirements (SEARs)
- Minimise human health and environmental risks to future site occupiers, users and during construction and development activities
- Manage the asbestos impacted fill materials and other contaminants across the site during construction and provide a validation report that outlines the operational phase management requirements to minimise potential for exposure to future site users, workers and incidental visitors
- Render the site suitable for the proposed concept development plans for The Forest High School, higher education land use setting and provision of an updated EMP (post remediation / earthworks and development)

13 References

- Architectus. (5 August 2022). The Forest High School Schematic Design Report (SSDA). Document number: K:\200420.00\Docs\C_Client\C05_Reports\04_SSDA Report, Issue A.
- *Contaminated Land Management Act 1997*
- EnHealth (2005) - *Management of Asbestos in the Non-Occupational Environment.*
- enStruct. (4 August 2022). *The Forest High School Bulk Earthworks.* Drawing number CV-0200, Option 2-E.
- enStruct. (29 April 2022). *The Forest High School Bulk Earthworks Section.* Drawing number CV-0201, revision B.
- enStruct. (09 December 2021). *The Forest High School Contamination Plan - Partial Excavation Courts Area.* Drawing number CV-0600-1, revision C.
- GHD. (2020, September). *Frenchs Forest Precinct - 187 Allambie Road, Allambie Heights - Preliminary Site Investigation.* 12535166.
- NEPC 1999, *National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013).*
- NSW EPA. (2020). *Assessment and management of hazardous ground gases. Parramatta:* NSW Environment Protection Authority.
- NSW EPA. (2016). *Environmental Guidelines, Solid Waste Landfills, Second Edition*.
- NSW Environment Protection Authority (2014) – *Waste Classification Guidelines, Part 1: Classifying Waste and Addendum.*
- NSW Environment Protection Authority, March 2007. *Guidelines for the Assessment and Management of Groundwater Contamination.*
- NSW Environment Protection Authority, October 2017. *Guidelines for the NSW Site Auditor Scheme (3rd edition).*
- NSW Environment Protection Authority, August 2011. *Guidelines for Consultants Reporting on Contaminated Sites.*
- NSW Government, 1998. *SEPP 55 – Remediation of Land*
- Oculus (2022). *The Forest High School Allambie Heights, Landscape Concept Design Report.* (Project number S20-032).
- Oculus (11 August 2022). *The Forest High School, General Arrangement Plan Overall Site .* (Project number S20-032). Drawings L200, issue 01.
- *Protection of the Environment Operations Act 1997.*
- *Protection of the Environment Operations (Waste) Regulation 2014.*
- Safe Work NSW (2016) – *Code of Practice: How to Safely Remove Asbestos*
- Tetra Tech Coffey. (2021, June). *The Forest High School Relocation, Detailed Site Investigation Report.* (ref: 754-SYDGE284698-AC).
- Tetra Tech Coffey. (2021a, May). *The Forest High School Relocation, Geotechnical Investigation Report. (ref: 754*-SYDGE284698-AB).
- Tetra Tech Coffey. (2021b, May). *The Forest High School Relocation, Asbestos and Hazardous Materials pre-Demolition Report.*
- Wilson, S., & Card, C. (1999). *Reliability and Risk in Gas Protection Design.* Ground Engineering.

Appendix A – Figures

Site boundary

Cadastre

P:\GIS\Project-4\project\Forest_High_School\P520739_Site_Overview.mxd\JOB No.\21-12-21\Virgil Robinson\Rev 0

Source: Aurecon

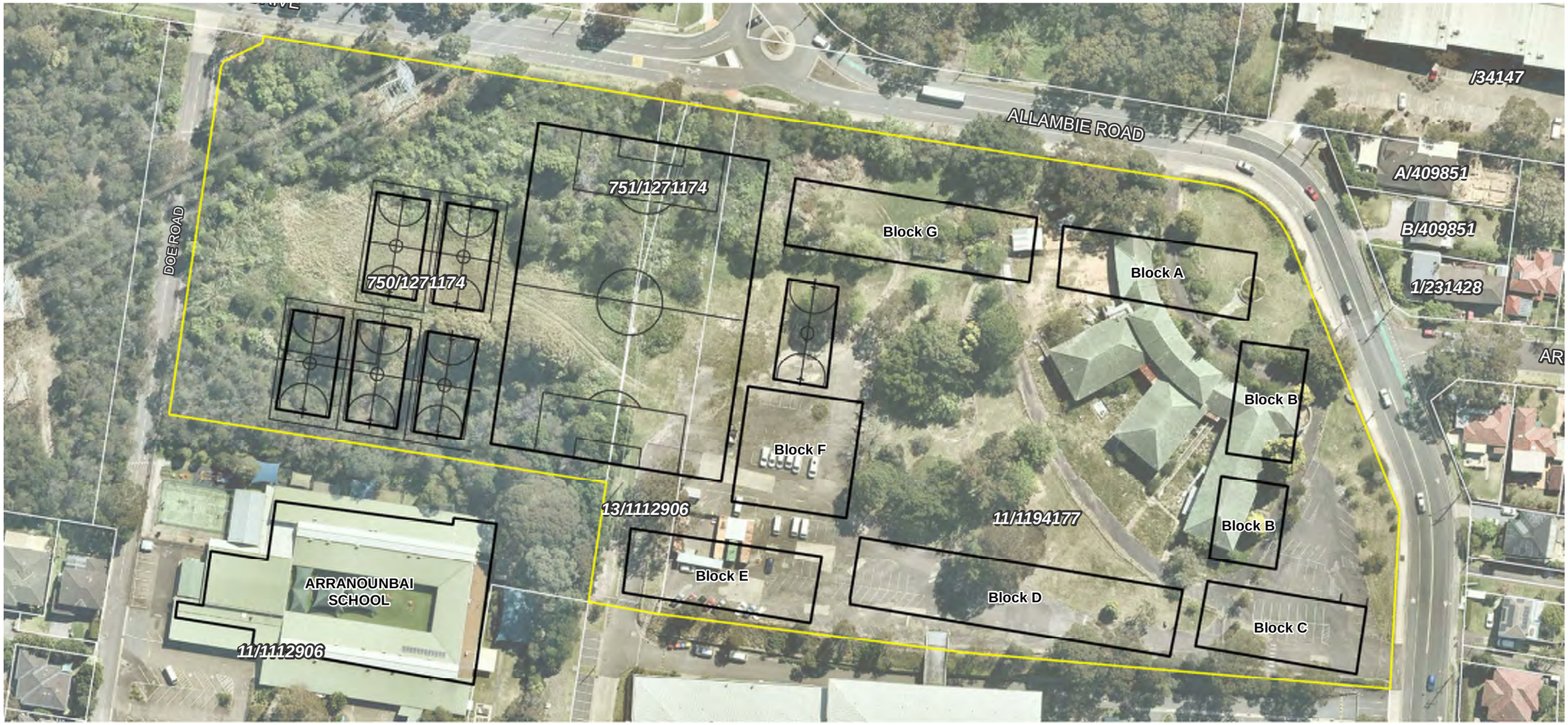
1:1,500

0 25 50 m

Projection: GDA 1994 MGA Zone 56

P520739 Forest High School Remedial Action Plan

FIGURE 1: Site Overview and Lot/DP



\\aurecon.info\Shares\AUSYD\Projects\GIS\Project-4\project\Forest_High_School\P520739_Site_Overview_rev1.mxd\JOB No.\19-08-22\Bridie.Jackson\Rev 0

Source: Aurecon

1:1,135

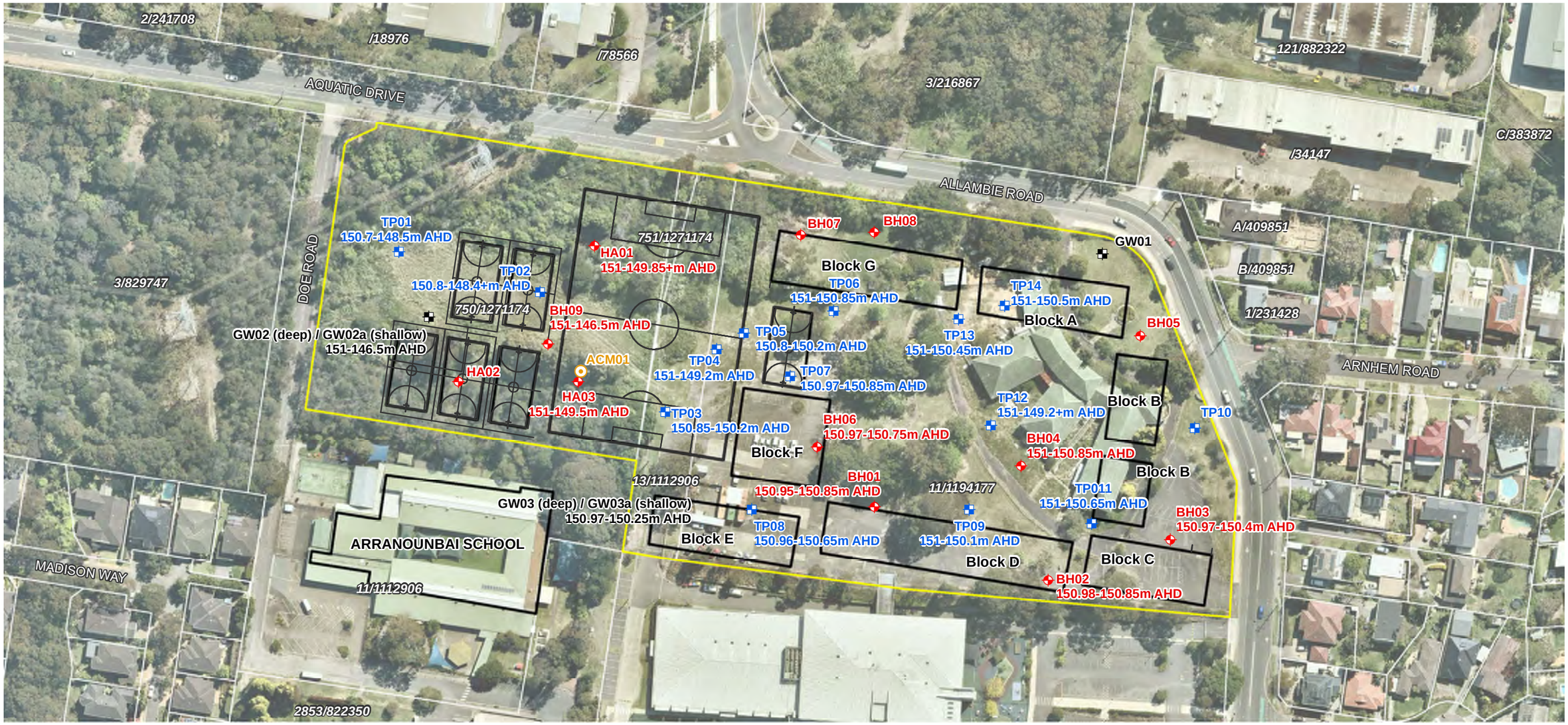
0 25 50 m

Projection: GDA 1994 MGA Zone 56

P520739 Forest High School Remedial Action Plan

FIGURE 2: Site Overview and Site Plan Design

aurecon



Site boundary
Design features
Cadastre

Borehole
Groundwater Well
Test Pit

Geotechnical investigation location

(Thickness of logged fill labelled where available)

Asbestos Fragment

\\aurecon.info\Shares\AUSYD\Projects\GIS\Project-4\project\Forest_High_School\P520739_GI_locations_rev1.mxd\JOB No.\19-08-22\Bridie.Jackson\Rev 0

Source: Aurecon

1:1,500
0 25 50 m

Projection: GDA 1994 MGA Zone 56

P520739 Forest High School Remedial Action Plan

FIGURE 3: Contamination Investigation Locations

aurecon

P:\GIS\Project-4\project\Forest_High_School\P520739_GI_locations.mxd\JOB No.\21-12-21\Virgil.Robinson\Rev 0

Site boundary

Cadastre

Geotechnical investigation location

(Thickness of logged fill labelled where available)

- Asbestos Fragment
- Borehole
- Groundwater Well
- Test Pit

Thickest fill layers with inclusions of brick, terracotta, potential for ACM (based on Tetra Tech Coffey 2021)

Indicative subsurface filling areas of the site and mounding of fill (based on GHD 2020 and Tetra Tech Coffey 2021)

Source: Aurecon

1:1,500

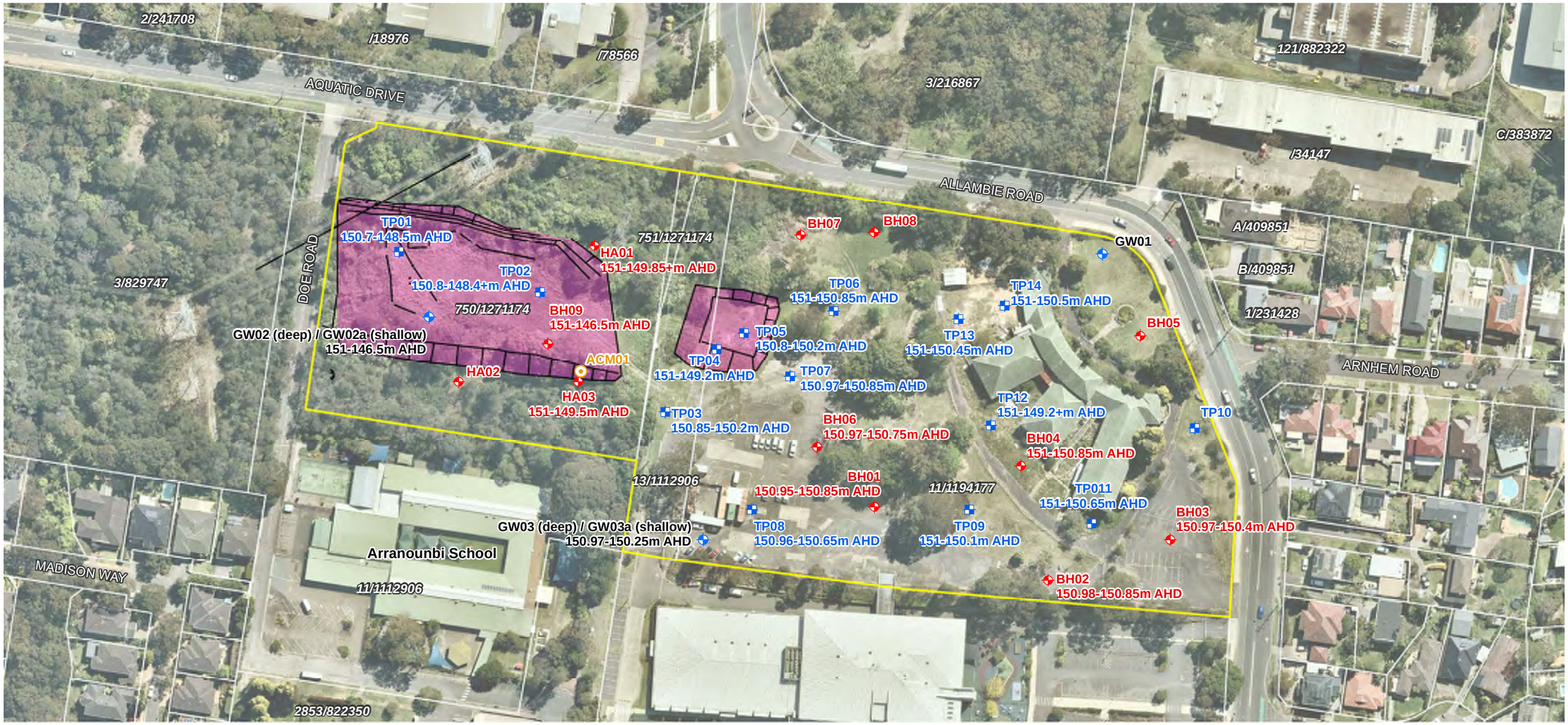
0 25 50 m

Projection: GDA 1994 MGA Zone 56

P520739 Forest High School Remedial Action Plan

FIGURE 4: Thickest fill layers and indicative filled areas of the site

aurecon



Contamination investigation location

(Thickness of logged fill labelled where available)

- Asbestos Fragment
- Borehole
- Groundwater Well
- Test Pit
- Site boundary
- Cadastre
- Partial survey overlay (Architectus Issue A, 26/11/2021)
- Main areas of deep uncontrolled filling across the site (indicative only)

Source: Aurecon

1:1,500

0 25 50 m

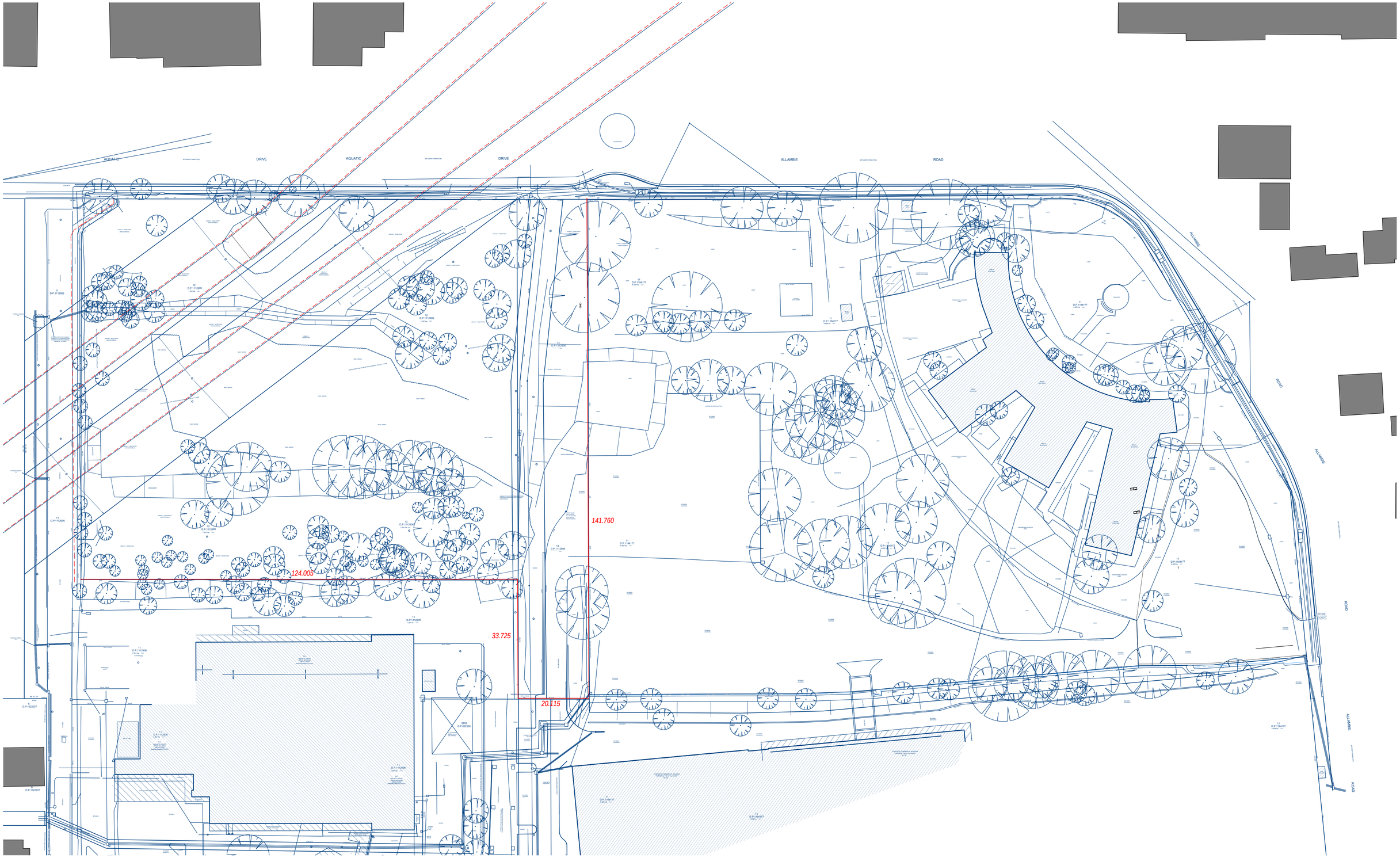
Projection: GDA 1994 MGA Zone 56

P:\GIS\Project-4\project\Forest_High_School\P520739_Survey_Overlay_rev1.mxd\JOB No.\21-02-22\bridie.jackson\Rev 0

P520739 Forest High School Remedial Action Plan

FIGURE 5: Main areas of deeper uncontrolled filling

Appendix B – Land survey and demolition plans



Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	100% SCHEMATIC DESIGN	26/11/2021

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

checked	Checker	scale	1 : 500@A1
drawn	Author	project no	200420.00

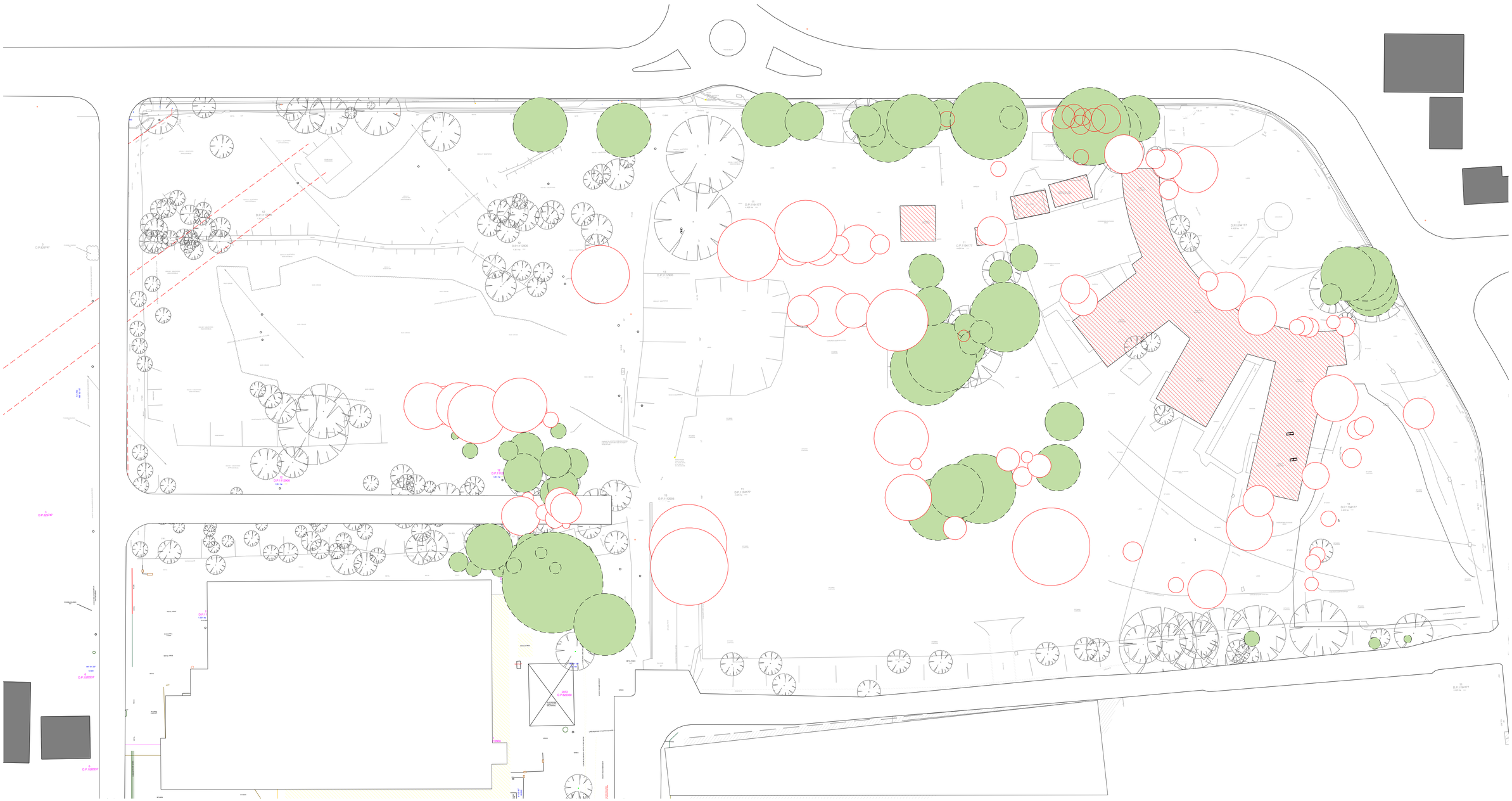
project
The Forest High School

drawing
EXISTING SITE SURVEY PLAN

drawing no. **SD0001**

issue **A**

26/11/2021 6:22:06 PM



Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	FOR INFORMATION - QS REVIEW	09/11/2021
B	100% SCHEMATIC DESIGN	26/11/2021

EXISTING BUILDING TO BE DEMOLISHED
SITE BOUNDARY
EXISTING TREES TO BE RETAINED
EXISTING TREES TO BE REMOVED
POWER LINES

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

checked	Checker	scale	1 : 500@A1
drawn	Author	project no	200420.00

project
The Forest High School

drawing
Demolition Plan

drawing no. **SD0501**

issue **B**

26/11/2021 6:37:46 PM

Appendix C – Bulk earthworks plans

A1

AQUATIC DRIVE

ALLAMBIE ROAD

ARNHEM ROAD

ALLAMBIE ROAD

PRIVATE ROAD

ARRANOUNBAI SCHOOL

AREA UNDER PLAYING FIELD BE FILLED WITH EXCESS CUT MATERIAL FROM THE SITE

AREA OF UNCONTROLLED FILL AS PER RAP REPORT BY AURECON

AREA OF UNCONTROLLED FILL AS PER RAP REPORT BY AURECON

AREA UNDER GYM BE FILLED WITH EXCESS CUT MATERIAL FROM THE SITE

AREA OF UNCONTROLLED FILL AS PER RAP REPORT BY AURECON

1:3 PERMANENT BATTER

1:2.5 PERMANENT BATTER

1:2 TEMPORARY BATTER

1:2 TEMPORARY BATTER

1:2 TEMPORARY BATTER

1:2 TEMPORARY BATTER

1:2 TEMPORARY BATTER

1:2 TEMPORARY BATTER

1:2.5 PERMANENT BATTER

1:2 TEMPORARY BATTER

1:3 PERMANENT BATTER

1:3 PERMANENT BATTER

TEMPORARY SHORING WALL ALONG BUILDING PLATFORM

FFL 152.12
BEL 151.82

FFL 155.10
BEL 154.80

FFL 154.80
BEL 154.50

FFL 152.40
BEL 152.10

FFL 148.54
BEL 148.24

FFL 146.30
BEL 146.00

FFL 147.60
BEL 147.30

FFL 151.20
BEL 150.90

FFL 151.20
BEL 150.90

BLOCK G

BLOCK A

BLOCK B

BLOCK F

BLOCK B

BLOCK E

MAIN ENTRY

ASSEMBLY COURT

GAMES COURT

GAMES FIELD

PARKING & LOADING ENTRY

EXCLUSION ZONE

EXISTING ELECTRICAL PYLON

LINE OF PLAYING FIELD ABOVE

CAR PARKING AND LOADING UNDER AT RL146.30

CAR PARKING AND LOADING UNDER AT RL144.00

DOG RUN

COLA

SSU DROP OFF AT RL153.80

NEW KISS 'N DROP

EXISTING SCHOOL BUS ZONE

ACCESSIBLE PARKING BAY

TRAFFIC INTERSECTION

141.50m

150.58m

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Uncontrolled Volume	**1.000**	0.000	3656.304sq.m	883.409 Cu. M.	0.000 Cu. M.	883.409 Cu. M.<Cut>
VOLUME SURFACE	**1.000**	**1.000**	24881.500sq.m	14182.986 Cu. M.	14020.992 Cu. M.	161.994 Cu. M.<Cut>

VOLUME OF ASBESTOS TO BE CAPPED : 20% OF 883m^3 = 176.7m^3

AREA OF GEOGRID FRO CAR PARK, ACCESS ROAD AND LOADING DOCK = 4,100m^2

BULK EARTHWORKS METHODOLOGY

STAGE 1

1. PROVIDE THE BULK EXCAVATION FOR BUILDINGS TO THE BULK EARTHWORKS LEVELS AS SHOWN ON THE PLAN WHICH COMPRISES OF FINISHED FLOOR LEVEL MINUS (SLAB THICKNESS + BASE COURSE).
2. PROVIDE BULK EXCAVATION FOR UNDERGROUND CARPARK, LOADING DOCK AND ACCESS ROAD WHICH COMPRISES OF FINISHED SURFACE LEVELS MINUS PAVEMENT (0.4m).
3. STOCKPILE THE VOLUME OF EXCESS UNCONTROLLED CUT MATERIAL WITHIN THE SITE.

STAGE 2

1. UNCONTROLL CUT MATERIAL EXCAVATED FROM STAGE 1 TO UNDERGO APPROPRIATE SEIVING AND REMOVAL OF WASTE MATERIAL TO BE RESUED ON SITE. THIS IS BASED ON THE GEOTECH REPORT SECTION 6.2.7 MATERIAL REUSE AND DISPOSAL, PREPARED BY TETRA TECH COFFEY, REFERENCE NUMBER 754-SYDGE284698-AB, DATED 31 MAY 2021.
2. AFTER UNDERGOING TREATMENT, UNCONTROL CUT MATERIAL TO BE RESUED AS CONTROL FILL UNDER THE SPORTS FIELD AND GYM.
3. LEFTOVER WASTE (ASBESTOS) AFTER CLEANING TO BE DISPOSED UNDER THE SPORTS FIELD.
4. GEOGRID TO BE USED IN PROPOSED ACCESS ROAD CARPARK AND LOADING DOCK.

1. * BULK EARTHWORKS LEVEL = FINISH SURFACE - (SLAB THICKNESS + BASE COURSE)
2. BULK VOLUMES DOES NOT INCLUDE STRIPPING OF TOPSOIL.
3. REFER ARCHITECTS DRAWINGS FOR BUILDING SETOUT
4. BULK EARTHWORK DRAWINGS ARE FOR BULK EXCAVATION ONLY. THEY ARE NOT TO BE USED FOR DETAILED EXCAVATION SUCH AS: LIFT SHAFTS, FOOTINGS, PITS, BACKFILL, TRENCHING AND LANDSCAPING.
5. BULK EARTHWORK SETOUT REFERS TO BULK EXCAVATION ONLY. THEY ARE NOT TO BE USED FOR BUILDING, KERB OR ANY OTHER SETOUT.

LEGEND

BE 22.00

SITE BOUNDARY
EASEMENTS
BULK EARTHWORKS MINOR CONTOUR
BULK EARTHWORKS MAJOR CONTOUR
BUILDING OUTLINE
BULK EARTHWORKS PAD OUTLINE
BATTER
BULK EARTHWORKS PLATFORM LEVEL
EXISTING WATER LINE
EXISTING ELECTRICITY OVERHEAD LINE
EXISTING ELECTRICITY UNDERGROUND LINE
EXISTING STORMWATER LINE
EXISTING GAS LINE
EXISTING COMMS LINE
CARPARK AND LOADING DOCK AREA 4250 m^2

Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)	2D Area (m^2)
1		-4.211	-2.100	2595.1
2		-2.100	-1.200	2811.7
3		-1.200	-0.900	1706.8
4		-0.900	-0.700	1093.3
5		-0.700	-0.400	1606.9
6		-0.400	-0.200	1143.8
7		-0.200	0.000	1312.6
8		0.000	0.100	682.5
9		0.100	0.200	632.1
10		0.200	0.300	655.8
11		0.300	0.400	649.5
12		0.400	0.700	1837.1
13		0.700	1.000	1752.0
14		1.000	1.400	1831.5
15		1.400	2.000	1468.7
16		2.000	4.400	1865.4

rev	date	description	drn	ch'k
E	04/08/22	UPDATED FOR NEW DESIGN	BEJ	PAL
D	11/07/22	VOLUME OF UNCONTROLLED FILLED ADDED	GBM	PAL
C	08/07/22	ISSUE FOR COSTING	GBM	PAL
B	01/06/22	ISSUE FOR CONCEPT DESIGN	PAD	PAL
A	13/05/22	BULK EARTHWORKS GEOGRID OPTION	PAD	PAL

rev	date	description	drn	ch'k

NSW GOVERNMENT Education School Infrastructure

enstruct group pty ltd

Level 4, 2 Glen Street
Milsons Point NSW 2061
Australia

Telephone (02) 8904 1444
Facsimile (02) 8904 1555
www.enstruct.com.au

enstruct

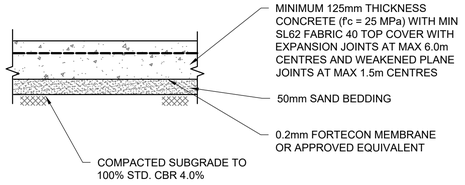
project: THE FOREST HIGH SCHOOL

drawing title: BULK EARTHWORKS OPTION 2

status: FOR INFORMATION ONLY

scale at A1	drawn by	checked	date
1:500	GBM	PAL	MAR-21

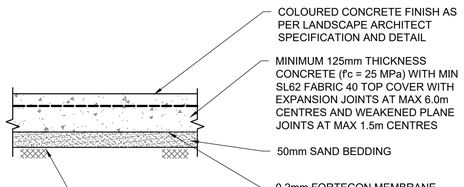
project no.	drawing no.	rev.
6310	C200-OPTION2	E



PV1

PAVEMENT P1
INSITU CONCRETE PAVING

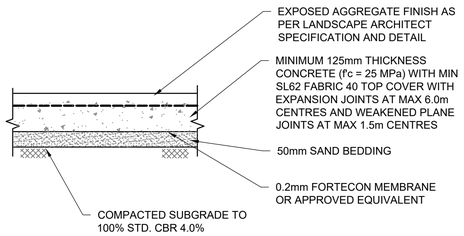
SCALE:1:10



PV2

PAVEMENT P2
INSITU COLOURED CONCRETE PAVING

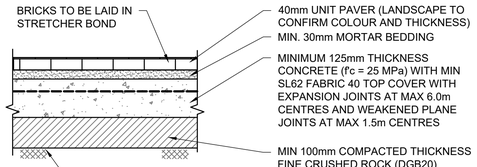
SCALE:1:10



PV3

PAVEMENT P3
INSITU CONCRETE BANDING WITH EXPOSED AGGREGATE

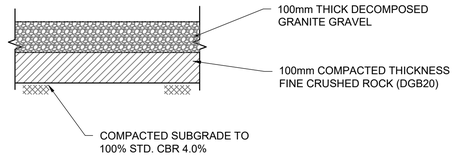
SCALE:1:10



PV7

PAVEMENT PV7
RECYCLED BRICK PAVING

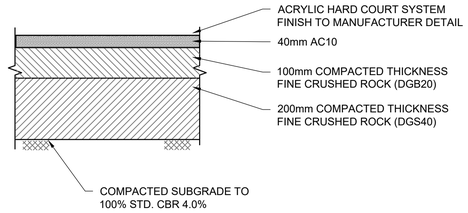
SCALE:1:10



PV4

PAVEMENT PV4
DECOMPOSED GRANITE GRAVEL

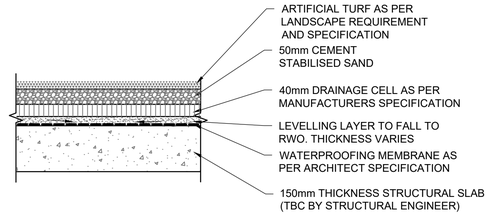
SCALE:1:10



PV8

PAVEMENT P8
SPORTS COURT

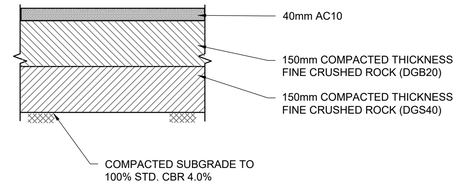
SCALE:1:10



PV9

PAVEMENT P9
SPORTS FIELD ON SUSPENDED SLAB

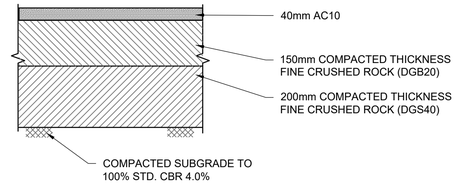
SCALE:1:10



P11

PAVEMENT P11
ACCESS ROAD

SCALE:1:10



P12

PAVEMENT P12
LOADING DOCK

SCALE:1:10

MP

MASS PLANTING AS PER LANDSCAPE ARCHITECT DETAIL

TF

TURFING AS PER LANDSCAPE ARCHITECT DETAIL

rev	date	description	drn	ch'k
D	12/08/22	REISSUE FOR 100% SD	MZV	PAL
C	03/12/21	EMERGENCY ACCESS ROAD ADDED	PAD	PAL
B	24/11/21	ISSUE FOR 100% SD	PAD	PAL
A	19/11/21	ISSUE FOR DRAFT 100% SD	PAD	PAL

rev	date	description	drn	ch'k

NSW GOVERNMENT Education School Infrastructure

enstruct group pty ltd

Level 4, 2 Glen Street
Milsons Point NSW 2061
Australia

Telephone (02) 8904 1444
Facsimile (02) 8904 1555
www.enstruct.com.au

enstruct

project: THE FOREST HIGH SCHOOL

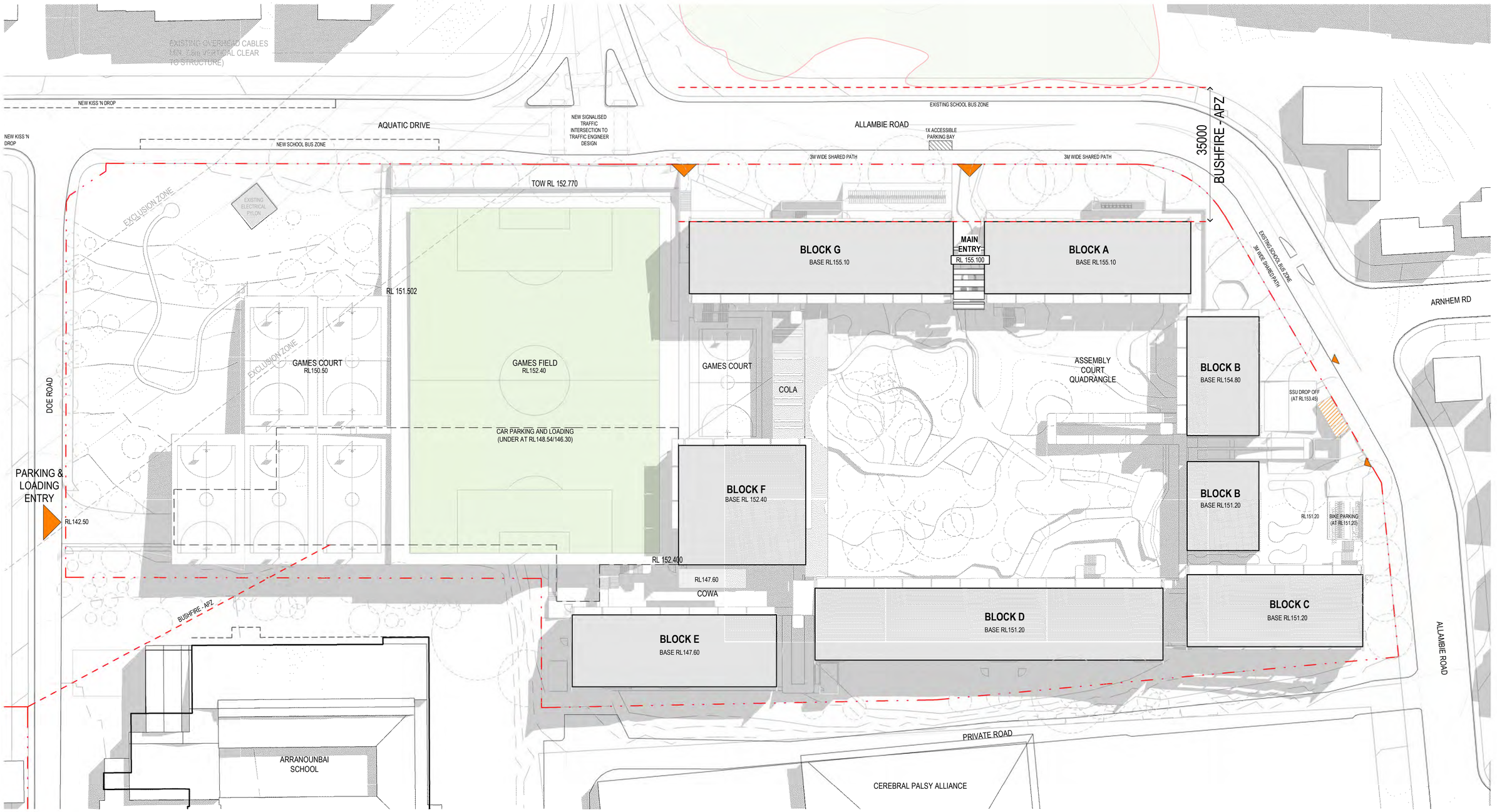
drawing title: PAVEMENT DETAIL

status: FOR INFORMATION ONLY

scale at A1	drawn by	checked	date
AS SHOWN	PAD	PAL	NOV-21

project no.	drawing no.	rev.
6310	CV-0405	D

Appendix D – Schematic design



Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
C	50% CONCEPT DESIGN ISSUE	20/05/2022
D	COORDINATION ISSUE	25/05/2022
E	100% CONCEPT DESIGN ISSUE	27/05/2022
F	FOR INFORMATION	10/06/2022
G	FOR INFORMATION	17/06/2022
H	50% SCHEMATIC DESIGN ISSUE	01/07/2022
I	FOR INFORMATION	08/07/2022
J	60% SCHEMATIC DESIGN ISSUE	08/07/2022
K	70% SCHEMATIC DESIGN	15/07/2022
L	100% SCHEMATIC DESIGN	22/07/2022
M	FOR INFORMATION	26/07/2022
N	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
O	100% SCHEMATIC DESIGN - CONEXT PLANS	01/08/2022
P	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

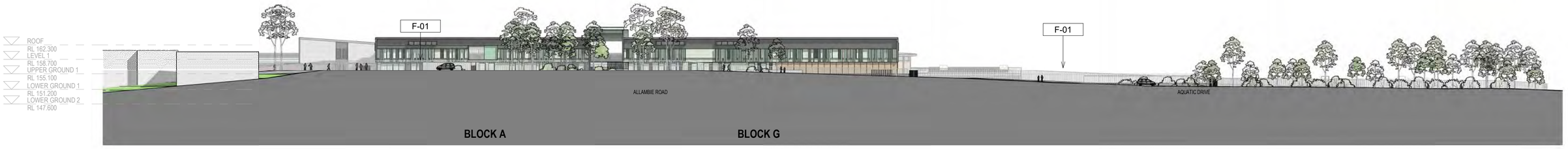
checked	SW	scale	1 : 500@A1
drawn	KG JL IT RW SW	project no	200420.01

project
THE FOREST HIGH SCHOOL

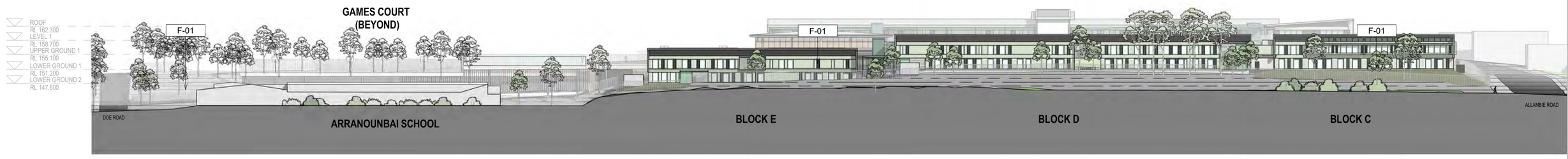
drawing
CONTEXT PLAN - SITE PLAN

drawing no. **SD1001** issue **P**

5/08/2022 7:56:47 PM



2 / 2001 North Elevation (Street)
SCALE: 1 : 500



3 / 2001 South Elevation (Street)
SCALE: 1 : 500

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	100% CONCEPT DESIGN ISSUE	27/05/2022
B	50% SCHEMATIC DESIGN ISSUE	01/07/2022
C	100% SCHEMATIC DESIGN	22/07/2022
D	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
E	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

checked	SW	scale	1 : 500@A1
drawn	JL	project no	200420.01

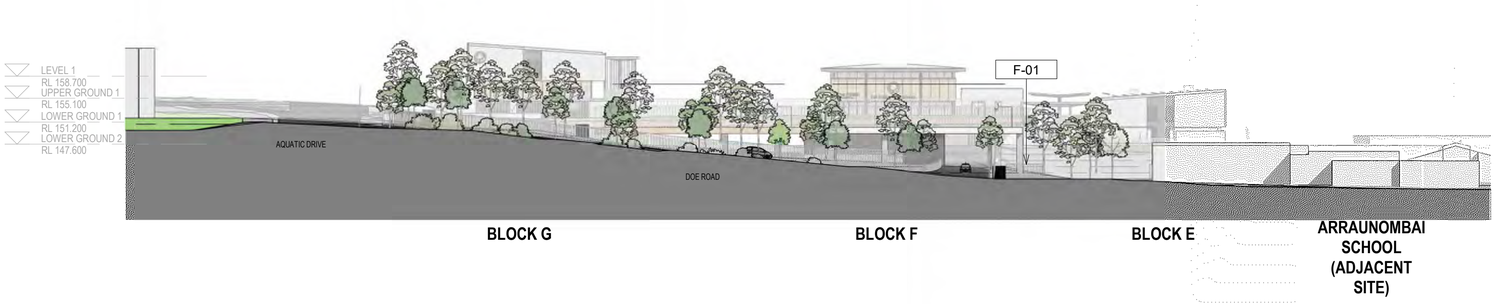
project
THE FOREST HIGH SCHOOL

drawing
SITE ELEVATIONS N S

drawing no. **SD2001**
issue **E**

5/08/2022 7:29:27 PM

1 / 2002 East Elevation (Street)
SCALE: 1 : 500



2 / 2002 West Elevation (Street)
SCALE: 1 : 500

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	100% CONCEPT DESIGN ISSUE	27/05/2022
B	50% SCHEMATIC DESIGN ISSUE	01/07/2022
C	60% SCHEMATIC DESIGN ISSUE	08/07/2022
D	100% SCHEMATIC DESIGN	22/07/2022
E	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
F	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

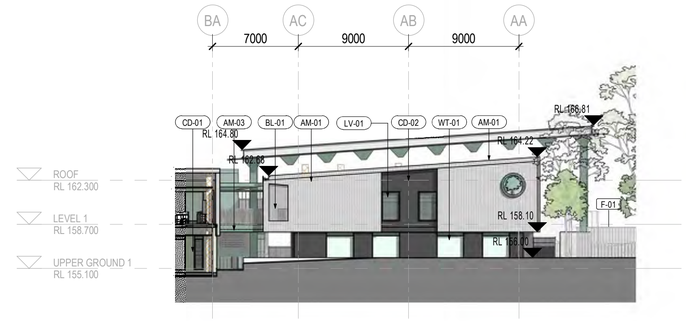
checked	SW	scale	1 : 500@A1
drawn	JL	project no	200420.01

project
THE FOREST HIGH SCHOOL

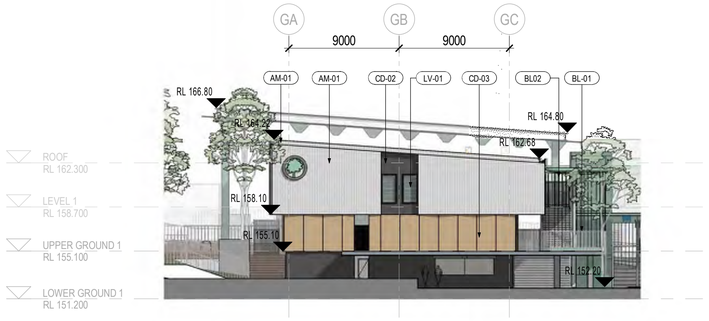
drawing
SITE ELEVATIONS E W

drawing no. **SD2002**
issue **F**

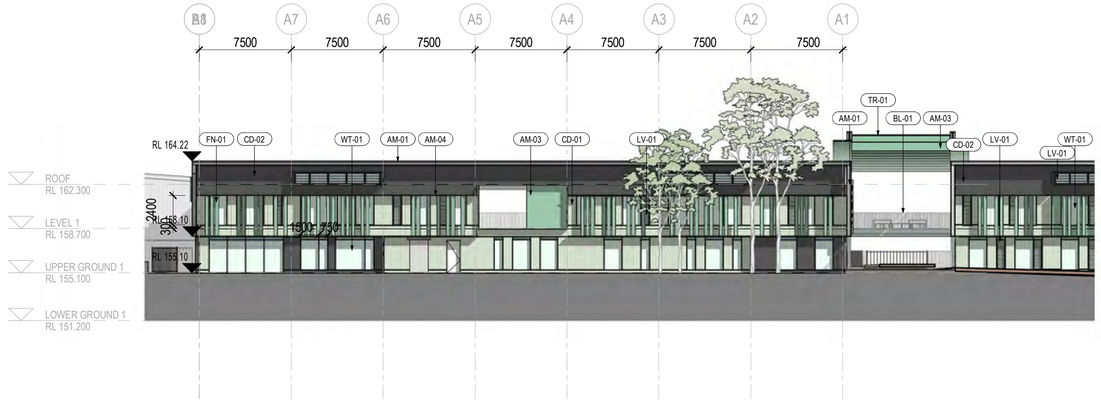
5/08/2022 7:30:18 PM



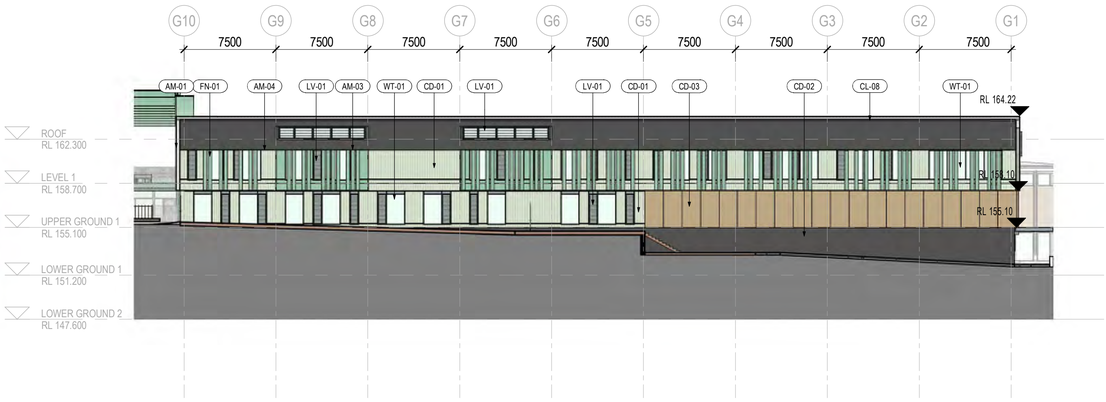
1 2003 ELEVATION BLOCK A - EAST
SCALE: 1 : 250



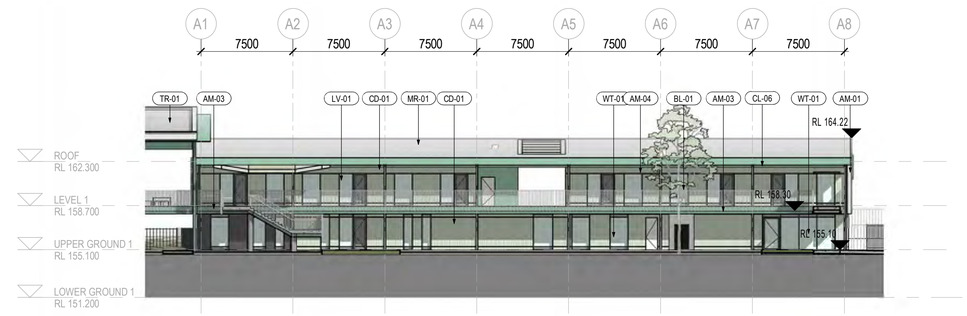
4 2003 ELEVATION BLOCK G - WEST
SCALE: 1 : 250



2 2003 ELEVATION BLOCK A - NORTH
SCALE: 1 : 250



5 2003 ELEVATION BLOCK G - NORTH
SCALE: 1 : 250



3 2003 ELEVATION BLOCK A - SOUTH
SCALE: 1 : 250

6 2003 ELEVATION BLOCK G - SOUTH
SCALE: 1 : 250

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	50% SCHEMATIC DESIGN ISSUE	01/07/2022
B	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
C	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

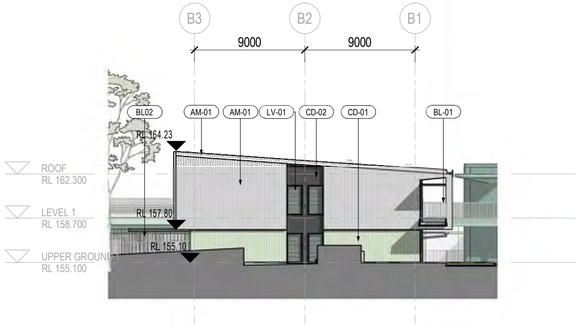
checked	Checker	scale	1 : 250@A1
drawn	JL	project no	200420.01

project
THE FOREST HIGH SCHOOL

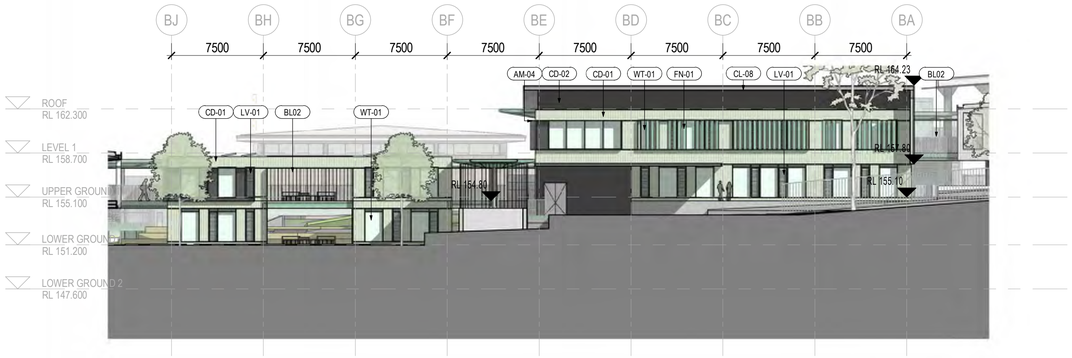
drawing
BUILDING ELEVATIONS G A

drawing no. **SD2003**
issue **C**

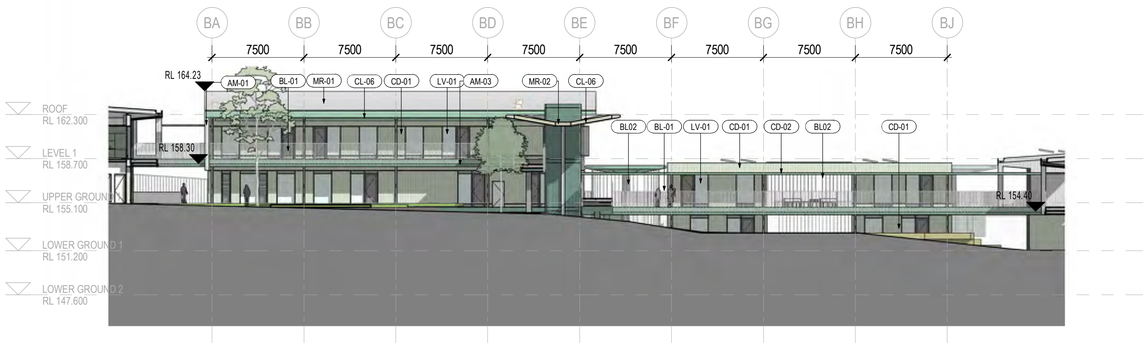
5/08/2022 7:31:22 PM



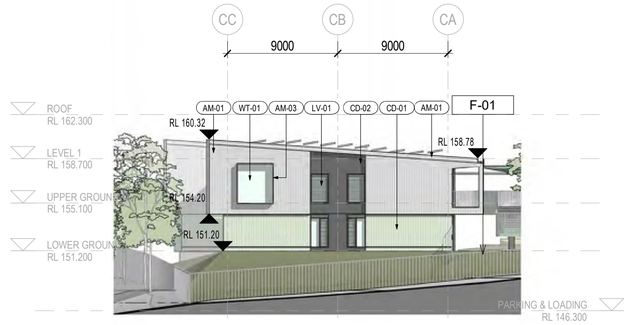
2 / 2004 ELEVATION BUILDING B - NORTH
SCALE: 1 : 250



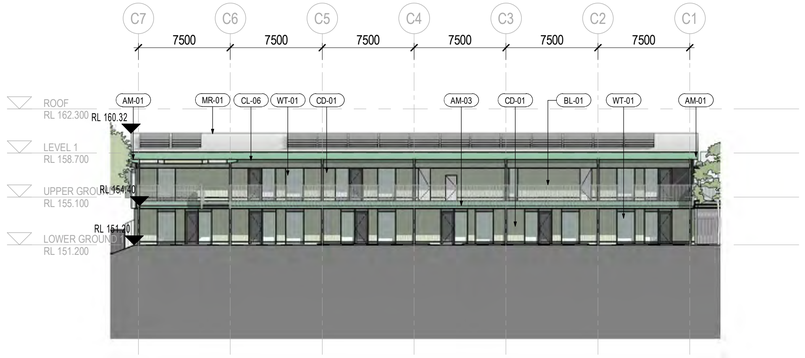
1 / 2004 ELEVATION BLOCK B - EAST
SCALE: 1 : 250



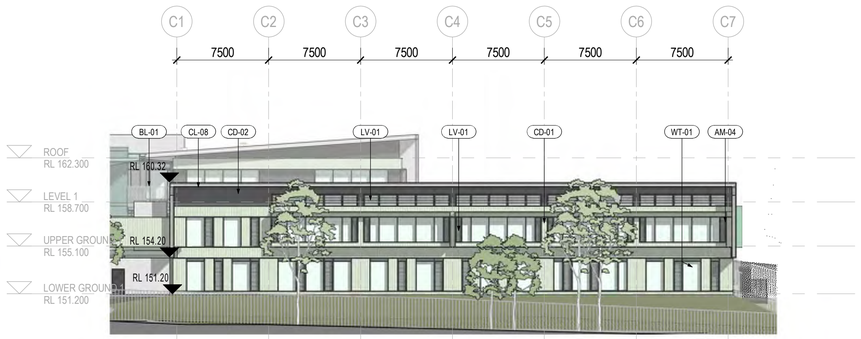
3 / 2004 ELEVATION BLOCK B - WEST
SCALE: 1 : 250



4 / 2004 ELEVATION BLOCK C - EAST
SCALE: 1 : 250



5 / 2004 ELEVATION BLOCK C - NORTH
SCALE: 1 : 250



6 / 2004 ELEVATION BLOCK C - SOUTH
SCALE: 1 : 250

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	50% SCHEMATIC DESIGN ISSUE	01/07/2022
B	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
C	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

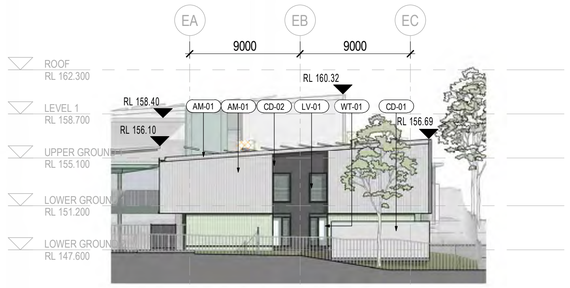
checked	Checker	scale	1 : 250@A1
drawn	JL	project no	200420.01

project
THE FOREST HIGH SCHOOL

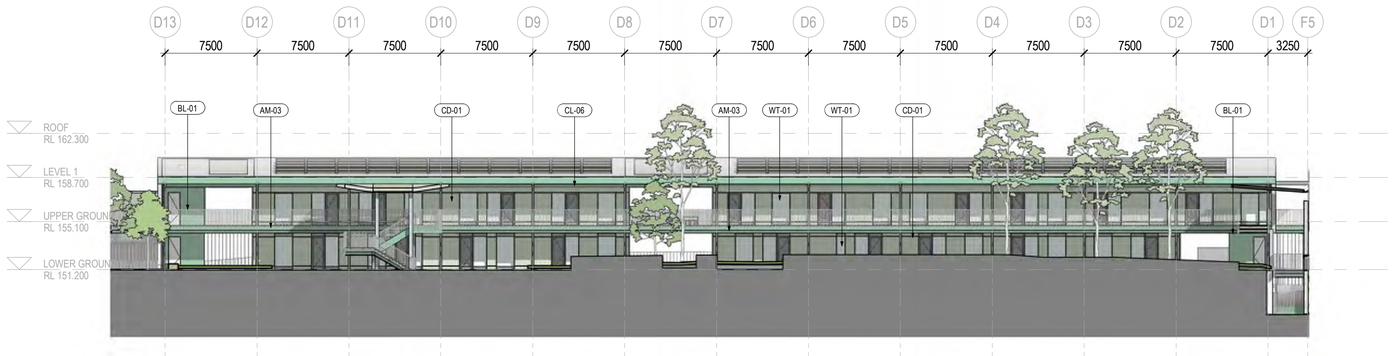
drawing
BUILDING ELEVATIONS B C

drawing no. **SD2004**
issue **C**

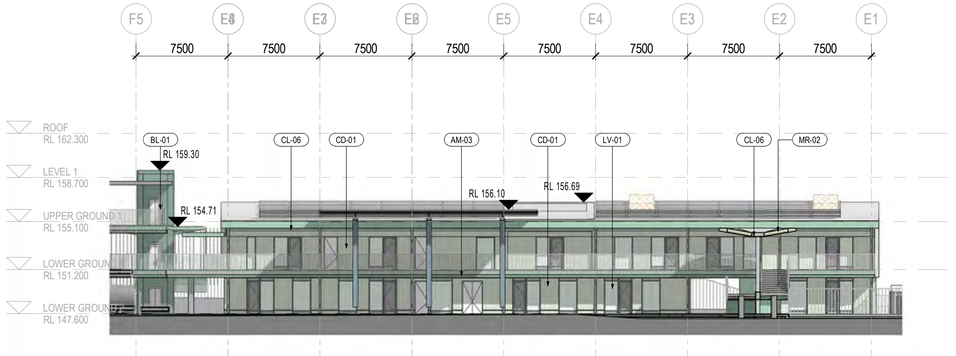
5/08/2022 7:32:16 PM



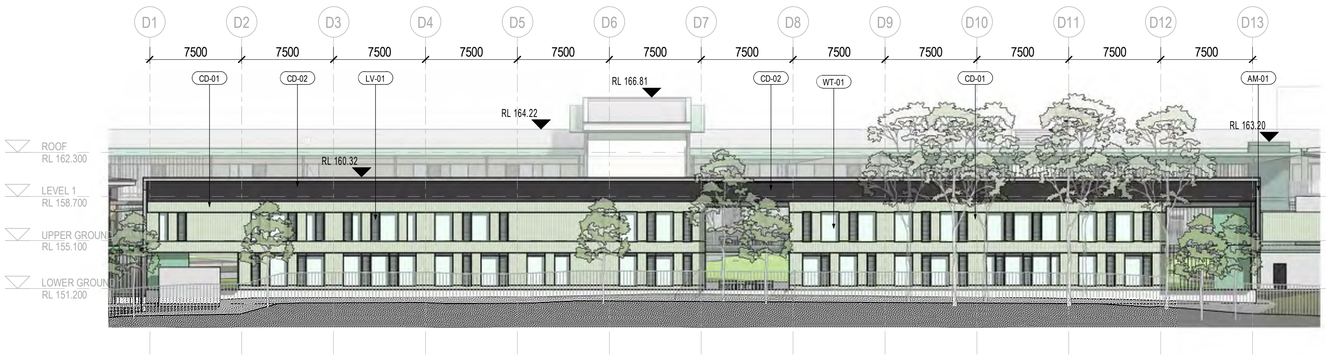
3 2005 ELEVATION BLOCK E - WEST
SCALE: 1 : 250



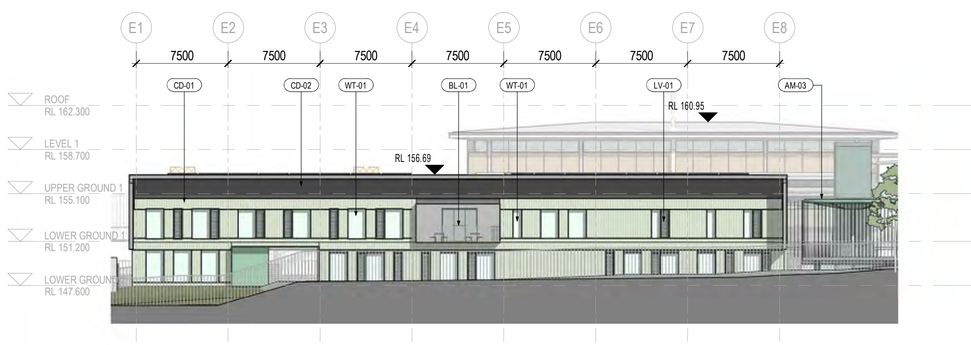
7 2005 ELEVATION BLOCK D - NORTH
SCALE: 1 : 250



2 2005 ELEVATION BLOCK E - NORTH
SCALE: 1 : 250



4 2005 ELEVATION BLOCK D - SOUTH
SCALE: 1 : 250



1 2005 ELEVATION BLOCK E - SOUTH
SCALE: 1 : 250

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	50% SCHEMATIC DESIGN ISSUE	01/07/2022
B	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
C	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

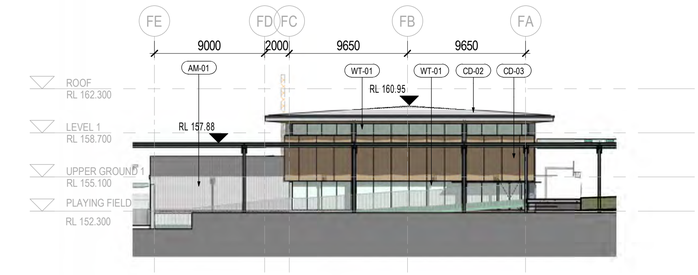
checked	Checker	scale	1 : 250@A1
drawn	JL	project no	200420.01

project
THE FOREST HIGH SCHOOL

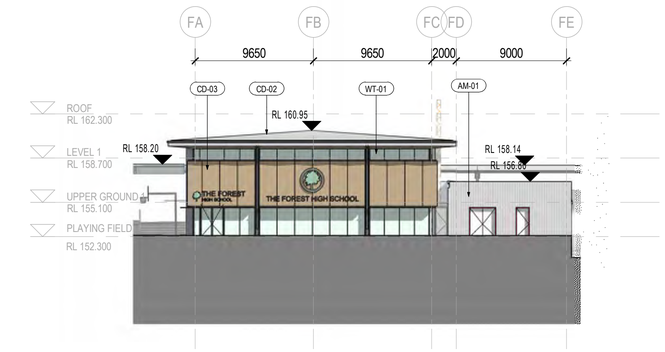
drawing
BUILDING ELEVATIONS C D E

drawing no. **SD2005**
issue **C**

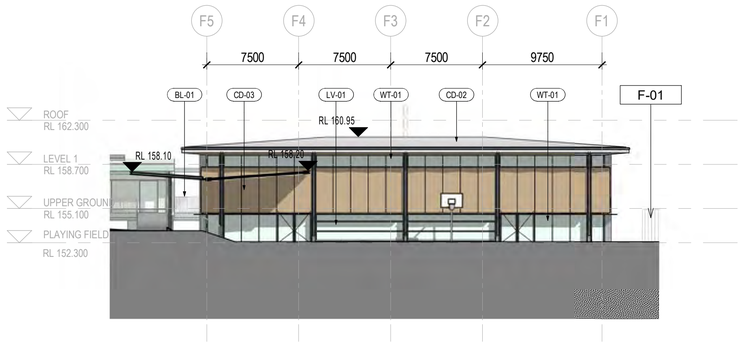
5/08/2022 7:33:24 PM



1/2006 ELEVATION BLOCK F - EAST
SCALE: 1 : 250



2/2006 ELEVATION BLOCK F - WEST
SCALE: 1 : 250



3/2006 ELEVATION BLOCK F - NORTH
SCALE: 1 : 250

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
B	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

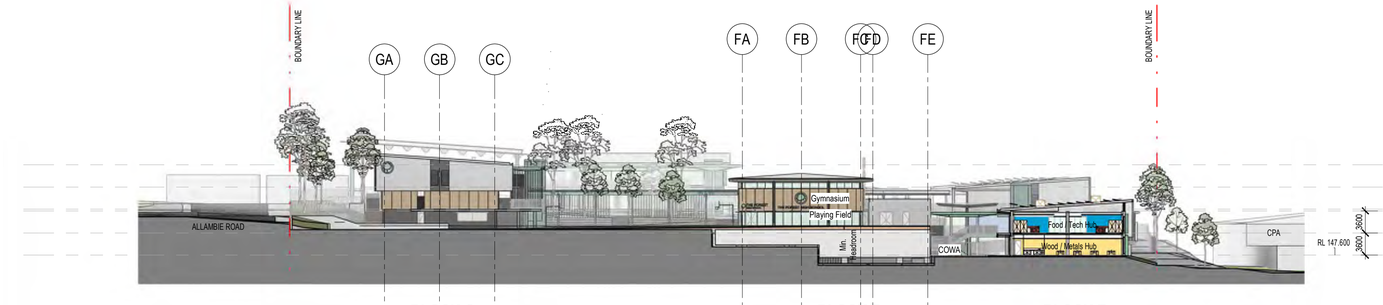
checked	Checker	scale	1 : 250@A1
drawn	Author	project no	200420.01

project
THE FOREST HIGH SCHOOL

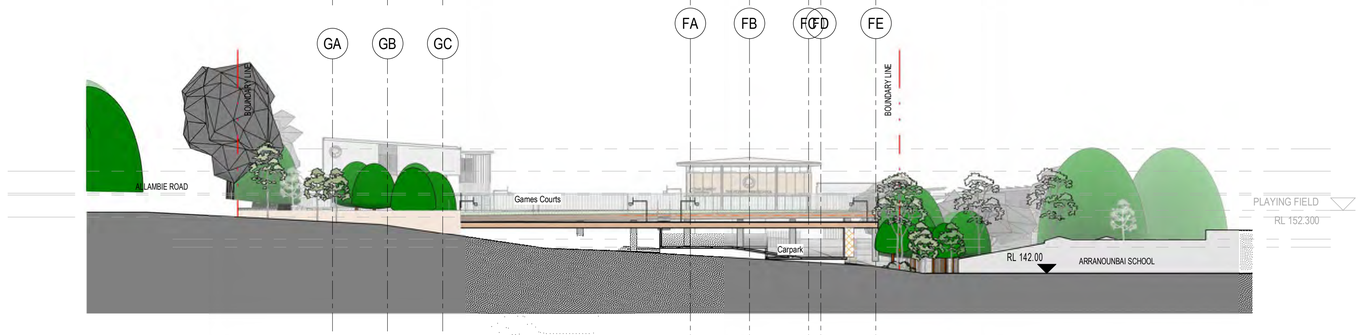
drawing
BUILDING ELEVATIONS F

drawing no. **SD2006**
issue **B**

5/08/2022 7:33:43 PM



1 / 2500 SECTION 01 - PLAYING FIELD / LOADING
SCALE: 1 : 500



2 / 2500 SECTION 02 - GAMES COURTS / ARRANOUNBAI
SCALE: 1 : 500

P1 F1 F2 F3 F4 F5 B1 B2 B3

4 / 2500 CARPARK SOUTH ELEVATION
SCALE: 1 : 500

3 / 2500 SECTION 03 - EAST / WEST SITE
SCALE: 1 : 500

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	EQUITABLE ACCESS MP - CONSULTANT ISSUE	13/04/2022
B	EQUITABLE ACCESS - COORDINATION	21/04/2021
C	FOR INFORMATION	17/06/2022
D	50% SCHEMATIC DESIGN ISSUE	01/07/2022
E	60% SCHEMATIC DESIGN ISSUE	08/07/2022
F	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
G	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

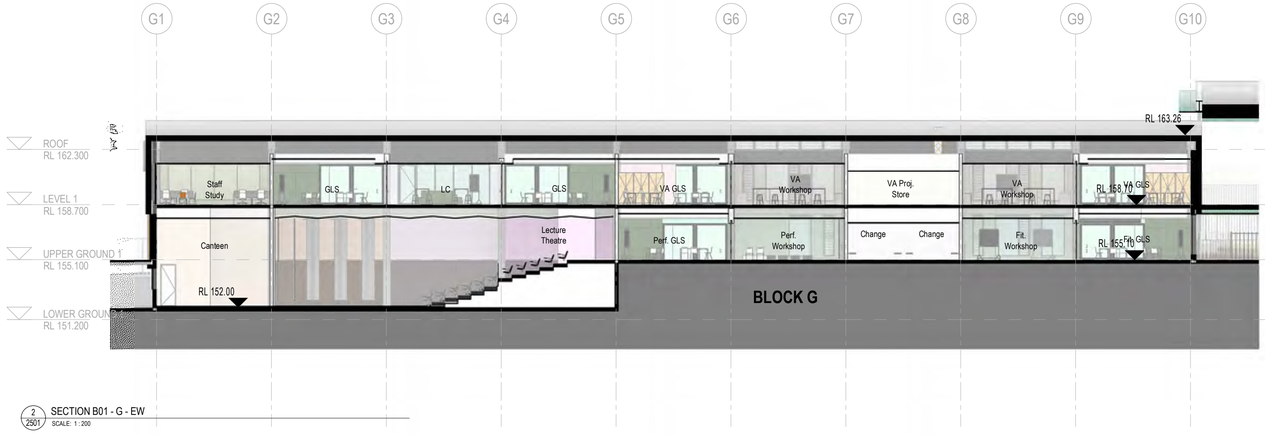
checked	KG	scale	1 : 500@A1
drawn	JL	project no	200420.01

project
THE FOREST HIGH SCHOOL

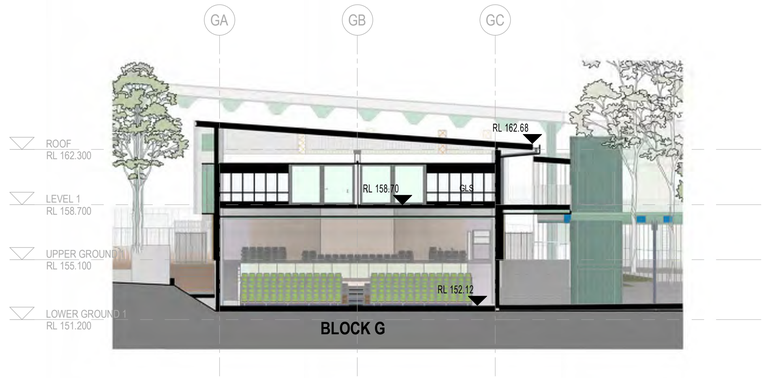
drawing
CARPARK SECTIONS / ELEVATION

drawing no. **SD2500**
issue **G**

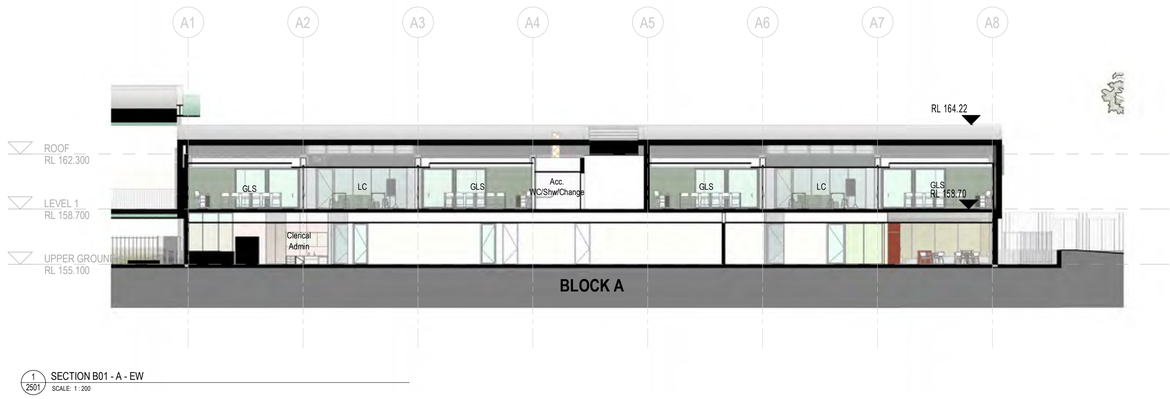
5/08/2022 7:34:44 PM



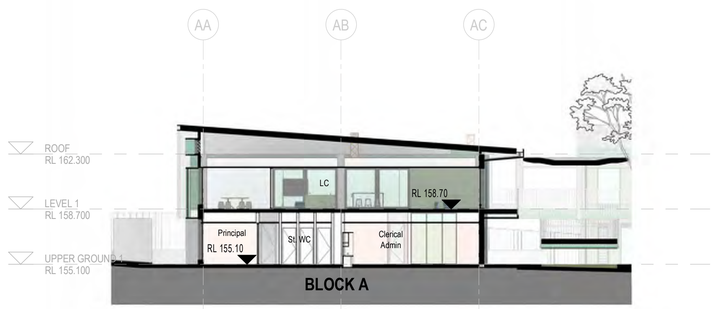
2/2501 SECTION B01 - G - EW
SCALE: 1 : 200



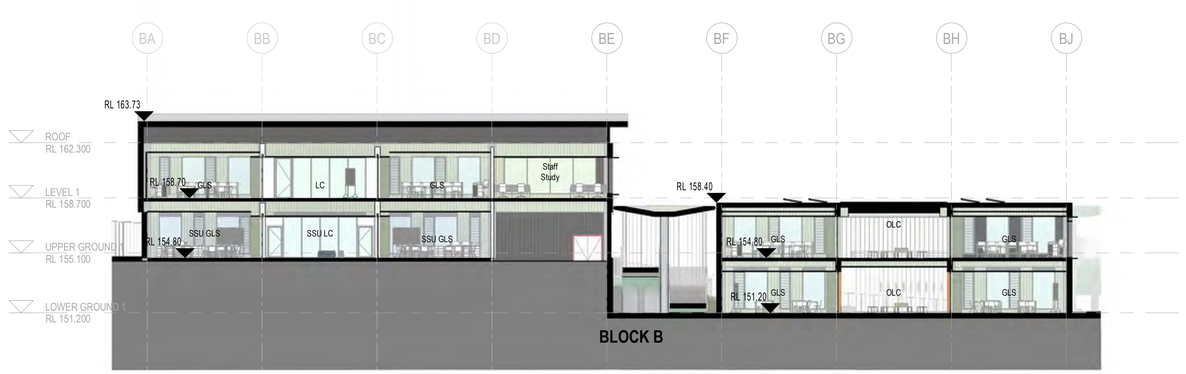
10/2501 SECTION B02 - G - NS
SCALE: 1 : 200



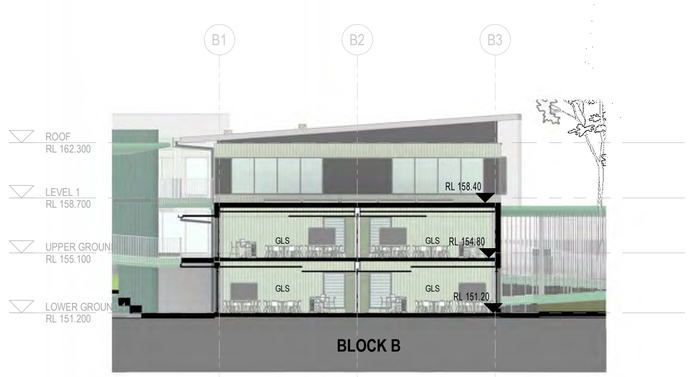
1/2501 SECTION B01 - A - EW
SCALE: 1 : 200



11/2501 SECTION B03 - A - NS
SCALE: 1 : 200



7/2501 SECTION B05 - B - NS
SCALE: 1 : 200



8/2501 SECTION B02 - B - EW
SCALE: 1 : 200

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	FOR INFORMATION	17/06/2022
B	50% SCHEMATIC DESIGN ISSUE	01/07/2022
C	60% SCHEMATIC DESIGN ISSUE	08/07/2022
D	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
E	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

Program

- Admin Space
- Amenity Space
- Circulation
- General learning Space
- GLS LCs
- Learning Space (outdoor)
- Staff Support Space

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

checked	Checker	scale	1 : 200@A1
drawn	Author	project no	200420.01

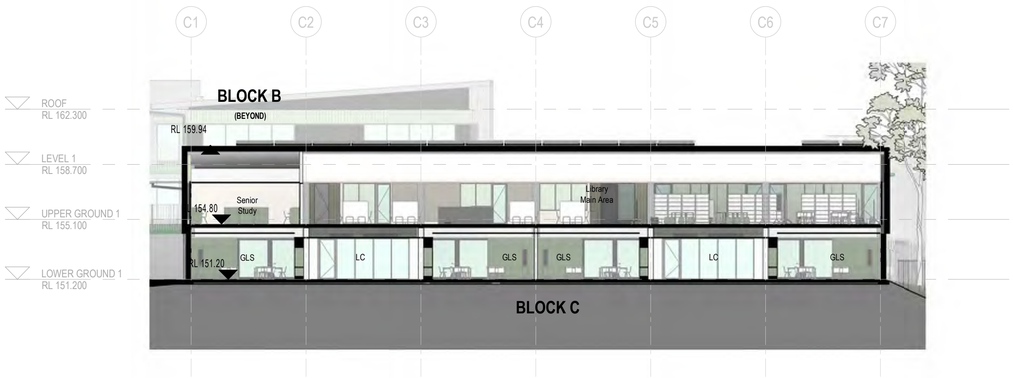
project
THE FOREST HIGH SCHOOL

drawing
BUILDING SECTIONS 1

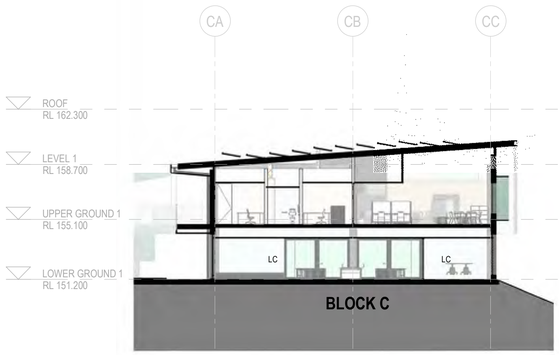
drawing no. **SD2501**

issue **E**

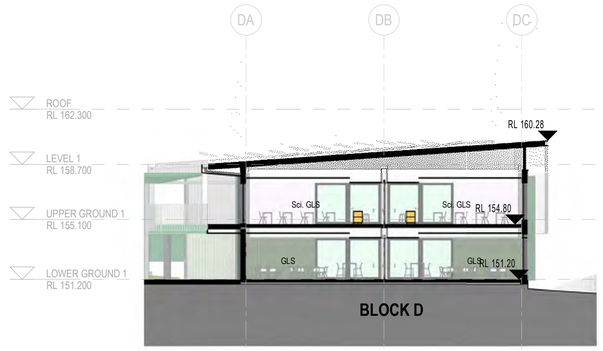
5/08/2022 7:46:49 PM



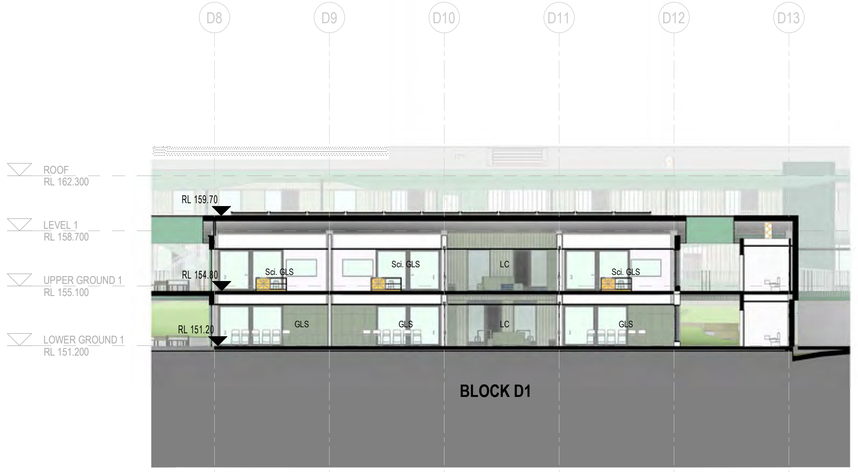
1 2502 SECTION B06 - C - EW
SCALE: 1 : 200



2 2502 SECTION B05 - C - NS
SCALE: 1 : 200

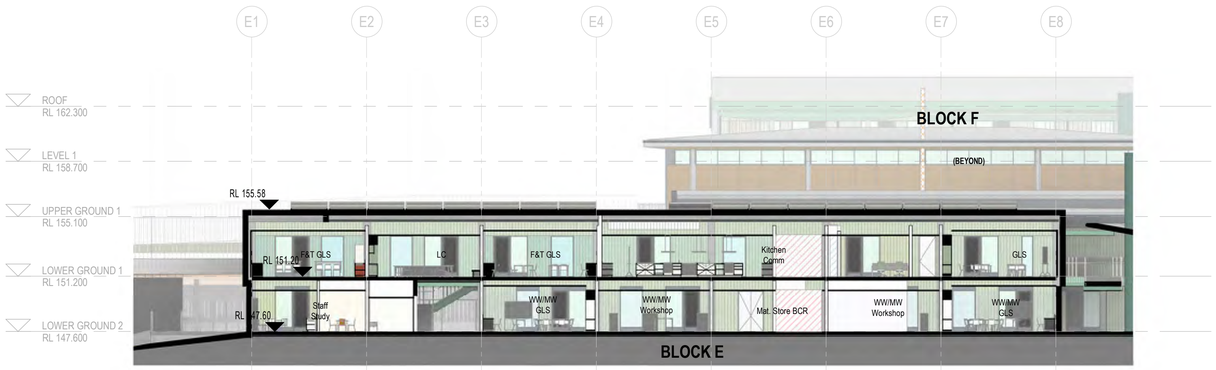


5 2502 SECTION B02 - D - NS
SCALE: 1 : 200

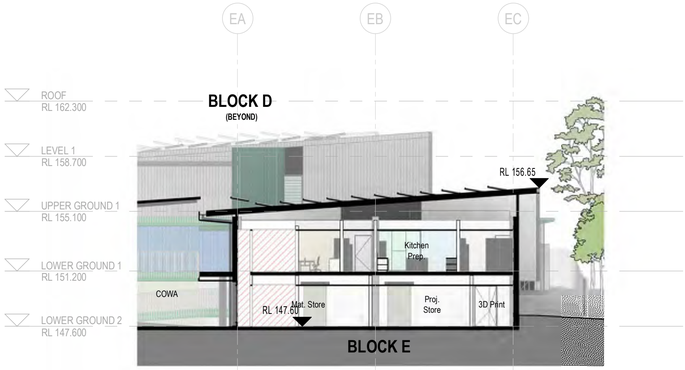


3 2502 SECTION B06 - D1 - EW
SCALE: 1 : 200

4 2502 SECTION B06 - D2 - EW
SCALE: 1 : 200



7 2502 SECTION B06 - E - EW
SCALE: 1 : 200



6 2502 SECTION B02 - E - NS
SCALE: 1 : 200

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	FOR INFORMATION	17/06/2022
B	50% SCHEMATIC DESIGN ISSUE	01/07/2022
C	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
D	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

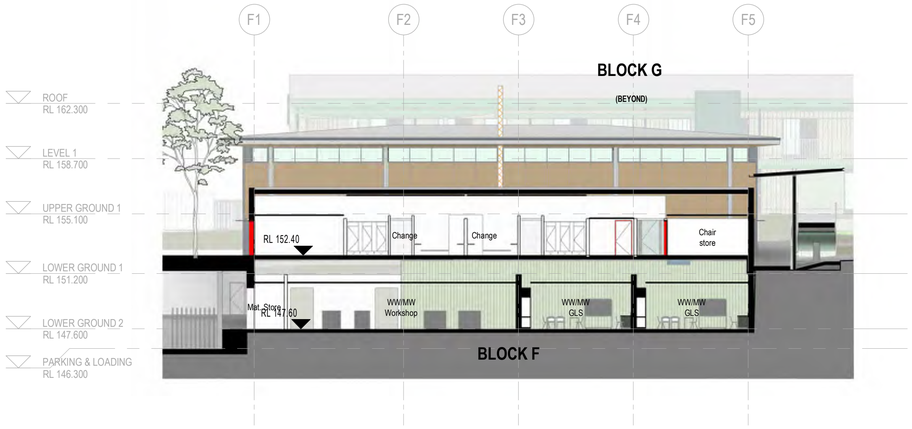
checked	Checker	scale	1 : 200@A1
drawn	Author	project no	200420.01

project
THE FOREST HIGH SCHOOL

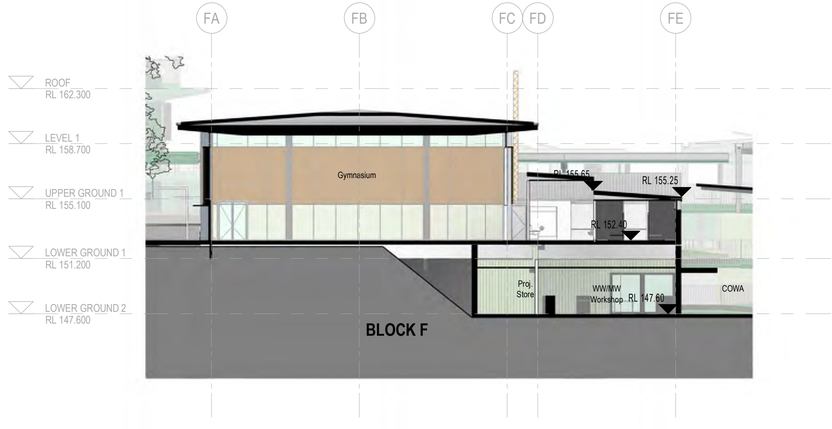
drawing
BUILDING SECTIONS 2

drawing no. **SD2502** issue **D**

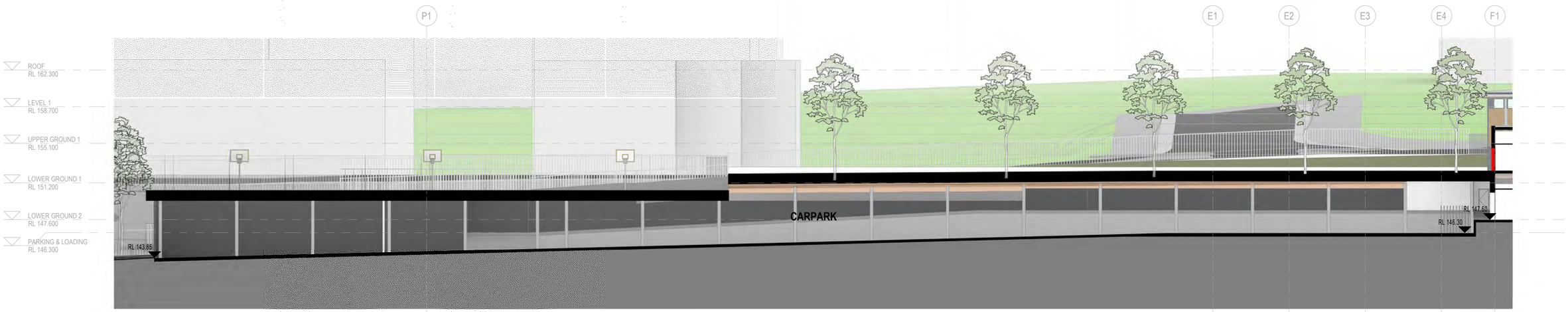
5/08/2022 7:48:18 PM



1 2503 SECTION B07 - F - EW
SCALE: 1 : 200



2 2503 SECTION B02 - F - NS
SCALE: 1 : 200



3 2503 SECTION B07 - CARPARK - EW
SCALE: 1 : 200

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
B	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 9400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

checked Checker
drawn Author
scale 1 : 200@A1
project no 200420.01

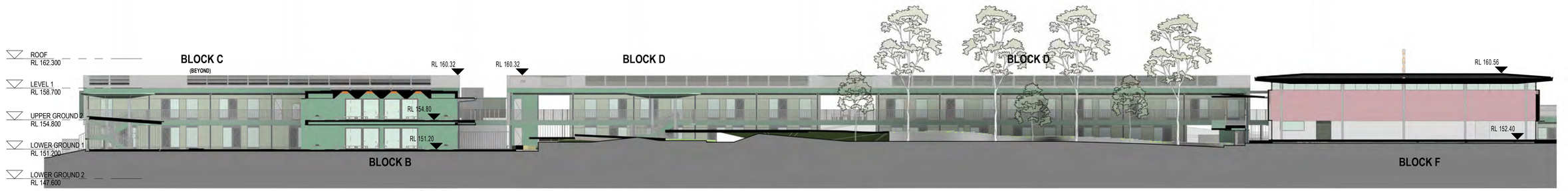
project
THE FOREST HIGH SCHOOL

drawing
BUILDING SECTIONS 3

drawing no. **SD2503**
issue **B**

5/08/2022 7:48:47 PM

1 / 2511 SITE SECTION 1
SCALE: 1 : 200



2 / 2511 SITE SECTION 2
SCALE: 1 : 250

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	100% CONCEPT DESIGN ISSUE	27/05/2022
B	FOR INFORMATION	17/06/2022
C	50% SCHEMATIC DESIGN ISSUE	01/07/2022
D	60% SCHEMATIC DESIGN ISSUE	08/07/2022
E	100% SCHEMATIC DESIGN	22/07/2022
F	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
G	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

checked SW | scale As indicated@A1
drawn IT | project no 200420.01

project
THE FOREST HIGH SCHOOL

drawing
SITE SECTIONS 1 & 2

drawing no. **SD2511** | issue **G**

5/08/2022 7:49:49 PM

1/2512 SITE SECTION 3
SCALE: 1 : 200

2/2512 SITE SECTION 4
SCALE: 1 : 200

Nominated Architect
Ray Brown, NSWARB 6359

Do not scale drawings. Verify all dimensions on site

issue	amendment	date
A	100% SCHEMATIC DESIGN	22/07/2022
B	100% SCHEMATIC DESIGN - CONSULTANT COORDINATION ISSUE	29/07/2022
C	100% SCHEMATIC DESIGN - REISSUE	05/08/2022

architectus™

Adelaide
Brisbane
Melbourne
Sydney
Perth

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
T (61 2) 8252 8400
F (61 2) 8252 8600
sydney@architectus.com.au
ABN 90 131 245 684

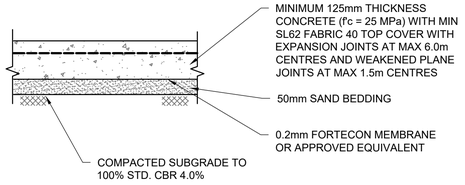
checked	SW	scale	1 : 200@A1
drawn	IT	project no	200420.01

project
THE FOREST HIGH SCHOOL

drawing
SITE SECTIONS 3 & 4

drawing no. **SD2512**
issue **C**

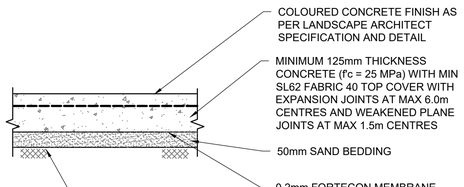
5/08/2022 7:51:40 PM



PV1

PAVEMENT P1
INSITU CONCRETE PAVING

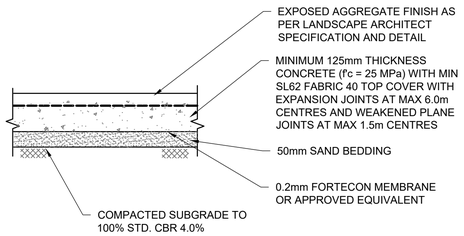
SCALE:1:10



PV2

PAVEMENT P2
INSITU COLOURED CONCRETE PAVING

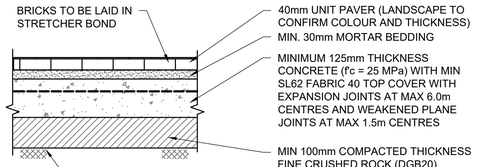
SCALE:1:10



PV3

PAVEMENT P3
INSITU CONCRETE BANDING WITH EXPOSED AGGREGATE

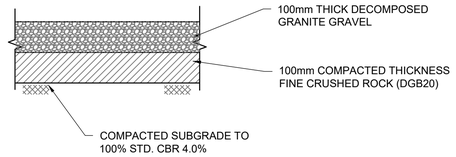
SCALE:1:10



PV7

PAVEMENT PV7
RECYCLED BRICK PAVING

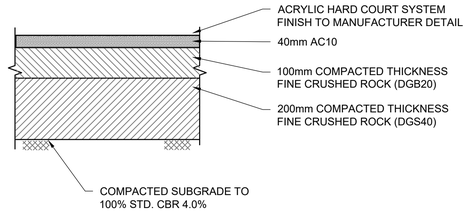
SCALE:1:10



PV4

PAVEMENT PV4
DECOMPOSED GRANITE GRAVEL

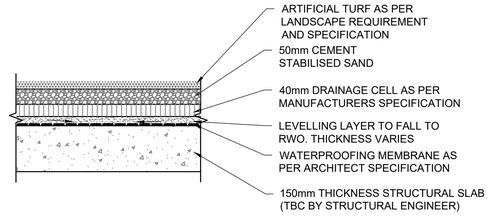
SCALE:1:10



PV8

PAVEMENT P8
SPORTS COURT

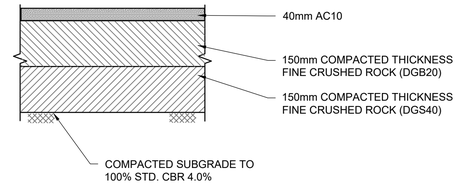
SCALE:1:10



PV9

PAVEMENT P9
SPORTS FIELD ON SUSPENDED SLAB

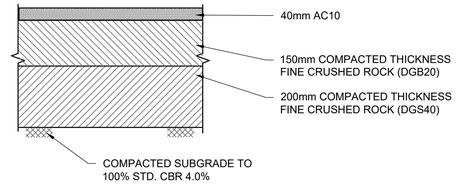
SCALE:1:10



P11

PAVEMENT P11
ACCESS ROAD

SCALE:1:10



P12

PAVEMENT P12
LOADING DOCK

SCALE:1:10

MP

MASS PLANTING AS PER LANDSCAPE ARCHITECT DETAIL

TF

TURFING AS PER LANDSCAPE ARCHITECT DETAIL

rev	date	description	drn	ch'k
D	12/08/22	REISSUE FOR 100% SD	MZV	PAL
C	03/12/21	EMERGENCY ACCESS ROAD ADDED	PAD	PAL
B	24/11/21	ISSUE FOR 100% SD	PAD	PAL
A	19/11/21	ISSUE FOR DRAFT 100% SD	PAD	PAL

rev	date	description	drn	ch'k

NSW GOVERNMENT Education School Infrastructure

enstruct group pty ltd

Level 4, 2 Glen Street
Milsons Point NSW 2061
Australia

Telephone (02) 8904 1444
Facsimile (02) 8904 1555
www.enstruct.com.au

enstruct

project: THE FOREST HIGH SCHOOL

drawing title: PAVEMENT DETAIL

status: FOR INFORMATION ONLY

scale at A1	drawn by	checked	date
AS SHOWN	PAD	PAL	NOV-21

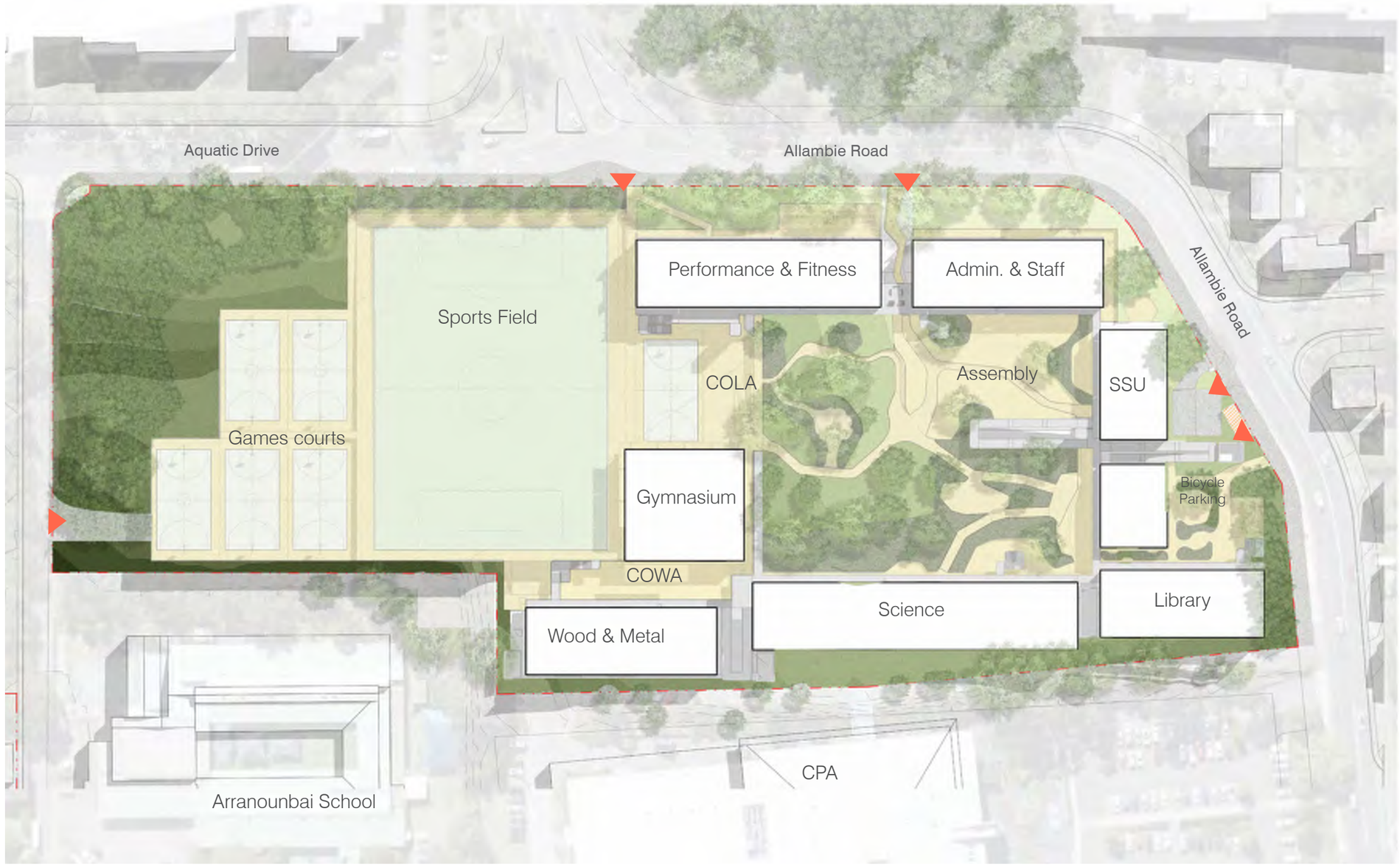
project no.	drawing no.	rev.
6310	CV-0405	D

5.1 Site Plan

The site has been arranged utilising the built form as a protective buffer from the busy Allambie Road, wrapping around from the north to the east and leaving a clear buffer to the western bushfire prone land.

The result is a large sheltered outdoor open space for the students that expands on to the sports field and playing courts to the west.

The sensitive zone where there is potential Aboriginal Archaeology will be further investigated and landscaped, but no built form has been located in this zone.



Not to Scale

Source: Oculus's Landscape Schematic Design Report