KANE

CONSTRUCTION ENVIROMENTAL MANAGEMENT PLAN
WESTMEAD CATHOLIC COMMUNITY EDUCATION CAMPUS

AUTHORISATION AND REVIEW

The project manager shall prepare this Construction *Environmental Management Plan (CEMP)* and authorise for implementation.

Each person who is to carry out construction work on this project will be made aware of relevant content from this CEMP during the induction process. The CEMP is available to download from the project webpage on the electronic software titled Hammertech.

Doc Title	Rev	Issue Description	Authorised By	Position	Sign	Date
CEMP	1	First issue	Nathan Parris	Project Manager		22/11/24
CEMP	2	Second Issue	Paul Calabro	Project Manager		31/03/25
CEMP	3	Updated org chart	Paul Calabro	Project Manager		30/06/25
CEMP	4	Updated Stakeholder details	Paul Calabro	Project Manager		09/09/25

The Work Health and Safety Management Plan (WHSMP) is reviewed by the project manager to ensure it remains up-to-date. The review frequency will not exceed 3 months. Ad-hoc reviews and changes to this CEMP may result from e.g. audits, design changes, changes to work methods, incidents including near-miss (on-site, other Kane sites, outside of Kane), complaints, alerts, changes to legislation/standards/codes, system updates etc. All reviews shall be recorded within Hammertech or in the table below.

Kane will utilise toolbox talks to inform persons carrying out construction work on this project of relevant revisions made to this CEMP.

Date Reviewed	Title of Document Reviewed	Change Description	Authorised By
30/06/2025	CEMP	Update project organisational chart	PC

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INTRODUCTION

The *Protection of the Environment Operations Act 1997 (NSW)*. The object of the Act is to achieve the protection, restoration and enhancement of the quality of the NSW environment. The Act repealed and consolidated a number of existing Acts to rationalise, simplify and strengthen the regulatory framework for environmental protection in NSW.

This plan (working in collaboration with the Work Health Safety Plan) outlines processes and procedures to eliminate or reduce the risks of harm to human health and the environment so far as is reasonably practicable from the scope of works. It is intended to:

- Encourage best practice environmental management through the planning, development, implementation and continuous improvement of environmental management procedures during the works,
- Prevent and minimise adverse impacts on the Environment, and
- Recognise and protect any special environmental characteristics of the Site (including cultural heritage significance).

This plan addresses:

- Environmental Requirements,
- Statutory Requirements,
- Environmental Objectives,
- Roles and responsibilities of all Kane and subcontractor engaged to undertake work on the project,
- Consultation, cooperation and coordination of activities,
- Training and awareness programmes to reduce risk of harm to health and the environment,
- Hazard identification and risk control
- Duty to notify EPA of Contaminated Land and Groundwater
- Management of Contaminated Land and Groundwater including Unexpected Finds,
- Erosion, sedimentation and waterway management
- Waste management,
- Threatened or protected vegetation and habitats heritage-listed buildings, precincts or assets,
- Cultural heritage artefacts,
- Incident Management including near misses,
- Complaints Management, and
- Auditing or other monitoring to confirm the effectiveness of this Plan.

NOTE – FOR MANAGEMENT OF ALL IDENTIFIED SAFETY RISKS, PLEASE REFER TO THE PROJECT WORK HEALTH AND SAFETY PLAN

When implemented, this plan facilitates a systematic approach to site environmental management by applying the processes, checklists and forms of the Kane Environmental Management System to achieve compliance with relevant Environment Protection Legislation.

The project team is identified in the chart below. Note – The chart is not intended to illustrate the reporting from the Project Manager to senior management (refer to clause 3.3.1 of the Kane WHSMS corporate organisation chart for management reporting).

Catholic Schools Parramatta Diocese

WINIM

KANE

Kane Corporate Support

BRETT MOORE
NSW General Manager

TRISTAN FORSTER
Joint Managing Director

JASON FARRUGIA
Senior Safety Manager

SAL PALAY
Quality Assurance Manager

Westmead Catholic Community Project Team

NATHAN PARRIS
Senior Project Manager

ANDREW CAMPBELL
Construction & Industrial Relations Manager

PAUL CALABRO
Project Manager

MATTHEW GILBERT
Senior Site Manager

DAMIEN MAHER
Senior Contract Administrator

SCOTTY NERO
Site Manager

WHITTAKER DOWNEY
Site Engineer
(Stucture, Civil, Landscaping)

RHYS STEWARD
Site Engineer
(Services & Fitout)

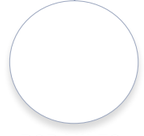
WILSON DOWLING
Sewer Infrastructure & Facade

HARRY WALKER
Project Coordinator

STEVEN BOURY
Foreman

STEPHEN DINTEN
OH&S

RYAN WYLIE
Labourer



ROB MILES
Apprentice

KEY STAKEHOLDERS:

Client Company Name:	Catholic Schools Parramatta Diocese Limited
Client's Address:	470 Church Street, Parramatta NSW 2150
Client Representative Name	Antonio El Fady
Client's Phone Number:	0448 390 129
Superintendent Company Name:	WINIM Development Pty Ltd
Superintendent's Address:	Level 10, 255 George Street, Sydney NSW 2000
Superintendent Representative Name	Alex Andrews
Superintendent's Phone Number:	0435 026 896
ACN:	600 668 399
Principal Contractor:	Kane Constructions
Principal Contractor's Address	2 John Street, Waterloo NSW 2017
Principal Contractor's Representative	Nathan Parris
Principal Contractor's Phone Number:	0401 395 980
ABN:	49 007 354 396
Project Name:	Westmead Catholic Community Education Campus
Site Address:	2 Darcy Road, Westmead NSW 2145
Site Phone Number:	Nathan Parris – 0401 395 980
Anticipated Project Start Date:	November 2024
Anticipated Project Finish Date:	March 2026
24 Hour Site Contact Details Name:	Matthew Gilber
Job Title:	Site Manager
Email:	mgilbert@kane.com.au
Phone:	0405 140 250

PROJECT SCOPE OF WORKS

The 'WCC Project' will see the relocation of the Sacred Heart Primary School and Sacred Heart Parish, currently situated on Ralph Street, to create a centrally located, collaborative and evangelising learning community at Darcy Road.

The works will be allocated into the following separable portions:

Separable Portion 1 is staged as follows:

- Separable Portion 1a is for the delivery of the future church and surrounds.
- Separable Portion 1b is for the delivery of the future church parking.

Separable Portion 2 is staged as follows:

- Separable Portion 2a (Primary School) is for the delivery of the Ground Floor, Level 1 and Level 2 (primary school portion).
- Separable Portion 2b (High school & balance of works) is for the delivery of Level 2 (balance of works), Level 3, Level 4, Level 5 and the external landscape works

ENVIRONMENTAL RESPONSIBILTIES

The allocation of sufficient resources is essential for producing, maintaining and improving our CEMS. Appropriate external resources, by way of specialist consultants, will be made available where required. The environmental responsibilities of Kane staff on this project is attached (must be read in conjunction with the Kane EMS responsibilities). The priority, order and timeframes in which the responsibilities are implemented may differ as determined by the Project Manager to suit the project construction programme and the findings of the risk assessment.

The responsibilities and associated timeframes of key environmental management positions are summarised in the Kane EMS and WHSMS Schedules (refer Who/When/How table at the top of each schedule). The attached responsibilities table defines how such system responsibilities will be satisfied by the positions held on this project. (refer to the project team chart for names and position abbreviations).

STAKEHOLDER CONSULTATION, COORDINATION and CO-OPERATION

Kane will provide stakeholders appropriate consultation, coordination and cooperation opportunities to enable their input into the environmental management strategies implemented on the project.

Site Management workshop with major stakeholders prior to commencing works on site to establish a shared appreciation of the project, the risks involved and to identify and to develop a collaborative risk mitigation solution.

Consultation, coordination and cooperation of activities associated with many aspects of the project including Quality, Safety and Environmental Management occurs at (not limited to);

- Client Meetings
- Design Meetings
- Project Team Meetings,
- Subcontractor Meetings,
- Pre-start Meetings,
- Toolbox Meetings,
- Health, Safety and Environment Committee Meetings

TRAINING AND COMPETENCY

Kane provides our employees with relevant training so they have the necessary competency and skills to deliver their project environmental management responsibilities. This includes induction training into the Environmental Policy, Environmental Management System and procedures.

Kane ensures ongoing training for all employees based on identified skill gaps. This targets the needs of individual employees and provides access to training most relevant to their roles and responsibilities. Certificates of competency are maintained and available to validate skills and competency upon request.

Kane seek Environmental advice and assistance and keep updated with changes to Environmental legislation, regulations and guidelines through the below listed sources (not limited to);

- EPA email Updates/Bulletins,
- Master Builders Association Member Bulletins
- Environmental Consultant email updates
- Legal representatives email updates
- Standards Australia Update emails etc.

Access to Acts, Regulations Australian Standards and Codes applicable to the work tasks is made available to all workers on site. Workers who wish to view such information must report to site management.

Induction training is mandatory for all Workers. Each Worker is required to complete a two stage induction process.

Stage 1, General Induction – The General induction covers Kane culture, values, key safety and environmental management expectations, risks and controls that applies across all Kane sites. The individual must successfully answer randomly selected multiple choice questions to demonstrate their understanding of the information presented, competency and the knowledge that is expected of them before progressing to stage 2.

Stage 2, Site Specific Induction – The Site induction is delivered by Kane Site Management and is an opportunity to build a positive relationship between the worker and Kane. This induction educates the individual of key safety and environmental management expectations, risks and controls specific to the site.

Employers of workers with limited English skills are required to provide interpreter assistance. The interpreter must translate the induction and sign a declaration on the worker's induction profile to verify their understanding of the information presented.

The information presented is unique to each site subject to the hazards being managed most commonly covering;

- Site Team Introduction
- Project Scope of Work
- Site Rules
- Emergency Procedure and Evacuation Plan
- Key locations on site
- Environmental Risk Controls
- Permit to Work Requirements
- Safe Work Method Statement SWMS
- Site Specific and Client Requirements
  - Traffic Management
  - Live Services
  - Hazardous Building Materials
  - Contaminated Soil
  - Chemicals, Dangerous Goods & Hazardous Substances
  - Confined Spaces

The information presented during the site induction is specific to the hazards, risks and controls at the site. During the induction, site management confirm all inductees are task specific procedures trained, current holders of the Construction Induction Card, and Certificates of Competency where applicable.

HAZARD IDENTIFICATION AND RISK CONTROL

The Act and Regulations impose duties on Kane/arete to manage risks by eliminating risks so far as is reasonably practicable, and if it is not reasonably practicable, to minimise and control those risks so far as is reasonably practicable.

Risk is the possibility that harm (environment damage or loss, injury or illness to people) might occur when exposed to a hazard.

A hazard means a situation or thing that has the potential to harm the environment or a person.

Risk control means taking action to eliminate risks so far as is reasonably practicable, and if that is not possible, minimising the risks so far as is reasonably practicable. Eliminating a hazard eliminates risks associated with that hazard.

When deciding what is 'reasonably practicable' to protect the environment and people from harm, Kane will take into consideration the following (not limited to):

- The likelihood of the hazard or risk concerned occurring
- The degree of harm that might result from the hazard or risk
- Knowledge about the hazard or risk, and ways of eliminating or minimising the risk
- The availability and suitability of ways to eliminate or minimise the risk, and
- After assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk. The cost of controlling a risk may be taken into account in determining what is reasonably practicable, but will not be used as a reason for doing nothing.

The risk management process adopted by Kane involves the 4 steps below (in the order listed):

1. **identify hazards** – find out what could cause harm
2. **assess risks** – understand the nature of the harm that could be caused by the hazard, how serious the harm could be (severity of risk) based on the likelihood of it happening
3. **control risks** – implement the most effective control measure that is reasonably practicable in the circumstances
4. **review control measures** to ensure they are effective and working as planned.

MAJOR ACTIVITIES AND ANTICIPATED HAZARDS (ENVIRONMENTAL ASPECTS)

An Environmental Risk Assessment is prepared to identify environmental aspects associated with the activities to be undertaken (refer Schedule R). The risk of those aspects occurring and causing environmental impact is rated, and control measures identified to reduce the risk. The overall project risks have been compiled through the conduct of a Risk Workshop taking into consideration the duties relevant to demolition, building and civil construction industries outlined below.

Potential for harm from	Description	Potential sources or work activity
Contaminated Soil or groundwater	Uncontrolled disturbance of contaminated soil or groundwater can harm the environment i.e. ▪ by entering clean soil and groundwater ▪ through industrial waste not being properly managed, transported or disposed ▪ contaminating waterways damaging marine ecosystems	Excavation of contaminated soil or groundwater
Solid Waste	Poorly managed waste can harm the environment i.e. ▪ waste becoming airborne spreading litter ▪ by entering the atmosphere ▪ by entering the soil and groundwater ▪ through hazardous industrial waste not being properly managed, transported or disposed ▪ contaminating waterways damaging marine ecosystems	All activities that generate waste on site including waste uncovered during excavation
Dust	Nuisance Dust can have a negative impact on environment i.e. ▪ the surrounding built environment ▪ causing the spread of infection ▪ human respiratory and cardiovascular systems irritating eyes, throat and skin	Demolition Soil disturbance and excavation Vehicle movements on unsealed roads Vehicles with muddy tyres driven onto sealed roads Dry cutting Grinding steel and cement products Fireproofing
Glues, Chemicals, Oils, Fuels, Substances	Glues, Chemicals, Oil and Fuel spills can; ▪ contaminate soil, groundwater and nearby waterways ▪ contaminate the air ▪ harm human health	Uncontrolled escape, spillage or leakage of a substance including dangerous good Plant/machinery refuelling/servicing Waterproofing Tiling Vinyl Laying Painting Caulking and Sealant works Cleaning
Waste water	Waste water can carry harmful pollutants contaminating soil and the stormwater system discharging into nearby creeks, rivers, wetlands, lakes and bays	Wet cutting of concrete, brick/blocks, pavers Concreting/grout core filling Cementitious Floor grinding/levelling Painting Plastering Soil/sediment loss and erosion
Stormwater, erosion and sediment	Rainwater falling on disturbed soil including un-vegetated land can carry harmful pollutants e.g. contaminating soil and sediment off site causing erosion and pollution entering the stormwater system discharging into nearby creeks, rivers, wetlands, lakes and bays	Heavy Rainfall on disturbed and un-vegetated soil Vehicles with muddy tyres driven onto sealed roads Any work involving soil disturbance Any work removing vegetation Any work requiring soil to be stockpiled Landscaping
Noise	Excessive noise can; ▪ Disturb the community and wildlife	Demolition Piling Rock excavation

	▪ Disturb sleep patterns of individuals sleeping during times when noise is permitted	Saw-cutting Plant/machinery use Rattle gun use
Odour and air pollution	Odour and air pollution can cause; ▪ Disturbance to the community from unwanted smells ▪ Nausea/headaches	Emissions from plant/machinery engines Overflowing septic tanks Chemical use Waste skip bin Contaminated soil Metal welding, grinding, cutting
Pathogens	Pathogens i.e. bacteria, viruses or other microorganisms can cause disease and harm human health	Animal waste and carcasses Used syringes Poor personal hygiene (not washing hands) Overflowing septic tanks Unhygienic amenities
Flora loss (affecting Fauna)	Damage and loss of plants/vegetation (including those protected under conservation strategies) that fauna rely on for food, shelter (habitat) etc. can affect harm the ecosystem critical for fauna survival.	Civil/earthworks Any work involving soil disturbance Any work removing trees, vegetation Any work within tree root zones
Damage to Heritage sites Cultural Heritage Harm	Damage and loss of the built environment that is heritage listed Harm caused to Traditional Land Owner (Aboriginal or Torres Strait Islander) cultural heritage	Alterations, additions and refurbishment on sites with known heritage significance. Tree removal e.g. of scarred trees. Earthworks potentially uncovering e.g. ancestral remains, stone arrangement, mound site etc. as identified in an Environmental Impact Statement.

The project Risk Assessment Worksheet RAW developed and authorised for implementation on this site. A risk rating tool (refer 5x5 matrix on page 1 of the RAW) is used to plot the likelihood of a hazard occurring against the consequence of the hazard on people and the environment.

The Rating tool determines extreme to low risk. Risks assessed to be extreme (after implementation of controls) have potential for catastrophic consequences. For any such risks, the Kane RAW requires the implementation of a Risk Control Priority to elevate the importance of giving priority to the task and placing more stringent controls.

The Hierarchy of Risk Control is used to determine the most effective control measure that is reasonably practicable in the circumstances. Each activity or hazard listed in the RAW identifies a series of controls in the order of the hierarchy.

The project RAW identifies, if elimination of the hazard and associated risk is not possible or practicable, a combination of the highest possible controls from hierarchy is selected. They are;

2. **Substitute** the hazard with a safer alternative (e.g. replace solvent-based paints with water-based)
   Use **engineering** controls (e.g. containing potential pollution using bunding, burst protection valves)
3. Use **administrative** controls (hazard not controlled at the source – e.g. training, procedures, permit systems)
   Use **personal protective equipment PPE** and **spill kits** (hazard not controlled at the source – e.g. protective gloves if individuals could be directly exposed to harmful pollution or waste)

Kane recognise the importance of supporting control measures with:

- Safe Work Method Statements SWMSs - describes the task, identifies the hazards and controls, and documents how the task is to be performed to minimise the risks (refer Kane Safety Management System)
- Training – to ensure workers involved are able to recognise the hazards, risks and controls
- Supervision - The level of supervision required will depend on the level of risk and the experience of the workers involved. Higher levels of supervision are necessary where inexperienced workers are expected to follow new procedures or carry out difficult and critical tasks.

Kane undertake regular proactive reviews of implemented control measures. **Environment Walks** or inspections are undertaken weekly to confirm controls are implemented, effective and working as planned. Such inspections are completed using Hammertech online Health, Safety, Environment, and Quality HSEQ software. Any actions are photographed and assigned to those responsible for close-out and tracked on the issues dashboard.

Failed and/or inadequate controls can become evident from incidents, near misses and non-conformances. Following an incident, near miss and non-conformance, the Risk Assessment shall be reviewed to confirm hazards, risks and controls are appropriate giving due consideration to the root causes and corrective actions determined in the incident investigation or non-conformance findings.

Monitoring and measurement may be allocated to an external consultant where required e.g. water testing, soils testing, air monitoring, noise and vibration etc. Kane shall ensure that all testing is analysed in a NATA accredited laboratory by a competent person using calibrated testing equipment.

CONTAMINATED LAND MANAGEMENT *Act 1997*

Many forms of contamination are dynamic in nature. They can migrate in groundwater or from surface run-off or wind, generate harmful vapours and cause onsite or offsite impacts to ecosystems. Contamination can also pose unacceptable health risks. If left unmanaged, contamination can become increasingly challenging and costly to address, particularly where the use of the land changes. These sources of harm require proactive action to ensure the use of contaminated land and groundwater does not place the community or the environment at risk of harm. This means ensuring the current use of land and groundwater is managed to minimise these risks of harm. Where land use changes are proposed, it also means that remediation of contaminated land is to a level 'fit for purpose' for its intended future use. The Act introduces new duties for contaminated land. These apply to harm that has already occurred or is continuing to occur - even in the absence of the harmful activities. *(EPA publication 1915)*

The **duty to manage** contaminated land requires a person in management or control of land to minimise risks of harm to human health or the environment from the presence of contamination in land or groundwater:

- A person can fulfil their duty based on what is known about contamination at the site, including the potential for contamination to be present, and when it is reasonable to expect a person (in management or control of the site) to have that knowledge.
- As knowledge on the potential for contamination increases, then the scope of a person's duty also increases, whether to assess risks or to manage them.

The Regulations set out circumstances where contamination may need to be reported to EPA under the duty to report of contamination (Act 1997 section 60). The **duty to report of contamination** promotes transparency of information, to continuously improve the available knowledge for all parties and improve the management of contaminated land risks.

What is contaminated land?

Section 5 Part 1 of the Contaminated Land Management Act 1997 (N0 140) defines:

Contamination of land, for the purposes of this Act, means the presence in, on or under the land of a substance at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.

It would be reasonable to assume land is not contaminated when:

- *a person has no direct knowledge of contamination being present or likely to be present: for example, no information in reports or site assessments disclosed as part of a sale of land, and no visible evidence of contamination (such as demolition waste, soil stains or signs of leaked substances); and*
- *there is no reasonable indirect knowledge that contamination could be present: for example, where, based on reasonable consideration of the use and historical uses of the site, its location and proximity to polluting activities, there is no information reasonably available to indicate likely contamination.*

ACTION - Determine if the site is contaminated (land and groundwater)

Search the following to determine knowledge of site contamination (land and groundwater);

- *site assessments prepared during the land acquisition process,*
- *site assessments prepared for the planning permit approval process or planning scheme processes,*
- *the physical site i.e. site inspection for e.g. tanks, stained soil, dumped waste and for the smell of odours*
- *the land adjacent to the site for existing contaminating activities*
- NSW EPA Website – *Contaminated Land Management Act 1997*
- NSW EPA Website – *Contaminated Land Management Regulation 2013*
  or Nationally
    - *Priority Sites Register* (PSR – Sites which EPA has formalised the management of contamination)
    - *EPA Environmental Audits* – EPA Audits assessing the suitability of a site for the proposed use
    - *Groundwater Quality Restricted Use Zone* - area, site or property where an environmental audit has been conducted and was found to have residual groundwater contamination

Where the above search process identifies land that is or may be contaminated, the circumstances of the contamination that make it notifiable to the EPA must be assessed in accordance with *NSW EPA Guidelines.*

The contamination of land is often complex requiring highly technical environmental knowledge. The assistance of contaminated land or environmental consultants is to be utilised where required to seek direction on complying with the risk management obligations.

https://www.epa.nsw.gov.au/your-environment/contaminated-land/managing-contaminated-land/engaging-consultant

The consultant engaged shall measure, evaluate and confirm;

- Whether notification to EPA is required (not all contamination is notifiable to the EPA)
- Provide guidance (or establish procedures) to manage protection of human health and the environment

Expectations outline implementation of the following risk management principles.

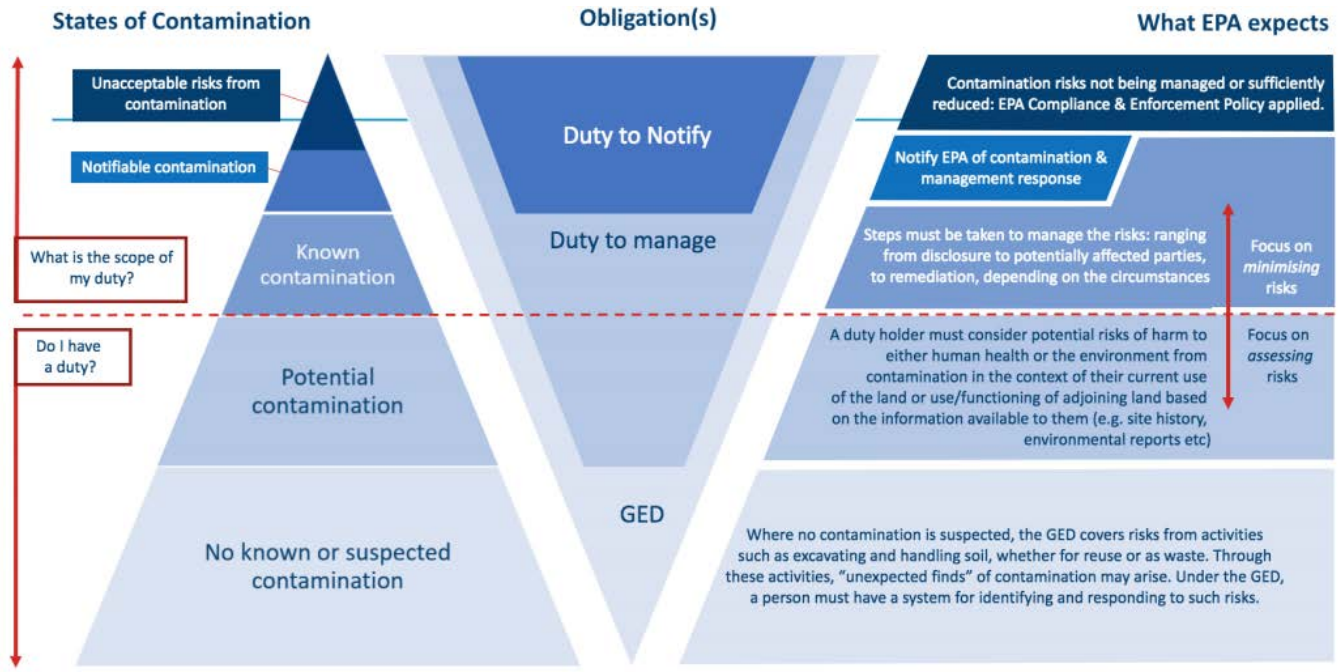


Figure 1 Contaminated land obligations and the knowledge of site contamination

CONTAMINATION THAT IS NOTIFIABLE TO EPA – *Guidelines on the Duty to Report Land Contamination under the Contaminated Land Management Act 1997.*

The following flowchart is used to determine the decision process for person/s responsible for reporting potential contamination to the EPA.

6. Appendix 1: Decision process and checklist for persons responsible for reporting potential contamination to the EPA

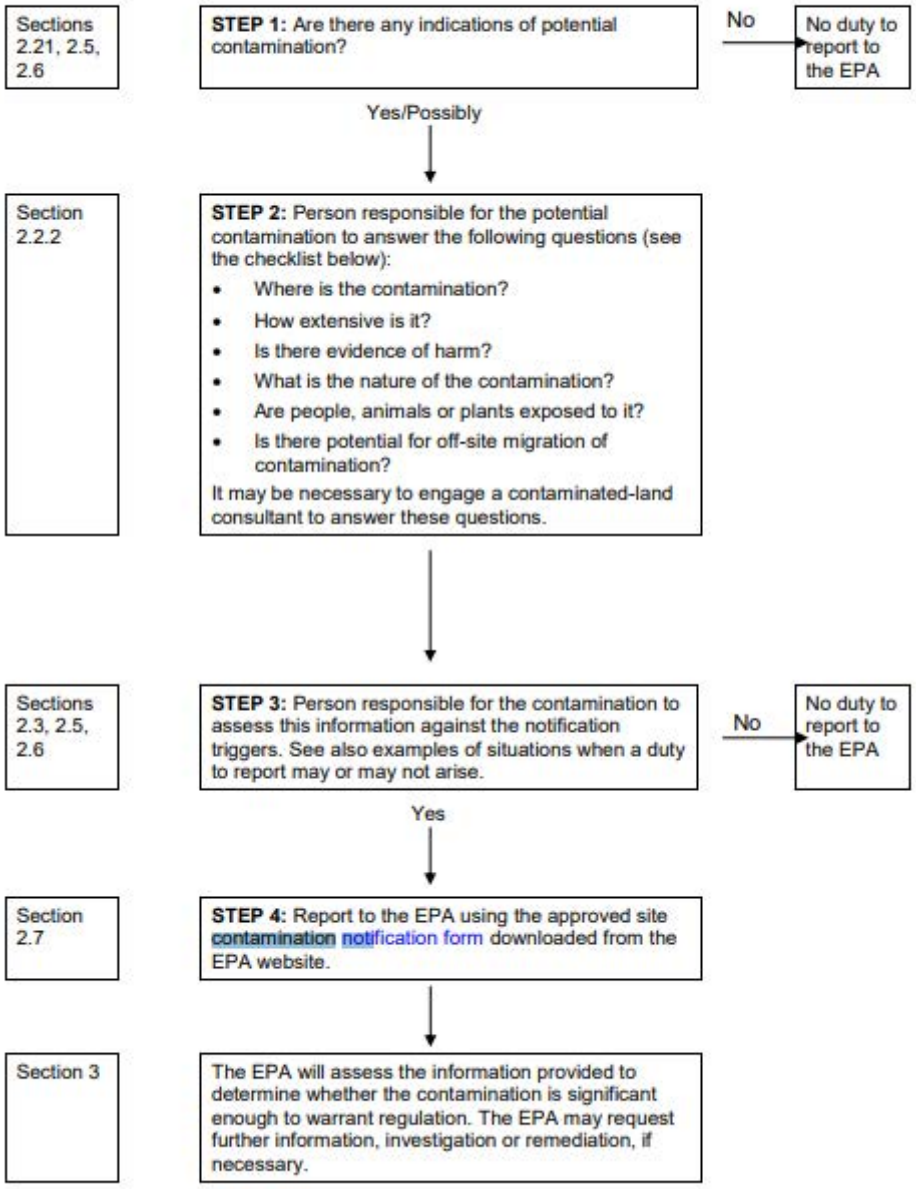


Figure 1: Decision process for use by persons responsible for reporting contamination to the EPA under the *Contaminated Land Management Act 1997*.

The following contamination is notifiable to EPA NSW. If the below listed contamination is suspected or known; the assistance of contaminated land or environmental consultants is to be utilised where required to review and interpret the circumstances of the contamination that make it notifiable.

Note – Notification exemptions apply.

Where notification is required to the EPA, the following information must be provided.

- location of the land;
- the activity resulting, or suspected as resulting, in the contamination;
- the nature and extent of the contamination;
- the nature of the risk of harm to human health and the environment from the contamination; and
- any other prescribed information, which includes information on the management response, or proposed management response, to the notifiable contamination.

Contamination	Reg Ref	Description
On-site soil contamination	Sect 2.3.1	▪ The contaminant is in or on soil on land under the management or control of a person; ▪ A person is, or is likely to be, exposed to the contaminant; and ▪ The concentration of the contaminant is, and is likely to remain, at a concentration that is: o above the average threshold for that contaminant; or o equal to or above localised elevated value threshold for that contaminant
Contamination of adjacent land	Sect 2.3.3	▪ The contaminant is in or on soil on land adjacent to land under the management or control of a person; ▪ The contaminant has entered / is likely to have entered from land under the management or control of the person; ▪ The concentration is or likely to remain, at a concentration: o above the average threshold for that contaminant; or o equal to or above the localised elevated value threshold for that contaminant
Foreseeable contamination of adjacent land	Sect 2.3.3	▪ The contaminant is in or on soil on land under the management or control of a person: o The contaminant is likely to enter and remain on land adjacent to that land; and o The concentration is likely to be above the health investigation levels (HIL) listed in Schedule B1 to the NEPM for that contaminant for the current use of the adjacent land.
Asbestos in or on soil	Sect 2.3.4	▪ There is a presence of friable asbestos in or on soil on land under the management or control of a person and a person is, or is likely to be, exposed to airborne asbestos fibre levels above 0·01 fibres per mL by means of inhalation
Actual or foreseeable contamination of surface water	Sect 2.3.5	▪ Entry or likely entry of a contaminant into surface water from land that is under the management or control of a person; and ▪ The contaminant in the surface water: o Is, or is likely to be, above the default guideline value / the guideline value for that contaminant; and o Is likely to continue to remain above the specified concentration.
Vapour inhalation pathway (vapour intrusion)	Sect 2.3.6	▪ The contaminant concentration: o —on average, in soil vapour samples from the land, is above the interim soil vapour HIL for volatile organic chlorinated compounds for the current use of the land; o —in an individual soil vapour sample from the land, is equal to or above 250% of the interim soil vapour HIL for volatile organic chlorinated compounds for the current use of the land or any land adjacent to the land; o —in soil vapour samples from the land, is above the soil vapour health screening levels listed in Schedule B1 to the NEPM (HSL) for vapour intrusion for the current use of the land or any land adjacent to the land;

		○ —in an individual soil vapour sample from the land, is equal to or above 250% the soil vapour HSL for vapour intrusion for the current use of the land or any land adjacent to the land; ○ —on average in soil samples from the land, is above the soil HSL for vapour intrusion for the current use of the land; ○ —in an individual soil sample from the land is equal to or above 250% of the soil HSL for vapour intrusion for the current use of the land or any land adjacent to the land; ○ —on average in groundwater samples from the land, is above the groundwater HSL for vapour intrusion for the current use of the land or any land adjacent to the land; ○ —in an individual groundwater sample from the land that is equal to or above 250% of the groundwater HSL for vapour intrusion for the current use of the land; and ▪ The contaminant concentration remains, or is likely to remain, above the concentration specified above; and ▪ A person is, or is likely to be, exposed to the contaminant or any by-product of the contaminant.

Waste *includes any of the following – (Waste Classification Guidelines – Part 1 Classifying Waste)*
This part of the Waste Classification Guidelines (the Guidelines) covers the classification of wastes into groups that pose similar risks to the environment and human health.
The following classes of waste are defined in clause 49 of Schedule 1 of the Protection of the Environment Operations Act 1997 (POEO Act):

- *special waste*
- *liquid waste*
- *hazardous waste*
- *restricted solid waste*
- *general solid waste (putrescible)*
- *general solid waste (non-putrescible).*

Industrial Waste *means*

(a) waste arising from commercial, industrial or trade activities or from laboratories; or
(b) waste prescribed to be industrial waste for the purposes of this definition

NEPM *National Environment Protection (assessment of site contamination) Measure 1999 means a Measure made under section 14(1) of the National Environment Protection Council Act 1994 (Commonwealth Act) and the equivalent provisions of the corresponding Acts of participating States and Territories.*

INCIDENT NOTIFICATION TO EPA

Schedule M details the incident classifications (Class 1, 2 and 3) used by Kane/arete to provide guidance on the type of incidents, their notification and investigation requirements.

Call 000 to report major pollution incidents.

Call **EPA NSW** on 131 555

(Notification Facts sheet can be found via the link below)

https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/reporting-and-incidents/21p2833-reporting-to-the-epa.pdf

Once the incident has been reported to EPA, you will be given a case number where a EPA field officer will be in contact to review your report in a timely manner.

A Notifiable incident means;

a) a pollution incident that causes or threatens to cause material harm to human health or the environment; or
b) a prescribed notifiable incident

Pollution Incident

A pollution incident means an incident or a set of circumstances—

a) that causes a leak, spill or other unintended or unauthorised deposit or escape of a substance; and
b) as a result of which, pollution has occurred or is occurring—

but does not include an incident or a set of circumstances that solely involves the emission of noise.

The link below guidance information is obtained from the EPA website

https://www.epa.nsw.gov.au/reporting-and-incidents/incident-management/reporting-and-managing-incidents

INCIDENT INVESTIGATION, CORRECTIVE AND PREVENTATIVE ACTION

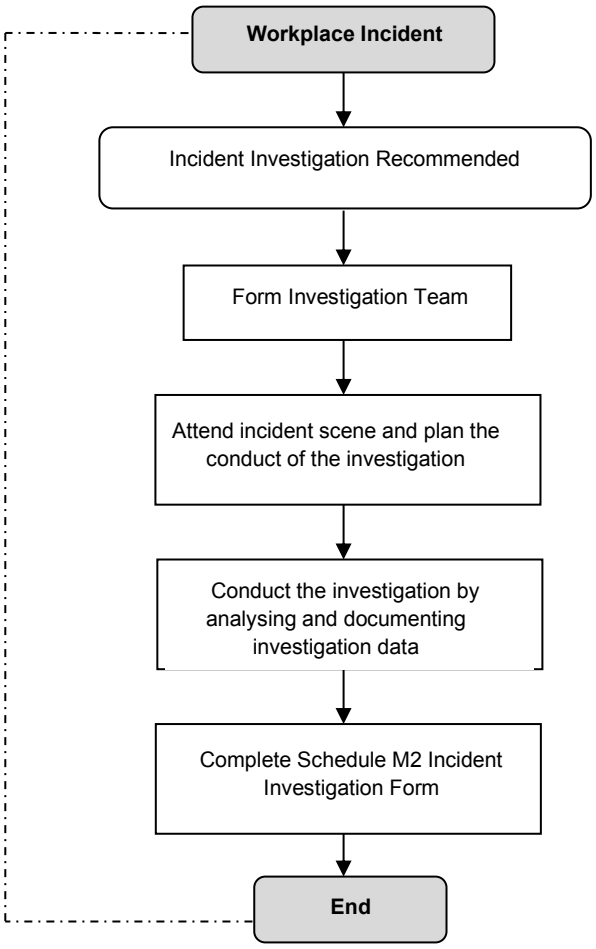
During the site induction, all workers are informed of their responsibility to immediately report all incidents and non-compliances to site management.

Incidents are investigated to identify the root causes and prevent further such incidents occurring at the workplace and other workplaces. The circumstances triggering notification from the project team to the state HSE Team is detailed in Schedule M of the WHSMS. The Site Manager (or any member of Kane/arete Management) at the workplace must use Schedule M as a reference tool to determine;

- If the circumstance is reportable to the Kane/arete HSE Team
- Who to contact and by when
- What to do immediately (i.e. Preservation of a regulator notifiable incident scene is a legal requirement)
- If the circumstance meets notification requirements to the regulator
- Actions needed for the incident investigation

Schedule M details the incident classifications (Class 1, 2 and 3) used by Kane/arete to provide guidance on the type of incidents, their notification and investigation requirements. An investigation is undertaken in accordance with the below chart and documented using Schedule M2. The findings of the incident investigation are reviewed by the HSE Team with a view to disseminating the lessons learnt to all projects.

Procedural and/or legislative Non-conformances are identified, investigated, corrected and prevented by raising an Improvement Notice or Non-conformance. The notice recipient must document the action taken to rescind the notice, including how to prevent recurrence. Kane Site Management determines if the rectification is satisfactory.



Comments / Notes

1. Refer to Schedule M to confirm if the circumstance is reportable to the Kane/arete HSE Team
2. Determine the Incident Classification Class 1,2 or 3
   - Class 1 – External Investigation Team
   - Class 2 - HSE Team Internal Investigation
   - Class 3 - Site Team Internal Investigation
3. System Manager/WHS Manager to liaise with Project and Site Manager. Include subcontractors, subject matter experts and consultants as required to form an Investigation Team.
4. Familiarise with environment, equipment and plant associated with the incident. Gather facts and photographs. Investigation team determines
   - Who to be interviewed
   - When to conduct interviews
   - What questions to ask
   - What information or evidence to collect
   - What photographs are required
5. Analyse data to find root cause/s of the incident and propose recommended actions
6. Project Manager finalises report and consults with Systems Manager/WHS Manager and Director, General / Construction / Operations Manager

UNEXPECTED FINDS – *Uncovering previously unknown or undetected contamination*

Contamination can be 'hidden' in structures and beneath surfaces that were previously not accessible for inspection and testing. This includes contamination beneath the soil surface e.g. from past practices of burying waste. The possibility of an 'unexpected find' can arise during works that uncover such hidden areas e.g. during excavation work and demolition of structures on or beneath the soil surface.

Step	Description	Action
1	Potential contaminated soil, groundwater or surface water, or ACM, is encountered during construction activities.	Cease work in the potentially impacted area as soon as it is safe to do so and move away from the area. Assess the potential immediate risk to worker health and surrounding environment posed by the unexpected find and assess if evacuation or assistance of emergency services is required.
2	Environmental management and Work Health Safety Management	Delineate an exclusion zone around the impacted area using fencing and/or appropriate barriers and signage. Additional control measures may be required for: • Odours and/or volatile compounds: odours suppression and no flames/sparks signage. • Potential asbestos containing materials: if area is small cover with weighted plastic sheeting or geofabric. For larger areas, use regular dust suppression as conditions require – refer to the project risk assessment. • Install environmental controls around the site to contain the contaminated material including diversion of water to minimise potential spread. • Personal Protective Equipment (PPE) will be worn if conditions have changed as per the relevant Material Safety Data Sheet (MSDS).
3	Assess the Un-Expected Find	A Contaminated Land Consultant should assess the unexpected find and provide: • Preliminary assessment of the nature of suspected contamination and immediate management controls if needed. • Advise what further assessment and/or remediation works are required and how such works are to be undertaken in accordance with contaminated site regulations and guidelines – refer to the CEMP or associated management plan. • The assessment may include a requirement to undertake a targeted site investigation to sample and analyse contaminated media. Suspected or identified contamination will be characterised with consideration of the Waste Classification Guidelines (NSW EPA, 2014).
4	Management or mitigation action and reporting	Based on advice of the Contaminated Land Consultant, implement necessary management or mitigation actions to minimise risk to human health and the environment and to allow the construction activities to recommence. Record details of the unexpected find and the actions undertaken, including the following, and notify the auditor, landowner; local council and/or NSW EPA: • Location, nature and extent of unexpected find • Scope, methodology and results of any investigation. • Scope, methodology and outcomes from any remedial activities completed. • Results of any validation sampling or clearance certificates (i.e. for asbestos). • Implemented changes to risk control measures.
5	Recommence Works	The Contaminated Land Consultant (if req'd) will provide relevant information and recommendations to the Kane Project Manager in accordance with the WHSE Manager particularly for considering any changes to existing site management plans. Recommence construction works once mitigation or remediation works have been implemented, sampling has validated that the remediation strategy has been successful and if it is then deemed safe to do so by Kane Constructions.

Kane/Arete Site Management will notify the State HSE Team in accordance with Schedule M

Kane/arete Site Management will consult with the State HSE Team and take action to protect human health and the environment in accordance with local Laws, Standards and Guidelines. The assistance of professional consultants is to be utilised where required to seek direction on measuring, evaluating and establish procedures to manage the protection of human health and the environment associated with unexpected finds.

DUTY TO MANAGE INDUSTRIAL WASTE

Waste must be classified before disposal.

The Regulations places the following **duties on persons depositing, transporting and receiving industrial waste**.

- **Industrial waste must only be deposited at a lawful place**
- **Receivers of industrial waste must be authorised**
- **Generators of industrial waste must take reasonable steps to ensure the waste will be transported to a lawful place**
- **Transporters must take all reasonable steps to ensure the waste is transported to a lawful place**

Lawful places require authorisations or permissions to process industrial waste.

The three main types of authorisations are;

Licence Holder

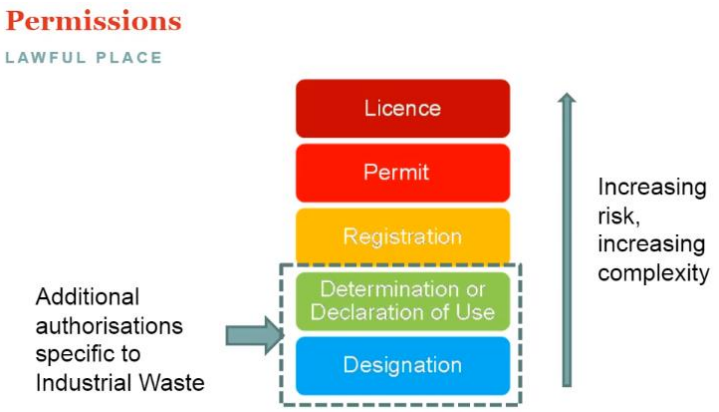
EPA Licence holder for high risk activities.

Permit Holder

Simplified form of EPA licence designed for less complex, less risky activities.

Registration

Form of notification to the EPA informing you are undertaking the activity which is described in the regulations.



FILL MATERIAL (Industrial Waste)

Fill material or soil from greenfield sites or sites previously used for residential is considered clean due to the historical use of the site being free of polluting activities.

Fill material or soil from brownfield sites, sites previously used for industrial or commercial purposes or sites with heavy pesticide use will be classified industrial waste irrespective if sampling and analysis determines concentrations.

An appropriately qualified person, such as an Environmental Consultant, should be engaged to complete a Preliminary Waste Classification, which will provide the information required to identify where the waste can be legally disposed of.

The Preliminary Waste Classification needs to be completed in accordance with relevant EPA sampling and assessment requirements. The findings from the Preliminary Waste Classification should be presented in a report.

The three steps to satisfy waste duties is outlined below.

Step 1: Classifying the Waste

Classification of waste is the process of identifying the category of the waste or soil and what subsequent management strategies are needed for its transportation off-site, including where it can be lawfully disposed.

As a minimum, the Waste Classification needs to include:

- A site history investigation, to identify the potential contaminants of concern.
- Soil sampling for the potential contaminants of concern at the required appropriate sampling density; and
- Comparison of the results against the EPA Waste disposal categories –

Where soil contains known or reasonably expected contaminants exceeding the upper limits for fill material in.*2* the soil will be classified as contaminated soil (A Priority Waste).

Soil Sampling

Soil sampling conducted in accordance with the EPA *NSW Sampling Design Guidelines which* is summarised below.

A Preliminary Waste Classification is completed to categorise soils for off-site reuse or disposal. This targets areas and depths of potential contamination and identifies potential contaminants of concern PCoC.

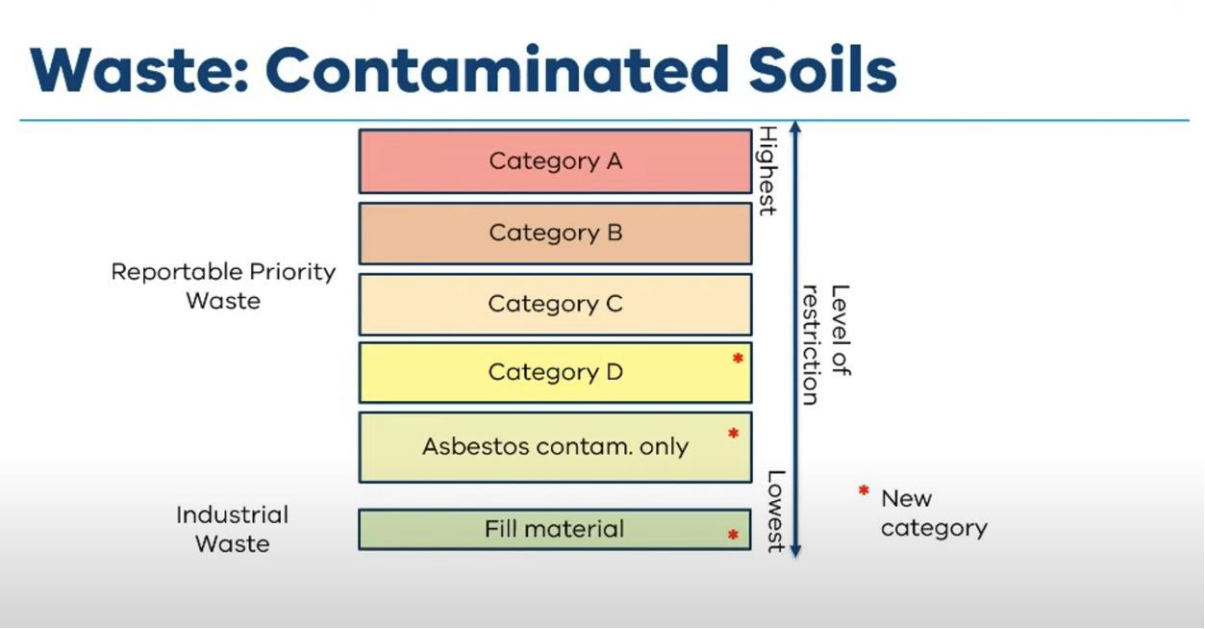
When the extent of PCoC and potential areas/depths of concern is known, the soil is divided into domains (e.g. fill, natural, stockpiles etc),

Sampling may first be completed to provide indicative results, however additional samples may be required in order to meet the minimum sampling density required for varying soil volumes.

Categorising Soils – National Reference (For guidance use)

Categorisation of soils can be based on either in-situ or stockpiled soil samples. Values used to determine soil categorisation can be either highest sample result or the 95% UCL $_{average}$ value for each contaminant.

There are five waste categories for soil as outlined below.



To determine the hazard category for each domain, contaminated soil must first be considered and excluded from Category A, then considered and excluded from Category B before it can be considered as Category C and so on. Any material receiving a category above Fill Material is considered a **Reportable Priority Waste** and must be transported using permitted / registered transporters and disposed of legally to appropriately licenced receiving facilities (refer Step 2).

Additional sampling may be required in instances where reportable priority waste is identified, in order to meet minimum sampling requirements, and waste codes will be allocated to the material.

It should be noted that multiple waste categories may be applied to soils within the same soil domains and will therefore require segregation and potential further sampling to validate appropriate waste category segregation.

The Environmental Consultant can direct Site Management to areas requiring segregation and any additional sampling where required.

Soil classified as fill material can be reused onsite;

- Not exceeding the upper limits for fill material contaminant concentrations or
- Can be received and reused onsite subject to satisfying the EPA Fill Material Determination or
- Deposited at a lawful place offsite in accordance with a relevant *EPA Licence, Permit, Registration or Determination*

Excavated material becomes surplus when it cannot be used by the project because of its physical, chemical or biochemical characteristics and location, and more material being available than is required. Surplus excavated materials are considered a waste unless reclassified as clean fill or determined suitable to be used onsite.

Step 2: Transport the Waste

Producers of reportable priority waste must use EPA's waste tracking system – Waste Locate. A secure login must be created on the EPA NSW website before Waste Tracker can be used.

https://www.epa.nsw.gov.au/your-environment/waste/tracking-waste-mla Classification information, approximate volumes and relevant waste codes are needed before the waste transporter can transport reportable priority waste. The Environmental Consultant can assist with this.

It is important that all information provided is correct to allow the waste transport company to determine if they themselves have appropriate EPA permissions to transport the waste and also that the receiving facility is appropriately licenced to accept the waste.

Checking the EPA Permissions Register

Waste transport companies must hold the appropriate EPA permissions to cart reportable priority waste in accordance with the soils waste categorisation and corresponding waste codes. Waste transport company permissions can be verified via the EPA Registered Permissions Portal.

Tip: If it's a company (e.g. Lantrak), just type the name into the "Duty Holder" box and press search…….. then scroll down the page.

Record Keeping

The waste transport company must provide transaction records confirming each waste pick up was deposited at a lawful place. These records are maintained by Kane and accompany the Waste Classification report.

Step 3: Disposal of Waste to a Lawful Place

Producers of reportable priority waste also have a duty to ensure that the waste has been correctly classified and is deposited at a lawful place. A lawful place is somewhere authorised to receive industrial waste under the Act, such as permissioned resource recovery facilities, transfer stations and landfills.

When giving your reportable priority waste to a transporter, you will need to fill out a waste transaction record in EPA's online Waste Tracker database as outlined in **Step 2** above. Waste Tracker verifies your waste is being taken to a lawful place and is transported appropriately to the facility. An Environmental Consultant engaged on the project can also assist in verifying the waste is reportable priority waste and lawfully deposited.

Copies of the waste transaction should also be retained from the waste transporter from the waste tracker portal, which show where the waste has been deposited. The waste transaction should include:

- the date and time of delivery,
- waste description, and waste amount,
- a name and address of the facility, facility ABN, and
- the transporter vehicle registration

***Reportable priority waste** is defined in the Environment Protection Regulations 2021 Division 3, Schedule 5 Waste Classification Table Columns 7 and 8. The EPA must be informed each time a reportable priority waste changes hands using the EPA's electronic waste tracker. Waste tracker replaces the Waste Transport Certificates system (refer https://www.epa.vic.gov.au/for-business/business-forms-permits-online-tools/waste-tracker).*

Action

- Include Waste Tracker login to Att 3 of this plan and check in the Setup for Success
- Check the audit includes
  - vehicles collecting and transporting reportable priority waste (transport) generated from sites owned / managed by Kane hold the permission to transport such waste
  - any waste facility where the industrial waste is delivered is authorised to receive such waste.

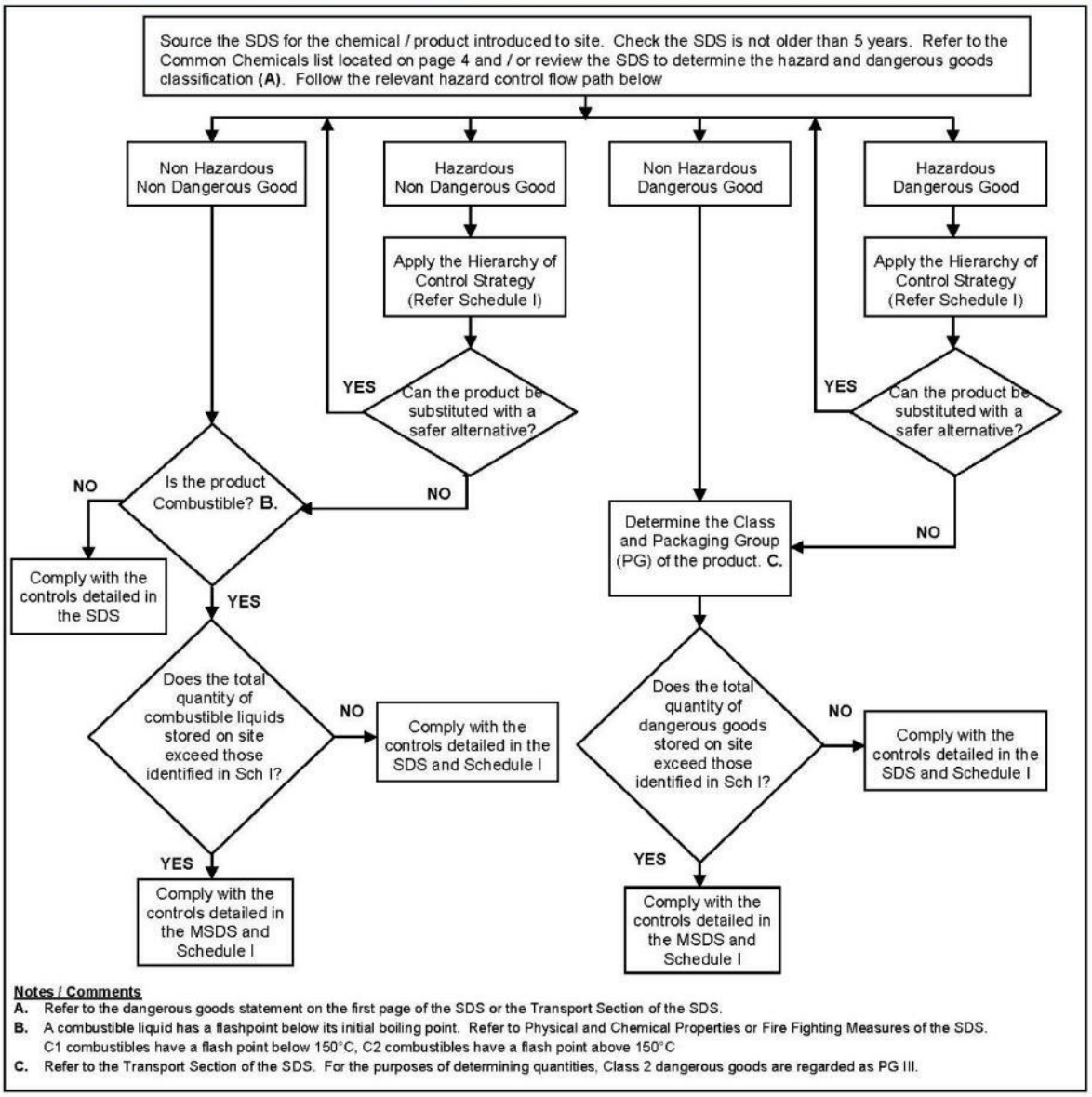
RISKS FROM CHEMICALS, DANGEROUS GOODS AND HAZARDOUS SUBSTANCES

A register of hazardous chemicals is maintained at the workplace and readily accessible to workers involved in using, handling or storing hazardous chemicals including anyone else who is likely to be affected by a hazardous chemical at the workplace. Kane use Schedule I/2 Chemical Register to satisfy this requirement. The register is accompanied by the current (not more than five years old) safety data sheet SDS for each chemical listed. A SDS is a document that provides information on the properties of hazardous chemicals, how they affect health, safety and environment in the workplace and how to manage the hazardous chemicals in the workplace.

The hazardous and/or dangerous good classification of a chemical / product helps determine how to safely use and store it. Kane implement the flowchart below to manage dangerous goods and hazardous substances. It is an excerpt from Schedule I of the Kane WHSMS and used as a detailed guide on how to;

- Determine if the chemicals/products introduced to site is classified hazardous and/or dangerous
- Safely store chemicals/products introduced to site classified hazardous and/or dangerous
- Safely store gas cylinders

Diagram 1: Chemical / Product Control Flow Paths



EMERGENCY PREPAREDNESS AND RESPONSE

Emergency preparedness and response procedures are developed after an assessment of:

- The hazards at the workplace,
- The possible consequences of an incident occurring as a result of those hazards
- The number of workers and other people at the workplace
- Remoteness or isolation of the workplace from emergency services

The documented assessment of emergency procedures and equipment is attached (refer Attachment 1).

If the Kane building site is within an area occupied by the client or immediately adjacent where an emergency in either occupied space may affect the other space, the Kane project manager shall chair a Prestart Meeting to agree and develop a coordinated emergency response procedure. This ensures the procedure in each occupied space is understood by each occupant and more likely to complement (work in unison) when emergency response is necessary. The documented prestart meeting is attached.

After careful consideration of the emergency preparedness/response assessment, and the outcome of the prestart meeting held with the client to coordinate emergency response, the project emergency procedures and evacuation plan is developed. When authorised for use by the Project Manager, the attached emergency procedures and the evacuation plan is:

- Communicated to all workers during the site induction
- Displayed in prominent locations
- Regularly reviewed to ensure it remains appropriate for the changing work site
- Practiced or tested and evaluated for effectiveness

Testing of the emergency procedures is important since it provides practical on-site training for those with responsibilities for specific actions in an emergency to practice their skills. It is equally important for site worker's involvement in practice drills so they receive training in the site specific emergency procedures including the opportunity to provide feedback on the effectiveness of the emergency procedure practiced.

The emergency procedures developed for this project include;

- Medical
- Evacuation of Site
- Personal Threat
- Arcing or Contact with Electrical Assets
- Escaping Gas
- Rescue from a Trench or Excavation or engulfment
- Rescue of a person suspended at height
- Electric Shock Rescue (Low Voltage Current)
- Drowning / Near Drowning Rescue
- Hazardous Material Localised Emergency
- Tower Crane Operator Rescue
- Bomb Threat
- Rescue of a person working in or on a roof area

Schedule O/4 Emergency Procedures Test – Record of Meeting is used to place structure around testing of select emergency procedures and details the outcome of the test.

Where a proprietary evacuation siren is required, an approved service agent of the manufacturer is engaged to install and provide training on the system use. The evacuation siren shall be tested and maintained in accordance with the manufacturer recommendations.

Where aerosol can type sirens are used, the instructions printed on the can shall be followed to ensure maximum effectiveness.

Kane engage first aid suppliers to maintain first aid cabinets (replenish first aid consumables) and fire service agents to inspect and maintain fire extinguishers (6 monthly and after each use).

AUDIT AND REVIEW

Kane undertake regular proactive audits and reviews to confirm compliance with this Environmental Management Plan. They include but not limited to:

Process Description	Hammertech System Reference	Minimum Implementation Frequency
Environment Walks	HSEQ Inspection Schedule F	Weekly
Safety Walks	HSEQ Inspection Schedule F	Weekly
Workplace Inspections	HSEQ Inspection Schedule F1	Monthly
Safety & Environment Audits	HSEQ Inspection Schedule C	Quarterly

Incidents, near misses and non-conformances can also trigger reactive audits and more stringent reviews. The following system documents prompt the review of controls post any incident including any test exercises:

Process Description	Hammertech System Reference
Improvement Notice and/or Non-conformance	HSEQ Inspection Schedule L
Incident Investigation	Incident Module Schedule M2
Workplace Injury and Disease Record	Incident Module Schedule N
Emergency Procedures Test	HSEQ Inspection Schedule O4

The Safety and Environment Audit form is used on site by the Project Manager to audit effective implementation of this EMP. Points are awarded for effective implementation and points taken where improvement is required. The audit facilitates recognising good practice safety and environmental management and requires corrective actions be raised where improvement is necessary. Each site is audited quarterly (minimum) to align with end of quarter reporting determined by the State HSE Team. The audit report is issued to the State HSE Team to review against company objectives/targets and identify trends that may appear (positive and negative). The audits are scheduled at the middle of the following months (or otherwise scheduled to avoid holiday and extremely busy periods i.e. lead up to Christmas)

- February (Jan – Mar)
- May (Apr – Jun)
- August (Jul – Sept)
- November (Oct – Dec)

Random internal audits are undertaken by the State HSE Team members. Reports are prepared and distributed to all staff on the project identified in the project team chart for actioning.

External audits are undertaken by the Federal Safety Commission, ISO9001, ISO14001, ISO45001 Third Party Certification auditors, and various consultants where the head contract specifies.

Federal Government WH&S Scheme projects are audited by Federal Safety Officers. The Federal Safety Commission Audit team schedule audits during periods where high risk work tasks are undertaken. Audit reports are prepared and submitted to Kane for actioning.

Kane Constructions certification to Standard ISO9001, ISO14001, ISO45001 requires third party surveillance audits be undertaken on annually. Projects are selected randomly. Each audit confirms if the company certification should remain. Corrective action must be promptly closed where identified.

Where head contracts require external audits of projects, the auditor is commonly required to have Lead Auditor competency. Audit frequency and reporting requirements differ based on client audit criteria, project complexity and risk.

ARCHIVING

Project archives are maintained electronically using Hammertech.

Records containing details listed under Regulation 69 must be retained for 2 years from the date on which the waste was classified.

All data and records will be available via secure log-in post-project completion.

DEFINITIONS, KEY TERMS AND ABBREVIATIONS

WHS	Work, Health and Safety
WHSMS	Work, Health and Safety Management System
EMS	Environmental Management System
ISO 14001	Australian and New Zealand Standard for Environmental Management Systems
ISO 45001	Australian and New Zealand Standard for Occupational Health and Safety Management Systems
WHSMP	Work Health and Safety Management Plan
Hammertech	Hammertech is an online Health, Safety, Environment, and Quality HSEQ database customised to include Kane accredited management system forms and processes. Accessible on any smart device, it integrates Kane management, sub-contractors and workers together into a real time HSEQ data gathering and sharing environment. The database facilitates gathering and review of subcontractor compliance information well before the task is due to commence on site and has proven to be more efficient than previous paper based systems. https://hammertechglobal.com/en_au/
SWMS	Safe Work Method Statement
PCBU	Person in Control of a Business or Undertaking
CSI	Critical Safety Incident A “Critical Safety Incident CSI” at the workplace is an event which does or has a high likelihood of traumatic effects on the individuals at the workplace. It has or is likely to cause strong emotional reactions, which have the potential to interfere with the ability of the individual, group or the workplace to function either at the time of the event or later. Examples of critical incidents include an event causing death or serious injury, suicide, major structural collapse, acts of terrorism, hold-up, hostage situation, shooting and assault at the workplace, including harm to people or damage to property caused by a natural disaster.
RAW	Risk Assessment Worksheet
PPE	Personal Protective Equipment
SDS	Safety Data Sheet (previously called a Material Safety Data Sheet MSDS)
EPA	Environment Protection Authority

ATTACHMENTS

- Schedule of Acts, Regulations, Standards and Guidance
- Environmental Responsibilities
- Project Risk Assessment Worksheet RAW (refer to the Environment section of Schedule R)

ATTACHMENT 1 - Schedule of Acts, Regulations, Standards and Guidance

The EPA uses three tiers of legal instruments and guidance to protect the environment:

- Acts
- Regulations,
- EPA guidance

PUBLICATION	SOURCE *Search using the title for each if unable to find*
Acts Protection of the Environment Operations Act 1997 Contaminated Land Management Act 1997 Protection of the Environment Administration Act 1991 Water Act 2007 (Commonwealth)	NSW EPA - Acts https://www.epa.nsw.gov.au/licensing-and-regulation/legislation-and-compliance/acts-administered-by-the-epa/act-summaries NSW Legislation https://legislation.nsw.gov.au/browse/inforce
Regulations Protection of the Environment Operations - Clean Air Regulations 2021 - General Regulations 2021 - Noise Control Regulation 2021 - Waste Regulation 2021	NSW EPA - Regulations https://www.epa.nsw.gov.au/licensing-and-regulation/legislation-and-compliance/acts-administered-by-the-epa/regulation-summaries

ATTACHMENT 2 – Environmental Responsibilities

The table below identifies the responsibilities of the positions held on this project. (refer to the project team chart for names and position abbreviations).

Description	PD/GM/ OM/CM	PM	SM	CM / CA	SE	FREQUENCY	COMMENTS
Review the contract for State, Local, client and site specific environment requirements including permits and approvals		R		P		Before project start Ongoing subject to staged approvals	
Search if the land & groundwater is contaminated *(refer Duty to Manage Contaminated Land in this plan)*		R		P		Before project start. Ongoing, if an Unexpected find is uncovered	Consultants are utilised where required to seek direction on measuring, evaluating and classifying the contamination
Notify the HSE Team if contamination exists *(refer Contamination Notifiable to EPA in this plan)*				I		Before project start Ongoing, if an Unexpected find is uncovered	
Review authorisations / permissions required to process anticipated waste including fill			I	P, I	I	Before project start. Ongoing, if an Unexpected find is uncovered	Consultants are utilised where required to seek direction on measuring, evaluating and classifying waste
Develop this EMP incorporating the outcome of the contract review and contamination status and authorise for use		P, R	I			Before project start. Reviewed minimum quarterly	Consultants are utilised where required to seek direction on measuring, evaluating, classifying waste and developing procedures to manage risk
Complete Sch R Risk Assessment incorporating the outcome of the contract and contamination review	R	P, R	I			Before project start Reviewed minimum quarterly	Prepared and updated by PM, reviewed by the PD / Construction Manager, implemented by the entire team
Prepare the Site Specific Induction		R	I, R	P, I	I	Before project start. Reviewed minimum quarterly	Deliver the content at each induction. Inductions to be shared between SM, CM, CA & SE
Inspect the Enviro Risks and controls for Compliance			I	I	I	Minimum weekly	Actions assign and closed using hammertech
Notify the HSE Team of any notifiable circumstance as listed in Schedule M and participate in incident investigation		I	I	I	I	If a notifiable circumstance as listed in Schedule M occurs	Investigation may uncover additional site specific controls and responsibilities
Audit and Implement Corrective Actions		I, R	R			Minimum quarterly	HSE Team may undertake random internal audits

P – Prepare, R – Review, I – Implement

Item #8 – Environmental Responsibilities

The project staff responsible for environmental management is assessed for competence, understanding and

acceptance of their environmental responsibilities. Confirmation of this is provided below.

Each individual shall complete the table to verify the items listed below. Write either Yes or No (alongside the item

in your column only) sign and date to confirm.

- Item 1- I understand my responsibilities identified in this Environmental Management Plan EMP
- Item 2 - I was consulted and given opportunity for input in the development of this EMP
- Item 3 - I am competent to carry out my responsibilities identified in this EMP
- Item 4 - I will carry out my responsibilities identified in this EMP

Name	**Nathan Parris**	**Paul Calabro**	**Damien Maher**	**Matt Gilbert**	**Whittaker Downey, Rhys Steward & Wilson Dowling**	**Other**
Title	Senior Project Manager	Project Manager	Senior Contract Administrator	Site Manager	Site Engineer	
Item 1 (yes/no)		YES	YES	Yes	RS- Yes WD- Yes WWD – Yes	
Item 2 (yes/no)		YES	YES	Yes	RS- Yes WD- Yes WWD – Yes	
Item 3 (yes/no)		YES	YES	Yes	RS- Yes WD- Yes WWD – Yes	
Item 4 (yes/no)		YES	YES	Yes	RS – Yes WD – Yes WWD – Yes	
Sign			YES			
Date		15/9/25	15/9/25	15/9/25	15/9/25 15/9/25 15/9/25	

ATTACHMENT 3 – Environment Management Meeting

ENVIRONMENT MANAGEMENT MEETING Agenda No 1

DATE:

HELD AT:

NEXT MEETING DATE

	COMPANY	EMAIL
PRESENT:		
Name	Kane Constructions Pty Ltd	@kane.com.au
Name	Kane Constructions Pty Ltd	@kane.com.au
Name	arete Australia	@arete.com.au
Name	arete Australia	@arete.com.au
APOLOGIES/ DISTRIBUTION:		
Name	Kane Constructions Pty Ltd	@kane.com.au
Name	Kane Constructions Pty Ltd	@kane.com.au
Name	arete Australia	@arete.com.au
Name	arete Australia	@arete.com.au

1. GENERAL **ACTION**

This meeting is held upon contract award by the construction team with input from Estimating and the Design Manager (DM for Design & Construct Projects ONLY). Note

The site team shall meet monthly so actions are monitored for close-out in a timely manner. The frequency of meetings may vary subject to project duration, results of risk control monitoring and risks associated with activities on site.

This agenda is mandatory. It is intended to deliver the following;

a) Consultation between the estimating and construction team at project commencement to highlight key environmental management risks and commitments made during the tender process

b) Kane Specific Environment Management requirements are captured in the Project Environment Plan e.g. from previous lessons learnt

c) Project Specific Contract requirements are thoroughly reviewed and summarised into key deliverable processes e.g. subcontract scope, risk assessment, weekly inspections, Audits etc

d) Applications and ongoing review for Permits or Approvals e.g. removal of native vegetation, changing a heritage register, working within a conservation area

e) Project Specific sub-plans are prepared to satisfy the contract

f) Environment management software is prepared e.g. Hammertech

g) The key environment management strategies are included in the Project Environment Plan.

h) Key members of the team and their responsibilities are clearly identified

i) The final draft revision of Project Environment Plan is issued to the client for approval

j) The first revision of Project Environment Plan is approved for implementation

2. HANDOVER FROM ESTIMATING TO THE CONSTRUCTION TEAM

a) Communicate, list or provide; — Estimator
   - Major Activities and Anticipated Hazards (environmental aspects/risks)
   - Environment management commitments made during the tender process
   - Key environmental management strategies
   - Environment related contract deliverables i.e. Permits or Approvals e.g. removal of native vegetation, changing a heritage register, working within a conservation area, protected species, cultural/archaeological sensitivity
   - Project specific sub-plans prepared to satisfy contract deliverables

b) Other

ACTIONS

1. Incorporate major activities, anticipated hazards, environmental aspects/risks and controls into the Project Environment Plan and Risk Assessment (Sch R)
2. Incorporate relevant environment management commitments and strategies into the Project Environment Plan and Risk Assessment (Sch R)
3. List any contract deliverables most appropriate to incorporate into subcontracts

3. DUTY TO MANAGE CONTAMINATED LAND (and groundwater)

a) **Review what is known and what you ought reasonably to know** — Project Manager
Complete the Hammertech Contamination Inspection.

b) Review the elapsed time since the soil contamination and groundwater investigation was undertaken. *Has any contaminating activity occurred on the land since the soil contamination and groundwater investigation was undertaken?*
If yes or an inspection determines additional contamination is suspected, seek guidance from an environmental consultant if additional testing is required
If no, or an inspection determines additional contamination is not suspected, the information from the soil contamination and groundwater investigation is considered the current state of contamination knowledge — Site Manager

c) Seek the opinion and guidance from an environmental consultant to;
   a. Determine if land/groundwater contamination **is notifiable to EPA**
   b. Provide guidance (or establish procedures) to manage the protection of human health and the environment from known contamination

ACTIONS

1. Complete the Hammertech Contamination Inspection — Contracts Manager
2. Determine if any contaminating activity has occurred on the land since the soil contamination and groundwater investigation was undertaken
3. Determine if land/groundwater contamination is notifiable to EPA
4. Develop procedures to manage the protection of human health and the environment from known contamination

4. DUTY TO MANAGE INDUSTRIAL WASTE

a) **Seek feedback from the Environmental Consultant on waste classification** Review the Waste Classification report completed to categorise soils for on-site reuse, off-site reuse or disposal — Project Manager

- Can fill material can be reused onsite?
  Note : Multiple waste categories may be applied to soils within the same soil domains and will therefore require segregation and potential further sampling to validate appropriate waste category segregation.
- Must the soil removed from site be deposited at a lawful place?
  Note : Any material receiving a category above Fill Material is considered a Reportable Priority Waste and must be transported using permitted / registered transporters and disposed of legally to appropriately licenced receiving facilities
- other

b) **Is the general waste company engaged authorised by EPA to receive the industrial waste / comingled waste from site?** i.e. permissioned resource recovery facilities, transfer stations and landfills

c) Other

ACTIONS

1. Determine the Waste Classification of soil
2. For Reportable Priority Waste removal, obtain documented verification that;
   a. Transporters are registered (have EPA permissions)
   Search Waste transport company permissions via the EPA website https://www.epa.vic.gov.au/about-epa/public-registers/permissions
   b. Receiving facilities are appropriately licenced
   Request the Receiving Facility provide a copy of their licence
   c. EPA Waste Tracker is activated. A secure login must be created on the EPA website before Waste.
   d. The waste transport company must provide transaction records confirming each reportable priority waste pick up was deposited at a lawful place. These records are maintained by Kane attached to the Waste Classification report.
3. Obtain documented verification (EPA authorisation licence/permission) from the waste company engaged to confirm they are authorised to accept the general comingled waste material from site
4. Other

5. REVIEW ENVIRONMENTAL RESPONSIBILITIES OF THE POSITIONS HELD ON THIS PROJECT

a)	Are responsibilities relevant/appropriate?	Project Manager
b)	Are any site specific responsibilities required to accommodate key deliverables?	
c)	Are responsibilities understood by the positions held on the project?	
d)	Are responsibilities being achieved/delivered on the project?	
e)	Do responsibilities need to be shared between staff or assigned to others?	
f)	Have staff signed the responsibilities matrix *Attachment 2*?	

ACTIONS

1. Update the responsibilities *Attachment 2* subject to the review and agreement reached
2. List each action/decision reached

6. RISK CONTROL MONITORING

a)	Review the hazards and risks to the environment from current and upcoming works against Project Risk Assessment Schedule R. Are the Major Activities and Anticipated Hazards (environmental aspects/risks) identified in Schedule R?	Project Manager
b)	Are the environmental risk controls identified in Schedule R current?	
c)	Are the environmental walks undertaken weekly as required by the EMP?	
d)	Are the environmental controls effective?	
e)	Other	

ACTIONS

1. List actions

7. ENVIRONMENTAL INCIDENT MANAGEMENT, REPORTING AND CORRECTIVE ACTION

a) Have all reportable circumstances as listed in Schedule M been notified to the state HSE Team? — Project Manager

- *Escape or leak of a harmful chemical or substance*
- *All unexpected finds of suspected contaminated soil, hazardous building materials, and items of heritage or cultural or archaeological significance*
- *Any pollution incident that causes or threatens to cause material harm to human health or the environment – pollution that causes a leak, spill or other unintended or unauthorised deposit or escape of a substance*
- *Land, Groundwater or surface water contamination*
- *Prohibition/Improvement/Infringement Notice*
- *Warnings or fines issued for breaches of state and local laws*
- *Unauthorised flora, habitat loss, Cultural Heritage/archaeological harm*
-

b) Are environmental incidents classified/investigated in accordance with Schedule M?

- Are community complaints associated with e.g. noise, dust, waste, mud on road, odour, and traffic management investigated
- Are incident learnings/corrective actions/ agreed improvements etc completed?

ACTIONS

1. List actions
2.

8. AUDITS

a) Review the most recent Environmental Audit Report — Contract Admin

- Identify the audit date
- Identify the type of audit (Internal/external)
- Identify the auditor name
- Did the audit identify any corrective actions?
  - If YES, are the corrective actions closed
- Did the audit identify any system improvement needs?
  - If YES, have you informed the State HSE Team?

b) Identify the date of when the next audit is due

c) Do any incidents, near misses and non-conformances warrant delivering a reactive audit i.e. rather than waiting for the next scheduled audit?

d) Other

ACTIONS

1. List actions

ATTACHMENT 4 – Environmental Resource Library – Guidance Sheets

Guidance Sheet 1: Working within or adjacent to waterways

Guidance Sheet 2: Managing stockpiles

Guidance Sheet 3: Managing truck and other vehicle movement

Guidance Sheet 4: Litter

Guidance Sheet 5: Surplus excavated material

Guidance Sheet 6: Hazardous waste

Guidance Sheet 7: Masonry and other solid material wastes

Guidance Sheet 8: Drilling mud

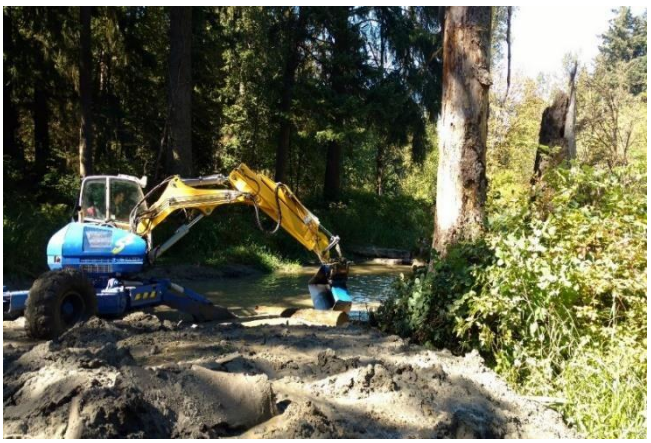
Guidance Sheet 9: Historic buried waste

Guidance Sheet 10: Sewage

Guidance Sheet 11: Wastewater

GUIDANCE SHEET 1 : Working within or adjacent to waterways

Works within or near waterways arise whenan activity changes the existing condition of a waterway or riparian area.



Works within a waterway can consist of:

- constructing a waterway crossing such as a bridge or culvert
- removing debris or material that is restricting waterway flow
- planting vegetation on embankments
- removing invasive vegetation
- rehabilitating wetlands.

Ensure you have obtained the appropriate permits from the relevant authority before conducting any works within a waterway.

Step one: identify hazards

Common hazards associated with works within a waterway include:

- increased erosion and sediment release into waterways and riparian areas
- increased waterway flow
- uncontrolled release of chemicals, hydrocarbons and waste by vehicles and construction equipment.

Step two: assess risks

To help assess the risk of generating environmental impacts from works within or adjacent to waterways, you can:

- consider the size, scale, and location of the proposed works
- understand the physical properties and soil characteristics of the waterway and riparian zone in the area of works
- assess the seasonal variations in waterway flow
- identify the impacts of construction techniques and methods for works
- within or near a waterway. Due to the size and scale of larger construction vehicles, unwanted erosion and sediment can be generated if construction equipment and vehicles are not managed appropriately
- understand the loading impacts of excavators, plant equipment and vehicles on soils and embankments
- identify entry and exit points and the limitations of access for construction works
- consider the chemical properties of lubricating oils used by excavators and plant equipment
- consider potential impacts to nearby sensitive receivers including aquatic ecosystems and riparian habitat.

Step three: implement controls

Consider implementing the following controls, appropriate for your activities, to limit the impacts to waterways and riparian areas at your site:

- Follow and comply with all permit and approval requirements obtained for your works.
- Minimise the duration of works within a waterway or floodplain.
- Schedule works to occur during drier months of the year and lowest flow of the waterway.
- Avoid works during times of the year when aquatic animals are likely to be under pressure, particularly during migration or spawning.
- Stabilise waterways to minimise erosion using non-invasive grass, vegetation, stabilisation matting or rock armour.
- Design and construct rock filter dams, modular sediment barriers, or silt curtains (see Figure 1) to assist in the reduction of sediment entering the waterway downstream.
- Minimise access by vehicles and people to the waterway, restricting access to essential works only and prevent access to unstable areas.
- Reduce the movement of sediment by encouraging deposition in specific areas of the waterways considering the size of the waterways using one or a combination of:
    - working on one bank
    - creating new channels/channel works
    - discharge pipes into creeks.
- Remove excavated material and debris from the project site or place it in a stable area above the high-water level of the waterway, or as far as possible from the waterway.
- Use bio-degradable lubricants and oils on excavators and plant equipment that work within or adjacent to waterways.
- Prevent livestock from accessing the waterway. If livestock are prevented from accessing a waterway, provide an alternative water supply.
- Monitor surface water quality regularly upstream and downstream from the works area. If monitoring shows a change in water quality, stop the works. Confirm if works are the cause of these changes, assess for any adverse impacts on aquatic ecosystem and modify work practices.
- Develop contingency measures for works within a waterway or floodplain. Your contingency measures should consider the consequences to the environment allowing for recurrence intervals of potential floods, and address:
    - methods to prevent water entering excavations
    - controls to be implemented when a storm event is forecast
    - measures to ensure that waterways and floodplains retain sufficient flood detention capacity to moderate peak water flows
    - a flood warning system
    - clean up procedures, including disposal of excess water
    - notification of relevant authorities if unplanned incidents occur that could pose a risk to the environment (see *Incident Notification* above).

- Plan reinstatement measures that may include:
    - proposed changes to the waterway including temporary short-term bypass pumping or temporary diversion channels
    - impacts to existing vegetation
    - erosion and sediment controls
    - proposed methods for reinstatement of the waterway bed and banks
    - a revegetation plan, including proposed species and locations, methods for weed control and ongoing maintenance until native species have established.

Figure 1. Engineered silt curtain installed to prevent migration of sediment for construction works within a waterway.

Step four: check controls

Monitoring controls you put in place can help you to ensure they operate effectively and as planned. For the management of works within or adjacent to waterways, this could include:

- regularly monitoring the strength and effectiveness of waterway stability measures (non-invasive grass, vegetation, stabilisation matting or rock armour) and reinforcing the installed stability measures as required
- regularly monitoring the strength and effectiveness of rock filter dams, modular sediment barriers, and floating silt curtains and performing maintenance to the associated controls and reinforcing the infrastructure as required
- monitoring the variations in waterway flow throughout the project
- monitoring the operation and effectiveness of bypass pumping and diversion channels.

GUIDANCE SHEET 2 : Managing stockpiles

Sediment and dust can be generated from unmanaged stockpiles.

Stockpiles in civil construction, building and demolition activities can include:

- excavated soils
- structural soils and backfill material
- demolition and waste materials stockpiles.

Figure 1. Silt curtain used to control sediment loss

Step one: identify hazards

Uncontrolled release of dust and sediment into the environment from stockpiling soil, construction, building and demolition materials.

Step two: assess risks

To help assess the risk of sediment and dust transport from stockpiling, you can:

- identify key stockpiling areas on your site
- understand how sediment and dust on site can be transported offsite and into the environment
- consider nearby sensitive receivers.

Step three: implement controls

The controls below may assist you to manage your stockpiles to prevent potential adverse impacts to the environment.

- Design and designate an area for stockpiles before site works commence. Locate stockpiles away from residential areas, other sensitive receivers and in a location where they are protected from prevailing wind.
- Shape stockpiles, taking into consideration width to height ratio, nature of stockpiled material, location, access and available area for the stockpile. Limit stockpile heights based on stability, manageability, dust and amenity impacts. More gentle slopes may be required for unstable soils.
- Divert storm water away from stockpiles using a catch drain or earth bank.
- Cover small stockpiles with tarpaulins or stabilisation matting (see Figure 2). Anchor covers to prevent them from blowing away.
- Contour stockpiles within floodplains to minimise erosion during high rainfall events.
- Minimise period of stockpile inactivity. For stockpiles to be left inactive for longer periods, establish vegetation or grass. Subsoil stockpiles may require an outer layer of topsoil to assist grass establishment.
- Surround stockpiles with sediment control fences to minimise run-off of material. Remove sediment when it is halfway up the sediment control fence, return the material to the stockpile and consider implementing additional controls for effective management.
- Use machinery to contour or scarify the surface of stockpiles to assist in the reduction of run- off

velocity and erosion.

- Suppress dust from small stockpiles using water or chemical dust suppressants, applying using a water truck or hand-held hose.

Figure 2. Covered stockpile

Step four: check controls

Monitoring controls you put in place can help you to ensure they operate effectively and as planned. For the management of works within or adjacent to waterways, this could include:

- Measuring and monitoring the size and geometry of the stockpiles. Adjust the height and dimensions of stockpiles as required to attain the desired stability and to control dust and amenity impacts.
- Monitoring of storm water catchment diversion controls. Ensure catch drains and earth banks are adequately diverting storm water.
- Removing accumulated stockpile material adjacent to sediment control fences and reinforce fences as required.

GUIDANCE SHEET 3 : Managing truck and other vehicle movement

On civil construction, building and demolition sites, vehicles regularly travel on unsealed surfaces and roads containing soil and mud, resulting in the generation and transport of sediment and dust.

Trucks and trailers that haul soil and other materials without a cover can lose materials in transport and generate sediment and dust.

Step one: identify hazards

Uncontrolled release of dust and sediment into the environment from vehicle movement.

Step two: assess risks

To help assess the risk of sediment and dust generation from truck and vehicle movements, you can:

- identify the planned movement and traffic routes of vehicles on your site and develop a traffic management plan
- identify entry and exit points, and high traffic areas on your site
- understand how sediment and dust onsite can be transported offsite and into the environment
- consider nearby sensitive receivers.

Step three: implement controls

Consider implementing the following controls to limit the sediment and dust generation at your site:

Manage site access

- Minimise site access to limit the impact from vehicles to roads.
- Stabilise site entry and exit points with a sealed road, aggregate or road base.
- Divert surface water run-off away from site access points so sediment is not washed or tracked offsite.

Manage road use

- Minimise the number of access roads used by vehicles.
- Seal roads with asphalt or a spray seal, or stabilise with aggregate, gravel or road base. Aggregate or gravel may need to be replaced periodically.
- Locate unsealed roads to avoid erodible areas of the site, such as sloping terrain or unstable soils.
- If roads are not stabilised or sealed, minimise dust using water or chemical dust suppressants.
- Provide sealed or stabilised car parks for site workers to park their vehicles.
- Restrict vehicles to defined roads and site entry and exit points. Fence the site to prevent vehicles bypassing designated site access points.
- Limit vehicle speeds onsite to minimise the generation of dust. Ensure roads are signposted and site workers are aware of designated speed limits.

Machinery hygiene

- Avoid and minimise mud, soil and dust entering on site from incoming trucks and vehicles.
- Identify and assess invasive plants that may be present and the feasibility of controlling the spread.
- Avoid driving in areas that may contain invasive plants and maintain clean machinery on site.

Manage dirt and mud on access roads/routes

- Cover trucks transporting loose materials with fitted canopies. Ensure all loads are covered before trucks leave site.
- Remove soil from the rim of trucks before they leave site. Place scraped material in a location where it won't be washed offsite. This control may only be suitable on projects with a small number of vehicles leaving site.
- Install rumble grids at site exit points to shake soil off trucks, taking care not to position them in or over a drainage line. Ensure the road between rumble grids and the site exit is stabilised and with adequate distance and wheel rotations (recommended minimum three-wheel rotation).
- Submerge rumble grids in water so tyres are washed as the truck crosses the rumble grid. Prefabricated rumble grid/wheel baths are available for purchase or hire. Drain and replace the water in the wheel bath periodically. Water from wheel baths should be treated as 'waste' and managed in accordance with the waste hierarchy (see section 8.2.1).
- Minimise use of a wheel wash or hand-held hose to wash vehicle tyres due to the large volume of wastewater generated. If a wheel wash or hand-held hose is used, treat the water as 'waste' and manage in accordance with the waste hierarchy, preferably capturing and treating the water (see section 8.2.1).
- Clean sediment off roads as soon as possible. This can be undertaken using a broom and shovel, water or street sweeper. Treat the water as 'waste' and manage in accordance with the waste hierarchy, preferably capturing and treating the water (see section 8.2.1).

Step four: check controls

Controls you put in place to prevent or mitigate risks must be monitored to ensure they operate effectively and as planned. For the management of truck and vehicle movement, this could include:

- monitoring of site entry and exit points and performing maintenance as required
- monitoring the driver compliance of speed limits and the canopy use on trailers
- monitoring of the condition and effectiveness of rumble grids and periodically removing built-up sediment and soil from under the rumble grids.

GUIDANCE SHEET 4: Litter

Litter onsite can generally comprise of:

- building material which is small enough in size or weight to be blown away in windy conditions or washed away during a storm and deposited into waterways
- general rubbish thrown away by construction workers.

Litter commonly includes solid wastes and putrescible wastes and is often caused by staff and the unavailability of suitable bins on the construction site.

Some litter can be particularly hazardous and is considered 'dangerous litter', such as glass, cigarette butts, and greasy rags.

Step one: identify hazards

Uncontrolled release of litter into the environment.

Step two: assess risk

To help assess the risk of litter entering the environment, you can:

- Identify the potential sources of litter on your site.
- Understand how litter generated onsite can travel offsite and into the environment.
- Consider nearby neighbours, drains and local waterways.

Litter can block storm water drains, impact the environment by contaminating local waterways and eventually the coast, and can create an amenity issue.

Step three: implement controls

Implementing the following controls may assist you with managing your litter onsite:

- Ensure materials are not left where they can be blown or washed away.
- Provide covered litter or skip bins:
    - Small bins are suitable for small rubbish like paper, food wrapping and drink containers that may be blown off site.
    - Skips with a closable lid are suitable for larger items like cardboard boxes, plastic wrapping and polystyrene (see Figure1).

Figure 2. Example of a recycling skip bin.

- Provide small litter bins for construction workers and staff at locations where they consume food or beverages.
- Provide separate recycling bins for recyclable litter.
- Arrange for an authorised contractor to collect skip bins to prevent overflow and transport to a site that is lawfully able to receive it.
- Collect scattered litter on the site daily, or whenever litter is observed on the site.
- Install temporary fencing around the site to help prevent litter from being carried offsite.
- Store waffle pods (used in some concrete pouring activities) in ‘scrap bags’, i.e. which are large transparent bags, and secure to the site fencing or other structure as appropriate. Arrange for collection of the waffle pods by an authorised contractor for it to be taken to a lawful place where it can be recycled.
- Notify staff of importance of litter avoidance via onsite induction or other training activities

Note: council bins may not be used on some building sites. You should check this with your localcouncil.

Step four: check controls

Controls you put in place to prevent or mitigate risks must be monitored toensure they work as planned – and improved if they do not.

For the management of litter, this could include:

- inspecting litter bins during daily site walks
- emptying the litter bin regularly and not allowing bins to overflow
- checking for litter generally.

GUIDANCE SHEET 5: Surplus excavated material

Excavated material becomes surplus if:

- the physical, chemical or biochemical characteristics of the material prevents it from being used by the project
- there is more material available than required for the project
- it is located too far from where it is required to make its use practical.

Note surplus excavated materials are considered a

waste unless reclassified as clean fill (see Step three) or determined suitable to be used onsite.

We look at surplus water from dewatering activities in Chapter 5: Erosion, sediment and dust and Chapter 6: Contaminated land and groundwater.

Step one: identify hazards

Uncontrolled release of surplus excavated material into the environment.

Step two: assess risk

To help assess the risk of surplus excavated material entering the environment, you can:

- identify the potential sources and locations of excavated material on your site – this can be undertaken through an assessment of soil, including determining the site history and soil sampling.
- understand how surplus excavated material generated onsite can leave the site and impact the environment
- consider nearby neighbours, drains and local waterways.

  Excavated material has the potential to block storm water drains and reduce water quality, whichcan harm human health and the environment.

Step three: implement controls

Implementing the following controls may assist you with managing yoursurplus excavated material on your site:

- Remove construction and demolition waste such as concrete, bricks, pipe and organic matter from or near excavated material, to maximise clean fill material classification so it may be used onsite as fill. See Waste classification assessment protocol (EPA publication 1827) which will take effect with new environment protection laws.
- Stockpile surplus excavated material separately to any clean fill (see section 6.3).
- Where excavated material has been identified as having naturally elevated levels of metals or other contaminants, seek approval from EPA before using it as fill material. Use excavated material onsite for site filling / levelling as appropriate and authorised.

Step four: check controls

Controls you put in place to prevent or mitigate risks must be monitoredto ensure they work as planned – and improved if they do not.

For the management of surplus excavated material, this could include reviewing the effectiveness of how surplus excavated material is storedonsite.

GUIDANCE SHEET 6: Hazardous waste

Hazardous wastes have a known risk to human health and the environment. Some hazardous wastes resulting from civil construction, building and demolition activities include asbestos, polychlorinated biphenyls (PCBs), lead,and acid sulfate soils (ASS).

Per-and poly-fluoroalkyl substances (PFAS) are an environmental contaminant of concern which may posea risk to human health and the environment.

Asbestos

Asbestos is a group of naturally occurring fibrous silicate minerals that were commonly used in the production of insulation and construction materials such as cement sheeting and piping due to its thermal and chemical stability.

It was also used in the manufacture of vinyl floor tiles, electrical components, brake linings, disc pads, paints and sealants, and a variety of other materials, for a wide variety of industrial, manufacturing, building and construction applications. When disturbed, the materials may release asbestos fibres which if breathed in can cause a range of health problems including asbestosis, lung cancer and mesothelioma.

For more information, see Safe Work NSW's Asbestos: A handbook for workplaces.

PCBs (Polychlorinated biphenyls)

PCBs are a stable group of chemical substances that do not degrade easily and are resistant to temperature changes, acids and alkalis.

PCBs may be encountered in old electrical equipment including transformers, capacitators, fluorescent light fittings, concrete caulking compounds, and a range of other products that take advantage of its chemical stability. Due to the serious health concerns associated with PCBs and their persistence in the environment, the importation and manufacture of PCBs in Australia has been banned since the 1960s.

PCB exposure can lead to human health affects including cancer, liver damage, neurological and immunological changes.

Lead

Lead is likely to be present in older structures, occurring in paint, old water pipes and other plumbing fittings, sheet lead, solders, lead flashing, lead light windows and glass. One of the major sources of lead in the environment are lead-based paints which are commonly used on window frames, doors, skirting boards, kitchen and bathroom cupboards, exterior walls, gutters and fascia and metal surfaces. Lead-based paint in good condition is usually not a problem, except in places where painted surfaces are subject to friction or impact such as windows and doors.

Exposure to lead through inhalation or consumption can result in harm to the brain and nervous system, particularly with unborn babies and young children, with symptoms including fatigue and poor coordination, depending on the type of exposure.

ASS (Acid sulfate soils)

ASS are naturally occurring and contain elevated levels of metal sulphide minerals. They typically occur in coastal areas, and inland waterways, wetlands and drainage channels which are waterlogged and have saline and anaerobic properties, as well as in mine spoil. When exposed to air, acid and heavy metals such as arsenic and aluminium can be mobilised and leach into the environment, contaminating groundwater and surface waters, posing a risk of harm to human health and the environment, and engineering works. However, ASS can be generally considered safe and harmless when not disturbed.

PFAS (Per-and poly-fluoroalkyl substances)

PFAS are a group of chemicals manufactured since the mid-20th century that have historically been used in firefighting foams and other industrial and consumer products including mist suppressants, non-stick cookware and food packaging. There are many types of PFAS, including perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS). PFAS can build up in food chains and may pose a risk to human health and the environment.

PFAS residues may be present in construction materials and therefore wastewater generated through construction and demolition also has the potential to contain PFAS. In addition, PFAS residues can be present in soil, sediments, groundwater and landfill leachate due to historical industrial activities.

While scientific research continues to be undertaken, EPA, consistent with federal guidelines from the Environmental Health Standing Committee (enHealth), takes a precautionary approach and advises people to reduce their exposure to PFAS. EPA's Interim position statement on PFAS (EPA publication 1669) reflects the most up-to-date information from the 2019 enHealth Guidance Statement and is supported by additional assessments by EPA.

Duty holders should familiarise themselves with their overarching obligations under the EP Act and supporting regulations, along with EPA Position Statements as issued from time to time. More information can be found at www.epa.vic.gov.au/for-community/environmental- information/pfas/pfas-and-epas-role.

Step one: identify hazards

Entry of hazardous wastes into the environment.

Step two: assess risk

To help assess the risk of hazardous wastes entering the environment, you can:

- Identify the potential sources of hazardous waste on your site.
    - For asbestos, prior to demolition works, review any asbestos registers and consider the location, quantity and condition of asbestos present and identify a suitable method for demolition.
    - For buildings suspected of containing PCBs or lead-based paints, sampling may be required prior to demolition.
    - If PFAS is present, undertake risk identification and assessment in accordance with the PFAS National Environmental Management Plan.
- Understand how hazardous waste generated onsite can travel offsite and into the environment via waterways, soil, groundwater or the air.
- Consider nearby neighbours, drains and local waterways that may be impacted if hazardous wastes were to enter the environment.

Step three: implement controls

Implementing the following controls may assist you with managing your hazardous wastes onsite:

Asbestos

- Take all reasonable steps to minimise the risks of handling, transporting and disposing of materials containing asbestos.
- Ensure those handling, transporting and disposing of materials containing asbestos are authorised to do so.
- For guidance relating to managing asbestos during demolition work,
- Notify Safe Work NSW before any asbestos removal work is carried out, as they may issue licenses which place restrictions on removal of specific types of asbestos-containing material or asbestos-contaminated dust.
- Ensure your asbestos waste is taken to a site that is lawfully able to receive it. This is not only the asbestos removalist's responsibility – it is also your responsibility (see section 8.6).

PCBs

- Equipment or parts containing PCBs must be placed into a sealed container which is then stored in a marked secondary sealable metal container (e.g. steel drum) containing absorbent (e.g. diatomaceous earth) until it can be taken to a site that is lawfully able to receive it.

Lead

- Minimise the generation of lead dust and fumes, including by cleaning work areas before and after demolition activities.
- Do not sand or burn off lead-based paint.
- For guidance relating to lead management prior to and during demolition, refer to Safe Work NSW.

Acid sulfate soils

- Prepare an ASS management plan for the site, including measures to:
    - avoid and minimise disturbance
    - prevent oxidation
    - neutralise acidity
    - dispose offsite.
- Restrict where possible the disturbance and excavation of ASS.
- Where excavation is required, ensure that treatment pads consisting of a clay liner and bund are present to manage the excavated soil.
- Add bagged lime, at appropriate levels, to excavated material onsite prior to backfilling.
- Collect acidic surface water using drains or shallow basins and treat before discharging.
- If removing and disposing of ASS offsite, either:
    - dispose of at a lawful place that already has an EPA-approved EMP for managing ASS.

PFAS

- Isolate PFAS-contaminated materials from the surrounding environment by providing appropriate barrier systems such as a primary (upper) and secondary (lower) composite liner, a primary leachate collection system and a secondary leachate detection and collection system
- For management of contaminated water, see Guidance sheet 11: Wastewater.

Use an accredited consigner. This is a professional approved by the EPA with knowledge on how to properly manage specific types of waste and ensure they are sent to a place that is lawfully able to receive them.

Step four: check controls

Controls that are put in place to prevent or mitigate risks must be monitored to ensure they work as planned – and improved if they do not.

For the management of hazardous waste, this could include:

- inspecting hazardous waste containers to ensure they are sealed and free of cracks or leaks
- undertaking offsite monitoring to ensure hazardous wastes are not entering the environment - this may involve monitoring water quality
- upstream and downstream of the project site for chemicals which are present in the onsite hazardous waste.

GUIDANCE SHEET 7: Masonry and other solid material wastes

Masonry and other solid material wastes foundon civil construction, building and demolition sites consists of:

- building rubble
- concrete
- asphalt
- bricks
- timber
- plastic
- glass
- metals
- bitumen
- trees
- shredded tyres
- e-waste (EPA website).

Step one: identify hazards

Entry of masonry and other solid material waste into the environment.

Step two: assess risk

Masonry and other solid material wastes have the potential to block storm water drains and contaminate land and local waterways.

To help assess the risk of masonry and other solid material wastes entering the environment, you can:

- identify the potential sources of masonry and other solid material wastes on your site
- understand how masonry and other solid material wastes generated onsite can be transported offsite and into the environment
- consider nearby neighbours, drains and local waterways.

Step three: implement controls

Implementing the following controls may assist you with managing masonry and other solid material waste generated from your activities:

- Store solid waste in a designated stockpile area or waste bin (sorted by type of solid waste) until a sufficient quantity has accumulated for removal.
- Have the waste taken to a site lawfully able to take that waste, which may include waste and resource recovery facilities and landfills.

Use an accredited consigner. This is a professional approved by the EPA with knowledge on how to properly manage specific types of waste and ensure they are sent to a place that is lawfully able to receive them.

Step four: check controls

Controls that are put in place to prevent or mitigate risks must be monitored to ensure they work as planned – and improved if they do not.

For the management of masonry and other solid waste material wastes,this could include:

- regularly inspecting rubble and other solid waste material stockpiles to ensure they are of appropriate dimensions, and that they are secured with tarps, fencing or other appropriate methods to prevent loose material from falling
- inspecting rubble and other solid material waste bins during daily site walks for any overflow or incorrect sorting
- inspecting the site to identify any masonry and other solid material waste that have not been placed in the correct storage location.

GUIDANCE SHEET 8: Drilling mud

Drilling mud is the liquid or sludge residue generated during drilling through soil or earth. It may comprise of a mixture of:

- naturally occurring rock and soil including sand, silt, gravel and clay
- naturally occurring organic matter including tree roots, grass and shrubs
- water and drilling fluid (which primarily consists of water and may also contain non-synthetic additives such as bentonite).

Drilling mud may also contain contaminants from within the soil and groundwater being excavated /drilled or as a result of the drilling process.

Step one: identify hazards

Entry of drilling mud into the environment.

Step two: assess risk

To help assess the risk of drilling mud entering the environment, you can:

- Identify where drilling mud is being generated and stored on your site.
- Understand how drilling mud generated onsite can move offsite and into the environment.
- Consider nearby neighbours, drains and local waterways.

Drilling mud has the potential to pollute land and, in particular, waterways.This can harm human health and the environment.

Step three: implement controls

Implementing the following controls may assist you with managing drillingmud generated from your activities:

- Ensure that additives or contaminants (for example, oil lubricants) are not introduced during the drilling or excavation operation.
- If use of oil-based additives cannot be avoided, use biodegradable oils where possible.
- Contain the drilling mud temporarily in pits or sumps onsite, or in clearly labelled drums.

- Have the drilling mud taken to a site that is lawfully able to receive it or remediate onsite depending on level of contamination (see Chapter 6: Contaminated land and groundwater).
- Consider any viable reuse options of the mud dependent on its level of contamination e.g. fill material, composting, road construction.
- Dewater the drilling mud naturally or allow to air-dry, or direct to a dewatering facility.
- If the drilling mud can remain safely onsite (see Chapter 6: Contaminated land and groundwater), you should develop and implement an ongoing management plan for the drilling mud. This can be incorporated into the site environmental management plan.
- Transport the drilling mud in a vehicle that is safe, secure and leak-free, with no contaminated residue in the tanker / tanker trailer.
- See section 8.7 on keeping drilling mud management records.

Use an accredited consigner. This is a professional approved by the EPA with knowledge on how to properly manage specific types of waste and ensure they are sent to a place that is lawfully able to receive it.

Step four: check controls

Controls that are put in place to prevent or mitigate risks must be monitored to ensure they work as planned – and improved if they do not.

For the management of drilling mud, this could include:

- inspecting drilling mud storage areas and containers to ensure there are no leaks or run-off
- regularly reviewing the management plan for drilling mud, to ensure controls are updated based on their effectiveness.

GUIDANCE SHEET 9: Historic buried waste

Historic buried wastes may become uncoveredduring excavation works on construction sites.

These wastes are often associated with closed landfills or illegal dumping grounds and can contain:

- Masonry and other solid material waste – consists of building rubble, concrete, asphalt, bricks, timber, plastic, glass, metals, bitumen, trees, shredded tyres and e-waste (see Guidance sheet 7: Masonry and other solid material wastes)
- Hazardous wastes – consists of asbestos,
- polychlorinated biphenyls (PCBs), lead, and acid sulfate soils (ASS) and any other material waste that has a known risk to human health and the environment (see Guidance sheet 6: Hazardous waste)
- Putrescible wastes – those that can be decomposed by bacterial action. They usually consist of discarded food, domestic garbage, animal carcasses, grass and garden clippings and prunings.

The presence of historic buried waste may indicate existing land and groundwater contamination.See Chapter 6: Contaminated land and groundwater for guidance on managing contamination.

Step one: identify hazards

Presence of buried wastes.

Step two: assess risk

To help assess the risk associated with buried wastes, you can:

- Identify historic activities which may have involved the burying of waste on the site.
- Locate potential areas where waste may be buried.
- Identify the content of any identified historic buried waste sites.
- Understand how historic buried waste may have decomposed resulting in release of contaminants into the environment.
- Understand the pathways of pollution to the environment from buried waste, considering nearby neighbours, drains, conduits and local waterways.
    - Define extent of the historic buried waste materials via methods including ground penetrating radar, test pitting and implementation of a comprehensive sampling program.
    - Investigate if the cap over the historic buried waste is appropriate to protect current and future site users and to minimise impacts to the environment.

- Identify the nature of material, odour levels, presence of methane, groundwater quality, groundwater levels and leachate quality to determine the correct management method (see Chapter 6: Contaminated land and groundwater).
- Identify whether the historic buried waste and any associated impacted material is to remain onsite or if it is to be excavated and removed. Engage a suitably qualified person to manage the process (see Work with an environmental consultant, EPA website).
- If the waste is required to be removed from the site, it must be taken to a place that is lawfully able to receive it.
- Ensure the area does not pose an immediate threat e.g. strong odours, sharp objects, or drums of unknown chemicals. Where an immediate threat is encountered, access to the area should be restricted and the threat removed by a suitably qualified person.
- Develop and implement an ongoing management plan to maintain and manage the site to ensure that risks to site users and the environment are minimised into the future.

Buried wastes create a risk of harm to human health and the environment by causing pollution ofair (gases), land, groundwater and surface waters, and present an explosion risk.

Contact EPA. If historic buried waste associated with a landfill is identified, contact EPA immediately – an in-depth assessment process may need to be followed.

Step three: implement controls

Implementing the following controls, in addition to those listed in Chapter 6:Contaminated land and groundwater, will assist you with managing buried waste discovered during your activities:

- Where historic buried waste has only been partly excavated, look to seal any uncovered waste - you may need approval from your local council to do this. Materials used to seal this waste may include geosynthetic liners and vegetative layers.
- If an existing cap over historic buried waste is found to be inadequate, undertake further capping works if the waste is to remain onsite.
- Control odours during excavation by minimising the working surface area and immediately covering with a clean fill (see Guidance sheet 5: Surplus excavated material). Use of a deodoriser may also be required to minimise emissions of malodorous gases to the atmosphere.
- Use sealed containers for the storage of small volumes of historic wastes and during transport to limit odour emissions.
- Limit leachate generation by minimising infiltration of ingress of water into the old landfill through installation of cut-off drains, banks or bunds around the excavation area.

Use an accredited consigner. This is a professional approved by the EPA with knowledge on how to properly manage specific types of waste and ensure they are sent to a place that is lawfully able to receive them.

Step four: check controls

Controls that are put in place to prevent or mitigate risks must be monitored to ensure they work as planned – and improved if they do not.

For the management of historic buried waste, this could include:

- monitoring upgradient and downgradient groundwater and surface water quality levels from any identified buried waste, including monitoring for leachate
- air quality monitoring for methane and sulphur gases of uncovered buried waste.

GUIDANCE SHEET 10: Sewage

Sewage is a type of wastewater typically composed of excrement, detergents and toilet paper. Improper management can lead to contamination of the surrounding environment, disease and illness, and odour issues.

Step one: identify hazards

Human exposure to sewage and its entry into the environment.

Step two: assess risk

Sewage can create nuisance odour and contamination of the surrounding environment. Due to its biological nature, it can cause viral, bacterial and parasitic diseases in humans and animals.

To help assess the risk of sewage entering the environment, you can:

- Identify the potential sources of sewage on your site, which includes identifying the location of underground sewage pipes.
- Understand the pathways for sewage flow from the site and into the environment.
- Consider nearby neighbours, drains, conduits and local waterways.

Step three: implement controls

Implementing the following controls may assist you with managing sewage discovered during your activities:

- Mark the location of underground sewage pipes onsite.
- Provide temporary toilets throughout the construction and demolition period, that are clearly signposted with appropriately sized waste and water tanks where there is no connection to sewer. Regularly service the facilities.
- Regularly inspect toilets and excavations for visual signs of sewage spills.
- Use an authorised contractor to collect the sewage waste.
- Where civil construction, building and demolition are expected to occur for a significant length of time, consider engaging an authorised contractor to connect the toilet facilities to the sewerage network.

- Assess the location of buried sewage pipes and mark out services on ground surface to prevent damaging them.

> **Use an accredited consigner.** This is a professional approved by the EPA with knowledge on how to properly manage specific types of waste and ensure they are sent to a place that is lawfully able to receive them.

Step four: check controls

Controls that are put in place to prevent or mitigate risks must be monitored to ensure they work as planned – and improved if they do not.

For the management of sewage waste, this could include:

- monitoring upstream and downstream surface water and groundwater
- reviewing the sampling and analysis program and update depending on effectiveness.

GUIDANCE SHEET 11: Wastewater

Wastewater is water that has been ‘used’, is contaminated (including contaminated storm water), or is ‘surplus’ (i.e. unwanted orexcessive), water resulting from dewatering activities.

Civil construction, building and demolitionactivities generating wastewater include:

- site dewatering
- vehicle and equipment washdown
- brick tile works
- concrete pour works
- painting and plastering
- air conditioner installations
- sewage generation (see Guidance sheet 10: Sewage).

Step one: identify hazards

Site dewatering

Dewatering is the permanent or temporary removal of ponded stormwateror infiltrated groundwater, usually for the purpose of excavation and construction activities.

Vehicle and equipment wash-down

Vehicles, machinery, tools and other equipment may require frequent or occasional washing on a construction site, with the washdown water potentially containingchemicals and / or sediments.

Other activities resulting in wastewater

Common construction and demolition activities with the potential to generate wastewater, include brick tile works, concrete pour works, painting and plastering, and air conditioner installations.

To help assess the risk of wastewater entering the environment, you can:

Step two: assess risk

- identify the potential sources of wastewater on your site
- understand how wastewater on your site can move offsite and into the environment
- consider nearby neighbours, drains and local waterways.

Site dewatering

Pumping out groundwater from an excavation or dewatering bore could cause groundwater drawdown, affecting nearby ecosystems, and draw contaminated water from other properties onto the site.

Discharge of potentially contaminated dewatering water to stormwater and reinjection into a groundwater aquifer could pollute surface water and groundwater's, posing a risk of harm to the environment and human health.

Vehicle and equipment wash-down

Washdown water can pollute waterways via the stormwater system if not managed appropriately.

Other activities resulting in wastewater

Wastewater from brick tile works, concrete pour works, painting and plastering, and air conditioner installations have the potential to enter the surrounding environment and pollute waterways.

Step three: implement controls

Site dewatering

The controls below may assist you to manage water resulting from dewatering activities to prevent potential adverse impacts to the environment. Consider engaging a suitably qualified person to manage this process (see Work with an environmental consultant, EPA website).

- Test the water resulting from dewatering activities for contaminants (see Chapter 6: Contaminated land and groundwater).
- Identify if the water can be reused onsite for activities such as dust suppression, vehicle and machinery wash down, earthworks compaction and revegetation.
- Treat contaminated water onsite where appropriate e.g. via flocculation or coagulation. Oils and grease may be removed from the surface of water by use of floating booms, pads and socks.
- Ensure any reuse of water does not cause ponding or run-off of water.
- For discharge to sewer, contact your local water authority to investigate whether the water meets the requirements for discharge to sewer by identifying the trade waste acceptance criteria and apply for a trade waste agreement.
- If discharge to a sewer is not viable and onsite treatment not appropriate, dispose of the water to a site that is lawfully able to receive it.
- Monitor upstream and downstream water quality during any discharge of treated water to a waterway (directly or via a stormwater drain) to check if discharge is affecting water quality of the waterway.

Cleaning of vehicle, equipment and roads

The controls below may assist you to manage your cleaning activities to prevent potential adverse impacts to the environment:

- Carry out washing of vehicles and equipment in a designated area, designed to allow collection of the washdown water.
- Cover the designated washdown area, where appropriate.
- Locate the washdown area away from drainage lines, stormwater inlets, waterways, areas of significant flora and fauna and other sensitive areas identified onsite.
- Contain wash out barrels in the designated washdown area for washing of tools and smaller equipment.
- Install sediment control structures e.g. fences or basins to collect sediments, downslope to prevent entry of sediment into drains and waterways (see Chapter 5: Erosion, sediment and dust).
- Appropriately bund the washdown area to contain all washdown water (see Chapter 7: Chemicals).
- Discharge the washdown water to the sewer with approval from the relevant water authority.
- Return concrete mixing and delivery trucks to the batching plant for washout, where possible. However, should this not be possible, designate an area onsite for washing out of concrete trucks, which:
    - is located near the site exit to encourage drivers to use it
    - signed for easy identification
    - is lined with an impervious liner (plastic or geotextile), allowing the water to evaporate, for concrete residue to then be disposed of as solid waste (in a skip bin or collected and transported to a site that is lawfully able to receive it) or used as a road base.
- Clean equipment off before washing to minimise use of water. Brush dirt and mud off equipment before you wash it.
- Avoid using solvents for cleaning vehicles and use phosphate-free soaps and biodegradable soaps.
- For tools used for water-based paints, use one container to wash the brush and another to rinse. The container used to wash the brush can be left to stand overnight to allow solids to settle – the contents can then be poured out and solids put in a bin.
- For tools used for oil-based paints, do not put on the ground and clean using a solvent bath. Contact a waste contractor to ensure it is taken to a lawful place.
- Where hazardous chemicals (see Chapter 7: Chemicals) are suspected to occur in the washdown water, ensure collection (e.g. via a sump with no outlet) and arrange for an authorised contractor to collect the washdown water and dispose of at a site that is lawfully able to receive it.
- For road cleaning:
    - Minimise use of roads by vehicles to reduce:
        - fuel and other chemical leaks from vehicles onsite
        - dust and sedimentation
        - frequency of vehicle washing.
    - Restrict access on and offsite during wet conditions.
    - Pave entry and exit roads with gravel and top dress these paths periodically.
    - Sweep roads at least once a day.

- Install rumble grids (see Figure 2) and wheel washes at entry and exit points and remove sediment from the wheel wash as required. Consider placing rumble grids under water via excavation of a shallow pit, to facilitate removal of sediment.

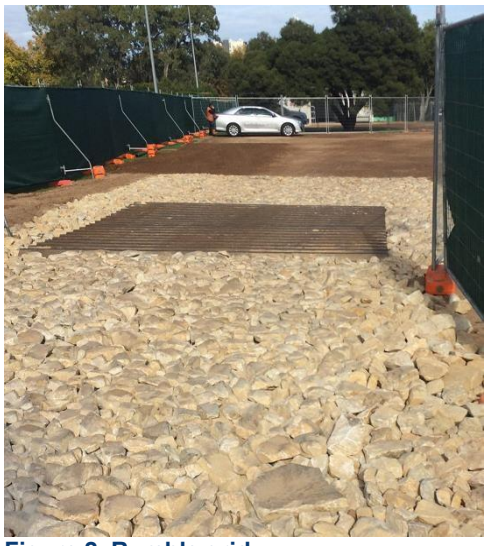


Figure 2. Rumble grid.

(photo courtesy of McConnell Dowell)

- Designate a paved parking area.
- Where the site is not large enough to install rumble grids and wheel washes, sweep the road daily.
- Install road sediment controls such as litter traps lined with filter cloth in all side-entry pits.
- Cover all loads of waste, including soil, being taken offsite to a site lawfully able to accept that waste.

Other activities resulting in wastewater

- Brick tile works
  - Mix mortars in areas that will not drain into the stormwater system.
  - Prevent wastewater from brick-cutting activities from entering the stormwater system.
  - Recycle or discharge surplus wastewater from brick-cutting activities to a contained area for evaporation.
- Concrete pour works
  - Carry out concrete mixing in a contained area to prevent residues and wastes from entering the stormwater system.
  - Install temporary bunds down slope gutters where the use of concrete pumps from public roadways is required.
  - Seal concrete once cured to prevent run-off water from becoming alkaline.

See above under ‘Cleaning of vehicle, equipment and roads’ for washdown controls.

- Painting and plastering
    - Keep unused paint in a tin or other sealed container.
    - Dispose of unwanted paint to a site that is lawfully able to receive it.
    - See above under ‘Cleaning of vehicle, equipment and roads’ for cleaning controls to clean up painting equipment.
    - Filter solvent used to clean oil-based paints, for reuse, or have it taken to a site that is lawfully able to receive it.
    - Allow plastering residues to dry within a designated contained area on the site. Then put solid waste into a skip bin or dispose of at a site that is lawfully able to receive it.
    - Consider using solid plastering wastes such as calcium sulfate as a clay modifier for landscaping works.
- Air conditioner installations
    - Ensure that air conditioners are installed to manufacturers specifications.
    - Direct saline wastewater from the air conditioner dump valve systems and cooling towers to a sewer, rainwater tank (non-drinking), or garden.
    - Install cooling towers so that wastewater from the tower does not enter the stormwater system.

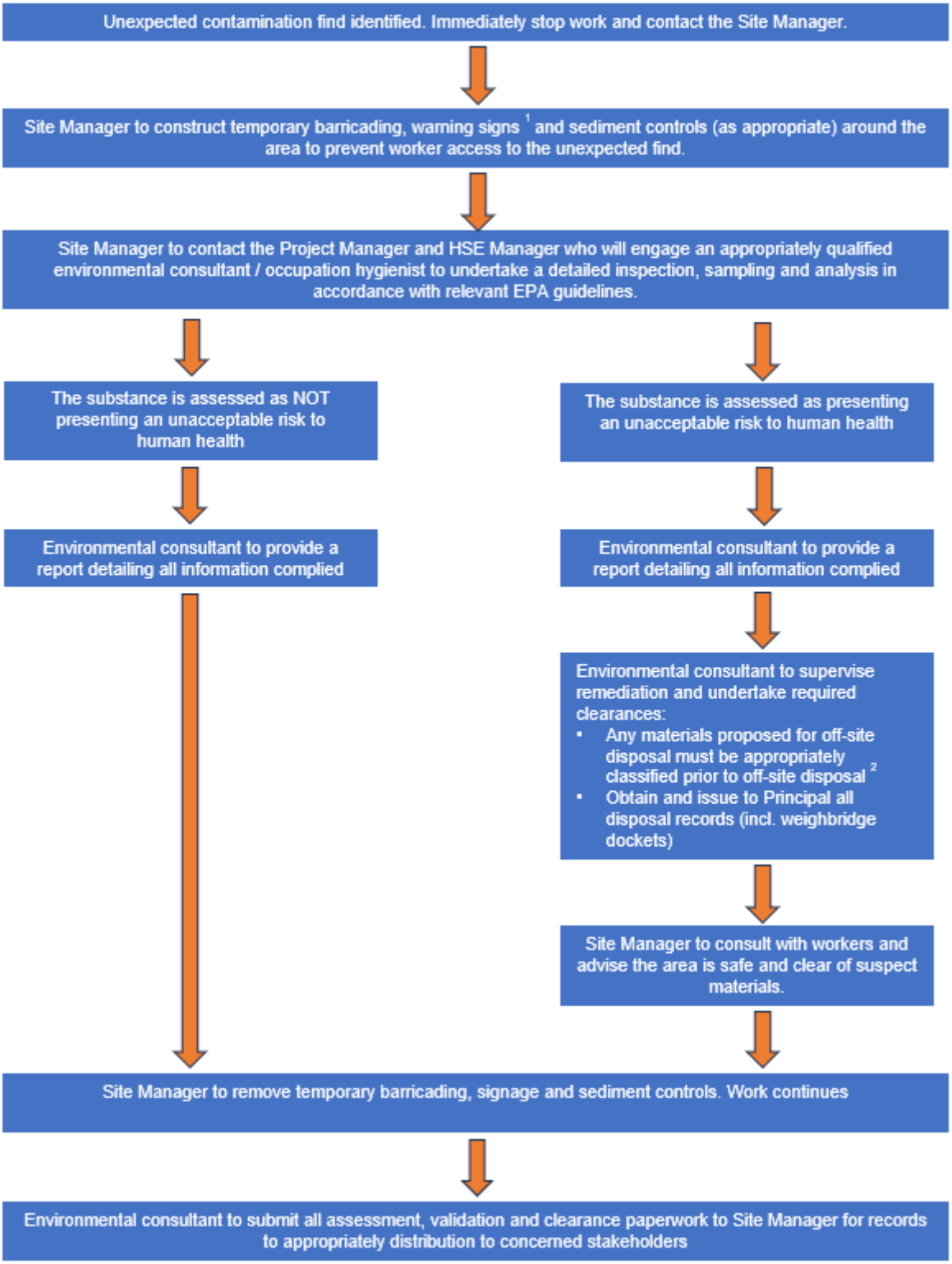
Step four: check controls

Controls that are put in place to prevent or mitigate risks must be monitored to ensure they work as planned – and improved if they do not.For the management of wastewater, this could include:

- monitoring upstream and downstream water quality, if discharging into waterways.
- inspecting bunds during daily site walks to ensure they are installed correctly.

g) an unexpected finds protocol for contamination and associated communications procedure; and

UNEXPECTED FINDS PROTOCOL (contamination)



Notes:

Warning signs shall be specific to the findings and potential hazards and shall comply with the Australian Standard 1319-1994 – Safety Signs for the Occupational Environment.

Any materials proposed for off-site disposal must be appropriately classified prior to off-site disposal as required by the Protection of the Environment Operations (POEO) Act 1997 in accordance with relevant EPA waste classification guidelines.

All works must comply with the provisions of the relevant legislation and guidelines.

h) an unexpected finds protocol for Aboriginal and non-Aboriginal heritage and associated communications procedure.

1. Purpose

This procedure has been developed to:

• Provide a consistent method for managing unexpected heritage items (both Aboriginal and Non-Aboriginal) that are discovered during activities undertaken by Kane Construction or contractors on behalf of Kane.

• Address obligations under the Heritage Act 1977 (NSW), National Parks and Wildlife Act 1974 (NSW), Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth) and the Coroner's Act 2009 (NSW).

2. Scope

This procedure assumes that an appropriate level of Aboriginal and non-Aboriginal heritage assessment has been completed before work commences on site. In some cases, such as exempt development, detailed heritage assessment may not be required. Despite appropriate and adequate investigation, unexpected heritage items may still be discovered during maintenance and construction works. When this happens, this procedure must be followed. This procedure provides direction on when to stop work, where to seek technical advice and how to notify the regulator and following Transport for NSW (Transport) internal reporting, if required

3. Types of unexpected heritage items and their legal protection

3.1 Aboriginal Objects

The National Park and Wildlife Act 1974 (NSW) protects Aboriginal objects which are defined as: "any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non Aboriginal extraction, and includes Aboriginal remains"

Examples of Aboriginal objects include stone tool artefacts, shell middens, axe grinding grooves, pigment or engraved rock art, burials and scarred trees.

Important: All Aboriginal objects, regardless of significance, are protected under law. If any impact is expected to an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) is usually required from Heritage NSW)5 and when a person becomes aware of an Aboriginal object they must notify the Department of Premier and Cabinet Secretary about its location6. Assistance on how to do this is provided in Section 6 (step 5).

3.2 Historic heritage items

Historic (non-Aboriginal) heritage items may include:

- Archaeological 'relics'. (3.2.1)
- Other historic items (i.e., works, structures, buildings or movable objects).

3.2.1 Archaeological relics

The Heritage Act 1977 (NSW) protects relics which are defined as:

"any deposit, artefact, object or material evidence that relates to the settlement of the area that comprises NSW, not being Aboriginal settlement; and is of State or local heritage significance"

Relics are archaeological items of local or state significance which may relate to past domestic, industrial or agricultural activities in NSW, and can include bottles, remnants of clothing, pottery, building materials and general refuse.

Important: All relics are subject to statutory controls and protection. If a relic is likely to be disturbed, a heritage approval is usually required from the Heritage Council of NSW. When a person discovers a relic, they must notify the Heritage Council of NSW of its location. Advice on how to do this is provided in Section 6 (Step 5).

3.2.2 Other historic items

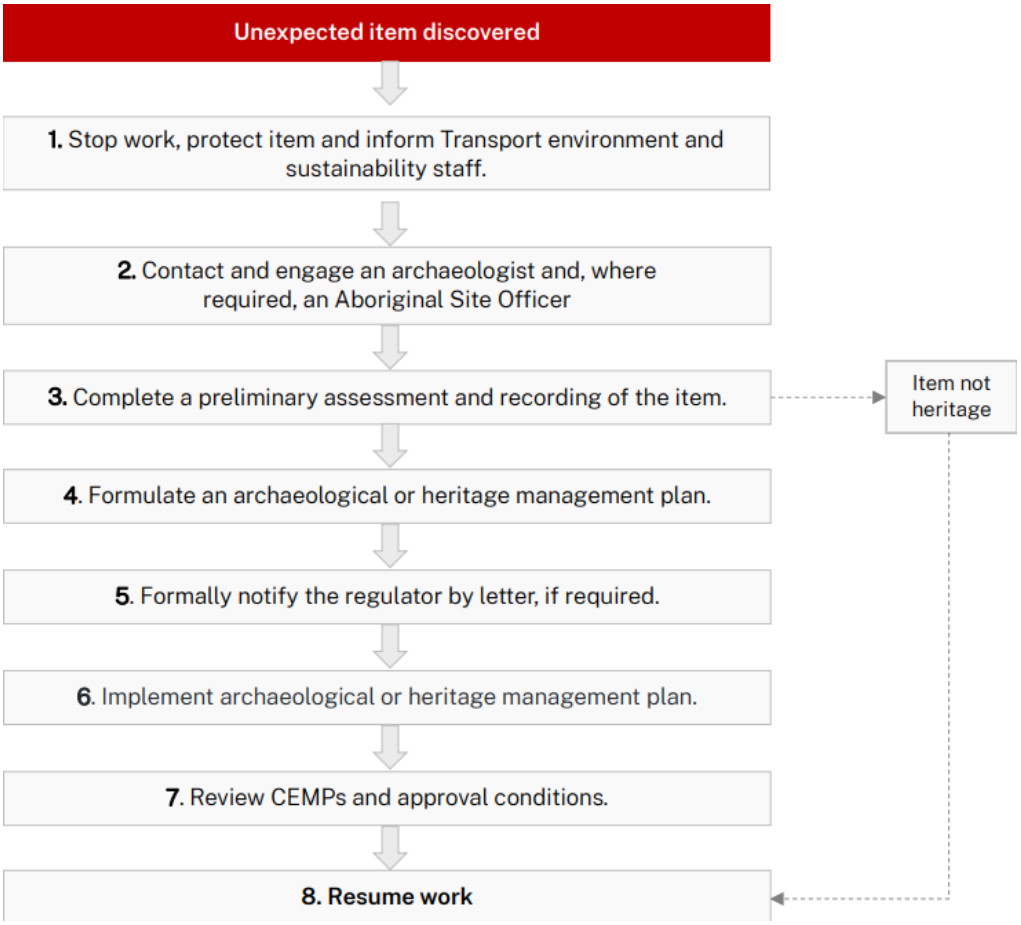
Some historic heritage items are not considered to be 'relics', but are instead referred to as works, buildings, structures or movable objects. Examples of these items that Kane may encounter include culverts, historic road formations, historic pavements, buried roads, retaining walls, tramlines, cisterns, fences, sheds, buildings and conduits. Although an approval under the Heritage Act 1977 (NSW) (Heritage Act) may not be required to disturb these items, their discovery must be managed in accordance with this procedure.

As a general rule, an archaeological relic requires discovery or examination through the act of excavation. An archaeological excavation permit under section 140 of the Heritage Act is required to do this. In contrast, 'other historic items' either exist above the ground's surface (e.g., a shed), or they are designed to operate and exist beneath the ground's surface (e.g., a culvert).

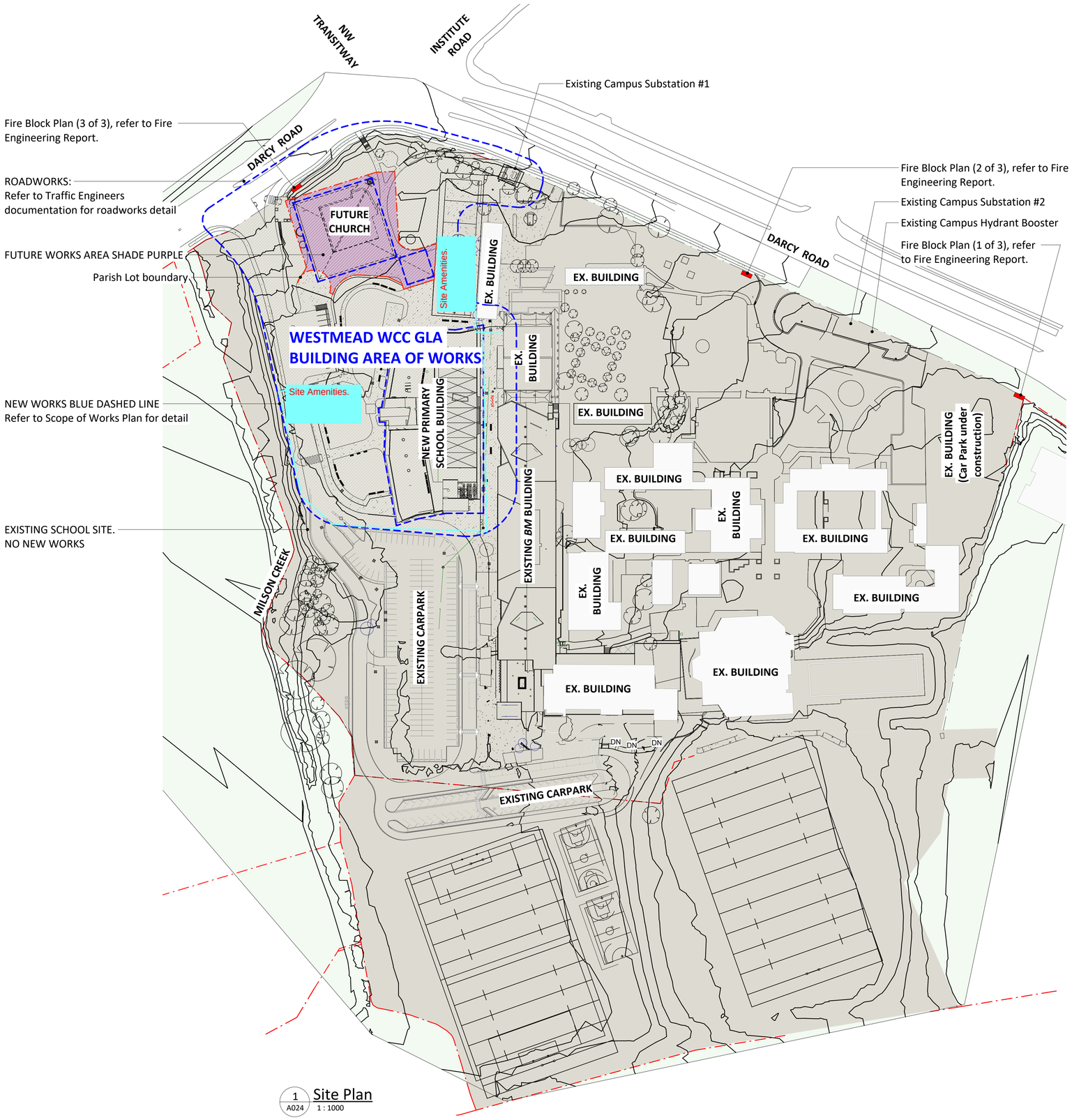
Despite this difference, it should be remembered that relics can often be associated with 'other heritage items' such as archaeological deposits within cisterns and underfloor deposits under buildings.

4. Procedure overview

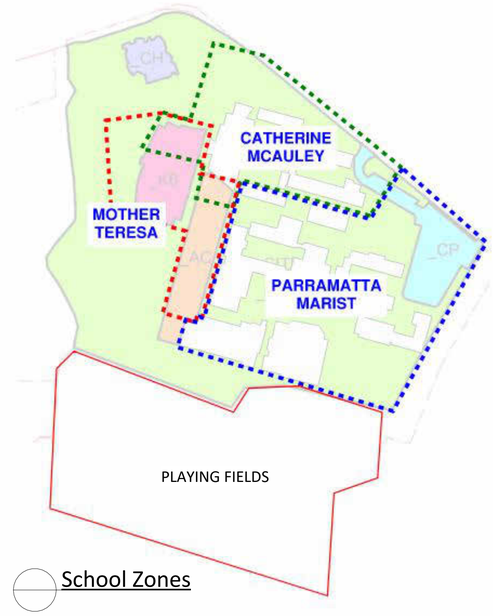
On discovering something that could be an unexpected heritage item ('the item'), the following procedure must be followed. There are eight steps in the procedure. These steps are summarised in Figure 1 below and explained in detail in Section 6.



SITE WATER SOURCE



1 A024 Site Plan 1 : 1000



Issue	Date	Subject	
1	02/10/2024	Issue for discussion	HPH
2	19/12/2024	Issued for Facade Tender	BCL
3	16/01/2025	SSDA Building Updates	BCL
A	19/04/2024	Tender Issue	BCO
B	07/05/2024	Tender Issue	BCO

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GLA Building

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Client
Catholic Schools
Parramatta Diocese

FOR REVIEW

North

Scale:	As noted
Sheet size:	A1
Drawn:	BCo
Checked:	BCo
Verified:	BCL

Sheet
Overall Plan
Site Plan

Project_no.	Sheet_no.	Issue
23145	A003	3

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17 March 2025

Sublime Electrical

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Taren Point NSW 2229

CERTIFICATE OF DESIGN – ELECTRICAL SERVICES (EXTERNAL WORKS)

SUBJECT PREMISES: **Westmead WCC GLA Building** **REVISION NO.: 1**

Pursuant to the provisions of Clause A5G3 of the Building Code of Australia 2022, I hereby certify that the above design is in accordance with normal engineering practice and meets the requirements of the Building Code of Australia, fire safety engineering report, and relevant Australian Standards. In particular, the design is in accordance with the following:

- National Construction Code 2022 — BCA Volume 1
- AS1158.3.1:2020 — Lighting for road and public spaces – Pedestrian area
- AS4282:2019 — Control of obtrusive effects of outdoor lighting
- AS3000:2018 — Electrical installation – Wiring Rules

I am an appropriately qualified and competent person in this area and as such can certify that the design complies with the above and which are detailed on the following drawings:

DOCUMENT NUMBER	REVISION	DRAWING NAME
WCCGLA-ELE-DWG-0000	P3	Cover Sheet and Legend, Symbols and Drawing List
WCCGLA-ELE-DWG-0010	P3	Site Plan

Full Name of Designer:	Mike Peh
Qualifications:	B. Eng Electrical
Address of Designer:	Level 12, 141 Walker Street, North Sydney, NSW 2060
Business Telephone No	0426 242 305
Name of Employer	Millimetre Consulting

Yours sincerely,

Mike Peh

Snr Electrical Engineer

ANNEXURES

b) Construction Traffic and Pedestrian Management Sub-Plan

Construction Traffic and Pedestrian Management Sub-Plan

2 Darcy Road, Westmead,
Westmead Community College

25/10/2024
Ref: P2702r01v01

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Document Control

Project No	P2702
Project	Westmead Catholic Community General Learning Area
Client	Kane Constructions Pty Ltd
File Reference	P2752r01v01_CTPMSP_Westmead Catholic Community Construction.docx

Revision History

Revision No.	Date	Details	Author	Approved by
v01	25/10/2024	Final	Jay Wu	Rhys Hazell

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Appendix C. Risk Assessment

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1 Introduction

1.1 Overview

Kane Constructions Pty Ltd engaged Ason Group to prepare a Construction Traffic and Pedestrian Management Sub-Plan (CTPMSP) to support construction of the Westmead Catholic Community general learning area (WCC GLA) building in Westmead.

It is understood that Development Consent SSD 10383 and a subsequent modification application grants the construction of a primary school with capacity for 1,680 students, new Parish Church, Catholic Early Learning Centre on the site at 2 Darcy Road, Westmead. A new multi-level car park is currently being delivered on-site to facilitate future parking demand.

Kane Constructions has been contracted to carry out part of the works approved under the SSD, comprising construction of the new primary school building and associated facilities and landscaping. The scope of works and deliverables covered by this is CTPMSP is highlighted in blue in **Figure 1**.

The works extend beyond the site boundary along the northern boundary to incorporate the approved modifications to the main site access arrangements with these works to specifically occur over the Christmas holiday period and outside the school term.

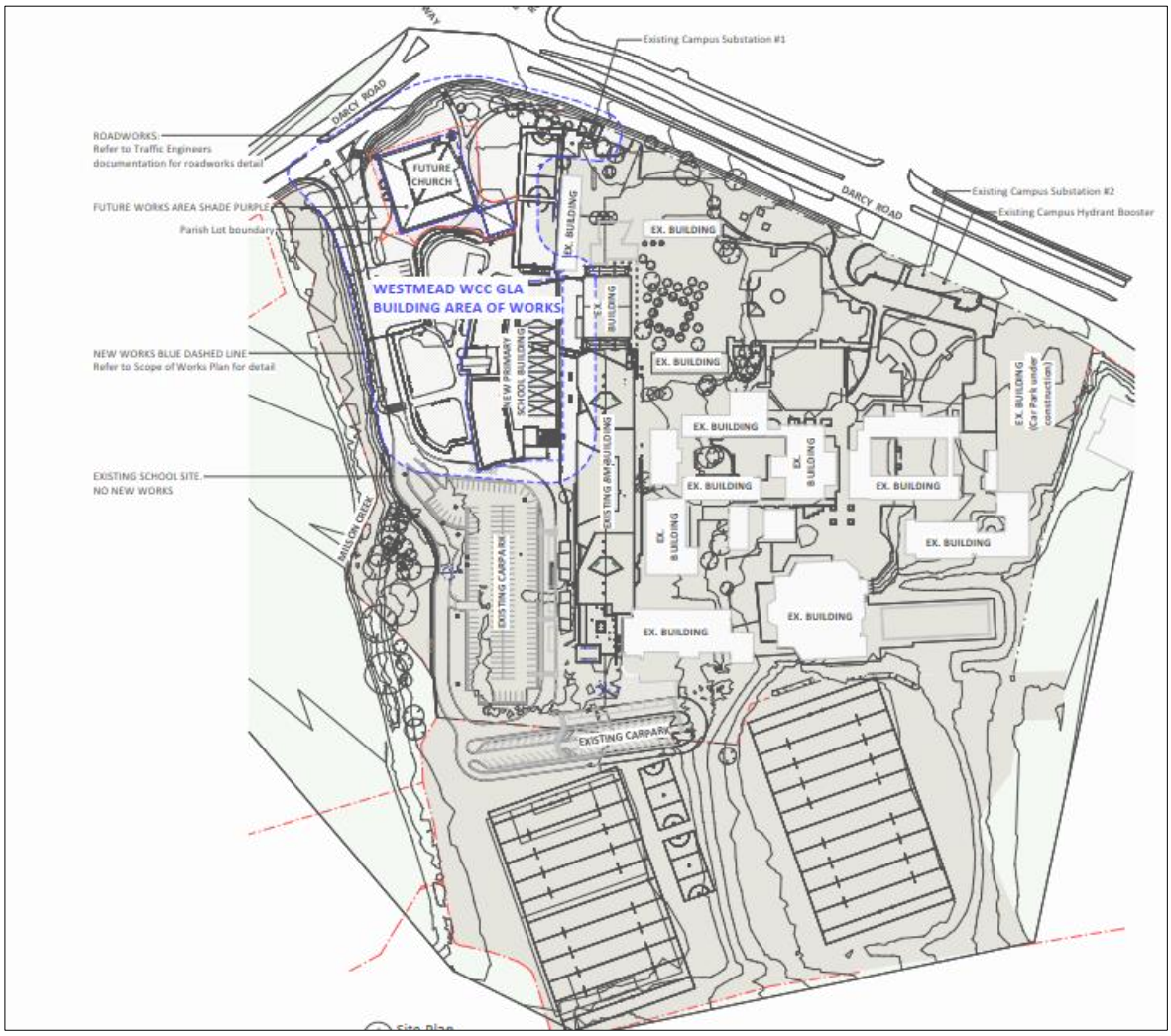


Figure 1: Location and extent of construction works

This CTPMSP details the measures and strategies to be completed during all construction works to minimise the effects of all works on the surrounding road network and to ensure the safety and efficiency of the community, construction workers and all road users. It should be read in conjunction with the broader Construction Management Plan (CMP) and developed for the project by Kane Constructions.

1.1.1 Site Context

The broader school site is located at 2 Darcy Road, Westmead and about 2 kilometres north-west of Parramatta CBD and 300 metres west of Westmead Railway Station. It occupies an area of about 12 hectares and is legally described as Lot 1 in DP 1095407 and Lot 1 in DP 1211982. The work areas incorporate the north-west section of the broader school site for delivery of the primary school general learning area building (subject site).

The site is in the City of Parramatta Local Government Area (LGA) with frontages to Darcy Road to the east and north. An internal roadway is adjacent to the western boundary with a dedicated site access in the north-west corner west of the Darcy Road traffic signals.

The Westmead Catholic Community (WCC) site currently contains three separate schools, including:

- Catherine McAuley Westmead predominantly occupying the central and northern parts of the site.
- and Parramatta Marist High School occupying the eastern part of the site.
- Mother Teresa Primary School occupying part of the Catherine McAuley school building in the centre of the site.

Collectively, the three schools currently accommodate about 2,630 students and 190 staff with a total of 286 parking spaces provided across three staff car parks across the site (including a small executive staff car park). A dedicated student drop-off/ pick-up area is located within the main car park and immediately south of the main school campus. The schools and their associated facilities will remain open during all construction works.

The location of the site and surrounding environs is shown in **Figure 1**. The main site access gate locations are also identified with Gate 3 being the primary drop-off/ pick-up access and Gate 2 facilitating staff access. The old Gate 1 access on Darcy Road (east of Gate 2) currently serves as the main multideck car park construction access.

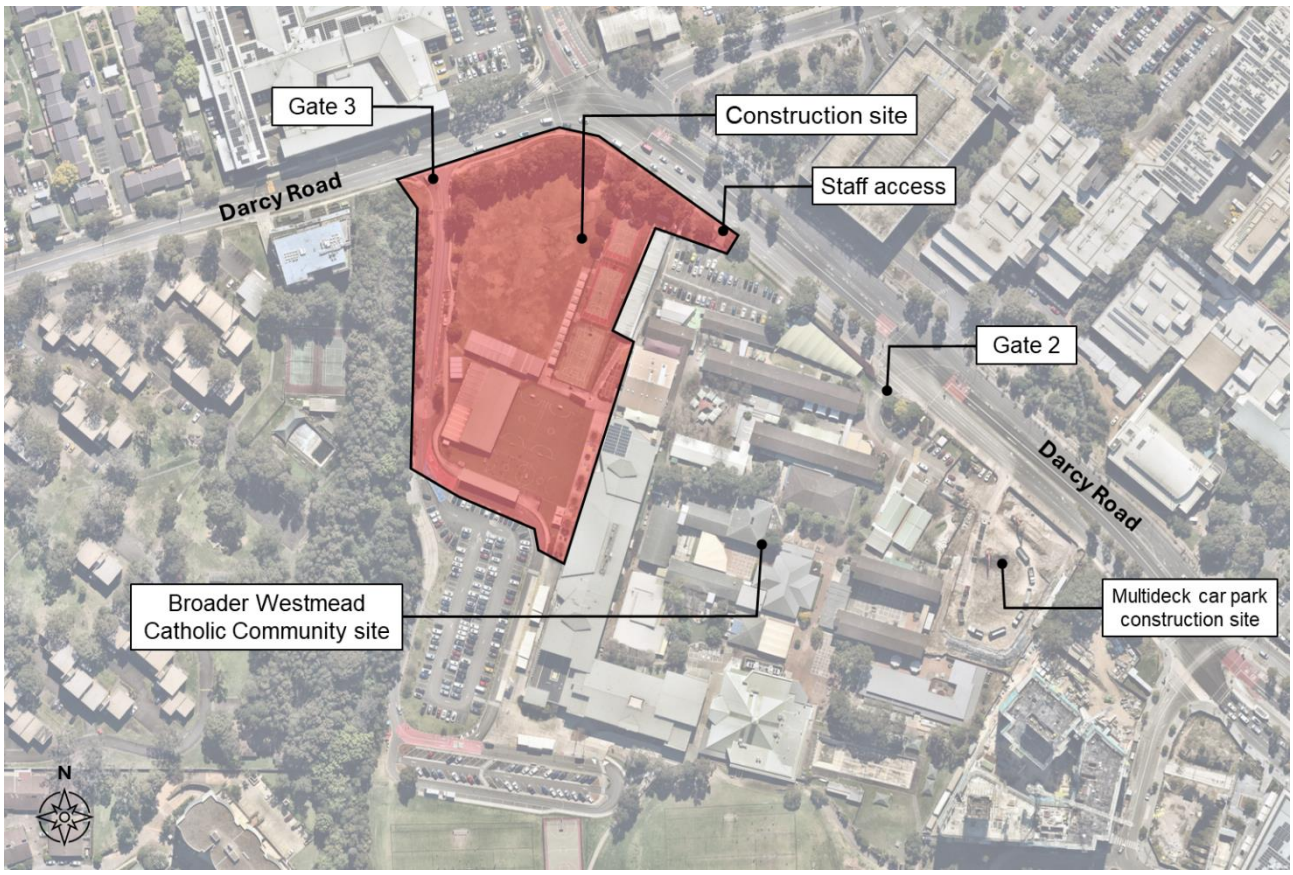


Figure 2: Site location and construction site extent

1.1.2 Road Network Summary

The key roads surrounding the site collectively provide access to and from the site and are summarised in **Table 1**.

TABLE 1: LOCAL ROAD NETWORK

Road Name	Description	Speed Limit	Parking	Features
Darcy Road	State Road and Local Road	40km/ hr	No	Bus Transitway (T-way) between Mons Road and Hawkesbury Road
Hawkesbury Road	Local Road	50km/ hr	No	Bus lanes provided for connection to T-way on Darcy Road
Bridge Road			Yes	Unrestricted kerbside parking on both sides
Alexandra Avenue			Yes	

1.2 Development Description

Approved SSD 10383 incorporates all demolition works and construction of a six-level primary school, new parish church building and alterations to the existing Mother Teresa Primary School building. The following uses will be included within the approved development:

- Creation of an additional 8,158sqm Gross Floor Area (GFA), comprising 7,153sqm for the new primary school building and 1,005sqm for the church.
- 1,460 additional students by 2033 including:
  - 1,260 additional primary school students and 76 additional FTE staff.
  - 200 places in the ELC and 25 FTE staff.
- Upgrades to the two existing access points from Darcy Road (Darcy Road/ Mother Teresa and Darcy Road/ multi-storey car park intersections).
- Retention of 212 existing on-site parking spaces and addition of 12 new spaces in an at-grade car park for use by the parish church.
- Provision of 194 new bicycle parking spaces, plus staff end-of-trip facilities.

1.3 Project Representatives and Stakeholders

This report has been prepared by consultants who hold a SafeWork NSW Work Health & Safety Traffic Control Work card, accredited for the 'Prepare a Work Zone Traffic Management Plan'. Details of the accredited consultants are provided below:

- Wenjie (Jay) Wu Ticket No. TCT1035997.
- Malcolm (Rhys) Hazell Ticket No. TCT0045321.

This CTPMSP has been prepared to meet the requirements outlined in the following documents:

- Appendix A and Appendix E, Section E.2 of the Transport for NSW Traffic Control at Work Sites Technical Manual (Issue No. 6.1, 2022).
- The Australian Standard Manual of Uniform Traffic Control Devices (AS1742.3-2019).

Through the preparation of this CTPMSP, the project representatives and stakeholders who have been/ will be consulted in the development of the construction traffic management strategy are listed in **Table 2**.

TABLE 2: PROJECT REPRESENTATIVES AND STAKEHOLDERS

Name	Organisation	Role
Behzad Saleh	City of Parramatta Council	Executive Traffic and Transport Engineer
~~TBC~~	~~Transport for NSW~~	~~TBC~~
Luke McClure	Kane Constructions	Senior Project Engineer
Rhys Hazell	Ason Group	Transport Consultant (team lead)
Jay Wu	Ason Group	Transport Consultant
Heather Trengrove	Transport for NSW	Principal Transport Planner

1.4 Stakeholder Engagement

1.4.1 Authority Consultation

Kane Constructions will liaise with relevant stakeholders regarding construction schedules and trucks routes and will raise any potential conflict with stakeholders as early as possible. The necessary stakeholder consultation actions are detailed in the below sections.

1.4.2 Stakeholder Notification

If any disruptions to surrounding public roads and/ or footpaths are necessary, key stakeholders (Council, TfNSW) are to be notified first and depending on the extent of the disruption, Kane Constructions is to advance notify affected property owners/ tenants via letter drops and agreed use of Variable Message Signs (VMS).

In this regard, the following procedures are to be followed:

- Kane Constructions will submit this CTPMSP to key stakeholders, namely Council and TfNSW (including the Transport Management Centre (TMC)) for review and liaise accordingly to address any such comment. If required, the CTPMSP will be updated and re-submitted.
- If any unforeseen disruptions to roadways/ footpaths occur, Council and/ or TfNSW is to be notified first and depending on the extent of disruption, Kane Constructions is to notify affected property owners/ tenants.
- In the event of heavy vehicle damage to any public asset/ infrastructure, Kane Constructions will notify stakeholder contacts, as necessary.
- If any future disruptions to the surrounding community, they will be notified by the appointed Communications and Community Liaison Representative (CCLR) in accordance with the procedures detailed in Section 5.4.

1.5 Relevant Conditions of Consent

The relevant Conditions of Consent SSD 10383 that sets out requirements for the CTPMSP are reproduced in **Table 3**, with a summary response and reference to the relevant section of this CTPMSP.

TABLE 3: RESPONSE TO CONDITIONS OF CONSENT

Condition No.	Requirement	Response
C14: Construction Traffic and Pedestrian Management Sub-Plan		
	The Construction Traffic and Pedestrian Management Sub-Plan (CTPMSP) must be prepared to achieve the objective of ensuring safety and efficiency of the road network and address, but not be limited to, the following:	
(a)	be prepared by a suitably qualified and experienced person(s);	Section 1.3
(b)	be prepared in consultation with Council and TfNSW	Section 1.3
(c)	detail the measures that are to be implemented to ensure road safety and network efficiency during construction in consideration of potential impacts on general traffic, cyclists and pedestrians and bus services;	Section 3
(d)	detail heavy vehicle routes, access and parking arrangements;	Section 2.7
(e)	detail construction vehicle access arrangements to demonstrate that: (i) construction vehicles can enter and leave the site in a forward direction; and (ii) the swept path of the longest construction vehicle entering and exiting the site in association with the new work, as well as manoeuvrability through the site, is in accordance with the latest version of AS 2890.2;	Section 3.1 & Appendix A
(f)	include details regarding safety of vehicles and pedestrians accessing adjoining properties, where shared vehicle and pedestrian access occurs;	Section 3.2
(g)	include details to demonstrate how the cumulative impacts of the concurrent construction of the development and the multi-storey car park (if applicable) would be managed;	Section 3.1
(h)	include details to demonstrate the construction vehicle access arrangements and existing student / staff access to the site during construction works to ensure safe operation of the school at all times; and	Section 2.3
(i)	detail the operational requirements for any Work Zones needed.	N/A
C27: Construction Parking		
	Prior to the commencement of any construction, the Applicant must provide sufficient parking facilities on-site, including for heavy vehicles, to ensure that construction traffic associated with the development does not utilise public and residential streets or public parking facilities.	Section 4
C28: Construction Worker Transportation Strategy		
	Prior to the commencement of any construction, the Applicant must submit a Construction Worker Transportation Strategy to the satisfaction of the Certifier. The Strategy must detail the provision of sufficient parking facilities or other travel arrangements for construction workers in order to minimise demand for parking in nearby public and residential streets or public parking facilities. A copy of the strategy must be submitted to the Planning Secretary for information.	Section 4

2 Proposed Works and Staging

2.1 Construction Activity

It is currently planned for early works to commence on-site in late October 2024 and expected to take approximately 15 months to complete. **Table 4** shows an overview of the construction staging including works staging, specific activities and duration, noting that some activities would occur simultaneously.

TABLE 4: OVERVIEW OF CONSTRUCTION STAGING

Stage	Construction Activity	Duration
1	Site Establishment & Early Works	3 months
2	Demolition	1 month
3	Excavation & Civil works	3 months
4	Road extension works	4 months
5	Structure & Facade	8 months
6	Fit out	6 months
	Total	**17 months [1]**

[1] includes overlap of staging and delivery strategy

A detailed overview of the construction methodology is contained in the Construction Management Plan (CMP). Details of vehicle access arrangements and pedestrian management measures proposed are discussed in the subsequent sections.

2.2 Construction Hours

Construction will take place in accordance with the Consent Conditions and carried out between the following hours:

- Monday to Friday: 7:00am to 6:00pm
- Saturday: 8:00am to 1:00pm
- Sunday and Public Holidays: No work.

As specified in Condition D6, Construction activities may be completed outside the standard permitted hours, if required:

- by the Police or a public authority for the delivery of vehicles, plant or materials
- in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or
- where a variation is approved in advance in writing by the Planning Secretary or her nominee if appropriate justification is provided for the works.

City of Parramatta Council has also indicated the need to limit construction vehicle activity in and around school drop-off and pick-up periods. This specifically includes 20–30-minutes prior to the morning bell (and 10 minutes after) and 10 minutes prior to the afternoon bell (and 20-30 minutes after) where construction traffic will not be permitted to enter or exit the construction site. In this regard, construction vehicle activity will be managed appropriately with vehicles to wait in the on-site marshalling area to mitigate the effects on overall delivery.

2.3 Construction Site Access

Given the site location and road hierarchy, construction vehicle access will need to occur via Darcy Road throughout all construction stages. The main construction site access gate is planned to be via a reconfigured access at the existing staff car park access driveway along the eastern site boundary. The existing access will be expanded to facilitate a 12-metre-wide construction vehicle access. All vehicles will turn left on entry and left on exit with the secure gate recessed into the site to ensure no queuing or delay to through traffic on Darcy Road.

This access will continue to facilitate staff access to and from the at-grade staff car park. The car park will be modified to ensure appropriate use and separation from construction vehicles, together with a reconfigured area to allow for temporary school minibus parking. Qualified traffic controllers will manage the area, as necessary. Overall, these modifications will ensure no net loss of parking on-site throughout all construction works.

The existing Darcy Road access driveway is shown in **Figure 3**.

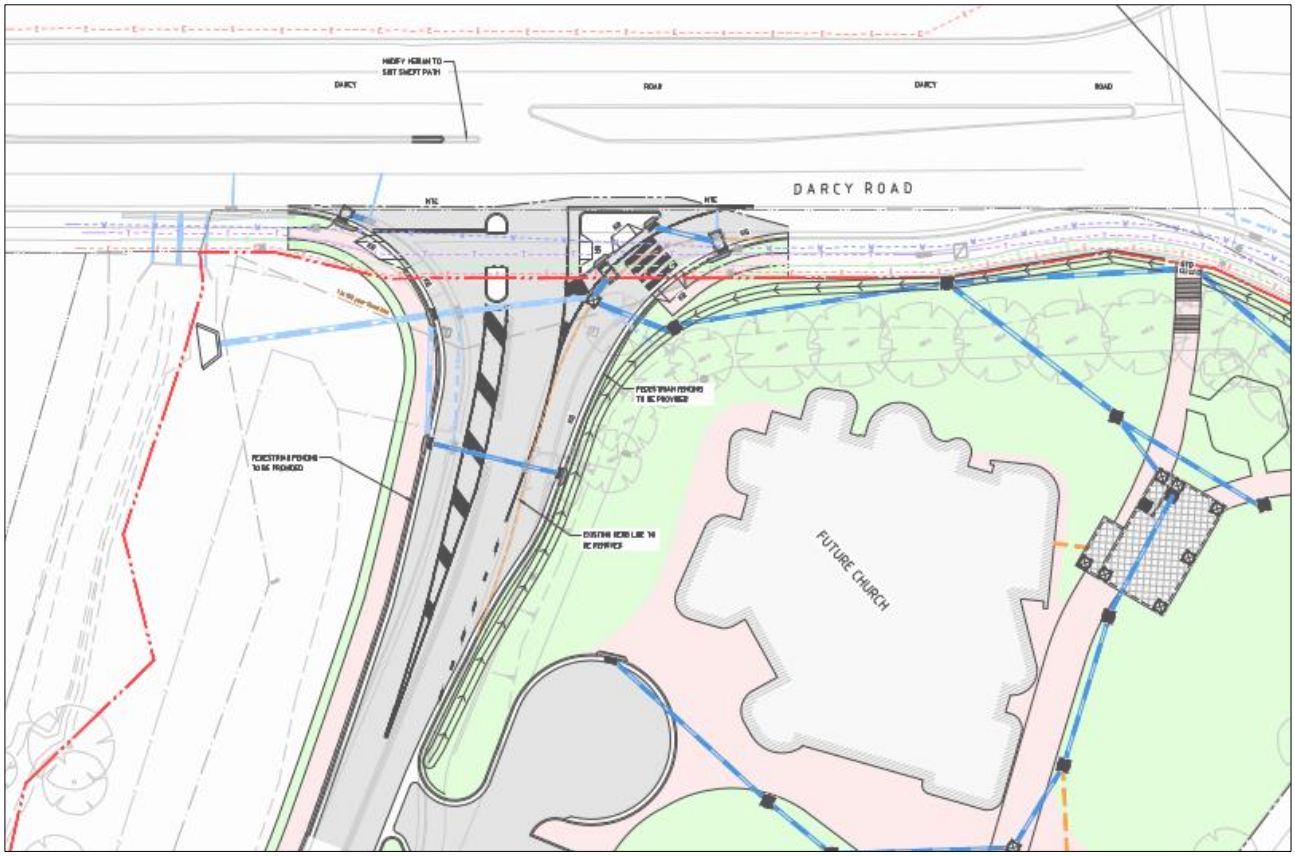
Source: Google Maps

Figure 3: Proposed Darcy Road main construction site access

The existing site access road in the north-west corner of the site will not be used for any construction vehicle activity during the school term. This access will continue to serve as the primary site access for staff and student drop-off/ pick up activity. There is opportunity to use this access for the purposes of specific construction works and only during school holiday periods following specific agreement with WCC stakeholders. The construction site access arrangements are shown graphically in **Figure 5**.

The main Darcy Road college access will also be upgraded as part of the approved construction works. These works are planned to occur over the summer school holiday period and prior to the return of students in 2025 to minimise any such impacts on college operations. These works are being delivered as a separable portion to the main Kane Constructions works with all 'for construction' plans managed by Kane Constructions in consultation with Northrop and ptc. Consultants. Engagement with City of Parramatta and TfNSW is ongoing to ensure timing and delivery of these works.

The approved Darcy Road access is shown in **Figure 4**.



Source: Northrop, Westmead Catholic Community Stage 1, Public Domain Works, PDWC04.01 revision 03, 11 October 2024

Figure 4: Darcy Road access separable portion works

The largest vehicle to require access throughout all construction stages will be 19-metre articulated vehicles, 18.1m truck and dogs and rigid trucks up to 12.5 metres long. Vehicle swept paths have been completed and with localised driveway widening, confirm that the access strategy is appropriate with all construction vehicles able to enter and exit the site with the aid of qualified traffic controllers, as required. Any security gates will be closed outside approved construction work hours and managed as required. They will be setback from Darcy Road to ensure no impact to through traffic.

The key construction vehicle swept paths are included in **Appendix A**.

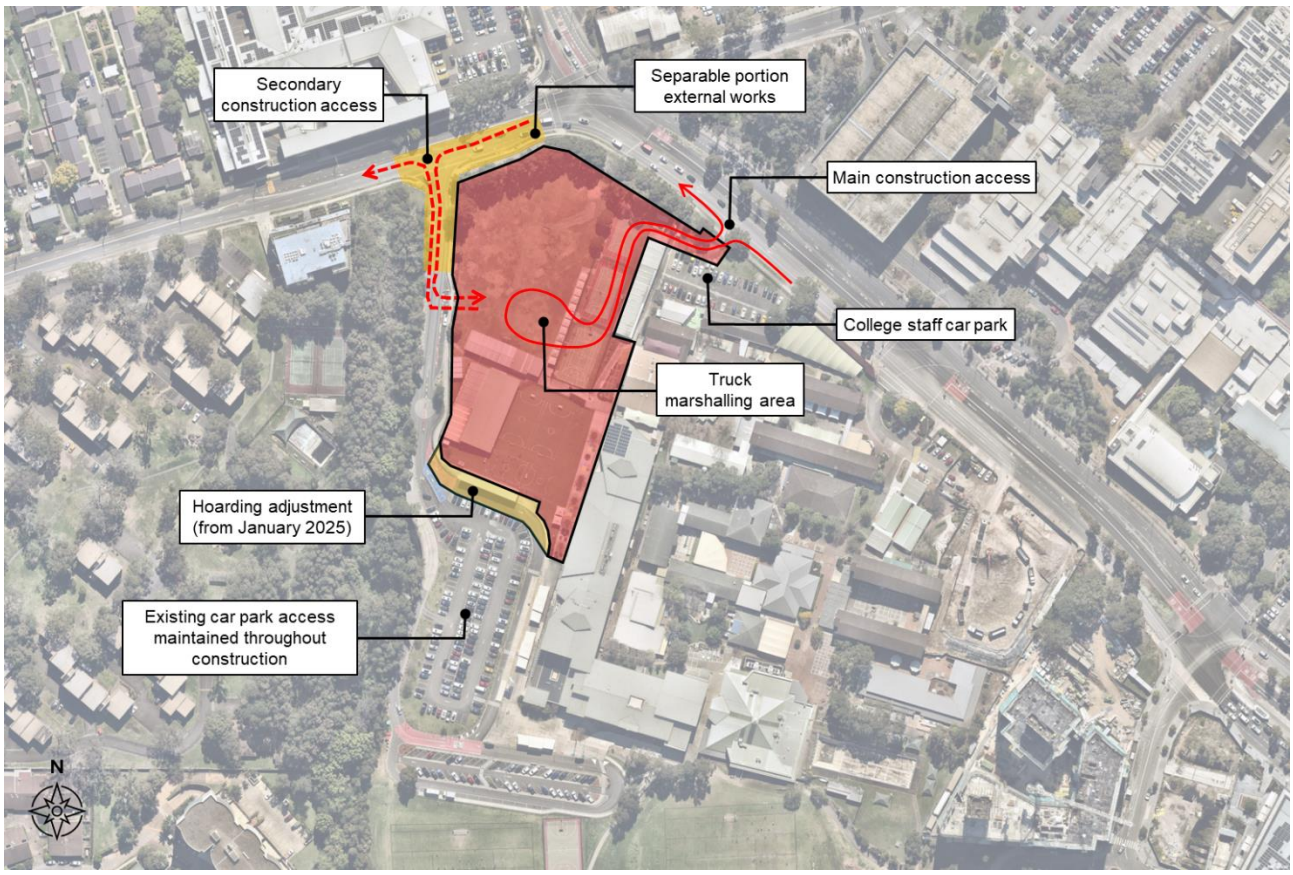


Figure 5: Overview of construction site access strategy

2.4 Works Zone

No works zone is proposed as part of any stage throughout the construction stages. All construction activities will occur wholly within the site boundaries, including with respect to maintaining existing school operations and separation of activities.

2.5 Site Hoarding

Class A fencing/ hoarding will be installed along the perimeter of the construction site prior to the commencement of works. The construction site extent and hoarding alignment will be modified in January 2025 to incorporate the existing bus shelter and entry road adjacent to the southern car park. Modifications to the existing car park layout will be implemented concurrently to maintain bus access to the dedicated bus zone further to the south and associated drop-off/ pick-up activity in the car park. The car park supply will be temporarily reduced by four spaces, with the layout indicatively shown in **Figure 8** and the bus swept path included in **Appendix A**.

All construction site access gates will be closed at all times outside the permitted construction hours.

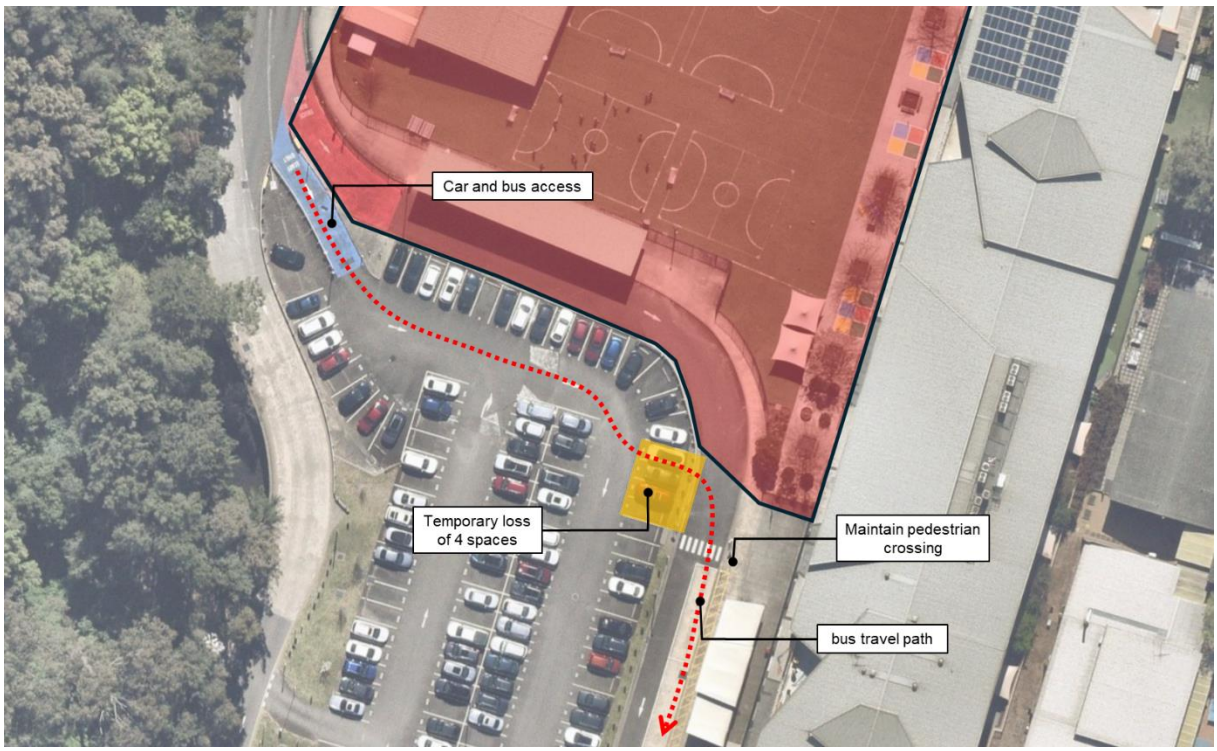


Figure 6: Temporary internal car and bus access arrangements

2.6 Crane Locations

One crane will be installed on-site to facilitate construction activities with the location shown in **Figure 7**. The use of mobile cranes will be required for installation of the tower crane and for dismantling.

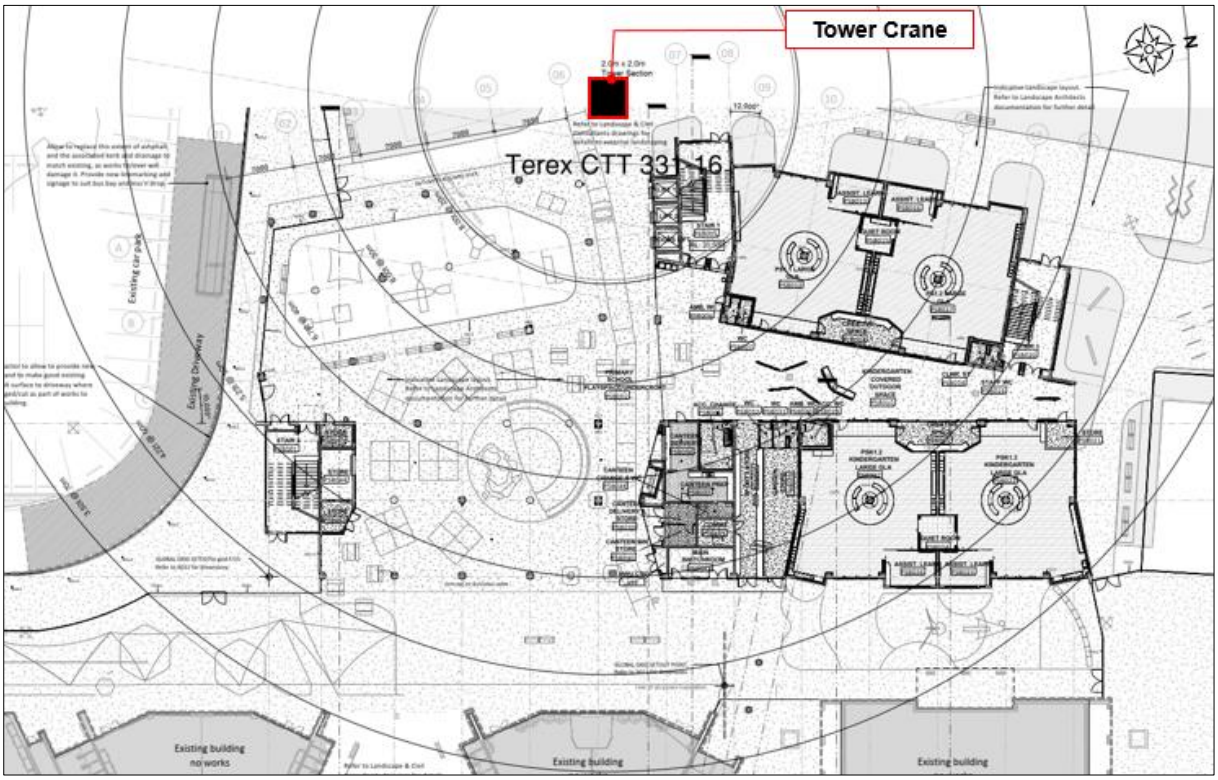


Figure 7: Indicative crane location

2.7 Construction Vehicle Volumes

The construction works will require access by a range of construction vehicles with the largest being 19 metre articulated vehicles, 18m truck and dogs and 12.5m rigid trucks.

It is expected that there will be around 40 trucks per day or up to eight trucks per hour during peak times. Truck movements will be minimised as much as possible during road network peak hours.

2.8 Truck Routes

Given the location of the site and defined construction vehicle site access arrangements, all heavy vehicles will access the site via the routes detailed in **Figure 8.** All construction vehicles will use Darcy Road as the primary route on approach and departure, with the primary route via the Western Motorway (and Great Western Highway) detailed as follows:

- Approach route: Western Motorway, Cumberland Highway, Great Western Highway, Hawkesbury Road, Darcy Road.
- Departure route: Darcy Road, Cumberland Highway, Western Motorway.

These routes will be used by most construction vehicles and represents the shortest available route to minimise impacts on the surrounding road network. The only alternative available route would involve the extent of use of the Great Western Highway and Cumberland Highway (and Old Windsor Road/ James Ruse Drive to the north). All vehicles must use Hawkesbury Road and Darcy Road (westbound) on approach and Darcy Road (westbound) on exit.

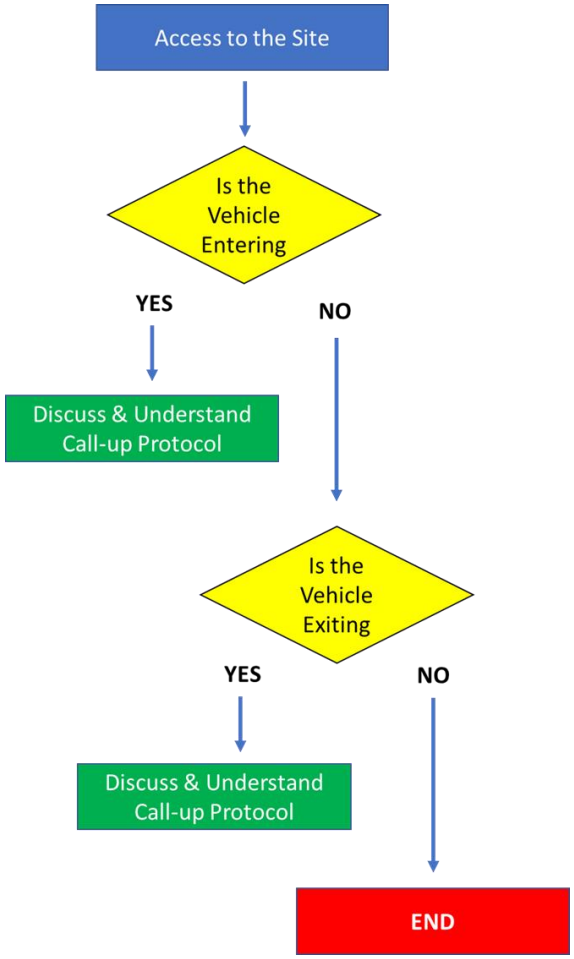
A copy of the approved routes will be distributed by Kane Constructions (and/ or appointed sub-contractors) to all drivers before their arrival to site. No trucks will be permitted to layover on any roads on approach. Mobile phones, two-way radios or app-based technology will be used to coordinate truck arrivals.

Figure 8: Construction vehicle approach and departure routes

2.9 Temporary Traffic Management Method

Traffic management will be implemented in accordance with the methodology outlined in the Traffic Guidance Scheme (TGS) included in **Appendix B** and access protocols defined in **Table 5.** All road users will be directed around the worksite where necessary to ensure physical separation from any hazards.

TABLE 5: ACCESS PROTOCOLS & METHODOLGY

Procedure	Responsibility	Notes
	Site Manager / Foreman / Traffic Controller	**ENTRY PROTOCOL:** Via UHF radio, channel agreed at pre-start. 1. Vehicle to advise gate controller when 200m from gate via UHF — vehicle to ensure flashing lights are on 2. Vehicle advises of metres from gate in 50m lots (i.e., 150m from gate 100m from gate). 3. Gate Controller advises safe to enter, vehicle enters site and decelerates behind barriers 4. If not safe to enter, vehicle is to continue driving and not stop / queue on the public roadway 5. Vehicle uses road network to return and make another attempt at entering site
	Site Manager / Foreman / Traffic Controller	**EXIT PROTOCOL:** Via UHF radio, channel agreed at pre-start. 1. Vehicle driver to radio Gate Controller to ensure exit is possible – vehicle to ensure flashing lights are on 2. If no issues driver to accelerate to exit gate and merge with traffic. 3. If driver cannot exit, Gate Controller to order vehicle to hold until gate is clear. **Gate Controller is not to stop traffic on the public road network**

2.10 Risk Assessment

A risk assessment is aimed to identify the hazards and risks associated with the works. The purpose of this risk assessment is to determine the controls required for the protection of road workers and road users. A risk assessment has been completed and is attached in **Appendix C**.

The list of key contacts shall be provided to all workers and contractors as part of site induction, as well as be posted on the site shed. Consideration should also be given to presenting this list of contacts on the project website.

2.11 Council Permits

The applicant is required to apply to Council for the following permits for the following activities which affect Council assets:

- **Road Use Permit** - The applicant shall obtain a Road Use Permit where any area of the public road or footpath is to be occupied as construction workspace, other than activities covered by a Road Opening Permit or if a Work Zone Permit is not obtained. The permit does not grant exemption from parking regulations.
- **Work Zone Permit** - The applicant shall obtain a Work Zone Permit where it is proposed to reserve an area of road pavement for the parking of vehicles associated with a construction site. Separate application is required with a Traffic Management Plan for standing of construction vehicles in a trafficable lane.
- **Road Opening Permit** - The applicant shall apply for a road-opening permit and pay the required fee where a new pipeline is to be constructed within or across the road pavement or footpath. Additional road opening permits and fees are required where there are connections to public utility services (e.g. telephone, telecommunications, electricity, sewer, water or gas) within the road reserve. No opening of the road or footpath surface shall be carried out without this permit being obtained and a copy kept on the site.
- **Elevated Tower, Crane or Concrete Pump Permit** - The applicant shall obtain an Elevated Tower, Crane or Concrete Pump Permit where any of these items of plant are placed on Council roads or footpaths. This permit is in addition to either a Road Use Permit or a Work Zone Permit.
- **Crane Airspace Permit** - The applicant shall obtain a Crane Over Airspace Permit where a crane on private land is operating in the air space of a Council road or footpath. Approval from the TfNSW for works on or near State Roads is required prior to lodgement of an application with Council. A separate application for a Work Zone Permit is required for any construction vehicles or plant on the adjoining road or footpath associated with use of the crane.
- **Hoarding Permit** - The applicant shall obtain a Hoarding Permit and pay the required fee where erection of protective hoarding along the street frontage of the property is required. The fee payable is for a minimum period of 6 months and should the period be extended an adjustment of the fee will be made on completion of the works. The site must be fenced to a minimum height of 1.8 metres prior to the commencement of construction and throughout demolition and/or excavation and must comply with WorkCover (New South Wales) requirements.
- **Skip Bin on Nature Strip** - The applicant shall obtain approval and pay the required fee to place a Skip Bin on the nature strip where it is not practical to locate the bin on private property. No permit will be issued to place skips.

3 Construction Impacts

3.1 Construction Traffic Impacts

Construction vehicles generated by the site would generally include all types of rigid trucks and up to 19 metre articulated vehicles and 18 metre truck and dogs. There is expected to be up to 40 trucks per day accessing the site on typical days and up to 80 trucks per day during peak activities (major concrete pour days). This will equate to 6-8 trucks during typical day peak hours or 12-16 on peak days.

These traffic generation estimates are noticeably less than the anticipated operational traffic generation of the development once completed. Overall, the construction traffic impact of the proposed development is expected to be minor and to largely occur outside the road network peak periods.

There will be select other developments under construction concurrently, including the following:

- multi-level car park construction site in the eastern corner of the site (completion May 2025)
- 3 Farmhouse Road residential development at to the east
- ongoing Westmead Children's Hospital construction works to the north.

Both the multi-level car park and 3 Farmhouse Road construction sites use Darcy Road for construction vehicle approach and departure routes. The multi-level car park is restricted to left turns on entry and exit and 3 Farmhouse facilitating full turning movements through the traffic signals on Darcy Road. Westmead Children's Hospital is understood to use Dragonfly Drive internal to the hospital and Mons Road (and Darcy Road). The combined number of construction vehicle movements on Darcy Road is expected to remain low in the context of the existing traffic volumes.

As discussed, construction vehicle movements will be limited around the school drop-off and pick-up times. It is also recommended that Kane Constructions consult as necessary to minimise any such cumulative construction traffic impacts as much as feasible. Construction activities will not have any impact on the surrounding existing site access driveways and intersections.

3.1.1 Vehicle Management

In accordance with TfNSW requirements and Conditions of Consent, all drivers are to be familiar with the Driver Code of Conduct before attending the site. A copy of the Code is included in **Appendix C**.

All vehicles transporting loose materials will have the entire load covered and/ or secured to prevent any large items, excess dust or dirt particles depositing onto the roadway during travel to and from the site. Public roads used by construction vehicles are to be kept clean at all times. All vehicles enter and exit the site in a forward direction.

All subcontractors must be inducted by Kane Constructions to ensure that the procedures are met for all vehicles entering and exiting the construction site. Kane Constructions will monitor the roads leading to and from the site and take all necessary steps to rectify any road deposits caused by construction vehicles.

Vehicle movements to, from and within the site shall do so in a manner which does not create unreasonable or unnecessary noise or vibration. No tracked vehicles will be permitted or required on any paved roads. Public roads, access points and internal parking areas will not be obstructed by any materials, unapproved vehicles, refuse skips or the like, under any circumstances. At no time shall heavy vehicles associated with the construction works park on local roads or footpaths in the vicinity of the site.

All vehicles will be wholly contained on site before being required to stop on entry. At no stage shall queuing or idling occur on the public road network. A schedule for deliveries of goods and materials will be

established prior to that day, with Traffic Controllers to maintain radio contact with construction vehicles. The anticipated deliveries will be made known to site personnel at daily prestart meetings.

All loading and unloading of materials will occur within the site boundary.

3.2 Pedestrian and Cyclist Impacts

With the exception of the road extension works stage, all construction activities will occur wholly within the site boundary and not affect the existing pedestrian and cyclist activity along Darcy Road. Pedestrian safety will be managed by qualified traffic controllers with minor impacts expected at times when construction vehicles need to enter the site. At such times, pedestrians may be temporarily held to balance the impacts and maintain road safety. Any such pedestrian delay is expected to be minor and manageable throughout all works stages and across the day. Such activity will be minimised during road network and school peak activity, as much as practical.

Most students associated with the school use Darcy Road east of the site to walk to and from Westmead Station and bus services and hence enter and exit the WCC via the dedicated pedestrian access east of Gate 2.

Pedestrian movements internal to WCC will also remain largely unaffected by construction activities. Those accessing the WCC from Darcy Road to the west will make use of a temporary pedestrian access along the western side of the existing main access road along the western boundary, if required. The existing footpath on the eastern side of main access road will also be maintained.

Overall, it is not expected that pedestrians or cyclists would be impacted by construction works except for during the public domain works where short-term footpath works will be necessary. Temporary alternative routes will be established to divert pedestrians/ cyclists to use other footpaths if and as required. Peak construction vehicle activities will be scheduled outside peak school times to minimise the possibility of conflicting movements.

3.3 Traffic Guidance Scheme

Site-specific TGS's have been developed to reflect specific work activities and/ or changes to road conditions and will be submitted to Council for approval, as required. Refer to **Appendix B** for details of the proposed work areas, location of temporary traffic control mechanisms and associated traffic management measures.

Any traffic controllers will possess the appropriate SafeWork NSW qualification to manage construction vehicle movements on the public road network when arriving and departing the construction site.

3.4 Authorised Traffic Controllers

There is a requirement for authorised traffic controller/s to be present at the construction accesses throughout all construction work stages. The responsibilities include:

- Implementation of the TGS.
- Pedestrian and cyclist management to prevent adverse conflicts between vehicle movements and pedestrians/ cyclists.
- Supervision of all vehicle movements across pedestrian footpaths at all times.
- Supervision of all loading and unloading of construction materials from any on-street works zone during the deliveries in the construction phase of the project (not required as part of overall construction strategy and only possible by separate application).

3.5 Driver Awareness & Code of Conduct

All drivers shall be made aware and adhere to the Driver Code of Conduct, outlined in **Appendix D.**

3.6 Worker Induction

All workers and subcontractors engaged on-site will be required to complete a site induction. The induction will include permitted access routes to and from the construction site for all vehicles, as well as standard environmental, work, health and safety (WHS), driver protocols and emergency procedures.

Any workers required to complete works or traffic control within the public domain must be suitably trained and covered by adequate and appropriate insurances.

3.7 Public Transport Impact

The construction activities are not expected to impact existing public transport services near the site. The small number of additional vehicles using the public transport corridors such as Darcy Road and Hawkesbury Road would not impact the operation of the public transport network in the vicinity of the site.

3.8 Emergency and Waste Collection Vehicle Access

Access to the site and adjacent school buildings by emergency vehicles will be maintained during construction. Emergency protocols on the site would include a requirement for suitably accredited site personnel to assist with emergency access from the street. Consequently, any potential impacts on emergency access would be effectively managed throughout the works.

Liaison would be maintained with Police and emergency services agencies throughout the construction period and a 24-hour contact would be made available for 'out-of-hours' emergencies and access.

4 Construction Worker Transportation Strategy

4.1 Overview

This strategy has been prepared as per condition B28 “Construction Worker Transportation Strategy” of SSD 10383. It has been developed to provide detailed travel arrangements for construction workers to minimise the demand for parking in nearby public and residential streets or public parking facilities.

Recognising the need for these procedures to adapt to changing circumstances in order to achieve the desired management of construction worker travel, the Strategy may be varied from time to time. Those circumstances include changes to the site works, altered traffic conditions and/ or off-site operational imperatives during construction.

Any changes to the Strategy shall be communicated to all construction workers, impacted community and stakeholders. Kane Constructions will be responsible for the review and update of this Strategy when required which will be reviewed per each stage of the works.

4.2 Public Transport Opportunities

Westmead Station is served by the T1 Western Line and T5 Cumberland Line which provide access to key destinations across Sydney including Parramatta, Sydney CBD and Liverpool. These lines also provide connections to Emu Plains, Richmond and Blacktown. Train services for the T1 Western Line run approximately every 5-10 minutes during peak and off-peak periods.

Several bus services operate through Westmead with most operating between Parramatta and the Hills District. Bus stops are located on Darcy Road in general traffic lanes as well as within the dedicated T-Way. Bus Only lanes are provided along the route between the Darcy Road T-Way and Parramatta.

Parramatta Light Rail (PLR) will connect Westmead to Carlingford through Camellia and Parramatta CBD with the two-way tracks covering a total distance of 12km. It will incorporate the key centres of Westmead (and Westmead Hospital precinct), Parramatta and Camellia with extension through to Carlingford along the redundant heavy rail corridor. Stage 1 is nearing completion with services planned to commence by the end of 2024. This significant transport infrastructure project will combine with existing established services to deliver a cohesive multi-modal public transport hub in Westmead within a 500 metre walk of the site.

4.3 Contractor Parking Strategy

It is anticipated that there will be up to 130 workers on-site at any given time, with up to 170 workers during peak activities. No construction worker parking will be provided on-site. As discussed, the site is located within close proximity to a range of high frequency public transport services, including train services through Westmead station and high frequency bus services along the Darcy Road T-Way. PLR Stage 1 is also undergone testing and expected to open by the end of 2024, with the Westmead stop on Hawkesbury Road within a 500-metre walk. Workers will be encouraged to use public transport at all times when accessing the site. Any such available on-street parking will not be used by workers.

Any such minor worker car parking demand can be accommodated within the Westmead Hospital multi-level public car park opposite the site on the other side of Darcy Road. This car park experiences moderate demand with available parking across weekdays. Any such minor additional demand would not materially change the availability of parking for staff and/ or visitors to Westmead Hospital. Pedestrian footpaths and

safe crossing points will also allow for worker access to the dedicated worker access gate on Darcy Road close to the construction site access.

4.4 Measures to Support Contractor Parking Strategy

The following are the strategies to be implemented by Kane Constructions for encouraging the use of public transport and carpooling to minimise parking on-site:

- An on-site secure tool drop-off and storage facility will be provided by Kane Constructions to allow workers to drop off and securely store tools and equipment within the site, thus removing the need to bring to site daily.
- Kane Constructions will encourage workers/ subcontractors to utilise public transport and carpool to and from the site. Workers will be informed of appropriate bus, light rail and train schedules/ timetables via toolbox talks, pre-start face-to-face meetings, email, and phone. The public transport schedules/ timetables will also be provided during site induction and relevant pages of the Strategy will be published within the site induction room, sheds and lunchrooms to communicate the available modes of transport.
- Kane Constructions will encourage each subcontractor to allocate a company representative to support the coordination of their respective construction worker travel arrangements. Kane Constructions will maintain regular communication with all construction workers regarding the use of public transport and should any potential issues arise, consult with the allocated company representative to ensure the future enforceability of the Strategy. This may include the implementation of shuttle/ carpooling, as suitable.
- Site amenities will include fridges, microwaves, etc to encourage workers to drop off their lunch on-site at the start of the day and minimise the need to leave the site for lunch.

Notwithstanding the above, Kane Constructions will also implement the following strategies to minimise contractor parking on surrounding residential streets.

- Include within site induction, restrictions for parking on local public roads in the vicinity and reinforce during toolbox talks.
- Encourage carpooling to reduce the number of cars required to park. Request that subcontractors with a significant number of workers implement carpooling arrangements.
- Encourage site staff and management to work remotely, if practicable.
- Monitor surrounding streets periodically and issue warnings respectively if workers are found to be using on-street parking inappropriately.
- Equipment and tools to be modularised in shipping containers where practical to reduce multiple small deliveries in personal vehicles.

5 Monitoring and Review

5.1 Monitoring Program

This CTPMSP shall be subject to ongoing review and will be updated accordingly. Regular reviews will be undertaken by the on-site coordinator. A review of the CTPMSP shall occur monthly. All and any reviews undertaken should be documented, however key considerations regarding the review of the CTPMSP shall be:

- To track deliveries against the volumes outlined within the report. Deliveries will be tracked against approved volumes and will keep a vehicle log - including registration and time of entry – for the purpose of assessing the effectiveness of these monitoring programs.
- To identify any shortfalls and develop an updated action plan to address issues that may arise during construction (parking and access issues)
- To ensure TGS's are updated (if necessary) by "Prepare a Work Zone Traffic Management Plan" cardholders to ensure they remain consistent with the set-up on-site.
- To ensure regular checks of all loads entering and leaving the site are covered as outlined within this CTPMSP.
- To complete a dilapidation report to periodically assess the condition of the road and note whether there has been any reduction in the quality of the road as a result of construction vehicles.

The development of a program to monitor the effectiveness of this CTPMSP shall be established by Kane Constructions.

The roadway (including the footpath) must be kept in a serviceable condition for the duration of construction. At the direction of Council, undertake remedial treatments such as patching at no cost to Council.

5.2 Work Site Inspections, Recording and Reporting

Recording and reporting of the monitoring programs shall be done in accordance with Section E.3, E.4 and E.5 of the TCAWs Manual. As such, the structure, schedule, and frequency of these activities have been considered and identified.

To inspect, review and audit the Temporary Traffic Management (TTM) arrangements implemented on site, the following actions are to be undertaken by suitably qualified personnel in accordance with TCAWS 6.1 requirement during all phases of construction, being:

TABLE 6: EXAMPLE REVIEW OF ACTIVITIES

Activity			Frequency or Details
Shift Inspections	☐ Yes	☐ No	
Regular Inspections	☐ Yes	☐ No	
TMP Review	☐ Yes	☐ No	
Road Safety Audit	☐ Yes	☐ No	
Other	☐ Yes	☐ No	
Comments			

Given that the length of construction and that no regular works have been proposed outside the site, monthly TTM inspections is considered sufficient.

5.3 Contingency Plan

A contingency plan shall be established by Kane Constructions and is to be included in the overarching CEMP. Notwithstanding, **Table 7** outlines an indicative plan to be undertaken by Kane Constructions in the event that the monitoring program identifies the management plan is not effective in managing the construction impacts.

TABLE 7: CONTINGENCY PLAN

Risk		Condition Green	Condition Amber	Condition Red
Construction Movements	Trigger	Both peak hour and daily Construction traffic volumes are in accordance with volume and time constraints as outlined within Section 3	Construction traffic volumes exceeds programmed Peak volumes but is within permissible daily volume constraints	Construction traffic volumes exceeds permissible volume and time constraints
	Response	No response required	Review and investigate construction activities, and where appropriate, implement additional remediation measures such as: • Review CTPMSP and update where necessary. • Provide additional training.	As with Condition Amber, plus; • If it is concluded that construction activities were directly responsible for the exceedance, submit an incident report to government agencies. • Stop all transportation into and out of the site.
Queuing	Trigger	No queuing identified	Queuing identified within site, but not on to public road	Queuing identified on the public road
	Response	No response required. Continue monitoring program	Review the delivery schedule prepared by Kane Constructions. If drivers are not following the correct schedule, then they should be provided with additional training and an extra copy of the Driver Code of Conduct	As with Condition Amber, plus • Review and investigate construction activities. • If it is concluded that construction activities were directly responsible for the exceedance, submit an incident report to government agencies. • Temporary halting of activities and resuming when conditions have improved. • Stop all transportation into and out of the site. • Review CTPMSP and update where necessary, provide additional training.
Noise	Trigger	Noise levels do not exceed imposed noise constraints, as outlined within the Noise Assessment Report (<45dBA), nor has	Noise levels in minor excess (<10dBA) of imposed noise constraints, or receipt of a single noise complaint	Noise levels greatly in excess (>10dBA) of imposed noise constraints or consistent noise complaints.

TABLE 7: CONTINGENCY PLAN

Risk		Condition Green	Condition Amber	Condition Red
		there been a traffic noise related complaint		
	Response	No response required	Undertake all feasible and reasonable mitigation and management measures to minimise noise impacts.	As with Condition Amber. If noise levels cannot be kept below applicable limits, then a different construction method or equipment must be utilised.
Traffic Guidance Scheme	Trigger	No observable issues (TGS implements according to plan)	Minor inconsistencies with TGS to onsite operations (such as covered signs, missing signs, fallen cones, etc.)	Failure to implement plan effectively (even if there has been no near miss or incident)
	Response	No response required	Traffic Controller to amend TGS on site and to keep a log of all changes	Stop work until an investigation has been undertake into the incident. There are to be changes made to the TGS to ensure that the safety of all workers, students and civilians are catered for.
Dust	Trigger	No observable dust	Minor quantities of dust in the air and tracking on to the road	Large quantities of dust in the air and tracking on to the road
	Response	No response required	Review and investigate construction vehicle movements and activities and respective control measures, where appropriate. Implement additional remedial measures, such as: • All drivers of vehicles transporting loose materials will be required to ensure the entire load is covered using a tarpaulin or similar impervious material. • Deployment of additional water sprays • Wheel wash station shall be positioned at the exit point of all gates. • Temporary halting of vehicle movements and activities and resuming when conditions have improved. • The roads will also be cleaned on a regular basis to minimise dust/dirt particles depositing externally from the site.	As with Condition Amber. • If it is concluded that construction vehicle activities and movements were directly responsible for the exceedance, submit an incident report to government agencies. • Implement relevant responses and undertake immediate review to avoid such occurrence in future.

5.4 Communications Strategy

Community consultation and complaints for will be managed in accordance with the Community Consultation and Complaints Handling Strategy (TBC).

A Communications and Community Liaison Representative (CCLR) shall be elected and shall be responsible for ensuring that the appropriate management response and handling procedures are instigated and carried through in the event of an environmental complaint. The roles of the CCLR would comprise:

- Lead and manage the community involvement activities, including liaison with property owners and key stakeholders.
- Be the primary daily contact to the public handling of enquiries/ complaints management / interface issues.
- Maintain the complaints register and make available the complaints register to the ER daily.
- Be available for contact by local residents and the community at all reasonable times to answer any questions.
- Liaise with property owners to co-ordinate access and to deal with specific property related issues arising from the upgrade works.
- Lead the delivery of communication and community engagement strategies and plans.
- Facilitate meetings, forums and arranging interviews to address concerns from community.
- Provide advice and participate with the project teams to improve and enhance the delivery of communication services to the community.
- Build, maintain collaborative and consultative working relationships with internal and external stakeholders.
- Be available for contact by local residents, key stakeholders and community representatives to answer queries and provide more information or feedback.

All employees who are made aware of a complaint, either verbal or written, are to immediately notify TOGA's Project Manager, who will then contact the CCLR. Upon becoming aware of a complaint, the protocol outlined below will be followed.

TABLE 8: RESPONSE STRATEGY

Ref	Protocol	Action
1	Record and acknowledge	Any employee who takes receipt of a complaint, either verbal or written, are to immediately notify Kane Constructions Project Manager who will then contact the Communications and Community Liaison Representative. Kane Constructions Project Manager will be available 24 hours a day, seven days a week and have the authority to stop or direct works. In the normal course of events, the first contact for complaints will usually be made in person or by telephone. The complainant's name, address, and contact details, along with the nature of the complaint, will be requested. If the complainant refuses to supply the requested information, a note will be made on the form and complainant advised of this.
2	Assess and prioritise	The CCLR will prioritise all complaints by severity for the risk to health and safety and will attempt to provide an immediate response via phone or email.
3	Investigate	An on-site investigation will be initiated in an attempt to confirm details relevant to the complaint and the cause of the problem. Any monitoring information and/or records at and around the time of the complaint will be reviewed for any abnormality or incident that may have resulted in the complaint.
4	Action or rectify	Once the cause of the complaint has been established, every possible effort will be made to undertake appropriate action to rectify the cause of the complaint and mitigate any further impact.

TABLE 8: RESPONSE STRATEGY

Ref	Protocol	Action
		The CCLR will assess whether the complaint is founded or unfounded and delegate the remediation of the issue to Kane Constructions Project Manager for action, as required.
5	Respond to Complainant	The CCLR will oversee the rectification of the issue and respond to the complainant once the issue has been resolved. The complainant will be provided with a follow up verbal response on what action is proposed within two hours during night-time works (between the hours of 6:00 pm and 10:00 pm) and 24 hours at other times. Where a complaint cannot be resolved by the initial or follow-up verbal response, a written response will be provided to the complainant within ten days.
6	Record	It is imperative that an assessment of the situation is carried out and documented to minimise the potential for similar complaints in the future. On this basis, every complaint received is to be recorded in the Community Correspondence Register. A copy of the completed form will be maintained for at least five years
7	Preventative Action	Once the complaint has been suitably handled, appropriate measures will be identified and implemented to negate the possibility of re-occurrence. The Community Correspondence Register is not finalised until the preventative actions are completed and recorded on the form.

In addition to the above, the CCLR is to notify the community liaison representative when traffic is expected to exceed the parameters set within "Condition Green" of **Table 7**. Notwithstanding, **Table 9** outlines an indicative communication strategy to ensure that adequate communication with key stakeholders have been met.

TABLE 9: COMMUNICATIONS STRATERGY

Risk	Impact	Comms Channel
Wider Traffic Disruption	Wider community and stakeholders informed through local and wider advertising and notification	• Stakeholder Meetings • Stakeholder email blast • Communications and Community Liaison Representative

Appendix A. Vehicle Swept Paths

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CONSTRUCTION VEHICLE ACCESS GATE

MAIN CONSTRUCTION ACCESS

FUTURE CHURCH

WESTMEAD WCC GLA BUILDING AREA OF WORKS

NEW PRIMARY SCHOOL BUILDING

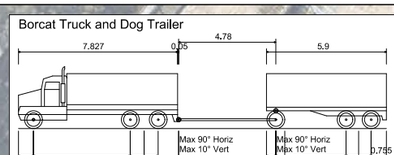
EX. BUILDING

SECONDARY CONSTRUCTION ACCESS

INDICATIVE CONSTRUCTION HOARDING LINE

N

Borcat Truck and Dog Trailer



VEHICLE ENVELOPE
300mm CLEARANCE
500mm CLEARANCE

Overall Length	18.097m
Overall Width	2.500m
Overall Body Height	3.045m
Min Body Ground Clearance	0.344m
Track Width	2.500m
Lock-to-lock time	8.00s
Curb to Curb Turning Radius	8.750m

GENERAL NOTES

DESIGNED: Jay Wu	PAPER SIZE: A3
APPROVED BY: R. Hazell	DATE: 23.10.2024
SCALE: 1:1000	0 10 20

CLIENT: Kane Constructions

PROJECT: 2752

2 Darcy Road

DOCUMENT INFORMATION

Construction Site Access - Demolition & Excavation

18.1m Truck and Dog Trailer Swept Path

FILE NAME	SHEET
AG2752-01-v01_CTMP.dwg	AG01

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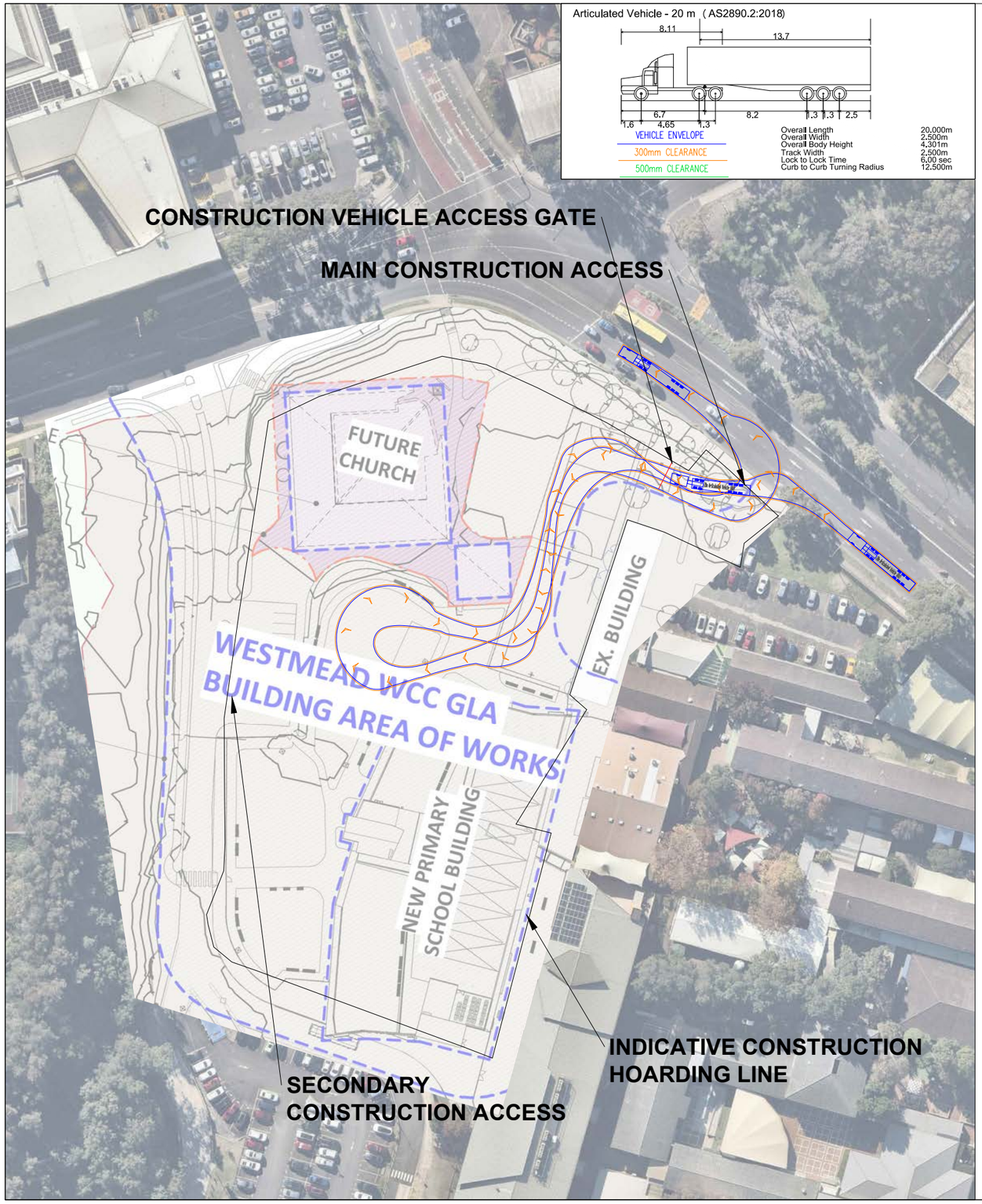

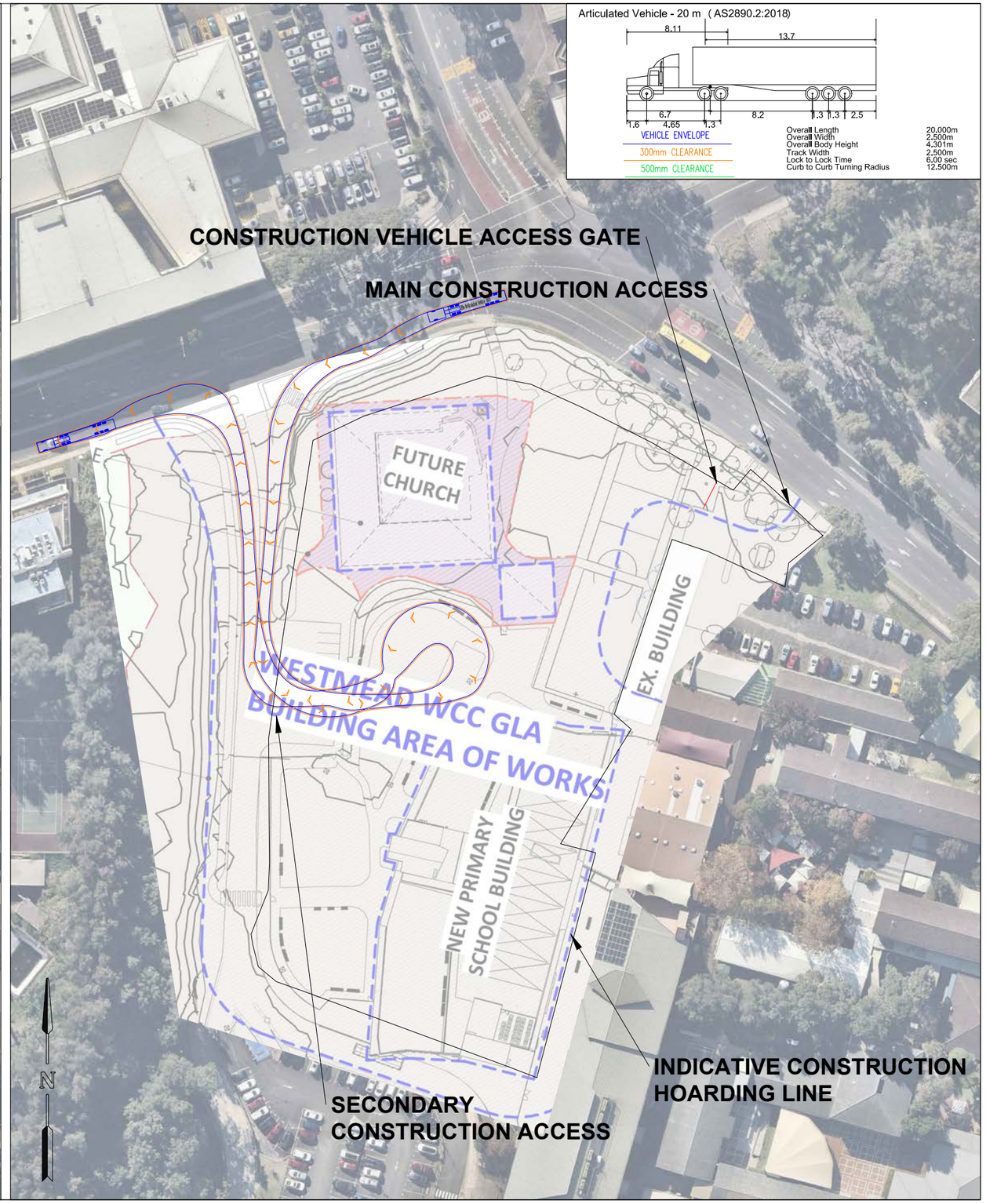

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SCALE: 1:1300	

CLIENT: Kane Constructions

PROJECT: 2752 — 2 Darcy Road

DOCUMENT INFORMATION: Construction Site Accesses — 20m Articulated Vehicle Swept Path Analysis

FILE NAME	SHEET
AG2752-01-v01_CTMP.dwg	AG02

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CLIENT
Kane Constructions

PROJECT
2752

2 Darcy Road

DOCUMENT INFORMATION
Construction Hoarding Arrangement

8.1m Coach Swept Path

FILE NAME	SHEET
AG2752-01-v01_CTMP.dwg	AG03

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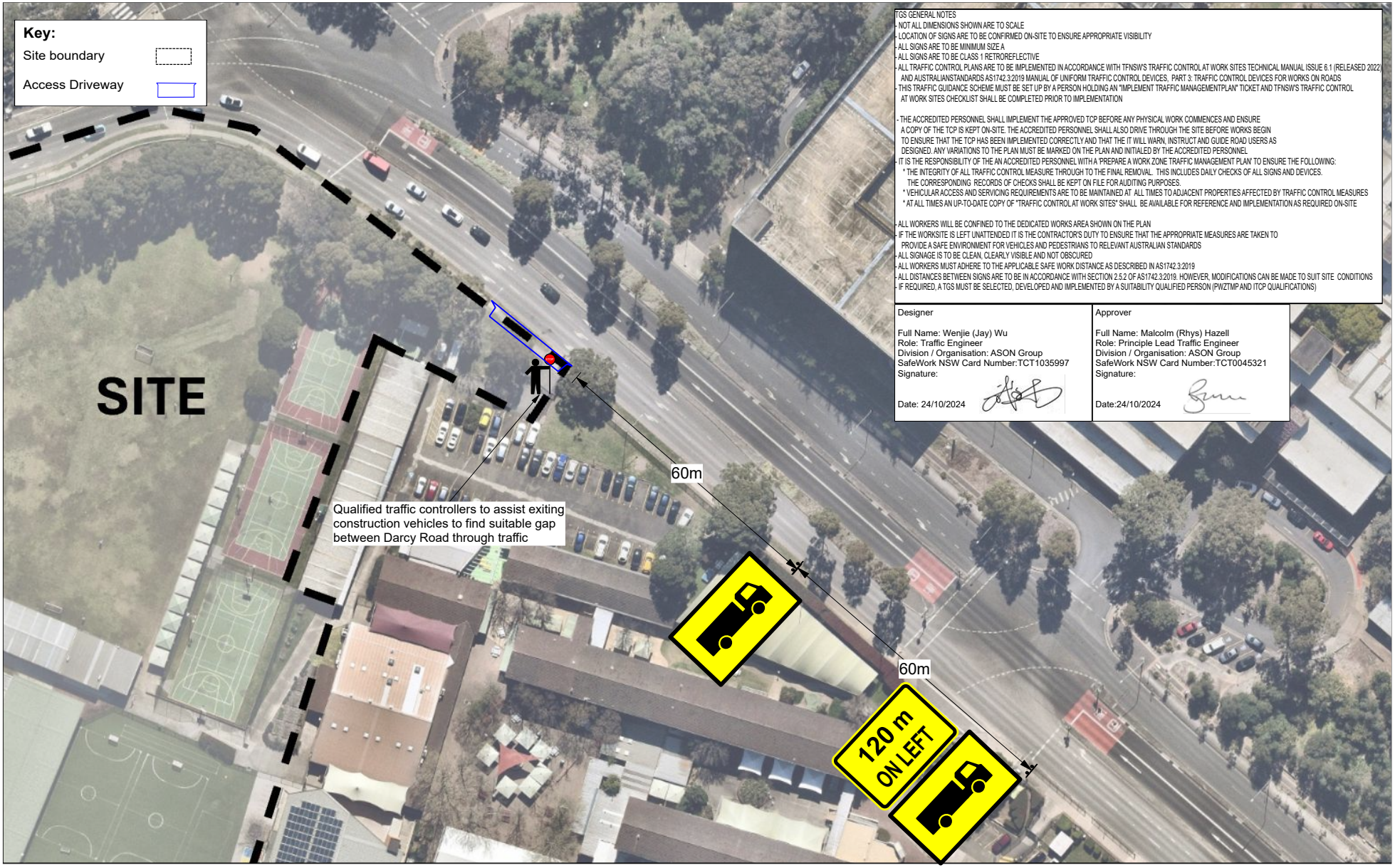
Appendix B. Traffic Guidance Scheme



TGS GENERAL NOTES
- NOT ALL DIMENSIONS SHOWN ARE TO SCALE
- LOCATION OF SIGNS ARE TO BE CONFIRMED ON-SITE TO ENSURE APPROPRIATE VISIBILITY
- ALL SIGNS ARE TO BE MINIMUM SIZE A
- ALL SIGNS ARE TO BE CLASS 1 RETROREFLECTIVE
- ALL TRAFFIC CONTROL PLANS ARE TO BE IMPLEMENTED IN ACCORDANCE WITH TFNSW'S TRAFFIC CONTROL AT WORK SITES TECHNICAL MANUAL ISSUE 6.1 (RELEASED 2022) AND AUSTRALIANSTANDARDS AS1742.3:2019 MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, PART 3: TRAFFIC CONTROL DEVICES FOR WORKS ON ROADS
- THIS TRAFFIC GUIDANCE SCHEME MUST BE SET UP BY A PERSON HOLDING AN "IMPLEMENT TRAFFIC MANAGEMENTPLAN" TICKET AND TFNSW'S TRAFFIC CONTROL AT WORK SITES CHECKLIST SHALL BE COMPLETED PRIOR TO IMPLEMENTATION

- THE ACCREDITED PERSONNEL SHALL IMPLEMENT THE APPROVED TCP BEFORE ANY PHYSICAL WORK COMMENCES AND ENSURE A COPY OF THE TCP IS KEPT ON-SITE. THE ACCREDITED PERSONNEL SHALL ALSO DRIVE THROUGH THE SITE BEFORE WORKS BEGIN TO ENSURE THAT THE TCP HAS BEEN IMPLEMENTED CORRECTLY AND THAT THE IT WILL WARN, INSTRUCT AND GUIDE ROAD USERS AS DESIGNED. ANY VARIATIONS TO THE PLAN MUST BE MARKED ON THE PLAN AND INITIALED BY THE ACCREDITED PERSONNEL
- IT IS THE RESPONSIBILITY OF THE AN ACCREDITED PERSONNEL WITH A 'PREPARE A WORK ZONE TRAFFIC MANAGEMENT PLAN' TO ENSURE THE FOLLOWING:
  * THE INTEGRITY OF ALL TRAFFIC CONTROL MEASURE THROUGH TO THE FINAL REMOVAL. THIS INCLUDES DAILY CHECKS OF ALL SIGNS AND DEVICES. THE CORRESPONDING RECORDS OF CHECKS SHALL BE KEPT ON FILE FOR AUDITING PURPOSES.
  * VEHICULAR ACCESS AND SERVICING REQUIREMENTS ARE TO BE MAINTAINED AT ALL TIMES TO ADJACENT PROPERTIES AFFECTED BY TRAFFIC CONTROL MEASURES
  * AT ALL TIMES AN UP-TO-DATE COPY OF "TRAFFIC CONTROL AT WORK SITES" SHALL BE AVAILABLE FOR REFERENCE AND IMPLEMENTATION AS REQUIRED ON-SITE

- ALL WORKERS WILL BE CONFINED TO THE DEDICATED WORKS AREA SHOWN ON THE PLAN
- IF THE WORKSITE IS LEFT UNATTENDED IT IS THE CONTRACTOR'S DUTY TO ENSURE THAT THE APPROPRIATE MEASURES ARE TAKEN TO PROVIDE A SAFE ENVIRONMENT FOR VEHICLES AND PEDESTRIANS TO RELEVANT AUSTRALIAN STANDARDS
- ALL SIGNAGE IS TO BE CLEAN, CLEARLY VISIBLE AND NOT OBSCURED
- ALL WORKERS MUST ADHERE TO THE APPLICABLE SAFE WORK DISTANCE AS DESCRIBED IN AS1742.3:2019
- ALL DISTANCES BETWEEN SIGNS ARE TO BE IN ACCORDANCE WITH SECTION 2.5.2 OF AS1742.3:2019. HOWEVER, MODIFICATIONS CAN BE MADE TO SUIT SITE CONDITIONS
- IF REQUIRED, A TGS MUST BE SELECTED, DEVELOPED AND IMPLEMENTED BY A SUITABILITY QUALIFIED PERSON (PWZTMP AND ITCP QUALIFICATIONS)

Designer	Approver
Full Name: Wenjie (Jay) Wu Role: Traffic Engineer Division / Organisation: ASON Group SafeWork NSW Card Number:TCT1035997 Signature: Date: 24/10/2024	Full Name: Malcolm (Rhys) Hazell Role: Principle Lead Traffic Engineer Division / Organisation: ASON Group SafeWork NSW Card Number:TCT0045321 Signature: Date:24/10/2024

NOTES

Plan Type: TGS Darcy Road Construction Access	**Project:** Job No: 2752 Address: 2 Darcy Road, Westmead	**Date:** 24/10/2024	asongroup
Client: Kane Construction Pty Ltd	**Drawing Title:** WCC GLA Construction TGS	**Scale @ A3:** NOT TO SCALE	
		Drawing Number:	

Appendix C. Risk Assessment

Westmead WCC GLA Building

Risk Assessment and Communication Tool

Project Number	2752r01
Project Name	Construction of school building
Site Location	2 Darcy Road, Westmead
Date of Assessment	08 October 2024
Revision	Issue A

Name	Company	Title

Document Control			
Date Issued	Revision	Issued By	Checked By
08/10/2024	Draft	Jay Wu	

Risk Matrix		**Consequence**				
		Minor	Major	Severe	Critical	Catastrophic
		A	B	C	D	E
Very Unlikely	1	Low	Low	Medium	Medium	Medium
Unlikely	2	Low	Low	Medium	Medium	High
Possible	3	Low	Medium	High	High	High
Likely	4	Medium	Medium	High	High	Extreme
Almost Certain	5	Medium	High	High	Extreme	Extreme

Description	
A - Minor	Could result in injury or illness not resulting in a LOSt work day or minimal environmental damage not required to be notified under jurisdiction requirements.
B - Major	Could result in injury or illness resulting in one or more LOSt work day(s) or environmental damage can be mitigated and is not required to be notified under jurisdiction
C - Severe	requirements where restoration activities can be accomplished.
D - Critical	Could result in permanent partial disability, injuries or illness that may result in
E - Catastrophic	hospitalisation of persons or environmental damage can be mitigated and is required to be notified under jurisdiction requirements.

Likelihood Descriptor	Design Likelihood
1 - Very unlikely	Industry experience suggests design failure is very unlikely. It can be assumed failure.
2 - Unlikely	Industry experience suggests design failure is unlikely to occur in the life of design.
3 - Possible	Industry experience suggests design failure is possible some time during the life of the product.
4 - Likely	Industry experience suggests design failure is likely to occur during the life of the product.
5 - Almost certain	Industry experience suggests design failure is almost certain to occur during the life of the product.

Risk Assessment and Communication Tool

Example

ID. Ref	Risk and/ or Hazard	Risk Description	Location	Existing Control	Initial Risk Rating			Design Response to risk and /or hazard	Status of Risk	Assignment of risk or hazard	Residual risk rating		
					C	L	RR				C	L	RR
1	Unauthorized Access to the Site	Site prevents unauthorised access	Entire Site	Nil	C	3	High	Exclusion barriers will be provided as part of the main works. The design provides a defined separation between construction and work areas.	Design Solution	Kane Constructions	B	2	Low
2	Interaction between pedestrians and vehicles	Vehicles and pedestrians to be separates as best possible	Entire Site & Access Roads	Nil	D	3	High	Dedicated footpath, pedestrian crossings and additional signage shall be provided to separate vehicles and pedestrians as best possible.	Design Solution	Kane Constructions	B	2	Low
3	Potential vehicle conflict points	Vehicles can crash with each other while manoeuvring through the site	Entire Site & Access Roads	Nil	B	3	Medium	Roadways are capable of two-way flow. Nonetheless, Traffic Controllers shall limit movements within disrupted areas to limit any safety issues. Low speeds throughout the site also reduce potential for crashes	Design Solution	Kane Constructions	B	1	Low

4	Fatigue	Injury caused by fatigue	Entire Site	Nil	C	3	High	Toolbox meetings and regular breaks (in line with WHS practices) to minimise fatigue	Design Solution	Kane Constructions	B	1	Low
5	Fall risks	Injury due to falls (in general)	Entire Site	Nil	E	3	High	Ensuring level changes across the site to be minimised as best possible, with additional black & yellow hazard tape/marking being installed where appropriate. Installation of handrails where level changes / ramps grades are significant.	Design Solution	Kane Constructions	C	2	Medium
6	Misdirected access into neighbouring site	Vehicle in unsafe locations	Entire Site	Nil	C	3	High	Ensuring appropriate directional signage has been provided to ensure vehicles do not access the wrong construction site, which could create potential safety breaches and hazards for all partied	Design Solution	Kane Constructions	B	2	Low
7	Conflicting Traffic Management	Coordinating Traffic Controllers could create misleading and wrong advice	Entire Site	Nil	C	3	High	Toolbox meetings, regular liaison with all construction teams and review of signage plans on site in order to minimise contradicting signage.	Design Solution	Kane Constructions	C	2	Medium

Appendix D. Driver Code of Conduct

Driver Code of Conduct

Safe Driving Policy for 2 Darcy Road, Westmead

Objectives of the Drivers Code of conduct

- To minimise the impact of earthworks on the local and regional road network.
- To minimise conflict with other road users.
- To minimise road traffic noise.
- To ensure truck drivers use specified heavy vehicles routes between the Site and the sub-regional road network.

Code of Conduct

The code of conduct requires that while driving any vehicle for work-related purposes. Drivers are to be issues with a copy of the Drivers Code of Conduct, and must comply with all of the following:

- Demonstrate safe driving and road safety activities.
- Abide by traffic, road, and environmental legislations.
- Follow site signage and instructions.
- Drivers must only enter and exit the site via the approved entry and exit points and travel routes.

The below activities in any vehicles will be considered as a breach of conduct and will result in removal from site:

- Reckless or dangerous driving causing injury or death.
- Driving whilst disqualified or not correctly licensed.
- Drinking or being under the influence of drugs while driving.
- Failing to stop after an incident.
- LOSs of demerit points leading to suspension of licence.
- Any actions that warrant the suspension of a licence.
- Exceeding the speed limit in place on any permanent or temporary roads.

Driver Responsibilities

All Drivers on site must:

- Be responsible and accountable for their actions when operating a company vehicle or driving for the purposes of work.
- Display the highest level of professional conduct when driving a vehicle at all times.

- Ensure they have a current driver licence for the class of vehicle they are driving, and this licence is to be carried at all times.
- Immediately notify their supervisor or manager if their drivers' licence has been suspended, cancelled, or has had limitations applied.
- Comply with all traffic and road legislation when driving.
- Assess hazards while driving.
- Undertake daily pre-start checks of mufflers, oil, tyre pressures, radiator, and battery levels of company vehicles they regularly used.
- Drive within the legal speed limits, including driving to the conditions.
- Not drive outside of the approved heavy vehicle routes. All drivers must obey weight, length and height restrictions imposed by the National Vehicle Regulator, and other Government agencies. Heavy Vehicles shall adhere to the selected routes.
- Do not queue on public roads unless a prior approval has been sought.
- Be aware that at no time may a tracked plant be permitted or required on a paved road.
- Never drive under the influence of alcohol or drugs, including prescription and over the counter medication if they cause drowsiness – to do so will merit disciplinary measures.
- All drivers to report to their supervisor if they have been prescribed medication prior to the start of work.
- Wear a safety seat belt at all times when in the vehicle.
- Avoid distraction when driving – the driver will adjust car stereos/mirrors etc. before setting off or pull over safely to do so.
- Report ALL near-misses, crashes, and scrapes to their manager,
- Report infringements to a manager at the earliest opportunity.
- Report vehicle defects to a manager prior to the next use of the vehicle.
- Follow speed limits as imposed within the estate.
- Keep loads covered at all times.
- Park in dedicated light vehicle or heavy vehicle parking spaces.
- Follow the approved site access/ egress routes only, as defined below.

Figure B: Construction Vehicle Route Map

Road Traffic Noise

Generating excessive noise is governed by legislation and is an offence. Heavy trucks generate a higher level of noise than light vehicles.

The amenity of surrounding road users/residents is to be maintained as far as practical during the construction process. Vehicles traveling to, from and within the site shall not create unreasonable or unnecessary noise or vibration to minimise interference to adjoining building operations.

No tracked vehicles will be permitted or required on any paved roads. All heavy vehicle operators are required to adhere to the following during the course of their duty:

- If possible, minimise road traffic noise by not using engine brakes near residences and built-up areas.
- All vehicles must be fitted with audible reversing alarms. These are essential for the safety of all personnel. Reversing alarms are, however, the source of potential noise complaints from neighbouring residents, so all drivers should be aware of this and try to minimise reversing when possible.
- Avoid loading and unloading of materials/deliveries outside of daytime hours.
- Trucks should not idle near residential receivers.
- Stationary sources of noise, such as generators, should be located away from sensitive receivers.
- Project personnel, including relevant sub-contractors, to acquaint themselves with noise and vibration requirements and the location of sensitive receivers during inductions and toolbox talks.
- Delivery vehicles should be fitted with straps rather than chains for unloading, wherever possible.
- Truck drivers should avoid compression-braking and overrevving as far as practicable when accessing the site during the approved hours and avoid them entirely outside of the approved work hours.
- Where night-time works are required, trucks should use broadband reversing alarms.

Site Team Responsibilities

Kane Constructions is responsible to take all steps necessary to ensure company vehicles are as safe as possible and will not require contractors/ workers to drive under conditions that are unsafe.

This will be achieved by undertaking the following:

- Ensuring all vehicles are well maintained and that the equipment enhances driver, operator, and passenger safety by way of:
  - Pre-commencement checks for all new plant arriving on-site and prior to undertaking any work.
  - Daily prestart inspections for all plant, vehicles, and equipment currently on-site.
  - All construction plant must be fitted with a flashing light, fire extinguisher and reverse alarms (or squawkers).
  - Ensure all operators onsite have a current verification of competency (VOC) for their current driver's licence of the appropriate class.
  - Ensure maintenance requirements are met and recorded.
- Identify driver training needs and arranging appropriate training or re-training. This may include providing the below:
  - Operator VOC assessment as part of all inductions.
  - Regular Toolbox discussions on safety features, managing fatigue, approved heavy routes, driver responsibility and drink-driving.
- Encouraging Safe Driving behaviour by:
  - Ensuring the subcontractor is informed if their staff become unlicensed.
  - Not covering or reimbursing staff speeding or other infringement notices.
  - Ensuring Legal use of mobile phones in vehicles while driving only and that illegal use is not undertaken.
- Encouraging better fuel efficiency by:
  - Use of other transport modes or remote conferencing, whenever practical.
  - Providing training on, and circulating information about, travel planning and efficient driving habits.

Crash or incident Procedure

- Stop your vehicle as close as possible to the scene, making sure you are not hindering traffic. Ensure your own safety first, then help any injured people and seek assistance immediately if required.
- Ensure the following information is noted:
  - Details of the other vehicles and registration numbers.
  - Names and addresses of the other vehicle drivers.
  - Names and addresses of witnesses.
  - Insurers details.
- Give the following information to the involved parties:
  - Name, address, and company details.
- If the damaged vehicle is not occupied, provide a note with your contact details for the owner to contact the company.
- Ensure that the police are contacted should the following circumstances occur:
  - If there is a disagreement over the cause of the crash.
  - If there are injuries.

  - If you damage property other than your own.
- As soon as reasonably practical, report all details gathered to your manager.

Environmental Procedures

A range of measures shall be implemented to ensure the following:

- No dirt or debris from the construction vehicles is tracked on to the public road network.
- Reduce the impacts to sensitive receivers, including, where practicable, starting noisy equipment away from sensitive receivers and implementing respite periods.
- Watering of dusty activities will be undertaken, or activities temporarily halted and then resumed once weather conditions have improved.
- Containment measures for spillages will be provided at appropriate locations, dangerous goods stores areas and main work areas.
- All vibratory compactors must not be used closer than 30 metres from residential buildings unless vibration monitoring confirms compliance with the vibration criteria, and
- Keep an accurate record which includes the range of measures undertaken to reduce environmental impacts.

Jay Wu

Transport Engineer – Ason Group

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Phone: +61 450 715 950

Jay has a Bachelor of Civil Engineering and has been working in traffic engineering and the transport planning industries for more than four years.

During this time, Jay has helped clients to deliver numerous of projects, via active stakeholder engagement, from initial scoping and baseline data collection through to full investigation and completion of projects.

He has solid experience in detailed design advice in relation to the preparation of reviews and technical advice (with consideration to AS2890 series), master planning, planning proposals, Construction Traffic Management Plans), Traffic Guidance Schemes and Traffic Impact Assessment (TIA).

Jay also has well developed knowledge on traffic engineering and transport related software programs such as, AutoCAD, SIDRA, PTV VISSIM, Rapid Plan and Microsoft Office applications.

Jay's project experience has involved acting on behalf of both public and private sector clients where he used his capabilities to provide strategic and expert advice on transport planning and traffic network performance matters that result in the most efficient and effective outcomes.

QUALIFICATIONS & EDUCATION

- BE (Honours) in Civil Engineering (University of New South Wales, Sydney)
- Member of Engineers Australia
- SafeWork NSW – Prepare a work zone traffic management plan (PWZ)

PROFESSIONAL BACKGROUND

- 2023 – Current: Ason Group
  Transport Engineer
- 2020 – 2023: PDC Consultants
  Traffic Engineer and Transport Planner

KEY SKILLS

- Traffic Impact Assessments
- Master Planning & Feasibility Studies
- Construction Traffic Management Plan
- Green Travel Plans & Transport Access Guides
- Transportation Modelling Analysis (SIDRA, VISSIM)
- Construction and Occupancy Certificate
- Design assessments and swept path analysis.

KEY PROJECTS & EXPERIENCE

Precinct Master Planning & Transport Assessment

- Marrickville Timberyard
- Leeds Street Precinct, Rhodes
- Rodborough Road, Frenches Forest
- Auburn Village
- Bong Bong Common Masterplan
- Holsworthy Town Centre
- Cooks Cove – due diligence
- Multiple planning proposals in Leppington Town Centre

SSDA/ DA Transport Assessment

- TOGA Central
- The Octagon, Parramatta
- Macquarie Rise, Macquarie Park
- Al-Faisal College, Auburn
- Narrabeen North Public School
- Multiple d'Albora marinas
- Multiple data centre projects
- Multiple DAs for major supermarket brands

Traffic Modelling & Analysis

- Babbage Road / Boundary Street Corridor – VISSIM
- Victoria Road Corridor – VISSIM
- Ramsgate Town Centre – SIDRA
- Bridge Road, Mackay – SIDRA

Construction Traffic Management

- 60 Margaret Street, Sydney
- TOGA Central
- Westmead Catholic Community Construction
- Edge South Estate
- Aspect Industrial Estate
- Ivanhoe Estate

Post-Approval Design & Compliance Certificate

- McEvoy Street mixed use development
- Boomerang Tower

Rhys Hazell

Principal Lead – Ason Group
Email: rhys.hazell@asongroup.com.au

With 25 years diverse experience in traffic and transport planning with a focus on a broad cross-section of both public and private sector clients across Australia, Rhys has developed a range of skills essential to achieving positive outcomes. He has extensive experience in a range of projects including large and small scale developments, Master planning, planning proposals, strategic transport assessments, transport planning, parking studies, construction traffic management, special event planning and detailed site layout design.

Rhys brings a combination of land use planning experience and technical transport knowledge, together with a definitive pragmatic approach to ensure a broader perspective on complex projects in an ever-changing environment. Regular involvement in stakeholder engagement is also an important attribute together with acting as an expert witness in the Land & Environment Court. He has strong verbal and written communication skills and views client engagement and practical guidance as key to achieving positive outcomes.

QUALIFICATIONS & EDUCATION

- Adv Cert. Traffic and Transport Management, University of Sydney, Sydney, Australia, 2008.
- BA Built Environment, Macquarie University, Sydney, Australia, 1997.
- Member of Australian Institute of Traffic Planning and Management.

PROFESSIONAL BACKGROUND

- 2023 – Current: Ason Group
Principal Lead
- 2021 – 2023: Stantec
Senior Principal Transport Planner
- 2018 – 2021: GTA Consultants
Director
- 2017 – 2018: Colston Budd Rogers & Kafes
Associate Director
- 2010 – 2017: GTA Consultants
Associate Director/ Senior Consultant
- 1998 – 2010: Colston Budd Rogers & Kafes
Transport Planner

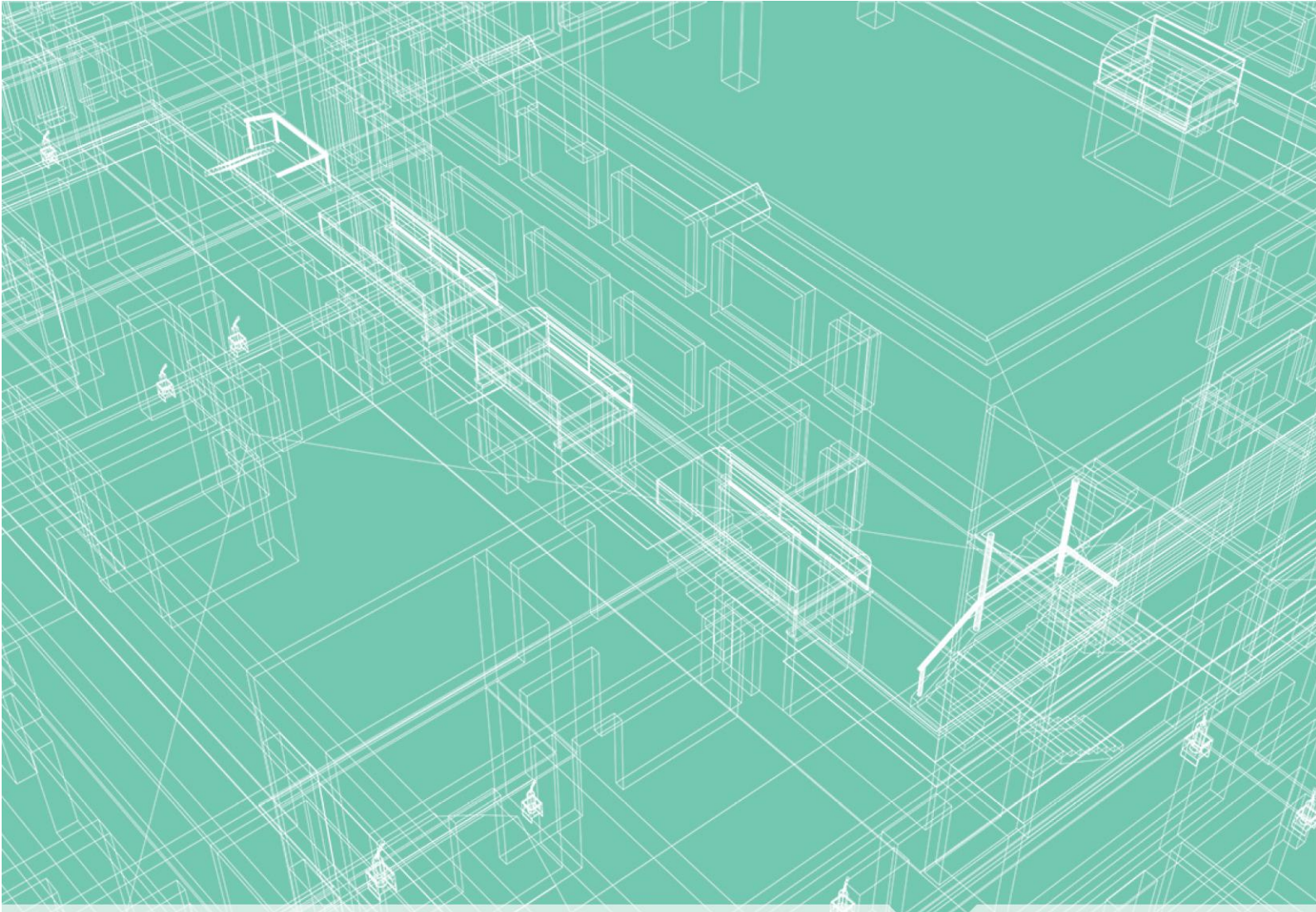
KEY SKILLS

- Project Management
- Transport Impact Assessments
- Master Planning & Feasibility Studies
- Strategic Transport Assessments
- Green Travel Plans & Transport Access Guides
- Local Area Traffic Management (LATM) Plans
- Transportation Modelling Analysis
- Construction & Occupancy Certification
- Car Park & Loading Dock Design & Assessment
- Construction Traffic Management Plans

KEY PROJECTS & EXPERIENCE

- The Post House, Central Square
- Five Dock Village
- WIN Grand, Wollongong
- Chatswood Chase
- Castle Towers
- Parramatta Square
- Direct Factory Outlets, Homebush
- Ashfield Mall
- Wicks Place, Marrickville
- Morling College redevelopment
- 338 Pitt Street, Sydney
- The Ribbon, Darling Harbour
- Gosford Alive
- Newcastle East End
- A By Adina, George Street, Sydney
- The Orchards, Norwest
- Black Hill industrial precinct
- Gregory Hills industrial precinct
- Tamworth industrial precinct
- Wynyard Walk Sydney
- Western Sydney Airport Construction Traffic
- Shellharbour Hospital
- Westmead Hospital Redevelopment
- Dubbo Base Hospital Redevelopment
- Armidale Hospital
- Lachlan Health Service (Parkes & Forbes hospitals)
- Marie Bashir Centre and RPA North-West Precinct
- Land & Environment Court Expert Witness (multiple)

c) Construction Noise and Vibration Management Sub-Plan



CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

WESTMEAD CATHOLIC COMMUNITY - GLA BUILDING

ACOUSTIC SERVICES

JHA

JHASERVICES.COM

This report is prepared for the nominated recipient only and relates to the specific scope of work and agreement between JHA and the client (the recipient). It is not to be used or relied upon by any third party for any purpose.

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1 INTRODUCTION

1.1 OVERVIEW

This Construction Noise and Vibration Management Plan (CNVMP) has been prepared by JHA Consulting Engineers on behalf of Kane Constructions Pty Ltd to address the Condition of Consent (SSDA-10383 and SSDA-10383-mod-1) Clauses C15 and D12-D17 for the proposed educational facility development located at 2 Darcy Road, Westmead, NSW 2145.

The development is divided into two stages, which incorporate the following:

- Demolition of structures,
- Construction of 5-storey building with outdoor rooftop space for Kindergarten to Year-6 students

This document and related work have been prepared following JHA Consulting Engineers Quality and Environmental Management Systems, which are based on AS/NZS ISO 9001:2015 and ISO 14001:2015, respectively.

1.2 PURPOSE OF THE CNVMP

The purpose of this CNVMP is to ensure that noise and vibration impacts due to construction activities are appropriately managed in accordance with relevant legislation and standards, plus protection of the nearby sensitive receivers. The objectives of this acoustic assessment are:

- Comply with the relevant Conditions of Consent as per SSDA-10383 and SSDA-10383-mod-1 (dated 14 February 2022).
- Identify noise-sensitive receivers that will potentially be affected by the works.
- Establish the appropriate noise level and vibration criteria in accordance with the relevant standards, guidelines and legislation.
- Determine whether the relevant criteria can be achieved based on assumed construction works and plant for the noise assessments. Where applicable, provide recommendations for any necessary acoustic control measures that will need to be incorporated into the development or use in order to ensure the assessment criteria.
- Provide recommendations for Construction Noise and Vibration Planning.

This CNVMP identifies the Contractor's obligations and the requirements to manage noise and vibration during construction such that the necessary allowances within the construction costs, programmes and work methodologies can be made. Relevant legislation, guidelines and standards are identified in this CNVMP.

1.3 NOISE AND VIBRATION ISSUES

This CNVMP addresses all works from construction works associated with the proposed development. The construction works will contribute noise and vibration emissions to the surrounding environment. Typically, this will comprise of continuous and intermittent noise and vibration from on-site construction equipment and plant equipment.

Construction noise associated with the project may include airborne and ground-borne noise impacts as follows:

- Airborne Noise: Proposed construction works will generate noise that will propagate through the air. Airborne noise generated by external construction activities is likely to impact surrounding sensitive receivers.
- Ground-borne noise and vibration impacts: Construction and piling works have the potential to generate noise and vibration that propagates through the ground and building structural elements, which is then radiated by vibrating wall and floor surfaces of nearby sensitive receivers.

1.4 RESPONSIBILITIES

The Main Contractor must be responsible for ensuring that the noise and vibration from activities carried out on-site are minimised as far as practical. The Main Contractor is responsible for:

- Ensuring that any site noise and vibration levels, plus any complaints, are monitored, investigated, managed and controlled in accordance with the recommendations provided in this plan.
- Ensuring procurement documents specify any requirements in relation to the management of noise and vibration.
- Ensuring all works are undertaken in accordance with the requirements of the contract documents and this plan.
- Ensuring all project personnel and sub-contractors employed are aware of their responsibilities regarding the management of noise and vibration during construction and assume the responsibilities assigned to them within the plan.
- Monitoring and managing exceedances of the noise and vibration impacts on sensitive receivers in accordance with the requirements of the relevant guidelines and standards.
- Consulting with the occupants of surrounding buildings to inform them of the nature of the construction works, to determine any specific noise and vibration sensitivity they may have and to negotiate respite times during noisier works.

1.5 AUTHORS

This report was prepared by Shahrokh Sepehrirahnama. Shahrokh is a Member of Engineering Australia and Member of the Australian Acoustical Society (MAAS). Quality Assurance was conducted by Jorge Reverter, MAAS.

2 DESCRIPTION OF THE PROPOSAL

2.1 SITE DETAILS

Westmead is a suburb of Sydney being shared by local government of City of Parramatta and Cumberland Council, and it is approximately 26km West of Sydney CBD inner southern suburb of Sydney, New South Wales, Australia.

The site is currently surrounded by a mix of commercial and residential receivers. The surrounding land uses are as follows:

- *North*: Immediately north of the site is currently Occupied by Medical Uses. It is identified as part of the Westmead Hospital Complex.
- *East*: Land to the east is currently occupied by Educational and Hospital uses. It is identified as the Westmead Campus of Western Sydney University, and the Greater Westmead Hospital Complex.
- *South*: Land to the south is currently occupied by residential receivers. It is identified as part of the greater Westmead residential area. The boundary between this residential area and the site is the T1 Western Railway Line.
- *West*: Land to the west of the site is currently identified as residential receivers. This land is part of the Monaco Estate and NSW Health Staff Housing for the nearby Westmead Hospital Complex.

Figure 1 shows the proposed development site and surrounding noise-sensitive receivers.

Figure 1: Proposed development and surrounding sensitive receivers (Noise Catchment Areas).

2.2 NOISE-SENSITIVE RECEIVER DETAILS

A summary of the nearest noise-sensitive receivers, grouped into Noise Catchment Areas (NCA's), surrounding the site is shown in Table 1, including approximate distances from the site to the NCA's boundaries, noting also the type of receiver within the NCA's.

NCA ID	*Sensitive Receiver*	*Receiver Type*	*Nearest Receiver Address*	*Approximate distance from the construction site*
1	Residential noise catchment	Residential	28 Darcy Rd	50m
2	Residential noise catchment	Residential	91 Bridge Rd	270m
3	Residential noise catchment	Residential	17 Darcy Rd	120m
4	Mixed-used noise catchment	Healthcare / Commercial	Corner Mons and Darcy Roads,	55m
5	Mixed-used noise catchment	Healthcare / Commercial	1 Mons Rd	60m
6	Mixed-used noise catchment	Educational / Residential	5 Maple Tree Rd	280m
7	Existing WCC Building	Educational	2A Darcy Road	10m

Table 1: Receivers surrounding the site and the approximate distances from boundaries.

It is noted that if noise and vibration impacts associated with the proposed development are controlled at the nearest noise-sensitive receivers, then compliance with the recommended criteria at all noise-sensitive receivers should be achieved.

3 SITE MEASUREMENTS

Attended and unattended noise surveys were conducted by JHA Consulting Engineers. The location, along with the results of the noise surveys, have been extracted from the JHA Acoustic report[1] and summarised in Table 2 and Figure 2 below.

Figure 2: Noise surveys location, Stage 1 (Red Shading) and boundary of the WCC site. *Source: JHA Acoustic Report*[1].

Location	*Rating Background Levels, dB(A)*			*L_{Aeq} Ambient Noise Levels, dB(A)*		
	Day 7am-6pm	*Evening 6pm-10pm*	*Night 10pm-7am*	*Day 7am-6pm*	*Evening 6pm-10pm*	*Night 10pm-7am*
L1	48	44	40	61	56	47
L2	50	50	44	63	63	57

Table 2: Results of the long-term noise monitoring. *Source: JHA Acoustic Report*[1].

[1] Noise and Vibration Impact Assessment for SSDA (SSDA-10383) by JHA Consulting Engineers (Ref: 190529-ACO-RPT-SSDA, Rev D), dated 23 June 2020.

4 NOISE AND VIBRATION CRITERIA

4.1 RELEVANT CODES AND STANDARDS

In preparing this CNVMP, the following documentation, including legislation, codes, standards, and guidelines have been considered:

- Regulatory Framework:
  - Environmental Planning and Assessment (EP&A) Act 1979.
  - Protection of the Environmental Operations (POEO) Act 1997.
  - NSW Environment Protection Authority (EPA) '*Noise Guide for Local Government*' (NGLG) 2023.
  - City of Parramatta Development Control Plan, 2023.
- Construction Noise and Vibration:
  - Development Conditions of Consent (SSD-10383 and SSD-10383-mod-1).
  - NSW Department of Environment and Climate Change (DECC) *'Interim Construction Noise Guideline'* (ICNG) 2009.
  - NSW DECC '*Assessing Vibration: A Technical Guideline*' 2006.
  - NSW Transport Roads & Maritime Services (RMS) *'Construction Noise and Vibration Guideline'* 2023.
  - Australian Standard AS 2436:2010 *'Acoustics – Guide to Noise Control on Construction, Maintenance & Demolition Sites'*.
  - British Standards Institution BS 6472:2008 *'Evaluation of human exposure to vibration in buildings (1 to 80 Hz)'*.
  - British Standards Institution BS 7385.2:1993 *'Evaluation and Measurement for Vibration in Buildings. Guide to Damage Levels from Ground-borne Vibration'*.
  - DIN 4150.3:2016 *'Structural Vibration – Effects of vibration on structures'*, German Institute for Standardisation.

4.2 REGULATORY FRAMEWORK

The Environmental Planning and Assessment Act 1979 (EP&A Act) provides the regulatory framework for the protection of the environment in NSW. The EP&A Act is relevant to planning matters and ensuring that the "environmental impact" associated with the proposed development is properly considered and reasonable before granting development consent to develop.

The assessment of "environmental impact" relies upon the identification of acceptable noise criteria, which may be defined in a Development Control Plan or derived from principles using guidelines like the NSW EPA Noise Policy for Industry (NPfI 2017) or Noise Guide for Local Government (NGLG 2023).

4.3 DEVELOPMENT CONDITIONS OF CONSENT (SSDA)

Clause C.15 of Section *Construction Environmental Management Plan* of the Development Conditions of Consent (SSDA-10383 and SSDA-10383-mod-1) states the following:

"...

C.15 The Construction Noise and Vibration Management Sub-Plan (CNVMSP) must address, but not be limited to, the following:

(a) be prepared by a suitably qualified and experienced noise expert;

(b) be consistent with the recommendations of the Noise and Vibration Impact Assessment Report, prepared by JHA, dated 23/06/2020;

(c) describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009);

(d) describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers;

(e) include strategies that have been developed with the community for managing high noise generating works;

(f) describe the community consultation undertaken to develop the strategies in condition C15(e);

(g) includes details of noise management measures (including scheduling of activities, noise barriers within the site, hoardings etc) that would be installed to ensure that existing students / staff within the site are not impacted by the construction noise;

(h) include a complaints management system that would be implemented for the duration of the construction; and

(i) include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the management measures in accordance with C12.

..."

Clauses D.12 to D-14 of Section *Construction Noise Limits* of the Development Conditions of Consent states the following:

"...

D.12 The development must be constructed to achieve the noise management levels and/or management and mitigation measures in the CNVMSP.

D.13 The applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the site outside of the construction hours of work outlined under condition D4 unless otherwise agreed with the Planning Secretary.

D.14 The applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use of 'quackers' to ensure noise impacts on surrounding noise sensitive receivers are minimised.

..."

Clauses D.15 to D.17 of Section *Vibration Criteria* of the Development Conditions of Consent states the following:

"...

D.15 Vibration caused by construction at any residence or structure outside the site must be limited to:

(a) for structural damage, the latest version of DIN 4150-3 2016 Structural Vibration – Effects of vibration on structures (German Institute for Standardisation, 1999); and

(b) for human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: a technical guideline (DEC, 2006) (as may be updated or replaced from time to time)

D.16 Vibratory compactors must not be used closer than 30m from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in condition D15.

D.17 The limits in conditions D.15 and D.16 apply unless otherwise outlined in a Construction Noise and Vibration Management Plan, approved as part of the CEMP required by condition C12 of this consent.

..."

4.4 NSW INTERIM CONSTRUCTION NOISE GUIDELINE

The ICNG suggest construction noise management levels that may minimise the likelihood of annoyance being caused to noise-sensitive residential receivers depending on the duration of work. The Noise Management Levels (NMLs) for long-term duration works are as follows for residential receivers:

Time of Day	*NML $L_{Aeq,15min}$*	*How to Apply*
ICNG Criteria for Recommended Standard Hours: Mon-Fri 7am-6pm Sat 8am-1pm No work on Sundays or public holidays	Noise affected: RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. ▪ Where predicted or measured $L_{Aeq,15min}$ is greater that the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. ▪ Where noise is above this level, the relevant authority may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

ICNG Criteria for Outside Recommended Standard Hours *Refer to approved hours from the Consent Conditions*	Noise affected: RBL + 5dB	▪ A strong justification would typically be required for work outside the recommended standard hours. ▪ The proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community.

Table 3: ICNG construction airborne noise criteria for residential receivers surrounding the construction site.

In order to establish the airborne construction noise criteria, noise levels from the unattended noise monitoring have been used for the noise-sensitive receivers – refer to Section 3. Table 4 below summarises the airborne construction noise criteria for most affected noise-sensitive receivers surrounding the development site.

Sensitive Receiver		*Noise Management Levels (NMLs) L_{Aeq} dB(A)*	
		Within Standard Hours	*Outside Standard Hours*
Residential	Noise affected / External	RBL+10	RBL+5
	Highly noise-affected / External	75	N/A
Educational / childcare	Internal	45	45
Commercial	External	70	70
Healthcare	Internal	45	45

Table 4: ICNG construction airborne noise criteria for noise-sensitive receivers surrounding the site.

The ICNG recommends maximum internal ground-borne noise levels at residences affected by nearby construction activities. Ground-borne noise is the noise generated by vibration transmitted through the ground into a structure and can be more noticeable than airborne noise for some sensitive receivers. The ground-borne noise levels presented below from the ICNG are for residential receivers during evening and night-time periods only, as the objective is to protect the amenities and sleep of people when they are at home.

- Evening (6 pm to 10 pm): $L_{Aeq,15min}$ 40dB(A) (internal)
- Night (10 pm to 7 am): $L_{Aeq,15min}$ 35dB(A) (internal)

The internal noise levels are assessed at the centre of the most affected habitable room. No assessments of ground-borne noise have been conducted as the nearest residential receivers are approximately 70m away.

4.5 VIBRATION CRITERIA

There are two items that shall be considered in the assessment of vibration impacts from construction works. These include vibration impacts in terms of human comfort and building damage.

4.5.1 HUMAN COMFORT

The Department of Environment and Climate Change (DECC) developed the document *'Assessing Vibration: A Technical Guideline'* in February 2006 to assist in preventing people from exposure to excessive vibration levels within buildings. It is based on the guidelines contained in BS 6472.1:2008 *'Guide to evaluation of human*

exposure to vibration in buildings – Vibration sources other than blasting'. The guideline does not, however, address vibration-induced damage to structures or structure-borne noise effects.

Vibration and its associated effects are usually classified as follows:

- *Continuous vibration*. An uninterrupted vibration for a defined period. This type of vibration is assessed based on weighted root-mean-squared (rms) acceleration values.
- *Impulsive vibration*. A vibration that has a rapid buildup to a peak followed by a damped decay may or may not involve several cycles of vibration (depending on the frequency and damping).
- *Intermittent vibration*. An interrupted periodic vibration of continuous or repeated periods of impulsive vibration, or continuous vibration that varies significantly in amplitude. This type of vibration is assessed on the basis of Vibration Dose Values (VDV).

Vibration criteria for continuous and impulsive vibration are presented in Table 5, in terms of vibration velocity levels. The values are assessed for the most critical frequency range (higher than 8 Hz, assuming sinusoidal motion). When assessing intermittent vibration comprising several events, it is recommended that the Vibration Dose Value (VDV) is used. Table 6 shows the acceptable VDV values for intermittent vibration.

Receiver Type	*Time*	*RMS velocity, mm/s [dB ref 10^{-6}mm/s]*			
		Continuous Vibration		*Impulsive Vibration*	
		Preferred	*Maximum*	*Preferred*	*Maximum*
Residences	Day-time	0.20 [106 dB]	0.40 [112 dB]	6.00 [136 dB]	12.00 [142 dB]
	Night-time	0.14 [103 dB]	0.28 [109 dB]	2.00 [126 dB]	4.00 [132 dB]
Offices, Schools, Educational and Worship	When in use	0.40 [112 dB]	0.80 [118 dB]	13.00 [142 dB]	26.00 [148 dB]

Table 5: Continuous and impulsive vibration criteria applicable to the site. Note: Day-time is 07:00am to 10:00pm and night-time is 10:00pm to 07:00am.

Place	*Time*	*Vibration Dose Values, $m/s^{1.75}$*	
		Preferred	*Maximum*
Residences	Day-time	0.20	0.40
	Night-time	0.13	0.26
Offices, Schools, Educational and Worship	When in use	0.40	0.80

Table 6: Intermittent vibration criteria applicable to the site.

4.5.2 STRUCTURAL BUILDING DAMAGE

Ground vibration from construction activities can damage surrounding buildings or structures. For unoccupied buildings, or during periods where the buildings are unoccupied, the vibration criteria for building damage suggested by German Standard DIN 4150.3:2016 *'Structural Vibration – Effects of Vibration on Structures'* and British Standard BS 7385.2:1993 *'Evaluation and Measurement for Vibration in Buildings'* are to be adopted. Guideline values from BS 7385.2:1993 and DIN 4150.3:2016 and are presented in Table 7 and Table 8 respectively.

Structural type	*Peak particle velocity, mm/s*	
	4 to 15Hz	*15Hz and above*
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s @ 4Hz increasing to 20mm/s @ 15Hz	20mm/s @ 15Hz increasing to 50mm/s @ 40Hz and above

Table 7: BS 7385.2:1993 Guideline values of vibration velocity for evaluating cosmetic damage.

Structural type	*Vibration velocity, mm/s (Peak Particle Velocity - PPV)*				
	Foundation			*Plane of floor uppermost full storey in horizontal direction*	*Floor slabs, vertical direction*
	1Hz to 10Hz	*10Hz to 50Hz*	*50Hz to 100Hz*	*All frequencies*	*All frequencies*
Type 1: Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
Type 2: Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
Type 3: Structures that because their particular sensitivity to vibration, cannot be classified under Type 1 and 2 and are of great intrinsic value (e.g. heritage buildings)	3	3 to 8	8 to 10	8	20

Table 8: DIN 4150.3:2016 Guideline values of vibration velocity (PPV) for evaluating the effects of short-term vibration.

5 CONSTRUCTION ACTIVITIES

Construction impact assessment has been carried out based on the information provided by Kane plus assuming typical construction work stages plus associated construction plant.

5.1 DESCRIPTION OF WORKS

The overall stages of work for the construction of the GLA building as provided by KANE are as follows:

- Separable Portion 2 (SP2) – primary School (GLA Building) (15 Months).

The assumed activities and plant relevant to the typical stage of works are summarised below in Table 9.

Stage of Works	*Main Activities*	*Typical Plant*
Excavation / Groundwork	Site Strip	Excavators (with buckets + pile cropping attachments), bogies, truck and dog, piling rigs, mobile crane/s (support cranes for piling rigs), concrete pumps, agitators delivery vehicles etc.
	Bulk Excavation	
	Fill and Compact	
Structure	Piling	Tower crane, concrete boom pump / concrete line pump, agitators, concrete vibrators, concrete cutters, telehandler etc.
	Foundation and columns	
	Ground Floor	
	Level 1 to Level 5	
Façade	Install plantroom equipment	Tower crane, materials hoist, boom lifts, scissor lifts, spider cranes etc.
	Install façade and roof	
Fit-out / Services	Rough-In services	Tower crane, materials hoist, boom lifts, scissor lifts, spider cranes, mobile cranes, telehandler etc.
	Ceiling and wet areas	
	Fit-off services	

Table 9: Assumed Stage of Works, related activities and typical plant used.

5.2 TYPICAL EQUIPMENT AND NOISE LEVELS

In accordance with the information provided and to assess the potential noise and vibration impacts during works from a quantitative point of view, the construction noise sources for the works occurring during the project and the associated equipment noise levels are listed in Table 10.

Sound power levels are based on the databases published by Australian Standard 2436:2010 '*Guide to Noise Control on Construction, Maintenance & Demolition Sites*', Roads and Maritime Services '*Construction Noise and Vibration Guideline*' and the UK Department for Environmental, Food and Rural Affairs (DEFRA).

Stage of works	*Item*	*Typical Sound Power Level L_{WAeq} (dB ref 1pW)*	*Typical Sound Pressure Level L_{Aeq} at 10m (dB ref 20μPa)*
Excavation / Groundwork	Excavator with hammer	107	79
	Tip Truck	114	86
	Electric Hand-Tools	102	74
Structure / Groundwork	Piling Rig	111	83
	Excavator (45tonne)	115	87
	Concrete saw	117	89
	Dozer (D8 or D9) with a ripper attachment	116	88
	Dewatering plant pumps	109	81
	Cranes	104	76
	Truck	107	79
	Hand tools (Electric)	102	74
Structure	Tower crane	105	77
	Mobile Concrete Pumps	108	80
	Forklifts / Manitou	106	78
	Concrete vibrator	115	87
	Pressure washer pumps	109	81
	Truck	107	79
	Hand tools (Electric)	102	74
Fit-out	Tower crane	105	77
	Material Hoist	98	73
	Forklifts	106	78
	Concrete Pump	108	80
	Concrete Agitator	109	76
	Truck	107	79
	Hand tools (Electric)	102	74

Table 10: Anticipated maximum airborne noise levels for the construction plant used during the different stages of the works.

5.3 RECEIVERS

For the noise and vibration impact assessment purposes and due to the distances between the site and the sensitive receivers, impact assessment has been carried out grouping the sensitive receivers as shown in Table 11.

Receiver Type	*Group*	*Receivers*	*Distance range to construction work (m)*
Residential	*A*	1 and 3	50 - 150
	B	2, and 6	150 - 300
Commercial	*C*	4 and 5	50 - 300
Healthcare	*D*	4 and 5	50 - 300
Educational	*E*	6	300 - 400
Existing WCC Buildings	*F*	7	10 - 200

Table 11: Noise sensitive receivers grouping for impact assessment purposes.

5.4 HOURS OF WORK

Construction hours of work for the project shall be as per clauses D4 to D7 under Section '*Construction Hours*' of the Development Conditions of Consent states the following:

" ...

D4. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:

(a) between 7am and 6pm, Mondays to Fridays inclusive; and

(b) between 8am and 1pm, Saturdays.

D5. Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours, subject to notification given to affected residents before undertaking the activities or as soon as is practical afterwards:

(a) 9am to 12pm, Monday to Friday;

(b) 2pm to 5pm Monday to Friday; and

(c) 9am to 12pm, Saturday.

D6. Construction activities may be undertaken outside of the hours in conditions D4 and D5, if required:

(a) by the police or a public authority for the delivery of vehicles, plant or materials;

(b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or

(c) where a variation is approved in advance in writing by the Planning Secretary or her nominee if appropriate justification is provided for the works.

D7. Rock breaking, rock hammering, sheet piling, pile driving and similar activities must be scheduled during the hours as identified in the CNVMSP, unless otherwise agreed within the Planning Secretary.

..."

6 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

A construction noise and vibration assessment has been carried out based on information supplied by KANE Construction Pty Ltd, which includes construction phases and construction plant associated as per Section 5. The Contractor will be responsible for preparing a Construction Works Plan and Schedule, which include all relevant noise and vibration information.

6.1 ASSESSMENT METHODOLOGY

An assessment of the likely noise and vibration impacts of the assumed stage of works on the most affected NCA's surrounding the site has been carried out. The assessment has considered the following:

- Typical construction activities considered in the noise impact are detailed in Section 5.1.
- Proposed construction hours as per Section 5.4.
- Typical noise source levels considered in the noise impact are detailed in Section 5.2.
- Project specific noise and vibration criteria at sensitive receivers as outlined in Section 4.
- The different construction phase assessments presented in Section 5.1 are based on the Project Program Timeline prepared by KANE Construction Pty Ltd. Worst-case scenario assessments have been presented in this report. It is understood that if noise from construction activities in different phases of the project complies with the worst-case scenario assessment, then other construction activity phases mentioned in the Project Program Timeline will comply with criteria established in Section 4 of this report.
- The predictions consider the continuous operation of the construction plant over the 15-minute assessment period plus a range of distances from the site boundaries.

The predictions represent the 'reasonable' worst periods of construction activities to assess the noise impact from the site during construction. The assumptions that were made within the assessment include the following:

- Height of the noise receiver at 1.5m above ground level.
- Atmospheric propagation conditions were modelled with neutral conditions.
- Construction noise sources (listed in Table 10) spread around the construction site.

The predicted noise levels at the surrounding sensitive receivers have been based on the assumptions and sound power levels of the equipment. It should be noted that the predicted noise levels generated during the construction works may vary depending on many factors, including:

- Final selection of plant and equipment which could differ from the plant presented in Table 10.
- Exact location of equipment and plant on site – relative to the noise-sensitive receivers.
- Shielding of noise provided by hoardings on site.
- Reflections provided by existing structures on and around the site.

6.2 ACOUSTIC SCREENING

As per the information provided by Kane, in order to reduce the noise impact of construction works to the residential receivers to the West (refer to NCA 1, 2, 3 and 6 in Table 1) and the educational receivers (receiver 5 and 7 in Table 1), hoarding is proposed during all phases of the construction work.

Figure 3 shows an indicative mark-up of the location and extent of the proposed hoarding, based on Kane information. We note that the most sensitive receiver is the existing WCC educational building due to the proximity to the construction site. Installing hoarding will primarily protect these WCC buildings and mitigate the internal noise level of spaces in those buildings. Table 12 Provides the proposed hoarding details for different sections shown in Figure 3.

Screen type	*Minimum Height*	*Most sensitive noise receivers*	*Type*
Section A	3m	WCC Buildings (<50m)	Solid counterweight hoarding
Section B	3m	WCC Buildings (<50m)	Solid post-fixed hoarding
Section C	2.4m	Residential + Commercial (>50m)	Fabric Shadecloth
Section D	2.4m	WCC Buildings (>50m)	Solid counterweight hoarding
Section E	1.6m	WCC buildings (shielded by Construction site accommodation)	Jersey Kerb Hoarding

Table 12: Recommended minimum working distances for vibration intensive plant from sensitive receivers.

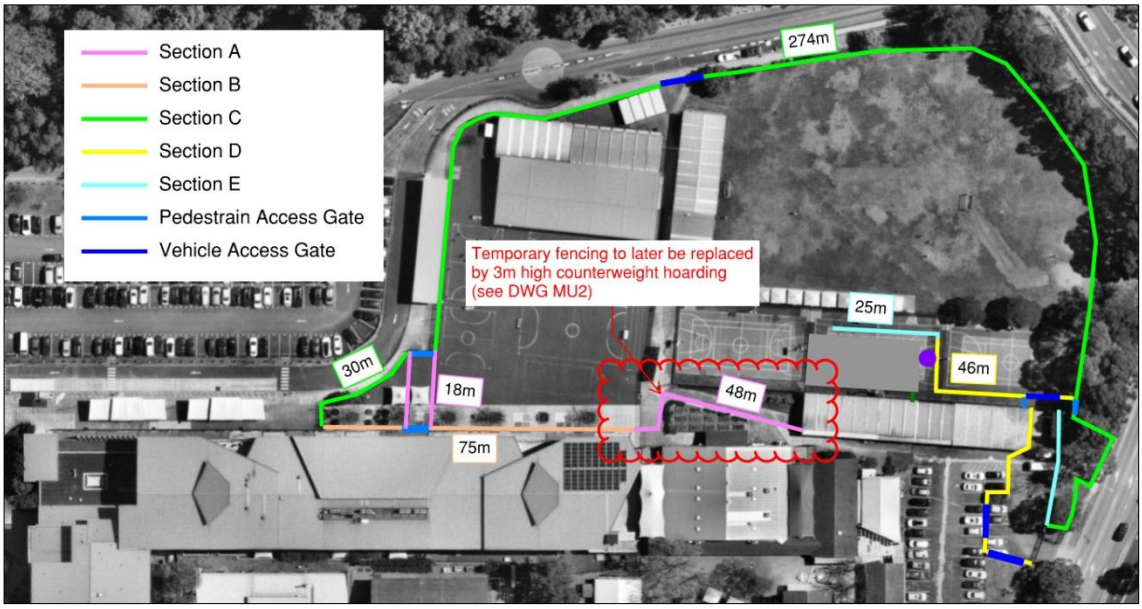

Figure 3: Site with proposed location and extent of hoarding/acoustic barrier. Source Kane Construction Pty Ltd.

6.3 CONSTRUCTION AIRBORNE NOISE ASSESSMENT

The predicted noise levels for SP2 are detailed in Table 10 and presented in the following sections. These predicted noise levels are typically representative of the worst-case 15 minutes that it would be expected. The predicted noise levels at receiver locations are calculated to be 1.5m above ground level, at the most affected point externally to each receiver that has been identified as the most affected.

The ICNG requires and is usual practice, a reasonable worst-case noise level to be predicted. For construction-type activities, this will typically be when the plant is operating close to an assessment location. However, it should be considered that on larger construction sites (such as this one) where the plant moves around, the noise will not be at the reasonable worst-case noise level throughout the entire duration of the activity: it will be lower when the plant is further away. Therefore, it can be stated that noise levels will be lower at times throughout the construction activity.

6.3.1 WITH PROPOSED HOARDING

The following predicted noise levels are conservative as they assume the typical worst-case sound power levels presented in Table 10, plus the proposed shielding of the construction noise over the transmission path to the nearest sensitive receivers.

Table 13to Table 17 presents the predicted worst-case construction noise levels without acoustic screening at the most affected points of the receiver groups as per Table 11.

Stages of Works	*Residential Receiver groups*	*Construction Noise Levels $L_{Aeq,15m}$ dB(A)*		
		Max	*Min*	*Complies with Highly Noise Affected?*
Excavation / Groundwork	*Group A (50 – 150m)*	84	75	No
	Group B (151 – 300m)	75	69	Yes
Structure	*Group A (50 – 150m)*	74	64	Yes
	Group B (151 – 300m)	64	58	Yes
Façade	*Group A (50 – 150m)*	69	60	Yes
	Group B (151 – 300m)	60	53	Yes
Fit-out / Services	*Group A (50 – 150m)*	60	50	Yes
	Group B (151 – 300m)	50	44	Yes

Table 13: Summary of predicted airborne noise levels at Residential receivers (Groups A and B) for equipment / plant used during the noisiest stages of the construction works.

Results show that predicted construction noise levels are expected to exceed the NMLs (orange font) whilst highly noise affected criteria will be met. During the Excavation / Groundwork the noise levels exceed the Highly Noise Affected criteria for residential receivers within 100m of the construction site. Noise mitigation measures for this stage are required to reduce the noise to below the Highly Noise Affected criteria.

Stages of Works	Construction Noise Levels at Commercial Receivers $L_{Aeq,15m}$ dB(A)	
	Group C (50– 300m)	Complies with NMLs?
Excavation / Groundwork	84 - 69	No
Structure	74 - 58	No
Façade	69 - 53	Yes
Fit-out / Services	60 - 44	Yes

Table 14: Summary of predicted airborne noise levels at Commercial / Industrial receivers (Group C) for equipment / plant used during the noisiest stages of the construction works.

Results show that predicted construction noise levels are expected to exceed the NMLs (orange font), except during the Façade and Fit-out / Services work stages, for commercial / industrial receivers within 250m of the construction site on the NCA 4 and NCA 5 as per Table 1. Noise mitigation measures are required to reduce the noise to below the NMLs for commercial / industrial receivers.

Stages of Works	Construction Noise Levels at Healthcare Receivers $L_{Aeq,15m}$ dB(A)	
	Group D (50 – 300m)	Complies with NMLs?
Excavation / Groundwork	61 - 45	No
Structure	50 - 35	Yes
Façade	45 - 30	Yes
Fit-out / Services	37 - 21	Yes

Table 15: Summary of predicted airborne noise levels at Healthcare receivers (Group D) for equipment / plant used during the noisiest stages of the construction works.

Results show that predicted construction noise levels are expected to exceed the NMLs (orange font), except during the Façade and Fit-out / Services work stages, for healthcare type of receivers in the NCA 4 and NCA 5 as per Table 1. Noise mitigation measures are required to reduce the noise to below the NMLs for healthcare receivers.

Stages of Works	Construction Noise Levels at Educational Receivers $L_{Aeq,15m}$ dB(A)	
	Group E (300 – 400m)	Complies with NMLs?
Excavation / Groundwork	30-27	Yes
Structure	17-15	Yes
Façade	12-10	Yes
Fit-out / Services	12-10	Yes

Table 16: Summary of predicted airborne noise levels at Educational receivers (Group E) for equipment / plant used during the noisiest stages of the construction works.

The predicted noise levels during the construction work are expected to meet the NMLs for the educational receivers within NCA 6 as per Table 1.

Stages of Works	Construction Noise Levels at WCC Educational Receivers site $L_{Aeq,15m}$ dB(A)	
	Group F (10-200m)	Complies with NMLs?
Excavation	46 – 20	Yes
Structure / Groundwork	34 – 10	Yes
Roof / Façade	31 – 10	Yes
Fit-out / Services	22 - 10	Yes

Table 17: Summary of predicted airborne noise levels at Educational receivers (Group F) for equipment / plant used during the noisiest stages of the construction works.

Results show that predicted construction noise levels are expected to meet the NMLs for the WCC building receivers within the site boundary, except during the Excavation stages. Further Noise mitigation measures are required for this stage to reduce the noise to below the NMLs for educational receivers.

Based on the results presented in Table 13 to Table 17 based on the proposed hoardings, exceedances of the NMLs are predicted to exceed at residential receivers, commercial and healthcare receivers. The predicted exceedance of the NMLs in the surrounding receivers triggers the proponent to apply all reasonable and feasible work practices to minimise the noise as much as possible, and community consultation, as per the requirements of the NSW ICNG. Refer to Section Appendix A for details.

The proponent should communicate with the affected residents and other affected noise sensitive receivers for works that are expected to be noisy.

6.3.2 RECOMMENDATIONS FOR CLOTH HOARDING

Noting that the exceedances in the previous section are due to the cloth hoarding – as it is acoustically transparent, i.e. it does not provide attenuation. Therefore, in order to comply with the construction noise criteria in the affected receivers noted in Section 6.3.1, the cloth hoarding is recommended to be replaced with a temporary flexible acoustic barrier as Echobarrier or similar.

Based on the above recommendation and assuming shielding of the construction noise over the transmission path to the nearest sensitive receivers using hoarding, the predicted noise levels are presented in Table 10.

Table 18 to Table 20 presents the predicted worst-case construction noise levels without acoustic screening at the most affected points of the receiver groups as per Table 11.

Stages of Works	Residential Receiver groups	Construction Noise Levels $L_{Aeq,15m}$ dB(A)		
		Max	Min	Complies with NMLs?
Excavation / Groundwork	Group A (50 – 150m)	68	58	Yes
	Group B (151 – 300m)	58	52	Yes
Structure	Group A (50 – 150m)	61	51	Yes
	Group B (151 – 300m)	51	45	Yes
Façade	Group A (50 – 150m)	56	46	Yes
	Group B (151 – 300m)	46	39	Yes
Fit-out / Services	Group A (50 – 150m)	43	34	Yes
	Group B (151 – 300m)	34	28	Yes

Table 18: Summary of predicted airborne noise levels at residential receivers (Groups A & B) for equipment / plant used during the noisiest stages of the construction works with the recommended hoarding installed in the transmission path to the Residential receivers.

Results show that predicted construction noise levels are expected to meet the required NMLs. Residential buildings within 50m to 70m of the construction site (Group A) are predicted to experience 10dB exceedance during the Excavation / Groundwork, as noted in Table 18 (orange font colour). These building withing the 50m to 70m distance are the Highly Noise Affected receivers. It is noted that the predicted noise level is based on the direct line of sight from the barrier to the nearest residential building without trees blocking the noise propagation.

Stages of Works	Construction Noise Levels at Commercial Receivers $L_{Aeq,15m}$ dB(A)	
	Group C (50– 300m)	Complies with NMLs?
Excavation / Groundwork	70 – 55	Yes
Structure	60 – 44	Yes
Façade	55 – 39	Yes
Fit-out / Services	46 - 30	Yes

Table 19: Summary of predicted airborne noise levels at commercial / industrial receivers (Group C) for equipment / plant used during the noisiest stages of the construction works with the recommended hoarding installed in the transmission path to the Commercial receivers.

Results show that predicted construction noise levels with shielding the commercial / industrial receivers in NCA 4 and NCA 5, as per Table 1, from noise using Acoustic Screen / Hoardings are expected to meet the NMLs.

Stages of Works	Construction Noise Levels at Healthcare Receivers $L_{Aeq,15m}$ dB(A)	
	Group D (50 – 150m)	Complies with NMLs?
Excavation / Groundwork	47 – 31	Yes
Structure	36 – 21	Yes
Façade	31 – 16	Yes
Fit-out / Services	23 – 10	Yes

Table 20: Summary of predicted airborne noise levels at helathcare receivers (Group D) for equipment / plant used during the noisiest stages of the construction works with the recommended hoarding installed in the transmission path to the Healthcare receivers.

The predicted noise levels during the construction work are expected to meet the NMLs for the healthcare receivers within NCA 6 as per Table 1. The only occurrence of exceedance by 2dB will be during Excavation stage for buildings within 50 to 60m distance from the construction site. Additional noise mitigation measures for this stage are required.

6.4 VIBRATION ASSESSMENT

The vibration-intensive plant used during the construction works may impact adjacent sensitive receivers. To assess the construction vibration impact due to heavy construction plants, the NSW RMS *'Construction Noise and Vibration Guideline'* provides safe working distances for vibration-intensive plants and is quoted for both 'cosmetic' damage (in accordance with BS 7385.2:1993) and human comfort (in accordance with DEC's *'Assessing Vibration: A Technical Guideline'*). The recommended safe working distances are provided in Table 21.

Plant Item	Description	Cosmetic Damage	Human Response
Vibratory Roller	200 kN (Typically 4-6 tonnes)	12m	40m
	300 kN (Typically 7-13 tonnes)	15m	100m
Vibratory Pile Driver	Sheet piles	2-20m	20m
Small Hydraulic Hammer	5-12 t excavator	2m	7m
Medium Hydraulic Hammer	12–18 t excavator	7m	23m
Large Hydraulic Hammer	18-34 t excavator	22m	73m
Pile Boring	<800m	2m	N/A
Jackhammer	Handheld	1m	Avoid Contact with Structure

Table 21: Recommended minimum working distances for vibration intensive plant from sensitive receivers.

The minimum working distances are indicative and will vary depending on the plant item and local geotechnical conditions. They are applicable to cosmetic damage of typical buildings under typical geotechnical conditions. The construction methods are to be reviewed to ensure that safe working distances are achieved.

All work, particularly piling, is to be conducted in accordance with the safe working distances. Where sheet piling is within 20m of a building, vibratory piling should be considered and vibration monitoring conducted in order to verify levels.

In relation to human comfort (response), the minimum working distances in Table 21 relate to intermittent vibration (VDV parameter) as for most construction activities, vibration emissions are intermittent in nature. Where the predicted vibration levels will exceed the human comfort objectives, the procedures in Section 7.1.2 are to be followed in order to mitigate the potential impacts at sensitive receivers.

If the contractor has concerns for the disruptions at the nearest sensitive receivers due to vibration-intensive plant use, it is recommended that prior to the commencement of the works, to undertake a preliminary vibration survey on each key vibration-generating activity / equipment to assess and define working distances and unattended vibration monitoring locations.

7 NOISE AND VIBRATION CONTROL RECOMMENDATIONS

This section of the Construction Noise and Vibration Planning provides general recommendations only and provides applicable criteria together with the best noise and vibration control practices to be observed during the proposed works.

Any noise from construction activities to be carried out on site must not result in *'offensive noise'* to any noise-sensitive receiver. To this end, the Contractor employed to undertake the construction works is responsible for ensuring that any site noise and, in particular, any complaints shall be monitored, investigated, managed and controlled.

7.1 GENERAL CONTROLS FOR NOISE AND VIBRATION

According to ICNG and AS2436:2010 *'Guide to Noise Control on Construction, Maintenance & Demolition Sites'*, the following techniques could be applied to minimise the spread of noise and vibration to the nearest sensitive receivers.

7.1.1 NOISE

If a process that generates significant noise levels cannot be avoided, the amount of noise reaching the receiver should be minimised. Two ways of achieving this are to either increase the distance between the noise source and the receiver or to introduce noise reduction measures such as screens.

Physical methods to reduce the transmission of noise between the site works and residences or other sensitive land uses are generally suited to works where there is longer-term exposure to the noise. Generic practices that will reduce noise from the site include:

- Increasing the distance between noise sources and sensitive receivers.
- Reducing the line-of-sight noise transmission to residences or other sensitive land uses.
- Constructing barriers that are part of the project design early in the project to introduce the mitigation of site noise.
- Installing purpose-built noise barriers and enclosures.

7.1.2 VIBRATION

Vibration can be more difficult to control than noise, and there are few general comments that can be made about its control. It should be kept in mind that vibration may cause disturbance by causing structures to vibrate and radiate noise in addition to perceptible movement. Impulsive vibration can, in some cases, provide a trigger mechanism that could result in the failure of building components that had previously been in a stable state.

During the erection of the new structure, some vibrations (transmitted through the existing structures near the demolition sites) are expected, which are more of a concern for the surrounding sensitive receivers.

It can also trigger annoyance being elevated into action by occupants of exposed buildings and should, therefore, be included in the planning of communication with impacted communities. It should be remembered that failures, sometimes catastrophic, can occur as a result of conditions not directly connected with the transmission of vibrations, e.g. the removal of supports from retaining structures to facilitate site access.

Where site activities may affect existing structures, a thorough engineering appraisal should be made at the planning stage.

General principles of seeking minimal vibration at receiving structures should be followed in the first instance. Predictions of vibration levels likely to occur at sensitive receivers are recommended when they are relatively close, depending on the magnitude of the source of the vibration or the distance associated. Relatively simple prediction methods are available in texts, codes of practice or other standards, however it is preferable to measure and assess site transmission and propagation characteristics between source and receiver locations.

Guidance for measures available for the mitigation of vibration transmitted can be sought in more detailed standards, such as BS5228.2:2009+A1:2014 *'Code of practice for noise and vibration control on construction and open sites. Vibration'* or policy documents, such as the NSW DEC *'Assessing Vibration: A technical guideline'*.

Identifying the strategy best suited to the control of vibration follows a similar approach to that of noise avoidance, control at the source, control along the propagation path, control at the receiver, or a combination of these. It is noted that vibration sources can include stationary plants (pumps and compressors), portable plants (jackhammers and pavement vibrators), mobile plants, pile-drivers, tunneling machines and activities, and blasting, amongst others. Unusual ground conditions, such as a high water-table, can also cause a difference in the expected or predicted results, especially when considering the noise propagated from piling.

7.2 STAGE-SPECIFIC CONTROLS FOR NOISE AND VIBRATION

The following are recommended to achieve the noise levels below the NMLs:

- Demolition Saw to be running 15% of the time over a 15min period, during demolition stage.
- Any trucks to be running only 30% of the time over a 15min period, for all construction stages. For example, trucks not idling and with the engine off for a minimum of 70% of the time when on site.

It is noted that any other construction plant should run for shorter time in a given period, if possible and feasible.

7.3 UNIVERSAL WORK PRACTICES

To minimise construction noise complaints due to preventable activities at any time of the day, the following work practices shall be considered:

- Regularly train workers and contractors (such as toolbox talks) to use equipment in ways to minimise noise.
- Ensure site managers periodically check the site and nearby residences and other sensitive land use for noise problems so that solutions can be quickly applied.
- Include in tenders, employment contracts, subcontractor agreements and work method statements clauses that require minimisation of noise and compliance with directions from management to minimise noise.
- Avoid the use of radios or stereos outdoors where noise sensitive receivers can be affected.
- Avoid shouting, and minimise talking loudly and slamming vehicle doors.
- Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices.

- Develop a one-page summary of approval or consent conditions that relate to relevant work practices and pin it to a noticeboard so that all site operators can quickly reference noise information.
- Workers may at times need to discuss or negotiate practices with their managers.
- Schedule high noise generating works outside of exam time or non-sensitive periods – i.e. during weekends or school holidays - to ensure the acoustic amenity of students.

For work practices during night-time, the following shall be considered:

- Avoid the use of equipment which generates impulsive noise.
- Minimise the need for reversing or movement alarms.
- Avoid dropping materials from a height.
- Avoid metal-to-metal contact on equipment.
- Schedule truck movements to avoid residential streets if possible.
- Avoid mobile plant clustering near residences and other sensitive land uses.
- Ensure periods of respite are provided in the case of unavoidable maximum noise level events.

7.4 CONSULTATION AND NOTIFICATION

The community is more likely to be understanding and accepting of noise if the information provided is frank, does not attempt to understate the likely noise level, and if commitments are firmly adhered to. Community Consultation shall be as per EIS requirements, and this has been addressed before the preparation of this CNVMP.

Recommended actions before and during construction are as per the endorsed Community Consultation Document – refer to Appendix A.

7.5 MANAGING NOISE LEVELS AND MAINTENANCE PROGRAM FOR PLANT AND EQUIPMENT

In terms of both cost and results, controlling noise at the source is one of the most effective methods of minimising the noise impacts from any construction activities. Recommendations for managing noise levels from plant and equipment are as follows:

- Use quieter methods:
  - Examine and implement, where feasible and reasonable, alternatives to rock-breaking work methods, such as hydraulic splitters for rock and concrete, hydraulic jaw crushers, chemical rock and concrete splitting, and controlled blasting such as penetrating cone fracture. The suitability of alternative methods should be considered on a case-by-case basis.
  - Use alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric controlled units where feasible and reasonable. Where there is no electricity supply, use an electrical generator located away from residences.
- Use quieter equipment:
  - Examine different types of machines that perform the same function and compare the noise level data to select the least noisy machine. For example, rubber wheeled tractors can be less noisy than steel tracked tractors.
  - Noise labels are required by NSW legislation for pavement breakers, mobile compressors, chainsaws and mobile garbage compactors. These noise labels can be used to assist in selecting less noisy plant.

- Pneumatic equipment is traditionally a problem – select super silenced compressors, silenced jackhammers and damped bits where possible.
- When renting, select quieter items of plant and equipment where feasible and reasonable.
- When purchasing, select, where feasible and reasonable, the most effective mufflers, enclosures and low-noise tool bits and blades. Always seek the manufacturer's advice before making modifications to plant to reduce noise.

- Operate plant in a quiet and efficient manner:
  - Reduce throttle setting and turn off equipment when not being used.
  - Examine and implement, where feasible and reasonable, the option of reducing noise from metal chutes and bins by placing damping material in the bin.

The Contractor shall prepare and implement a regular plant and equipment use and maintenance program. This is to ensure that 'noisy' equipment or tools are not used. This program should ensure that the contractor will:

- Regularly inspect and maintain equipment to ensure it is in good working order. Also check the condition of mufflers.
- Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.
- For machines with enclosures, check that doors and door seals are in good working order and that the doors close properly against the seals.
- Return any hired equipment that is causing noise that is not typical for the equipment – the increased noise may indicate the need for repair.
- Ensure air lines on pneumatic equipment do not leak.

7.6 WORKS TIMING RESTRICTIONS AND SCHEDULING

Works should be carried out during periods specified by the approved Construction Hours. Scheduling noisy work during periods when people are least affected reduces noise impact on those. Recommendations for work scheduling are as follows:

- Provide respite periods.
- Schedule activities to minimise noise impacts:
  - Organise work to be undertaken during the recommended standard hours where possible.
  - When works outside the recommended standard hours are planned, avoid scheduling on Sundays or public holidays.
  - Schedule work when residential receivers are not present (for example, commercial residential receivers).
  - Schedule noisy activities around times of high background noise (local road traffic or when other local noise sources are active) where possible to provide masking or to reduce the amount that the construction noise intrudes above the background.
  - Consult with affected residential receivers about scheduling activities to minimise noise impacts.
- Organise deliveries and access:
  - Nominate an off-site truck parking area, away from residences, for trucks arriving prior to gates opening.

- Amalgamated loads can lead to less noise and congestion in nearby streets.
- Optimise the number of vehicle trips to and from the site – movements can be organised to amalgamate loads rather than using a number of vehicles with smaller loads.
- Inform, and consult where possible, the potentially noise-affected residences or other sensitive land uses of designated access routes to and from site, and make drivers aware of nominated vehicle routes.
- Schedule deliveries to nominated hours only.

7.7 ADDITIONAL NOISE AND VIBRATION CONTROLS

There will likely be times or situations when construction works exceed the stated criteria at the nearest receivers, particularly when works occur in the areas closer to the receiver(s). Therefore, all feasible and reasonable noise control measures should be considered.

If, during construction, an item of equipment exceeds either the noise criteria at any location or the equipment noise level limits, the following noise control measures, together with construction best practices presented in this Section shall be considered to minimise the noise and vibration impacts of the project on the surrounding noise sensitive receivers:

- Schedule noisy activities to occur outside of the most sensitive times of the day for each nominated receiver. For example, the residential receivers are likely to be more sensitive to noise before 8am and after 6pm.
- Consider implementing equipment specific temporary screening for noisy equipment, or other noise control measures recommended in Appendix C of AS2436:2010. This will most likely apply to noisier hand-held items such as jack-hammers and circular saws.
- Locate specific activities such as carpentry areas (use of circular saws, etc.) to internal spaces or where shielding is provided by existing structures or temporary screening.
- Limit the number of trucks and heavy vehicles on site at any given time through scheduling deliveries at differing times.
- Traffic rules should be prepared to minimise the noise impact on the community.
- When loading and unloading trucks, adopt best practice noise management strategies to avoid materials being dropped from height.
- Avoid unnecessary idling of trucks and equipment. Vehicles and equipment to be turned off when not in use.
- Ensure that any miscellaneous equipment (extraction fans, hand tools, etc.) not specifically identified in this plan incorporates silencing/shielding equipment as required to meet the noise criteria.

If the measured construction vibration levels exceed the appropriate criteria during the works, one or more of the following measures should be taken:

- Modifications to construction equipment used.
- Modifications to methods of construction.
- Rescheduling of activities to less sensitive times.

If the measures given cannot be implemented or have no effect on noise or vibration levels or impact generated, a review of the criteria should be undertaken, and the noise and vibration strategy amended.

7.8 MONITORING PROGRAM

Where noise and vibration criteria are being exceeded or in response to valid complaints, noise and/or vibration monitoring should be undertaken. This would be performed inside the premises of the affected property and on site adjacent to the affected receivers.

Monitoring is to be undertaken by an experienced noise and vibration monitoring professional or an acoustic consultant. The results of any noise or vibration monitoring are to be provided to the relevant party or person in a timely manner allowing the builder to address the issue and respond to the complaints.

Noise and vibration monitoring can take two forms:

- Short-term monitoring: Short-term monitoring consists of attended monitoring when critical stages of the construction are occurring. This normally provides real-time assistance and guidance to the sub-contractor on site letting them know when the noise and vibration criteria are exceeded allowing the selection of alternative method on construction or equipment selection in order to minimise noise and vibration impacts.
- Long-term monitoring: Similarly long-term monitoring uses noise and vibration loggers providing real-time alerts to the builder / site manager when the noise and vibration criteria are exceeded. Typically, the noise and vibration loggers stay on site for a period of several months for the critical construction stages of the project. Sometimes the period of construction noise and vibration monitoring is dictated by the local authorities through the Conditions of Consent if applicable.

Both methodologies are complementary and normally used simultaneously providing a significant of amount of data via the long-term monitoring but also providing information on the sources of noise and vibration generating exceedances via the short-term or attended monitoring.

The following may be included in a noise monitoring report:

- The type of monitoring conducted (for example, at a particular project stage or following complaints) and a brief statement of the measurement method.
- The noise / vibration conditions on the consent / licence, or the relevant noise management objectives.
- Descriptions of the nearest affected residences and other sensitive land uses or, in the case of complaints, description of the complainant location and complaint.
- Plan or diagram showing the location of the monitoring and the noise generating works.
- Description of the instrumentation used.
- Name and relevant qualifications or professional memberships of monitoring personnel.
- The weather conditions during monitoring.
- The time(s) and duration(s) of monitoring, including dates – in the case of complaints.
- A clear description of the construction activities taking place during the monitoring.
- The results of monitoring at each monitoring location, including a comparison with the consent conditions or relevant noise management objectives.
- A clear statement outlining the project's compliance or non-compliance with the conditions or objectives.

- Where the monitored level is higher than the conditions or objectives, the reasons for non-compliance should be stated, strategies for minimising noise identified and stated, and the appropriate actions to implement the strategies.

As per construction noise and vibration assessment in Section 6.2, noise levels for the existing WCC Buildings (NCA 7) are expected to exceed the NMLs during Excavation stages of construction. Therefore, it is recommended that noise and vibration monitoring shall be carried out during excavation to ensure the amenity of students and staff.

The following noise and vibration monitoring measures are recommended:

- 1-off noise and vibration monitor to be installed in CELC Building at the most noise affected, closest to the construction site of the GLA building.
- 1-off noise and vibration monitoring to be installed at the boundary site closest to the most affected building of NCA 1.

The figure below shows the proposed noise and vibration monitoring locations based on the area of works.

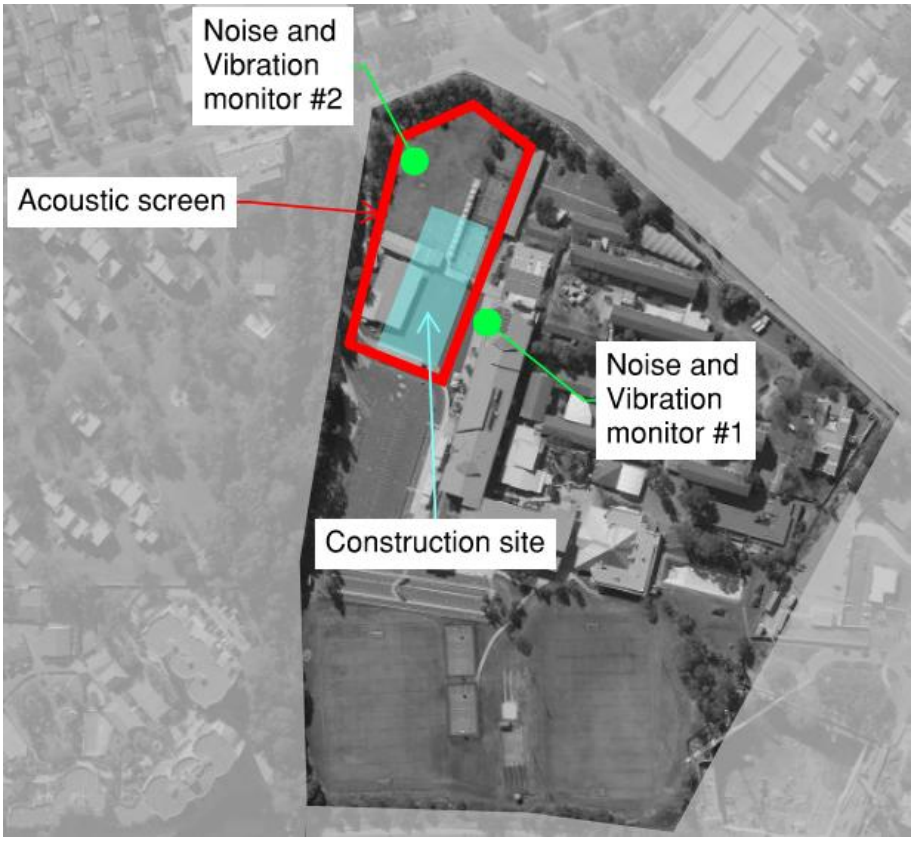

Figure 4: Proposed locations of noise and vibration monitoring.

7.9 WORKERS' TRAINING AND AWARENESS

The Contractor shall provide all project personnel and subcontractors with training on the environmental obligations through project inductions, toolbox talks, and through Safety Works Methods (SWMs).

All Project work personnel and subcontractors shall undergo a general project induction prior to commencing work. This should include a noise component to reinforce the importance of noise issues and the measures that will be implemented to protect the environment.

All inductions shall be carried out by the site manager, or his designate in the site office as appropriate. During the induction, each contractor / worker shall be taken around the site to ensure they are fully aware of the exclusion zones and site specific environment.

Site inductions and daily SWMs and toolbox talks will highlight the specific environmental requirements and activities being undertaken at each work area which will include relevant noise management matters.

7.10 OCCUPATIONAL HEALTH AND SAFETY

In addition to potential noise and vibration impacts on the community and structures, construction noise and vibration can also have an adverse impact upon the health of workers. It is important that Contractors adopt noise management strategies to prevent or minimise worker exposure to excessive noise and vibration. Such measures will also assist in reducing noise and vibration impacts on the surrounding community.

The National Occupational Health and Safety Commission (NOHSC) recommends a maximum acceptable workplace noise exposure level of 85dB(A) ($L_{Aeq,8h}$) for an eight-hour time period.

Personnel involved in operations should be issued with ear plugs or earmuffs which must be used whenever noise levels interfere with normal speech when individuals are standing at a distance of 1m from each other, or when the $L_{Aeq,8hr}$ exceeds 85dB(A).

Signs should be erected and made visible at the entry to all areas where noise levels will exceed 85dB(A).

7.11 CONSTRUCTION TRAFFIC ROUTES

The Contractor shall establish and implement traffic routes for deliveries to the site, which minimise the noise impact on surrounding noise-sensitive receivers as best possible.

8 CONCLUSIONS

A construction noise and vibration assessment has been carried out for the proposed works for the educational facility development at 2 darcy Road, Westmead NSW. This report addresses the Development Conditions of Consent (SSDA-10383 and SSDA-10383-mod-1) clauses C.15 and D12 to D17.

In particular, this report identifies the Contractor's obligations and the requirements to manage noise and vibration during construction such that the Contractor can make the necessary allowances within the construction costs, programmes and work methodologies.

The responsibilities of all stakeholders are identified, and a framework for the management of noise and vibration during construction works is provided.

This report establishes relevant noise level criteria, details the acoustic assessment and provides comments and recommendations for the proposed development.

Potential construction noise and vibration impacts on the surroundings have been presented in this report, and recommendations based on the relevant guidelines have been provided. It is expected that the predicted exceedance of the NMLs in the surrounding receivers triggers the proponent to apply all reasonable and feasible work practices to minimise the noise as much as possible, as well as community consultation, as per the requirements of the ICNG. Refer to Section 6 for details.

Based on the information provided by Kane regarding the proposed hoardings, use of the Shadecloth hoarding on the side of the construction side to Residential, Commercial and Healthcare receivers, results in exceedances of 10dB above the criteria for highly affected residential receivers. To meet the NMLs for all the sensitive receivers, it is recommended to replace Shadecloth with temporary flexible acoustic barrier – i.e. Echobarrier or similar - to mitigate the construction noise emission.

For each of the work stages and associated plant, assuming that they are exceeding the noise level criteria, the noise control measures presented in Section 7 shall be considered and implemented wherever reasonable and feasible in order to minimise any potential noise impact. Operation time restrictions shall be applied to 'noisy' construction plants to minimise noise impact to the nearest sensitive receivers.

The information presented in this report shall be reviewed if any modifications to the selection of equipment / machinery, construction methodologies and modifications to the works construction program.

Based on the information presented in this report, relevant objectives will be satisfied, and therefore approval is recommended to be granted.

JORGE REVERTER | ACOUSTIC GROUP MANAGER

Jorge is an acoustic group manager with over 20 years of comprehensive experience in the acoustic consultancy field in Australia and Spain.

His experience includes a broad spectrum of acoustics projects covering: transport infrastructures, land planning, room acoustics, building acoustics, noise and vibration control for building services, environmental noise control and assessments, programming and computer modelling.

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BEng. Telecommunications - Acoustics, 1999. Universitat Politecnica Valencia (Spain)

MSc. Occupational Health and Safety, 2008. Universitat Jaume I (Spain)

AFFILIATIONS

Member of Australian Acoustical Society (MAAS)

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- Santa Sophia Catholic School, Box Hill ($150m) – new K-Y12 multistorey school incl. a creative and performing arts centre
- Science Technology Engineering & Mathematic School (STEM), Sydney Science Park
- St. Rita's College, Clayfield, QLD – new learning precinct for performing arts & drama
- St. Marks Catholic College, Multipurpose Hall, Stanhope Gardens
- Clancy Catholic College, West Hoxton
- St. Anthony of Padua College, Austral
- St Patrick's College, Sutherland
- Hurstville Marist College
- Trinity Grammar School, Summer Hill
- St Patrick's Primary School, Mortlake, Stage 3
- St. Michael's Catholic Primary School, Daceyville
- Marist Catholic College, North Sydney
- Mccarthy Catholic College, Tamworth
- Stella Maris Arts Building, Manly
- Barker College, Rosewood Centre – award winning sports facility
- SINSW Hastings Secondary College Upgrade
- SINSW Hunter River High School
- SINSW Irrawang High School
- SINSW Ultimo Public School
- SINSW Edmondson Park Public School
- SINSW Harrington Park Public School
- SINSW Wilton Public School
- SINSW Mosman High School Major Upgrade
- TAFE NSW Meadowbank Multi-Trades and Digital Technology Hub ($154m): new world-class, 15,000sqm specialist trade and digital skills training facility
- UNSW Health Translation Hub ($600m)
- TAFE NSW Connected Learning Point (CLP) centres in regional NSW areas
- UTS Central, Sydney ($300m) – 17-storey glass façade building
- University of Wollongong Electron Microscope, Wollongong
- University of Sydney F07 Carslaw Extension LEES1, Sydney
- Australian National University RSPE, Canberra
- University of Sydney Narrabri Wheat Facility, Narrabri
- Macquarie University Bioscience
- UTS Architecture Studios
- UNSW - Myers Studio, Fig Tree Lane, COFA Recording Studios, Lecture Theatre
- St. Andrew's College, Student Accommodation, University of Sydney campus
- SINSW Darcy Road Public School, Wentworthville
- SINSW Monaro High School, Cooma
- SINSW Galungara Public School, Schofields
- SINSW Jordan Springs Public School
- SINSW Newcastle Educational Campus

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Shahrokh is a Senior Acoustic Engineer specialised in Acoustics, Structural vibration, and ultrasound technologies with a strong academic background in mechanical engineering. His projects included acoustic designs for buildings and environmental noise planning, vibration / acoustic condition monitoring of structures, and sound surveying for transportation noise.

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- St Aloysius Catholic College, Cronulla
- St Anthony Padua School Austral, Childcare
- St Mary's Catholic College – Toukley
- St John Bosco College, Engadine
- Mosman High School
- Westmead Catholic Community School
- Eagle Vale High School
- Hills Grammer School
- Catholic College Wodonga, Victoria
- Mile End Community Church, Rouse Hill
- Perth Australia Temple
- Adelaide Australia Temple
- Eastern Suburbs Police Stations
- Marrickville Police Station – HVAC upgrade
- Moama Police Station
- Broken Hill Hospital (Mental Health Unit and Emergency Department)
- Liverpool Hospital Academic Precinct
- Tamworth Hospital (Mental Health Hospital)
- Southern Cross Community Housing
- Landcom Affordable Housing, Mullumbimby
- Landcom Glenfield mixed development
- Eden Street, Arncliffe Residential Blocks
- Auburn Megamall
- Showground Castle Hill
- Dan Murphy's Prahran, Victoria
- Noise mitigation in Containership structures - Singapore
- UTS – Sydney Metro Tunnel Noise mitigation - Epping

APPENDIX A: COMMUNITY COMMUNICATION STRATEGY

URBIS

WESTMEAD CATHOLIC COMMUNITY EDUCATION CAMPUS

Community Communication Strategy

Prepared for
CATHOLIC SCHOOLS PARRAMATTA DIOCESE C/-
KANE CONSTRUCTIONS
4 October 2024

URBIS STAFF RESPONSIBLE FOR THIS REPORT WERE:

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Acknowledgement of Country

Urbis acknowledges the Traditional Custodians of the lands we operate on.

We recognise that First Nations sovereignty was never ceded and respect First Nations peoples continuing connection to these lands, waterways and ecosystems for over 60,000 years.

We pay our respects to First Nations Elders, past and present.

The river is the symbol of the Dreaming and the journey of life. The circles and lines represent people meeting and connections across time and space. When we are working in different places, we can still be connected and work towards the same goal.

Title: Sacred River Dreaming
Artist Hayley Pigram
Darug Nation
Sydney, NSW

All information supplied to Urbis in order to conduct this research has been treated in the strictest confidence. It shall only be used in this context and shall not be made available to third parties without client authorisation. Confidential information has been stored securely and data provided by respondents, as well as their identity, has been treated in the strictest confidence and all assurance given to respondents have been and shall be fulfilled.

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1. INTRODUCTION

The Catholic Schools Parramatta Diocese (CSPD) is preparing to commence construction of the Westmead Catholic Community (WCC) Education Campus at 2 Darcy Road, Westmead.

This Community Communication Strategy (CCS) has been prepared by Urbis Engagement, on behalf of CSPD (the proponent). This CCS has been prepared in line with the Development Consent item C9 within the Development Consent for SSD-10383. The following CCS also outlines the approach in response to F12 which states:

The Community Communication Strategy, as approved by the Planning Secretary, must be implemented for a minimum of 12 months following the completion of construction.

1.1. CROSS-REFERENCE OF CONSENT REQUIREMENTS

Table 1 identifies the references within this CCS as they relate to the requirements under Development Consent Condition SSD-10383 – Community Communication Strategy.

Table 1 Response to Consent Requirements SSD-10383

Condition reference	Condition	Report reference
C9	No later than two weeks before the commencement of any construction, a Community Communications Strategy must be submitted to the Planning Secretary for approval and be approved by the Planning Secretary prior to the commence of construction or within another timeframe agreed with the Planning Secretary. The Community Communication Strategy must provide mechanisms to facilitate communication between the Applicant, the relevant Council and the community (including adjoining affected landowners and businesses, and other directly impacted by the development), during the design and construction of the development for a minimum of 12 months following the completion of construction. The Community Communication Strategy must:	This document
C9	(a) Identify people to be consulted during the design and construction phases;	Section 4: Stakeholders – people to be consulted during design and construction
C9	(b) Set out procedures and mechanisms for the regular distribution of accessible information about or relevant to the development;	Section: 5.1: Information provision
C9	(c) Provide for the formation of community-based forums, if required, that focus on key environmental management issues for the development;	Section 5.2: Community-based forums
C9	(d) Set out procedures and mechanisms:	See below

Condition reference	Condition	Report reference
C9(d)	(i) Through which the community can discuss or provide feedback to the Applicant;	Section 5.3: Enquiries and feedback response
C9(d)	(ii) Through which the Applicant will respond to enquiries or feedback from the community and	Section 5.3: Enquiries and feedback response
C9(d)	(iii) To resolve any issues and mediate any disputes that may arise in relation to construction and operation of the development, including any disputes regarding rectification or compensation.	Section 5.4: Dispute resolution and mediation
C9	(e) Include any specific requirements around traffic, noise and vibration, visual impacts, amenity, flora and fauna, soil and water, contamination, heritage.	Section 5.1: Introduction
D1	A site notice(s) must be prominently displayed at the boundaries of the site during construction for the purpose of informing the public of project details and must satisfy the following requirements: (a) (minimum dimensions of the site notice(s) must measure 841 mm x 594 mm (A1) with any text on the site notice(s) to be a minimum of 30-point type size; (b) the site notice(s) must be durable and weatherproof and must be displayed throughout the works period; (c) the approved hours of work, the name of the builder, Certifier, structural engineer, site/ project manager, the responsible managing company (if any), its address and 24-hour contact phone number for any inquiries, including construction/ noise complaint must be displayed on the site notice(s); and (d) the site notice(s) must be mounted at eye level on the perimeter hoardings/fencing and must state that unauthorised entry to the site is not permitted.	Section 5.1: Introduction
A31	At least 48 hours before the commencement of construction until the completion of all works under this consent, or such other time as agreed by the Planning Secretary, the Applicant must: (a) make the following information and documents (as they are obtained or approved) publicly available on its website: (i) the documents referred to in condition A2 of this consent; (ii) all current statutory approvals for the development; (iii) all approved strategies, plans and programs required under the conditions of this consent; (iv) regular reporting on the environmental performance of the development in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent; (v) a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications	Section 5.1: Information provision

Condition reference	Condition	Report reference
	in any conditions of this consent, or any approved plans and programs; (vi) a summary of the current stage and progress of the development; (vii) contact details to enquire about the development or to make a complaint; (viii) a complaints register, updated monthly; (ix) audit reports prepared as part of any independent audit of the development and the Applicant's response to the recommendations in any audit report; (x) any other matter required by the Planning Secretary; and (b) keep such information up to date, to the satisfaction of the Planning Secretary and publicly available for 12 months after the commencement of operations.	
C1, C2	C1. The Applicant must notify the Planning Secretary in writing of the dates of the intended commencement of construction and operation at least 48 hours before those dates. C2. If the construction or operation of the development is to be staged, the Planning Secretary must be notified in writing at least 48 hours before the commencement of each stage, of the date of commencement and the development to be carried out in that stage.	Section 3.1: Communication timeline Section 5.1: Information provision
F12	The Community Communication Strategy, as approved by the Planning Secretary, must be implemented for a minimum of 12 months following the completion of construction.	Section 3.1: Communication timeline

2. PROJECT OVERVIEW

2.1. THE SITE

The Westmead Catholic Community Education Campus site is located at 2 Darcy Road, Westmead within the Parramatta Local Government Area (LGA). It is approximately 2 kilometres to the northwest of the Parramatta CBD and approximately 300m to the west of Westmead Train Station.

The site is comprised of two lots, legally described as Lot 1 in DP1095407, owned by the Trustees of the Roman Catholic Church of Parramatta, and Lot 1 in DP1211982, owned by the Trustees of the Marist Brothers.

The site has an area of approximately 12 hectares and is irregular in shape. It is bound by Darcy Road to the north, the T1 North Shore and Western / T5 Train Line to the south, the Western Sydney University (WSU) Westmead Campus to the east, and residential development to the west.

The site forms part of the Westmead Health and Education Precinct within the *Westmead Place Strategy 2036*, comprising Westmead Hospital, Westmead Private Hospital and the Western Sydney University Medical Research Institutes. The NSW Government regards this Precinct as "*Westmead's engine room, defined by its world-class health, research, education and innovation facilities*."

Figure 1 Site aerial

Source: NearMaps and Ethos Urban – Environmental Impact Statement (SSD-10383)

2.1.1. Existing development

The site currently contains three separate schools, which collectively accommodate approximately 2,630 students and 190 staff. These include:

- Catherine McAuley Westmead (secondary girls school), which predominately occupies the northern portion of the site.
- Parramatta Marist High School (secondary boys school), which occupies the eastern portion of the site.
- Mother Teresa Primary School (co-educational primary school), which occupies part of one of the Catherine McAuley Westmead buildings.

. The existing buildings are generally constructed of brick, with building heights ranging between one and three storeys. They are all located in the northeastern portion of the site.

The southern portion of the site contains open sports fields used by Parramatta Marist High School, and an at-grade car park occupies the western portion of the site.

2.2. PROJECT CONTEXT

In 2020, CSPD lodged a State Significant Development Application (SSDA) with the NSW Department of Planning, Housing and Infrastructure (DPHI), formerly the NSW Department of Planning, Infrastructure and Environment) that sought to meet the needs of the region's growing population by providing new and upgraded education facilities.

Specifically, the SSDA sought approval for:

- A new multi-storey primary school for approximately 1,680 students that would cater to existing students at Mother Teresa Primary School on the site and facilitate the relocation of Sacred Heart Primary School at Ralph Street to the site
- A new Parish Church
- A Catholic Early Learning Centre
- Landscaping
- Pedestrian and vehicle access upgrades.

The SSDA was approved in February 2022 and CSPD appointed Kane Constructions to undertake the construction phase.

2.2.1. Construction

Redevelopment and upgrades of WCC include:

- Alterations to an existing school building (Mother Teresa Primary School) and change of use to provide an early learning centre for 200 students and 25 full-time equivalent (FTE) staff
- Construction of a six-storey (including rooftop open space) new primary school building including classrooms and learning spaces, recreation spaces, canteen, storage, amenities and rooftop open space
- Staged increase in student numbers accommodating a total of 1680 students (1260 additional) and 76 additional FTE staff. Student increases will take place over 10 years.
- Construction of a new parish church with 400 seats
- Upgrades and alterations to two existing driveways, retention of 212 existing car parking spaces and provision of 12 additional car parking spaces
- Associated works including tree removal, pedestrian access, and landscaping.

3. OBJECTIVE AND APPROACH

The engagement approach is adapted from the International Association of Public Participation's (IAP2) *Public Participation Spectrum*. The spectrum (Figure 2) describes goals for public participation and the corresponding promise to the public. For this CCS, the engagement objective aligns with the goal of informing or consulting with stakeholders and the community. This means our objective is to either:

- Provide balanced and objective information to assist stakeholders in understanding the project; or
- Obtain public feedback and respond to enquiries and concerns throughout the duration of the construction and 12 months following completion.

Figure 2 IAP2 Public Participation Spectrum

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions	To obtain public feedback on analysis alternatives and/or decisions	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision- making in the hands of the public.
PROMISE	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

Source: IAP2

To achieve these objectives, the engagement approach involves:

- Providing the community with regularly updated information about the project and construction program
- Providing timely responses to enquiries to enable ongoing risk identification and management/resolution
- Ensuring understanding of the benefits of the project; as well as the potential impacts (during construction and operation) and how these will be managed
- Building community stakeholder relationships and maintaining two-way communication with those impacted or interested
- Managing community expectations and building trust by delivering on commitments
- Providing timely information to impacted stakeholders, neighbours and the broader community
- Addressing and correcting misinformation in the public domain
- Reducing the risk of project delays caused by negative third-party intervention
- Leaving a positive legacy in the community.

3.1. COMMUNICATION TIMELINE

The CCS aligns with the project timeline for the construction of WCC and seeks to inform stakeholders at key milestones of the project, including when the most impactful works will take place.

The following timeline provides a high-level overview of the proposed consultation ahead of construction commencing on-site.

Table 2 Communication timeline summary

Milestone / activity	Expected timing	Activity on site	Engagement activity
Issue of Development Consent	February 2022	Nil	▪ Community Communications Strategy (CCS) development for DPHI approval (this document).
Construction preparation (2 weeks before starting on site)	November 2024	Nil – construction management plans submitted for DPHI's approval (including this document).	▪ Notification to direct neighbours and surrounding community (identified in Section 4.1 of this document). ▪ Notification to include a URL to all drawings and management plans available on DPHI's website. ▪ Notification to include a URL to the project website (information available on the CSPD website). **Notification to be issued following DPHI's approval of CCS.*
Site preparation (before works commence)	October 2024	Nil	▪ CSPD website updated with the construction program.
Construction works commence	November 2024	Hoarding installed. Early works underway.	▪ Refer to Section 5 procedures and mechanisms during construction.
Westmead Catholic Community Education Campus in operation.	April 2026 (ongoing)	Use of Westmead Catholic Community Education Campus.	▪ CSPD website updated with reference to all events at WCC that involve the use of new facilities. ▪ Continued consultation via CSPD's regular communication channels, including the School website, phone and email (refer to Section 5) and the Schools community newsletter/updates.

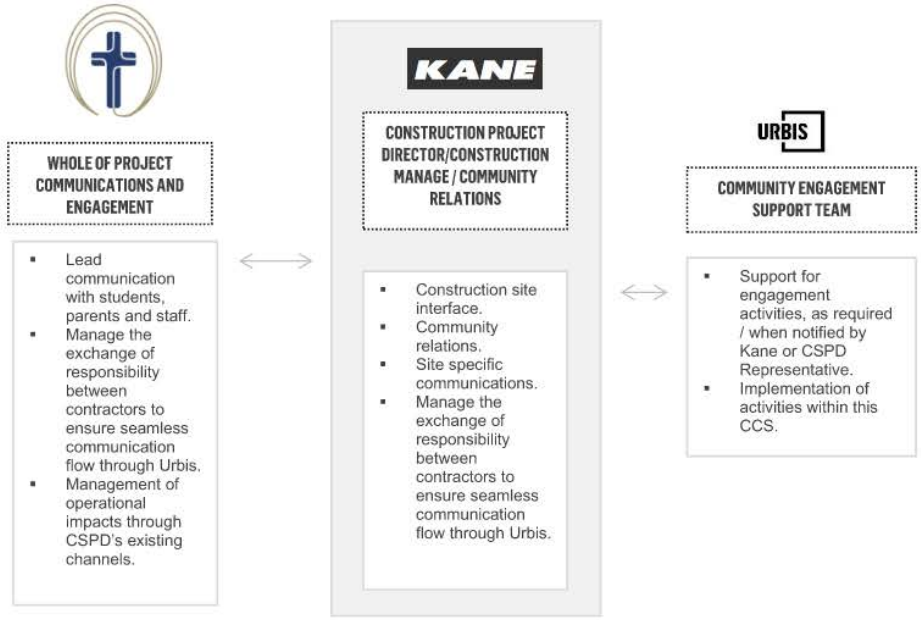
3.2. COMMUNICATIONS INTERFACE (ROLES AND RESPONSIBILITIES)

The successful delivery of the project is contingent on a coordinated, consistent and considered approach to community communication and stakeholder engagement.

From the community's point of view, response to issues should appear seamless. To achieve this, the Community Engagement Support team (point of contact from Urbis) will work collaboratively with CSPD's appointed Contractors, Consultant team and CSPD's communications team to ensure all internal and external communications are in lockstep.

As Kane Constructions' scope of construction ends (anticipated in April 2026), Urbis will liaise directly with CSPD to ensure enquiries and community notifications continue to be delivered.

Figure 3 Communication interface



4. STAKEHOLDERS – PEOPLE TO BE CONSULTED DURING DESIGN AND CONSTRUCTION

In line with Condition C9(a), this section identifies the people to be consulted during the design and construction phases of WCC.

For the purpose of this CCS, people to be consulted during construction are referred to as stakeholders. It will be important to ensure that stakeholders and the surrounding community (including adjoining affected landowners and others directly impacted by the development) are proactively well-informed about construction activity and impacts.

This includes the nearby residents who could potentially be impacted by noise, traffic and access as a result of construction. The surrounding community are familiar with this development as CSPD undertook a comprehensive stakeholder engagement program throughout each stage of planning for the SSDA.

Therefore, engagement with stakeholders and the surrounding community will focus on the specific potential impacts of construction work associated with construction.

4.1. ABOUT THE SURROUNDING COMMUNITY

The site is nestled within a diverse range of land uses. To the west and north-west, is a mix of low to high-density residential areas, including the Westmead Hospital Accommodation Complex and detached dwellings along Darcy Road and Bridge Road. Small-scale retail and commercial properties are present along Darcy Road to the west.

The site is also surrounded by various health and education facilities to the north, east, and south-east. These include Westmead Private Hospital, Westmead Public Hospital, and Western Sydney University's Westmead Campus. Supporting facilities such as consulting rooms, research centres, and a large car parking complex are also located to the northeast.

Figure 4 identifies the stakeholders to be consulted. This area has been informed by the previous community consultation undertaken as part of the SSDA to ensure previously consulted community members can remain updated on the project. These stakeholders have also been selected given their proximity to the site and the potential impact they will experience during both the construction and operational phases.

During the consultation to inform the Environmental Impact Statement (EIS), residents and businesses identified the following areas of potential impact (in relation to construction):

- Noise and traffic during construction
- Disruption to traffic flows on the local street system
- Out of hours of work
- Pedestrian safety as a result of changes to traffic flow in and around the Schools and precinct
- Perceived property damage due to dust
- Visual impact/change of view from current oval outlook
- Day-to-day operational impacts to the School community as a result of construction work on site.

Figure 4 Neighbours and the surrounding community

Legend

The site

Surrounding community

4.2. STAKEHOLDER MATRIX

This section provides a detailed summary of the stakeholders to be consulted, the dedicated communications interface, communications activities, and identified areas of interest or impact. This table will be reviewed and updated throughout the construction period.

Table 3 Stakeholder matrix

Stakeholder	Communication activities (see Section 5)	Identified areas of interest or impact	Communication timing
Landowners ▪ Diocese of Parramatta ▪ Marist Australia	▪ Project meetings/emails ▪ Emails ▪ Briefings	▪ Permit/Authority approvals ▪ Impacts on land inc. encumbrances ▪ Impacts on local characteristics ▪ Impacts of construction activities including noise, dust and vibrations ▪ Impact on local on and off-street parking availability	Ongoing
Project partners ▪ Marist Australia ▪ Sisters of Mercy Parramatta	▪ Project meetings/emails	▪ Project program and timing ▪ Construction impacts	Ongoing
Schools ▪ Mother Teresa Primary School Executive Team, staff, teachers, students and parents	**During construction** ▪ Enquires and feedback management (refer to Section 5.3)	▪ Traffic management ▪ Visual impacts ▪ Impacts on local characteristics	▪ Design ▪ Construction ▪ Operation (for 12 months after completion of construction)

Stakeholder	Communication activities (see Section 5)	Identified areas of interest or impact	Communication timing
▪ Parramatta Marist High Executive Team, staff, teachers, students and parents ▪ Catherine McAuley Executive Team, staff, teachers, students and parents ▪ Parramatta Marist High Old Boys Union – Alumni Association ▪ Sacred Heart Parish Community	▪ Issues resolution and mediation of disputes ▪ Incident management ▪ Construction notifications as required ▪ Face to face meetings as required ▪ Construction signage. **During operation** ▪ Via CSPD's regular method of enquiry management (refer to Table 6 of Section 5.3).	▪ Impacts of construction activities including noise, dust and vibrations ▪ Impact on local on and off-street parking availability	
City of Parramatta ▪ Council staff	▪ Emails ▪ Briefings	▪ Traffic management ▪ Visual impacts ▪ Community engagement, including management of enquiries and concerns ▪ Permit approvals ▪ Impacts on local characteristics ▪ Impacts of construction activities including noise, dust and vibrations	▪ Design ▪ Construction ▪ Operation (for 12 months after completion of construction)

Stakeholder	Communication activities (see Section 5)	Identified areas of interest or impact	Communication timing
		▪ Impact on local on and off-street parking availability	
Elected officials ▪ City of Parramatta – Mayor and Councillors ▪ State MP ▪ Federal MP	▪ Emails ▪ Briefings	▪ Traffic management ▪ Visual impacts ▪ Community engagement, including management of enquiries and concerns ▪ Permit approvals ▪ Impacts on local characteristics ▪ Impacts of construction activities including noise, dust and vibrations ▪ Impact on local on and off-street parking availability ▪ Permit approvals ▪ Impacts of construction activities including noise, dust and vibrations	▪ Design ▪ Construction ▪ Operation (for 12 months after completion of construction)
Surrounding community ~~▪ Jesuit Refugee Services~~ ▪ NSW Health and the Local Health District Patients and visitors	**During construction** ▪ Enquires and feedback response (refer to Section 5.3).	**Potential likely concerns during construction could be:** ▪ Traffic management ▪ Visual impacts	▪ Design ▪ Construction ▪ Operation (for 12 months after completion of construction)

Stakeholder	Communication activities (see Section 5)	Identified areas of interest or impact	Communication timing
▪ Westmead Private Hospital Staff, patients and visitors ▪ Western Sydney University Executive, staff and students ▪ Neighbours ▪ Local community ▪ Local businesses	▪ Issues resolution and mediation of disputes ▪ Incident management ▪ Construction notifications as required ▪ Face to face meetings as required ▪ Construction signage. **During operation** ▪ Via CSPD's regular method of enquiry management (refer to Table 6 of Section 5.3).	▪ Impacts on local characteristics ▪ Impacts of construction activities including noise, dust and vibrations ▪ Impact on local on and off-street parking availability ▪ Concerns regarding the increase in pedestrian activity ▪ Construction timing including the expected finished date	

5. PROCEDURES AND MECHANISMS

5.1. INFORMATION PROVISION

In line with Condition C9(b), this section sets out the procedures and mechanisms for the regular distribution of accessible information about the project.

Table 4 Communication activities for information provision.

Activity	Description	Stakeholder	Timing
Establishment of a website, phone number and email address	Project contact details and up-to-date project information will be provided in all communication activities. The CSPD website will provide an overview of project details, construction-related management documents, construction updates, and enquiry contact details. See Section 5.3 for the point of contact/s for construction. The process for responding to enquiries is outlined in Section 5.3.	All stakeholders and the surrounding community	Information will be available online no less than 48 hours before the start of construction (in accordance with DCC A31. Ongoing enquiry management and website content will be available for a minimum of 12 months following the completion of construction.
Access to Information	In accordance with Development Consent Condition A31, at least 48 hours before the commencement of construction until a minimum of 12 months following the completion of all works under this consent, or such other time as agreed by the Planning Secretary, information, and documents (as they are obtained or approved) will be made publicly available on the CSPD website. This information will include access to all drawings and management plans required by the Conditions of this Consent. The approach is to provide the community with a link to this information (once submitted and available on DPHI's website), as well as provide direct copies of this information on the CSPD website. The notification about this information being publicly available will be issued in	Stakeholders and the surrounding community	No less than 48 hours before construction information will be available online (CSPD's website) and remain updated for a minimum of 12 months following the completion of construction.

Activity	Description	Stakeholder	Timing
	a community newsletter ahead of construction starting on-site.		
Signage (site notices)	The enquiries and complaints phone number and email address will be included on signage at the front of the site. In accordance with Development Consent Condition D1, the signage will be prominently displayed at the boundaries of the site during construction for the purposes of informing the public of project details.	Stakeholders and the surrounding community	Information and signage will be available on-site throughout construction being undertaken as part of the approved SSDA.
Start of construction notification letterbox drop (newsletter letter)	In line with Development Consent C1, a community newsletter will be prepared. The newsletter will outline the construction timeline, impacts and mitigation measures, and include the enquiries and complaints' phone number and email address. In line with Development Consent C2, subsequent notifications will be issued at least 48 hours before the commencement of each stage of work.	Surrounding community (Individual households and businesses)	No less than 48 hours before start of construction. No less than 48 hours before the start of construction of each subsequent stage.
Face-to-face meetings	Face-to-face project briefings with key stakeholders and community groups will be held to provide project information about environmental management issues for the development.	Stakeholders and the surrounding community	As required depending on the level of community interest and feedback.
Construction notification letterbox drop (out-of-hours and unplanned work)	A newsletter to inform the community about changes to construction (such as out-of-hours and unplanned work). The letter would outline works, impacts and mitigation measures, and the enquiries and complaints phone number and email address.	Immediate neighbours Neighbouring schools (parents, students and staff)	At least 72 hours before undertaking the activities or as soon as is practical afterwards.
Sensitive receiver consultation procedure	In line with Development Consent Condition C19(e), for traffic, noise and vibration, visual impacts, amenity, flora and fauna, soil and water, contamination, and heritage impacts, sensitive receivers will be informed via letterbox drop ahead of time.	Stakeholders and the surrounding community and the surrounding schools' community (parents,	Before undertaking the activities or as soon as is practical afterwards.

Activity	Description	Stakeholder	Timing
	The community will also be notified via a community newsletter (with a link to the CSPD website, which includes drawings and post-approval management plans). These plans will outline how impacts to traffic, noise and vibration, visual impacts, amenity, flora and fauna, soil and water, contamination, and heritage will be managed. While our approach anticipates sensitive receivers to be most interested / impacted, the whole community catchment (shown in Figure 4) will be notified of this information if required.	students, teachers)	

5.2. COMMUNITY-BASED FORUMS

In line with Condition C9(c), depending on the level of stakeholder interest and feedback in the first three months of construction, the principal contractor or their authorised representative will consider the establishment of community-based forums to enable a deeper focus on key environmental management issues for the project.

Following the start of construction, this process will be reassessed every six months through to completion of work. The assessment process will measure the level of enquiries reviewed over the construction period.

Public meetings and presentations will be held as frequently as required. The frequency will be determined by the level of community enquiries.

Meetings would involve:

- Updating the community on the environmental management of the development works
- Providing a direct face-to-face consultation between the project team and the concerned community members.

Meetings and presentations will be held on an as-required basis to respond to concerns raised by the local community members. If required, any environmental concerns raised by the community will continue to be addressed via community notifications, website updates and enquiry responses.

The above forums are considered appropriate to the scale of the development works. If required, we would recommend community-based forums be held on-site and attended by at least one School representative, relevant technical leads as required.

5.3. ENQUIRIES AND FEEDBACK RESPONSE

In line with Conditions C9(d)(i) and C9(d)(ii), this section sets out procedures and mechanisms through which the community can discuss or provide feedback to the Applicant and how the Applicant will respond to these enquiries.

The table below outlines construction contact points that will be established and maintained through the design and construction phases of WCC.

Table 5 Contact point for construction

Channel	Details
Point of contact	Nathan Parris, Kane Constructions
Mailing address	2 John Street, Waterloo NSW 2017
Phone number	1800 244 863
Email	engagement@urbis.com.au
Website	https://www.parra.catholic.edu.au/about/key-initiatives/westmead-catholic-community

Table 6 Contact point for operation

Channel	Details
Point of contact	[operational enquiries – details to be confirmed]
Mailing address	[operational enquiries – details to be confirmed]
Phone number	[operational enquiries – details to be confirmed]
Email	[operational enquiries – details to be confirmed]
Website	https://www.parra.catholic.edu.au/about/key-initiatives/westmead-catholic-community

All construction-related feedback and enquiries will be recorded in a Complaints Register. Refer to Section 5.4 for details regarding the complaints, issues and the dispute resolution process.

All feedback and enquiries during construction will be answered in accordance with the timeframes below.

Table 7 Response times

Channel	Response time
Email	One business day (if contact is made outside of business hours, a response will be provided on the next business day)
In-person contact	One business day (if contact is made outside of business hours, a response will be provided on the next business day)
Site phone line	Thirty minutes - during business hours (if contact is made outside of business hours, a response will be provided on the next business day)
Website contact	Three business days (if contact is made outside of business hours, a response will be provided on the next business day)

5.4. DISPUTE RESOLUTION AND MEDIATION

In line with Conditions C9(d)(iii) and C9(d)(ii), this section sets out procedures and mechanisms to resolve any issues and mediate any disputes that may arise.

5.4.1. Complaints management

Robust and timely enquiry and complaints management are integral to building and maintaining two-way communication within the community throughout construction. All construction-related enquiries will be managed via Urbis in consultation with CSPD (or their representative) and Kane Constructions.

All operational enquiries (including 12 months post-construction) will be managed by CSPD or their representative.

Figure 5 and Figure 6 outline the enquiry and complaints management process for both construction and operation. These processes provide a procedure for issue resolution and the mediation of disputes, targeting resolution within seven days from the date the issue was first raised.

This mechanism allows for the identification and implementation of corrective measures in response to issues raised by the community, to minimise the likelihood of recurrence. All complaints will be recorded in a Complaints Register, and inline with Condition A31v(iii), will be available on the CSPD website.

Complaints, issues and disputes regarding operations will be recorded and passed on to the CSPD. The CSPD will manage operational enquiries through existing mechanisms (refer to Figure 6 for this detail).

Nature/ theme of concerns may include, but are not limited to the following:

- Noise and traffic during construction
- Disruption to traffic flows on the local street system
- Out of hours of work
- Pedestrian safety as a result of changes to traffic flow in and around the Schools
- Perceived property damage due to dust
- Day-to-day operational impacts to the Schools' community as a result of construction work on site.

Figure 5 Complaints, issues, and disputes resolution process (construction)

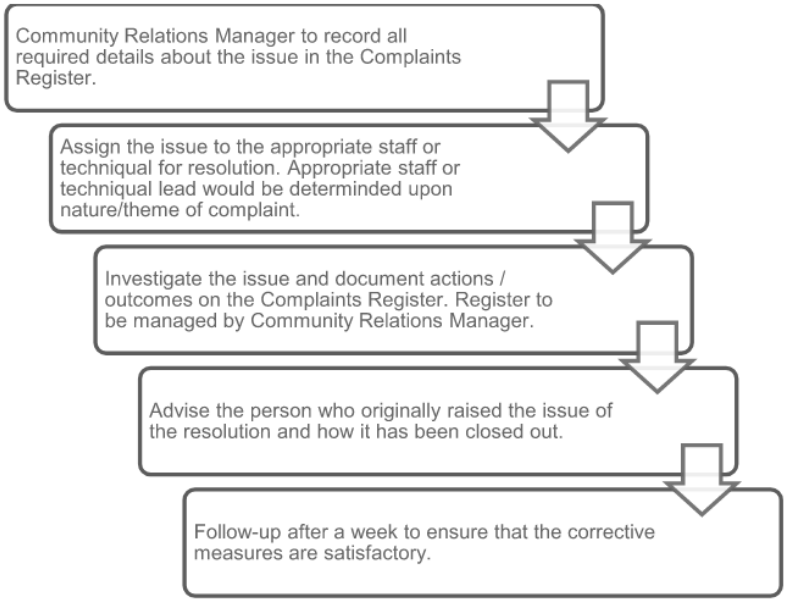
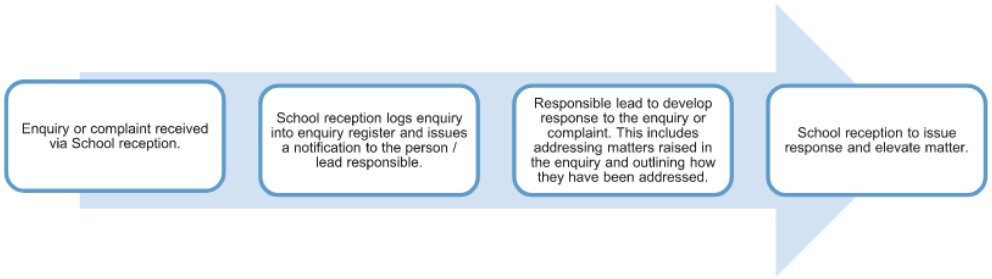


Figure 6 Mediating complaints, issues and disputes regarding Schools operations (during operation when construction is completed)



Complaints register

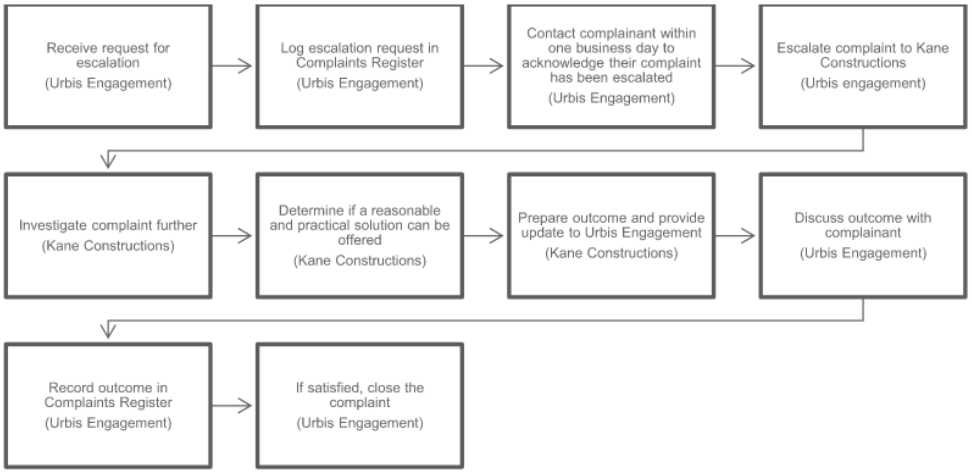
All complaints will be recorded in a Complaints Register. This register will be established at least 2 weeks before commencing construction and will include:

- A description of the complaint including the date, day and time of the complaint and works occurring that resulted in the complaints.
- Who made the complaint and relevant contact details (if provided)
- Format of the complaint received and referenced (if applicable)
- The investigative response to the complaint
- Any further actions to prevent reoccurrence
- The requirement for stakeholder follow-up or escalation (if necessary).

5.4.2. Escalation process

Figure 7 outlines the escalation process should the Complaints handling process (Figure 6) fail to resolve the complaint. Escalation actions will also be recorded in the Complaints Register. The party responsible for each action is noted in brackets.

Figure 7 Complaints escalation process



5.4.3. Independent mediation

In some circumstances, a complaint may be referred for independent mediation. The role of independent mediation is to assist in facilitating communication between conflicting parties to reach a voluntary and mutually agreeable outcome to a dispute. The purpose of this process is to mediate and not arbitrate. A mediator actively encourages and facilitates discussion toward an outcome but cannot order or decide an outcome.

Issues and complaint escalation to independent mediation would be at the recommendation of the Community Relations Manager following a thorough review of the complaint information in consideration of the project planning and assessment process. Generally, complaints that would require a change to the approved project scope of works would not be referred for mediation and a complaint would only be referred for mediation once.

The actions of the independent mediator would depend on the type of issue. However, the process may include the following general steps:

- Establishing expectations upon the expected behaviour and involvement of all parties
- Meet with the complainant and project team to understand concerns and suggest methods as appropriate to resolve and/or work through issues
- Seek involvement of various internal and external subject matter experts
- Provide recommendations or next steps that clearly reflect input from all parties.

If mediation is required, DPHI would appoint an independent mediator who would hold suitable qualifications and have experience in mediating disputes of a similar nature. In instances where a complainant remains unsatisfied, DPHI will be advised.

DISCLAIMER

This report is dated 4 October 2024 and incorporates information and events up to that date only and excludes any information arising, or event occurring, after that date which may affect the validity of Urbis Ltd **(Urbis)** opinion in this report. Urbis prepared this report on the instructions, and for the benefit only, of Westmead Catholic Community Education Campus c/- Kane Constructions **(Instructing Party)** for the purpose of Community Communication Strategy **(Purpose)** and not for any other purpose or use. To the extent permitted by applicable law, Urbis expressly disclaims all liability, whether direct or indirect, to the Instructing Party which relies or purports to rely on this report for any purpose other than the Purpose, and to any other person which relies or purports to rely on this report for any purpose whatsoever (including the Purpose).

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This report has been prepared with due care and diligence by Urbis and the statements and opinions given by Urbis in this report are given in good faith and in the reasonable belief that they are correct and not misleading, subject to the limitations above.

d) Construction Waste Management Sub-Plan

2 Darcy Rd, Westmead NSW 2145

Educational Facility

CONSTRUCTION & DEMOLITION WASTE MANAGEMENT PLAN

27/10/2024

Revision C

Client

Kane Constructions

https://www.kane.com.au/

Architect

Alleanza

https://www.alleanza.com.au/

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SCOPE

A Waste Management Plan (WMP) is to be submitted with all development applications for new and change-of-use developments that will generate construction, demolition and operational waste.

This WMP applies only to the **construction** and **demolition** phases of the proposed development. The requirements outlined in this WMP must be implemented on site during construction and demolition and may be subject to review upon any change to the design. Construction and demolition waste management requirements will also be subject to review as part of the Construction Management Plan.

The waste management for the **operational** phase of the development is not addressed in this report. An operational WMP is provided separately.

REVISION REFERENCE

Revision	Date	Prepared by	Reviewed by	Description
A	14/10/2024	S. Dib	H. Wilkes	Draft
B	16/10/2024	H Wilkes	J Parker	Amendment
C	27/10/2024	H Wilkes	J Parker	Final

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1 ACKNOWLEDGEMENT OF COUNTRY

Elephants Foot Consulting acknowledges that every project we work on takes place on First Peoples Land. We recognise Aboriginal and Torres Strait Islander People as Traditional Custodians of this land. We pay respect to ancestors and Elders, past and present.

2 INTRODUCTION

2.1 Background

EFC has been tasked to prepare the following waste management plan for Kane Constructions for the management of construction and demolition waste generated by the Educational Facility located at 2 Darcy Rd, Westmead NSW 2145.

Waste management strategies and auditing are a requirement on construction sites to promote strong sustainability outcomes. It is EFC's belief that a successful waste management strategy contains three key objectives:

i. ***Promote responsible source separation*** to reduce the amount of waste that goes to landfill, by implementing convenient and efficient waste management systems.

ii. ***Ensure adequate waste provisions and robust procedures*** that will cater for potential changes during the operational phase of the development.

iii. ***Comply*** with all relevant Australian Standards, council codes, policies, and guidelines.

This report has also been prepared in line with the requirements for Credit 2 Construction and Demolition Waste (Credit Achievement) under Green Star Buildings v1.

2.2 Site Summary

The proposed development falls under the LGA of City of Parramatta Council. The site is currently occupied by:

- A generally empty site with two demountable buildings and three sports courts. The demountable buildings will be removed and one sports court will be demolished

The proposal consists of:

- Sacred Heart Primary School which will cater to:
  - 1680 primary school students
  - 200 CELC students

All figures and calculations are based on area schedules as advised by our client and shown on architectural drawings.

2.3 Site Location

The site is located at 2 Darcy Rd, Westmead NSW 2145, as shown below. The site has frontages and vehicular access via Darcy Road.

Figure 1: Site Plan

Source: Google Maps 2024

2.4 Legislation and Guidance

Information provided in this WMP comes from a wide range of construction and demolition waste management guidance at the local, state, and federal levels. The primary sources of guidance include:

- Parramatta Development Control Plan 2023: Appendix 2: Waste Management
- Australian Government, Department of Sustainability, Environment, Water, Population and Communities. *Construction and Demolition Waste Guide – Recycling and Re-use Across the Supply Chain*. (2014, November).
- NSW Waste Avoidance and Resource Recovery (WARR) Strategy 2014-2021
- NSW Waste Classification Guidelines 2014
- Australia's National Waste Policy 2018

2.5 Waste Diversion Targets

To quantify and measure this sustainable approach to waste management, the NSW WARR Strategy 2014-2021 outlines specific targets in order to clarify the state's long-term goals and priorities. These targets were supported by industry, community, state, and local governments during the Strategy's consultation phase, and include:

- Increasing construction and demolition recycling rates to 80%
- Increasing waste diverted from landfill to 75%
- Reducing litter by 40%
- Reduce illegal dumping incidents by 30%

2.6 Report Objectives

Throughout this report, EFC aims to encourage where practical, having regard to the design, the nature of the material to be demolished and the site constraints, the following waste management practices for the duration of the demolition and construction stages of the development:

- Re-use of excavated material on-site and disposal of any excess to an approved site;
- Green waste mulched and re-used on-site as appropriate, or recycled off-site;
- Bricks, tiles and concrete re-used on-site as appropriate, or recycled off-site;
- Plasterboard waste returned to supplier for recycling;
- Framing timber re-used on site or recycled off-site;
- Windows, doors and joinery recycled off-site;
- All asbestos, hazardous and/or intractable wastes are to be disposed of in accordance with WorkCover Authority and EPA requirements;
- Plumbing, fittings and metal elements recycled off site;
- Ordering accurate quantities of materials and prefabrication of materials where possible;
- Re-use of formwork;
- Careful source separation of off-cuts to facilitate re-use, resale or recycling.

2.7 Limitations

This report has been prepared by EFC for the sole purpose of providing a Construction and Demolition Waste Management Plan (C&D WMP) to support a development application. The report is provided with the following limitations:

- This report is for the sole use of Kane Constructions (including their officers, employees and advisers) and should not be used or relied upon by any other party without prior written consent from EFC;
- Drawings, estimates and information contained in this report have been prepared by analysing information, plans and documents supplied by the client, or nominated third parties. Any assumptions based on the information contained in the report are outside the control of EFC;
- The calculations presented in the report are estimates only. The amount of waste generated will be dependent on the approach taken by site management, including the levels of training and education offered to site staff and the actions and attitudes of staff themselves.
- The site manager will make adjustments as required based on actual waste volumes (e.g. if waste volumes are greater than estimated, then waste storage capacity and collection frequencies will increase accordingly) and increase the amount of waste storage and collection frequency accordingly;
- The report has been prepared with all due care and attention; however, no assurance or representation is made that the WMP reflects the actual outcome. EFC will not be liable to for any plans or outcomes that are not suitable for purpose, whether as a result of incorrect or unsuitable information or otherwise;
- EFC offer no warranty or representation of accuracy or reliability of the WMP unless specifically stated;
- Examples of equipment provided in this report should be reviewed by the appropriate equipment supplier who will assess the correct equipment for supply. Reference to any other business or product besides EFC and EFC equipment is for information purposes only, and is not officially endorsed or recommended by EFC.

3 GENERAL WASTE MANAGEMENT PROVISIONS

3.1 Stakeholder Roles and Responsibilities

All stakeholders have a responsibility for their own environmental performance and compliance with all legislation.

The Construction Contractor will be responsible for implementing this WMP, although site staff have a responsibility to ensure their own compliance at all times. Where possible, an Environmental Management Representative (EMR) should also be appointed for the project to help ensure compliance. The following table demonstrates the primary roles and responsibilities of the respective stakeholders:

Table 1: Stakeholder Roles and Responsibilities

Roles	Responsibilities
Site Management	• Organise waste collections as required; • Organise replacement or maintenance requirements for bins; • Investigate and ensure prompt clean-up of illegally dumped waste materials; • Notify the Principal Certifying Authority (Council) of the appointment of waste removal, transport or disposal contractors for waste tracking purposes; • Ensure waste related equipment is well maintained; • Ensure accurate calculations so only the required amount of materials are ordered; • Ensure segregation of materials to maximise reuse and recycling; • Check waste sorting and storage areas routinely for cleanliness, hygiene, contamination and OH&S issues; • Ensure all monitoring and audit results are well documented and are carried out as specified in the WMP; • Ensure effective signage, communication and education is provided to site staff/contractors; • Provide staff/contractors with equipment manuals, training, health and safety procedures, risk assessments, and PPE to control hazards associated with all waste management activities; • Assess any manual handling risks and prepare a manual handling control plan for waste and bin transfers;
Site Staff/Contractors	• Ensure adequate separation and disposal of waste streams in compliance with the WMP; • Abide by all relevant OH&S legislation, regulations, and guidelines; • Attend training and inductions as required; • Clean and transport bins as required; • Carry out daily visual inspections of waste storage areas; • Organise, maintain and clean the waste storage areas;
Environmental Management Representative (EMR)	• Approach and establish the local commercial reuse of materials where reuse on-site is not practical; • Establish separate skips and recycling bins for effective waste segregation and recycling purposes; • Ensure staff and contractors are aware of site requirements; • Provision of training of the requirements of the WMP and specific waste management strategies adopted for the development; • Contaminated waste management and approval of off-site waste transport, disposal locations and check licensing requirements; • Arrange assessment of suspicious potentially contaminated materials, hazardous materials and liquid waste; • Monitor, inspect and report requirements.
Waste Collection Contractors	• Provide a reliable and appropriate waste collection service; • Provide feedback to site management regarding contamination of waste streams; • Work with site management to customise waste systems where possible.

3.2 Monitoring and Reporting

It is recommended that the following measures be taken to improve demolition and construction waste management in future and to provide more reliable waste generation figures:

- Compare projected waste quantities with actual waste quantities produced.
- Conduct waste audits of current projects (where feasible).
- Note waste generated and disposal methods.
- Look at past waste disposal receipts.
- Record this information to help in waste estimations for future waste management plans.

Monthly waste reports to be provided, as well as a single cumulative waste report that covers the entire duration of construction and demolition works. Waste is to be reported in kg

Records of waste volumes recycled, reused or contractor removed are to be maintained. Additionally, dockets/receipts verifying recycling/disposal in accordance with the WMP must be kept and presented to Council or the EPA if and when required.

Daily visual inspections of waste storage areas will be undertaken by site personnel and inspection checklists/logs recorded for reporting to the Site Manager on a weekly basis or as required. These inspections will be used to identify and rectify any resource and waste management issues.

Waste audits are to be carried out by the Building Contractor to gauge the effectiveness and efficiency of waste segregation procedures and recycling/reuse initiatives. Where audits show that the above procedures are not carried out effectively, additional staff training should be undertaken and signage re-examined.

All environmental incidents are to be dealt with promptly to minimise potential impacts. An incident register must be maintained on-site at all times and should include the contact details of the 24-hour EPA Pollution line. Likely incidents to occur during the construction and demolition stage of the development may involve fuel or chemical spills, seepage or mishandling of hazardous waste, or unlicensed discharge of pollutants to environment.

3.3 Opportunities for Reuse and Recycling

There are many opportunities to reduce the volume of waste generated during demolition and construction. Adaptive reuse of building materials should be encouraged, with significant consideration given to methods of reusing or recycling materials onsite as well as sourcing used or recycled materials from elsewhere to be used on site.

The site should facilitate where practical reuse and recycling by 'deconstruction', whereby various materials are carefully dismantled and sorted. Any unwanted reusable materials can be taken to a second-hand building centre, reducing waste disposal costs.

Materials that are individually wrapped should also be avoided where possible, with preference given for materials that can be delivered in returnable packaging such as timber pallets.

The table below gives examples of potential reuse and recycling options for the materials likely to be used/generated in construction and demolition at this development:

Table 2: Potential Reuse/Recycling Options for Construction Materials

Material	Reuse/Recycling Potential
Asphalt	Hot in-place recycling or reprocessed into Reclaimed Asphalt Pavement (RAP).
Bricks	Cleaned and/or rendered for reuse, crushed for fill, sold or provided to a recycled materials yard
Cardboard Packaging	Recycled at a paper/cardboard recycling facility
Carpet	Cleaned and reused for the same purpose, reused in landscaping or garages/sheds, recycled at an appropriate processing facility
Concrete, Masonry, Spoil	Reused on-site as fill, levelling or crushed for road base
Doors, Windows, Fittings	Reused in new or existing buildings or sent to second-hand supplier
Glass	Recycled at a glass recycling facility, aggregate for concrete production, crushed for termite barrier, reused as glazing
Green Waste (Organics)	Mulched, composted for reuse, trees chipped for use in landscaping or removed carefully and reused onsite or sold
Hardwood Beams	Reused as floorboards, fencing, furniture or sent to second-hand timber supplier
Insulation Material	Reprocessed to remove impurities and reused for the same purpose or as off-cuts, compressed for ceiling tile manufacture
Metal, Steel/Copper Pipe	Recycled at a metal recycling facility, melted into secondary materials for structural steel, roofing, piping etc. copper sold for re-use
Other Timber	Reused in formwork, ground into mulch for garden or sent to second-hand timber supplier
Plasterboard	Crushed for reuse in manufacture of new plasterboard, returned to supplier or used in landscaping
Plastics	Reused as secondary materials for playgrounds, park benches etc.
Roof Tiles	Cleaned and reused, crushed for reuse for landscaping and driveways or sold or provided to a recycled materials yard
Soil	Stockpiled onsite for reuse as fill
Synthetic & Recycled Rubber	Reused for the same purpose or reprocessed for use in manufacture/construction of safety barriers, speed humps
Topsoil	Stockpiled onsite for reuse in landscaped areas

3.4 Management of Hazardous Waste Materials

For the purpose of this report, hazardous waste materials include any waste that poses a hazard or potential harm to human health or the environment, particularly asbestos waste and asbestos containing material (ACM). The general advice provided in this report is superseded by any specific hazardous materials or remediation control plans prepared for the project.

During the construction phase of the development, there must be a commitment to engage qualified and certified contractors to remove all contaminated/hazardous materials (e.g. asbestos) and dispose of all contaminated/hazardous waste at an appropriately licenced facility, where applicable.

In the event that any contaminated or hazardous materials are unexpectedly uncovered during demolition or excavation works, the Site Manager is to stop work immediately in that location and contact the relevant hazardous waste contractor prior to further works being undertaken in the area.

The following general mitigation measures will apply:

- Contaminated material stockpiled on site will be minimised as far as possible and should be stored on HDPE liner, in a bunded location which is protected from inclement weather;
- Sediment fences should be installed around the base of stockpiles and the stockpiles should be covered. Where excavated material requires validations, samples should be taken for NATA laboratory testing as per the requirements of the contamination assessment prior to restoration works, backfilling exercises and disposal;
- Any trucks carrying contaminated materials should be securely and completely covered immediately after loading the materials (to prevent windblown emissions and spillage) and must be licensed by the NSW Environmental Protection Authority (EPA);
- Decontamination of all equipment prior to demobilisation from the site is important so that contaminated materials are not spread off-site.

3.5 Management of Excavation Waste

For the purpose of this report, excavation waste consists of any unwanted material generated from excavation activities such as a reduced level dig, site preparation and levelling and the excavation of foundations, basements, tunnels and service trenches. This will typically consist of soil and rock. The general advice provided in this report is superseded by any specific hazardous materials or remediation control plans prepared for the project.

All excavated material generated on this site may be re-used in the landscaping or used on other sites as fill material, provided no contamination is present. If sandstone is found to be present, this may be sold or incorporated into the building design.

The following measures and safeguards will apply to the development for excavated material:

- Wherever practical, excavation material will be reused as part of the development;
- Excavation material that is not natural (virgin) material will be transported to an approved landfill site or off-site recycling depot;
- A waste classification assessment of the fill material should be undertaken prior to it being acceptable for waste disposal purposes;
- Transportation routes for excavation material removed from site will be identified and used.

4 SITE SPECIFIC WASTE MANAGEMENT PROVISIONS

4.1 Demolition Waste Volumes and Management

The demolition stage of the development provides the greatest opportunity for waste minimisation and resource recovery. The first thing that should be considered is whether it is possible to reuse existing buildings or parts of buildings for the proposed use. With careful on-site sorting and storage and by staging work programs it is possible to reuse many materials, either on or off-site.

The existing demountable buildings at this site will be removed, a sports court will be demolished and a new school will be constructed. Where possible, materials will be reused, such as crushing concrete for use as clean fill. However, the majority of the components of the building will either be reused for the same purpose or disposed of offsite.

A demolition contractor will be engaged during this phase of the project. The contractor will be responsible for ensuring all demolition activities are planned and undertaken in accordance with relevant waste minimisation policies and DA requirements.

The table below illustrates the anticipated volumes of materials generated at this development during the demolition stage. Volumes have been advised by our client.

Table 3: Demolition Waste Conversion

Material	Volume (m3)	*Tonnes (t)	**Appx. Percentage Recovered
Excavation Material	2246.0	2246.0	99.8%
Green waste	1351.0	202.7	80%
Tiles	117.0	117.0	100%
Concrete	195.0	292.6	100%
Timber	741.0	140.8	33%
Plasterboard	2028.0	405.6	50%
Metals	819.0	409.5	100%
Other waste	195.0	58.5	50%
Totals	**7692.0**	**3872.6**	

**The conversion of materials from volume to tonnes is based on the information provided in a consultation paper published by WA Department of Water and Environmental Regulation <https://www.der.wa.gov.au/images/documents/our-work/consultation/current-consultation/Consultation%20Sheet%20-Approved%20method%20for%20recyclers.pdf>*

***The percentage of recycled demolition waste is estimated by BINGO, and is based on the average quantities of materials received and recovered at their facilities.*

The table below illustrates how the demolition materials will be managed, and estimates percentage of materials diverted from landfill.

Table 4: Demolition Waste Management

			How Waste will be Managed			
Type of Material	**Less than 10m³**	**Estimated Tonnage**	**Reuse On-Site**	**Recycle**	**Landfill**	**Estimated Tonnage of Material Diverted from Landfill**
Excavation Material	☐	2246.0	☐	☒	☒	2240.4
Green Waste	☐	202.7	☐	☒	☒	162.1
Tiles	☐	117.0	☐	☒	☐	117.0
Concrete	☐	292.6	☐	☒	☐	292.6
Timber	☐	140.8	☐	☒	☒	46.5
Plasterboard	☐	405.6	☐	☒	☒	202.8
Metals	☐	409.5	☐	☒	☐	409.5
Other Waste	☐	58.5	☐	☒	☒	17.6
Total		**3872.6**	**Total**			**3488.4**
Total Diversion of Waste from Landfill (Minimum 90%)						**90.1%**

4.2 CONSTRUCTION WASTE VOLUMES AND MANAGEMENT

Waste generated during the construction stage of the development will be managed by the principal contractor and sub-contractors, with materials being reused and recycled wherever possible. Where neither reuse nor recycling are possible, waste will be disposed of as general waste at a licensed landfill site.

Recyclable material generated during construction will largely consist of off-cuts and discarded bricks, timber, steel, concrete, tiles, plasterboard, and piping, as well as packaging materials.

It is important to note that source separation of waste on-site may offer cost savings when compared to the disposal of mixed waste at landfill sites. Further cost savings may be achieved through the use of reusable and recycled-content materials and by reusing materials salvaged from the demolition stage of the development.

The table below illustrates the anticipated volumes of materials generated at this development during the construction stage. Volumes have been advised by our client.

Table 5: Construction Waste Conversion

Material	Volume (m3)	*Tonnes (t)	**Approx. Percentage Recovered
Bricks	20.76	24.9	100%
Tiles	0.76	0.8	100%
Concrete	142.50	213.8	100%
Timber	6.63	1.3	33%
Plasterboard	51.07	10.2	50%
Metals	10.26	5.1	100%
Totals	**231.99**	**256.0**	

**The conversion of materials from volume to tonnes is based on the information provided in a consultation paper published by WA Department of Water and Environmental Regulation <https://www.der.wa.gov.au/images/documents/our-work/consultation/current-consultation/Consultation%20Sheet%20-Approved%20method%20for%20recyclers.pdf>*

***The percentage of recycled waste is estimated by BINGO, and is based on the average quantities of materials received and recovered at their facilities.*

The table below illustrates how the construction materials will be managed, and estimates percentage of materials diverted from landfill.

Table 6: Construction Waste Management

			How Waste will be Managed			
Type of Material	**Less than 10m³**	**Estimated Tonnage**	**Reuse On-Site**	**Recycle**	**Landfill**	**Estimated Tonnage of Material Diverted from Landfill**
Bricks	☐	24.9	☐	☒	☐	24.9
Tiles	☒	0.8	☐	☒	☐	0.8
Concrete	☐	213.8	☐	☒	☐	213.8
Timber	☒	1.3	☐	☒	☒	0.4
Plasterboard	☐	10.2	☐	☒	☒	5.1
Metals	☐	5.1	☐	☒	☐	5.1
Total		**256**	**Total**			**250.1**
Total Diversion of Waste from Landfill (Minimum 90%)						**97.7%**

4.3 Recycling Directory

Construction and demolition materials removed from site will need to be managed in accordance with the provisions of current legislation and may include segregation by material type classification in accordance with NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste* and disposal at facilities appropriately licensed to receive the particular materials.

Please find the below recommendations for recycling drop off locations for all materials likely to be generated at this development. Only the nearest locations are provided.

The waste collection contractors and recycling facilities engaged in the project must be in compliance with the requirements of Credit 2 Construction and Demolition Waste (Credit Achievement) under Green Star Buildings v1.
During the engagement waste contractor and recycling facilities, A Disclosure Statement is required from waste contractors and processing facilities outlining how the company and their reporting aligns with the Green Star Construction and Demolition Waste Reporting Criteria.

Table 7: Recycling Directory

	Business Name	Suburb	Distance (km)
Excavation Material	BINGO Industries Recycling Centre	Auburn	6.2
	Sydney Transwaste Industries	Homebush West	10.7
	Benedict Recycling	Belrose	13
Green Waste	BINGO Industries Recycling Centre	Auburn	6.2
	Sydney Transwaste Industries	Homebush West	10.7
	Benedict Recycling	Belrose	13
Bricks	The Brick Pitt	Smithfield	4.4
	BINGO Industries Recycling Centre	Auburn	6.2
	Benedict Recycling	Belrose	13
Tiles	BINGO Industries Recycling Centre	Auburn	6.2
	Concrete Recyclers (Group) Pty Ltd	Camellia	6.4
	Benedict Recycling	Belrose	13
Concrete	BINGO Industries Recycling Centre	Auburn	6.2
	Concrete Recyclers (Group) Pty Ltd	Camellia	6.4
	Benedict Recycling	Belrose	13
Timber	BINGO Industries Recycling Centre	Auburn	6.2
	AKA Civil	Rosehill	10.2
	Benedict Recycling	Belrose	13
Plasterboard	BINGO Industries Recycling Centre	Auburn	6.2
	Wetherill Park Resource Recovery Centre	Wetherill Park	9
	Benedict Recycling	Belrose	13
Metals	BINGO Industries Recycling Centre	Auburn	6.2
	Wetherill Park Resource Recovery Centre	Wetherill Park	9
	Benedict Recycling	Belrose	13

4.4 Site-Specific Operational Measures

Training/Site Inductions

All staff employed during the demolition and construction stages of the development must undertake site-specific induction training regarding the procedures for waste management. Employees of the head contractor will undertake a specific induction outlining their duties and how they are to enforce the waste management procedures.

Induction training will include the following at a minimum:

- Legal obligations;
- Emergency response procedures on site;
- Waste storage locations and separation of waste;
- Litter management in transit and on site;
- The implications of poor waste management practices;
- Correct use of general-purpose spill kits;
- Responsibility and reporting (including identification of personnel responsible for waste management and individual responsibilities).

Materials Selection and Ordering

- Selection of all materials will be undertaken by architectural designers;
- Prefabrication of materials off-site where possible;
- Materials requirements are to be accurately calculated to minimise waste from over-ordering;
- Materials ordering process is to aim at minimisation of materials packaging;
- Material Safety Data Sheets (MSDS) are to accompany all materials delivered to site, where required, to ensure that safe handling and storage procedures are implemented.

Waste Avoidance Opportunities

- Limiting unnecessary excavation;
- Selection of construction materials taking into consideration to their long lifespan and potential for reuse;
- Ordering materials to size and ordering pre-cut and prefabricated materials;
- Reuse of formwork;
- Planned work staging;
- Use of naturally ventilating buildings to reduce ductwork;
- Reducing packaging waste on-site by returning packaging to suppliers where possible, purchasing in bulk and requesting cardboard or metal drums rather than plastics;
- Requesting metal straps rather than shrink wrap and using returnable packaging such as pallets and reels;
- Reduction of PVC use;
- Use of low VOC (volatile organic compounds) paints, floor coverings and adhesives;
- Use of fittings and furnishings that have been recycled or incorporate recycled materials;
- Use of building materials, fittings and furnishings with consideration to their longevity, adaptation, disassembly, reuse and recycling potential.

Site Procedures

- Excavated materials will be used onsite where practical;
- Green waste will be mulched and reused in landscaping either onsite or offsite;
- Concrete, tiles and bricks will be reused or recycled offsite;
- Steel will be recycled offsite; all other metals will be recycled where economically viable;
- Framing timber will be reused on-site or recycled off-site;
- Windows, doors and joinery will be recycled off-site where possible;
- Plumbing, fittings and joinery will be recycled off-site where possible;
- Plasterboard will be re-used in landscaping on-site or returned to the supplier for recycling where possible;
- All used crates will be stored for reuse unless damaged;
- All glass that can be economically recycling will be;
- All solid waste timber, brick, concrete, rock, plasterboard and other materials that cannot be reused or recycled will be taken to an appropriate facility for treatment to recover further resources or for disposal to landfill in an approved manner;
- All asbestos, hazardous and/or intractable wastes are to be disposed of in accordance with WorkCover Authority and EPA requirements;
- Provision for the collection of batteries, fluorescent tubes, smoke detectors and other recyclable resources will be provided on site;
- Beverage container recycling will be provided on-site for employee use;
- All waste and recycling will be disposed of via council approved systems.

4.5 Location and Design of Waste Management Facilities

General Requirements

All waste management facilities onsite should:

- Be conveniently located to enable easy access for on-site movement and collection;
- Be incorporated with other loading/unloading facilities;
- Have sufficient space for the quantity of waste generated and careful source separation of recyclable materials;
- Have sufficient space to contain any on-site treatment facilities, such as compaction equipment;
- Have adequate weather protection and, where required, be enclosed or undercover;
- Be secure and lockable;
- Be well-ventilated and drained to the sewer;
- Be clearly sign-marked to ensure appropriate use.

Waste and Recycling Receptacles

A sufficient quantity of skip bins should be provided for the separate storage of each type of C&D material generated on site. This will assist in maximising source separation and resource recovery, while reducing the costs and quantity of materials disposed of at landfill.

The size of the receptacles should be appropriate to the nature of waste generated and the available storage area. In general, the following options would be acceptable:

Bin Size	Access	Dimensions
2.5m	Top loading	
3m	Drop door walk-in	
4m	Drop door walk-in	
5m	Drop door walk-in	
6m	Double doors walk-in	

Source: Aussie Bins

If the developer chooses to adopt a traditional waste management strategy, whereby waste is deposited into comingled skip bins to be sorted offsite, a single skip bin would be considered sufficient for purpose. However, if the site is to pursue source separation, dedicated skips for the following materials are recommended:

- Timber;
- Plasterboard;
- Concrete;
- Bricks;
- Scrap metal;
- General waste.

Separate receptacles for the safe disposal of hazardous waste types (i.e. light bulbs, batteries, etc) will also be provided where applicable. Where possible, additional bins will be provided in common areas for the collection of commingled recyclables such as beverage containers (glass, plastic, aluminium), paper products, recyclables food containers, etc. Specialised bins for cigarette butts should also be provided.

Safety and Signage

The following safety measures should be considered for the waste storage area:

- Location should not interfere with sight lines of drivers entering or leaving the site;
- Skip bins should be clearly visible and located in well-lit areas;
- Safe paths of travel should be designated using reflective tape, barriers and cones;
- Skip bins must be secured and must not be over-filled to reduce risk of injury through bins moving and falling objects.

Standard signage will be installed in all waste areas, with all skip bins colour coded and labelled appropriately on all sides to allow clear identification of the type of waste to be deposited into each bin.

Refer to the EPA's website for standard construction waste and recycling signs:

www.epa.nsw.gov.au/wastetools/signs-posters-symbols.htm

Space and Siting Requirements

The waste storage area will be located adjacent to the entrance to the site to enable access and allow sufficient space for the required skip bins and servicing requirements. The storage area will also be flexible in order to cater for change of use throughout demolition and construction works.

Where space is restricted, dedicated stockpile areas will be allocated onsite, with regular transfers to the dedicated skip bins for sorting and collections.

The position of the designated waste holding area onsite may change according to building works and the progression of the development. Access, visual amenity and WHS will always be integral to the selection of waste storage area locations. Any stockpile locations will take into account slope and drainage factors to avoid contamination of stormwater drains during rain events.

Servicing and Transport

The frequency of waste removal from site will be determined by the volume of materials deposited into the dedicated skip bins. Skip bins will be monitored on a daily basis by the Site Manager to ensure they do not overflow. If skip bins are reaching capacity, removal and replacement should be organised for within 24 hours.

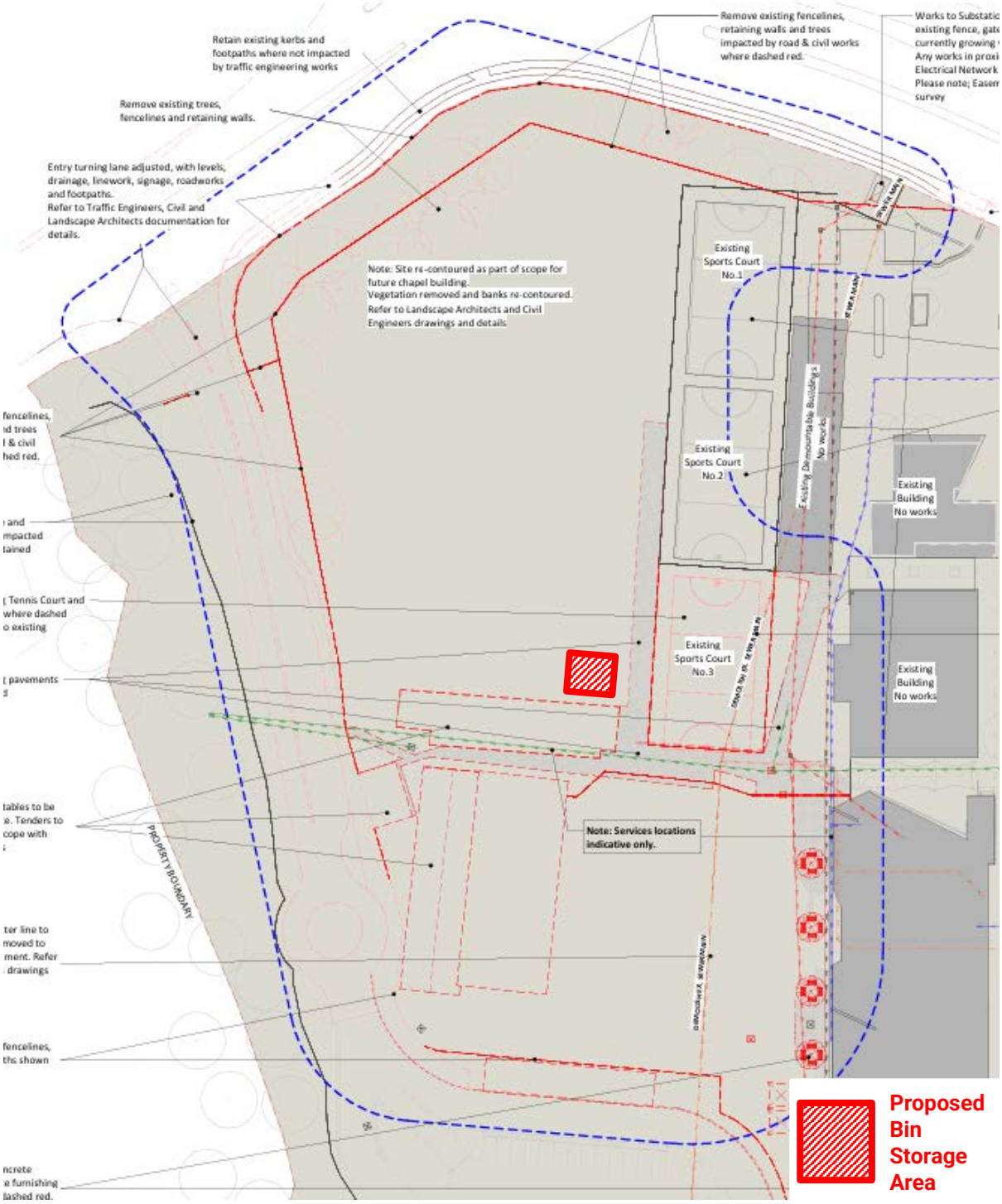
All skip bins leaving the site will be covered with a suitable tarpaulin to reduce spillage of waste while in transit.

All waste collection for construction works will be conducted between approved hours as per Council requirements (typically between 7am and 7pm Monday to Friday, and between 7am and 1pm on Saturdays). All waste generated on site will be transported to an approved and appropriately licensed resource recovery facility and/or landfill site.

4.6 Site Plans

Existing Structures

Note: the proposed bin location is indicative only, this may change based on site logistics



Source: Alleanza Architecture, A004, Rev. B, 06/05/2024 – *Overall Plan Demolition & External Work*

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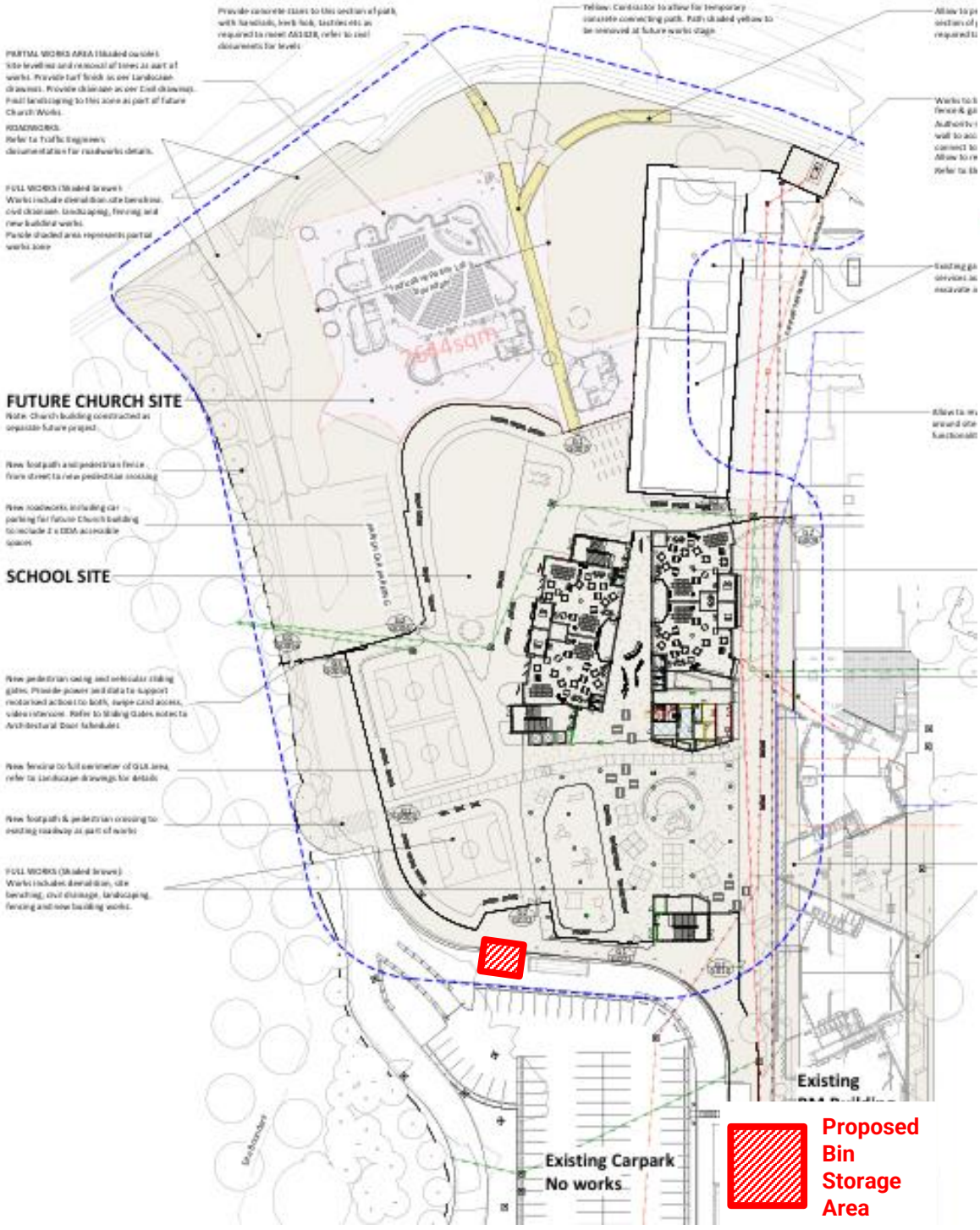
Proposal

Note: the proposed bin location is indicative only, this may change based on site logistics.



Source: *Alleanza Architecture, A005, Rev. B, 06/05/2024 – Overall Plan Proposed Works*

e) Construction Soil and Water Management Sub-Plan

NORTHROP

CIVIL ENGINEERING REPORT: SOIL & WATER MANAGEMENT PLAN

WCC GLA

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PREPARED FOR
Kane Constructions Pty Ltd
2 John Street
Waterloo NSW 2017

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Revisions

Rev	Date	Description	Prepared	Reviewed	Approved
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1. General

1.1 Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Kane Constructions to prepare the Civil Engineering design and documentation in support of a Construction Certificate for the proposed K6 Building development in the Westmead Catholic College Precinct at Darcy Road, Westmead.

This report covers the works shown as the Northrop Drawing Package required for the development of the site including:

- Erosion and Sediment control.

1.2 Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

- Detailed Design Phase Civil Documentation prepared by Northrop:
  - 192734-DDC01.11 Specification Notes – Sheet 01
  - 192734-DDC01.12 Specification Notes – Sheet 02
  - 192734-DDC02.01 Sediment and Soil Erosion Control Plan
  - 192734-DDC02.11 Sediment and Soil Erosion Control Details – Sheet 01
  - 192734-DDC02.12 Sediment and Soil Erosion Control Details – Sheet 02

- NSW Department of Housing Manual, “Managing Urban Stormwater Soil & Construction” 2004 (Blue Book)

- City of Parramatta Council Engineering Design Specifications

2. Erosion and Sediment Control

The objectives of the erosion and sediment control for the development site are to ensure:

- Adequate erosion and sediment control measures are applied prior to the commencement of construction and are maintained throughout construction; and
- Construction site runoff is appropriately treated in accordance with City of Parramatta Council requirements.

As part of the works, the erosion and sedimentation control will be constructed in accordance with Council requirements and “Managing Urban Stormwater Soil & Construction” 2004 (Blue Book) prepared by Landcom, prior to any earthworks commencing on site.

2.1 Sediment Basins

A temporary sediment basin has been designed to capture site runoff during construction and has been located towards the north western side of the site, in the lowest point. The construction of the basin will be undertaken in stages to enable maximum runoff capture assisted by diversion swales and direct runoff to the basin.

Calculations to determine the concept design basin size have been based on available geotechnical information regarding soil types and through the use of the Soils and Construction Volume 1 Manual.

To ensure the sediment basin is working effectively it will be maintained throughout the construction works. Maintenance includes ensuring adequate settlement times or flocculation and pumping of clean water to reach the minimum storage volume at the lower level of the settling zone. The settling zone will be identified by pegs to clearly show the level at which design storage capacity is available.

The pumped water from the sediment basin can be reused for dust control during construction.

Overflow weirs are to be provided to control overflows for rainfall events in excess of the design criteria.

The concept sediment basin sizing is summarised in the table below. Detailed sediment basin sizing, configuration and location shall form part of the Detailed Design Documentation.

The sediment basin has been located for future conversion into the permanent water quality basin.

2.2 Sediment and Erosion Control Measures

Prior to any earthworks commencing on site, sediment and erosion control measures shall be implemented generally in accordance with the Construction Certificate drawings and the "Blue Book". The measures shown on the drawings are intended to be a minimum treatment only as the contractor will be required to modify and stage the erosion and sedimentation control measures to suit the construction program, sequencing and techniques. These measures will include:

- A temporary site security/safety fence is to be constructed around the site, the site office area and the proposed sediment basin.
- Sediment fencing provided downstream of disturbed areas, including any topsoil stockpiles.
- Dust control measures include covering stockpiles, installing fence hessian and watering exposed areas.
- Placement of hay bales or mesh and gravel inlet filters around and along proposed catch drains and around stormwater inlets pits; and
- The construction of a temporary sediment basin as noted above in Section 2.1.
- Stabilised site access at the construction vehicle entry/exits.

Any stockpiled material, including topsoil, shall be located as far away as possible from any associated natural watercourses or temporary overland flow paths. Sediment fences shall be installed to the downstream side of stockpiles and any embankment formation. All stockpiles and embankment formations shall be stabilised by hydroseeding or hydro mulching on formation.

2.3 Wet Weather Management

In circumstances of heavy rain sufficient to affect site access and ground conditions the Site Manager and Site Health, Safety and Environment representative should complete a site inspection before work commences. The inspection needs to be focused on.

- The suitability of pedestrian access to the amenities and into the construction work areas
- The suitability of access for plant and equipment
- The suitability of ground conditions for plant and equipment to operate
- Nominate the construction zones suitable for work to commence
- Actions to remediate those areas not suitable for work to commence (de-water; prepare ground conditions and access ways etc.)

It is noted that the storage of equipment during wet weather will be placed in areas to not prohibit or disrupt operation of the sediment and soil erosion control measures.

3. Further Commentary

3.1 SSD Conditions

The Minister for Planning and Open Spaces has provided Conditions of Consent for the proposed development at Darcy Road, Westmead. Conditions associated with the Construction Soil and Water Management Plan have been provided below with further commentary for consideration by Kane Constructions Pty Ltd and the Certifying Authority.

C17. The Applicant must prepare a Construction Soil and Water Management Plan (CSWMSP), and the plan must address, but not be limited to the following:

a) be prepared by a suitably qualified expert, in consultation with Council.

b) describe all erosion and sediment controls to be implemented during construction, as a minimum, in accordance with the publication Managing Urban Stormwater: Soils & Construction (4th edition, Landcom 2004) commonly referred to as the 'Blue Book'.

c) include an Acid Sulfate Soils Management Plan, if required, including measures for the management, handling, treatment and disposal of acid sulfate soils, including monitoring of water quality at acid sulfate soils treatment areas.

d) provide a plan of how all construction works will be managed in a wet-weather events (i.e. storage of equipment, stabilisation of the Site).

e) detail all off-Site flows from the Site; and

f) Describe the measures that must be implemented to manage stormwater and flood flows for small and large sized events, including, but not limited to, 1 in 5-year ARI and 1 in 100-year ARI [flood prone sites]).

Northrop Commentary

The following comments have been provided with respect to Condition C17 for consideration by Kane Constructions Pty Ltd and the Certifying Authority.

(a) Please refer to the CV of the designer provided in Appendix C. Kane Constructions have approached City of Parramatta Council to initiate discussions regarding the proposed measures to control soil erosion and sedimentation during construction including proposed methods of discharging stormwater from the site.

(b) Please refer to Section 2 of this report and associated Civil Engineering drawings as listed:

- 192734-DDC01.11 Specification Notes – Sheet 01
- 192734-DDC01.12 Specification Notes – Sheet 02
- 192734-DDC02.01 Sediment and Soil Erosion Control Plan
- 192734-DDC02.11 Sediment and Soil Erosion Control Details – Sheet 01
- 192734-DDC02.12 Sediment and Soil Erosion Control Details – Sheet 02

(c) By Geotechnical Engineer

(d) Please refer to section 2.3 of the report.

(e) Once stormwater is collected in the sediment basins and flocculated, clean water is to be discharged to existing site stormwater infrastructure within the development site. From here, clean water is conveyed in the Council owned stormwater infrastructure away from the site.

(f) Please refer to Section 2 of this report and associated Civil Engineering drawings as listed:

- 192734-DDC01.11 Specification Notes – Sheet 01
- 192734-DDC01.12 Specification Notes – Sheet 02
- 192734-DDC02.01 Sediment and Soil Erosion Control Plan
- 192734-DDC02.11 Sediment and Soil Erosion Control Details – Sheet 01
- 192734-DDC02.12 Sediment and Soil Erosion Control Details – Sheet 02

The erosion and sediment control plans have been designed in accordance with the requirements of NSW Department of Housing Manual, “Managing Urban Stormwater Soil & Construction” 2004 (Blue Book) and City of Parramatta Council’s Engineering Design Specifications.

Surface flows generated during storm events up to the 1 in 10-year storm event are directed over land or within the constructed pit and pipe network to the sediment basin. Stormwater runoff that has accumulated in the basin is to be flocculated prior to discharge to the existing stormwater system.

Storm events greater than the 1 in 10 year will still experience flows being directed to the sediment basin however the site will likely become overwhelmed as temporary control measures are not typically sized to cater for such events both in the Blue Book and City of Parramatta Council’s requirements. Stormwater will likely overtop the basin and spill to areas downstream of the works within the broader site area. The project design team have consulted with City of Parramatta Council to discuss the proposed measures to control soil erosion and sedimentation during construction including proposed methods of discharging stormwater from the site.

Appendix A – Soil and Water Management Plans

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CITY OF PARRAMATTA COUNCIL DEVELOPMENT GUIDELINES .THE AFOREMENTIONED GUIDELINES INCLUSIVE OF ALL SPECIFICATIONS TAKE PRECEDENCE OVER NOTES PROVIDED BELOW.

EXISTING SERVICES

1. ALL UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA OR DIAL BEFORE YOU DIG SEARCHES, THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND CONFIRM THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY. NOTE SERVICE AUTHORITY REQUIREMENTS FOR LOCATING OF SERVICES PRIOR TO COMMENCEMENT OF WORKS.
2. CARE TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATIONS ARE TO BE UNDERTAKEN OVER COMMUNICATION, GAS OR ELECTRICAL SERVICES. HAND EXCAVATION ONLY IN THESE AREAS.
3. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL EXISTING SERVICES THAT ARE TO BE RETAINED IN THE VICINITY OF THE PROPOSED WORKS. ANY AND ALL DAMAGE TO THESE SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AT THE CONTRACTORS EXPENSE.
4. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE ADJUSTMENT (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS.
5. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS UNLESS DIRECTED OTHERWISE ON THE DRAWINGS OR BY THE SUPERINTENDENT.
6. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES SERVICES TO ALL BUILDINGS ARE NOT AFFECTED BY THE WORKS AND ARE MAINTAINED AND NOT DISRUPTED.
7. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL GAIN APPROVAL OF THE PROGRAM FOR THE RELOCATION AND/OR CONSTRUCTION OF TEMPORARY SERVICES AND FOR ANY ASSOCIATED INTERRUPTION OF SUPPLY.
8. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.
9. THE CONTRACTOR IS TO ALLOW TO POTHOLE ANY SERVICES WITHIN A PUBLIC RESERVE WITHIN THE EXTENT OF WORKS (E.G. STORMWATER CROSSINGS).

SEDIMENT BASIN MANAGEMENT

1. PRIOR TO ANY FORECAST WEATHER EVENT, LIKELY TO RESULT IN SEDIMENT LADEN RUNOFF ON THE SITE, ANY EXISTING DETENTION BASINS/TRAPS SHALL BE DEWATERED TO PROVIDE SUFFICIENT CAPACITY TO CAPTURE SEDIMENT LADEN WATER FROM THE SITE.
2. ANY SEDIMENT LADEN WATER CAPTURED ON-SITE MUST BE TREATED TO ENSURE IT WILL ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES PRIOR TO ITS RELEASE FROM SITE. A SAMPLE OF THE RELEASED TREATED WATER MUST BE KEPT ON-SITE IN A CLEAR CONTAINER WITH THE SAMPLE DATE RECORDED.
3. NO ALUMINIUM BASED PRODUCTS MAY BE USED TO TREAT TURBID WATER (FLOCCULATING/COAGULANTS) ON-SITE WITHOUT THE PRIOR WRITTEN PERMISSION FROM AN APPROPRIATE COUNCIL OFFICER. THE APPLICANT MUST HAVE DEMONSTRATED ABILITY TO USE SUCH PRODUCTS CORRECTLY AND WITHOUT ENVIRONMENTAL HARM PRIOR TO ANY APPROVAL.
4. THE CHEMICAL/AGENT (FLOCCULATING/COAGULANTS) USED IN TYPE D AND TYPE F BASINS TO TREAT TURBID WATER CAPTURED IN THE BASIN MUST BE APPLIED IN CONCENTRATIONS SUFFICIENT TO ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES (TSS < 50mg/L, TURBIDITY < 60 NTU, 6.5 < pH < 8.5) WITHIN THE 5-DAY RAINFALL DEPTH USED TO CALCULATE THE CAPACITY OF THE BASIN, AFTER A RAINFALL EVENT.
5. ALL MANUFACTURERS INSTRUCTIONS MUST BE FOLLOWED FOR THE USE OF ANY CHEMICALS/AGENTS USED ON-SITE, EXCEPT WHERE APPROVED BY THE RESPONSIBLE PERSON OR AN APPROPRIATE COUNCIL OFFICER.
6. SUFFICIENT QUANTITIES OF CHEMICALS/AGENTS TO TREAT TURBID WATER (FLOCCULATING/COAGULANTS) MUST BE PLACED SUCH THAT WATER ENTERING THE BASINS/SEDIMENT TRAP MIXES WITH THE CHEMICALS/AGENTS AND IS CARRIED INTO THE BASIN/TRAP.
7. ANY BASIN MUST BE DEWATERED AS SOON AS PRACTICAL, ONCE WATER CAPTURED IN THE BASIN ACHIEVES COUNCIL'S WATER QUALITY OBJECTIVES.
8. INSPECT THE SEDIMENT BASINS AFTER EACH RAINFALL EVENT AND/OR WEEKLY. ENSURE THAT ALL SEDIMENT IS REMOVED ONCE THE SEDIMENT STORAGE ZONE IS FULL. ENSURE THAT OUTLET AND EMERGENCY SPILLWAY WORKS ARE MAINTAINED IN A FULLY OPERATIONAL CONDITION AT ALL TIMES.

ACCESS AND SAFETY

1. THE CONTRACTOR SHALL COMPLY WITH ALL STATUTORY AND INDUSTRIAL REQUIREMENTS FOR PROVISION OF A SAFE WORKING ENVIRONMENT INCLUDING TRAFFIC CONTROL.
2. THE CONTRACTOR SHALL PROVIDE TRAFFIC MANAGEMENT PLANS FOR THE PROPOSED WORKS COMPLETED BY A SUITABLY QUALIFIED PERSON AND APPROVED BY COUNCIL / REGULATORY AUTHORITY. WORK IS NOT TO COMMENCE ON SITE PRIOR TO APPROVAL OF TRAFFIC MANAGEMENT SCHEME.
3. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES ACCESS TO BUILDINGS ADJACENT THE WORKS IS NOT DISRUPTED.
4. WHERE NECESSARY THE CONTRACTOR SHALL PROVIDE SAFE PASSAGE OF VEHICLES AND/OR PEDESTRIANS THROUGH OR BY THE SITE.
5. THE CONTRACTOR SHALL ENSURE PUBLIC ACCESS EXTERNAL TO THE SITE IS IN ACCORDANCE WITH COUNCILS / AUTHORITY / SITE MANAGERS REQUIREMENTS.

SEDIMENT AND SOIL EROSION

1. THE SEDIMENT & EROSION CONTROL PLAN PRESENTS CONCEPTS ONLY. THE CONTRACTOR SHALL AT ALL TIMES BE RESPONSIBLE FOR THE ESTABLISHMENT & MANAGEMENT OF A DETAILED SCHEME MEETING COUNCILS AND OTHER REGULATORY AUTHORITY REQUIREMENTS AND MAKE PAYMENT OF ALL FEES.
2. THE CONTRACTOR SHALL INSTIGATE ALL SEDIMENT AND EROSION CONTROL MEASURES IN ACCORDANCE WITH STATUTORY REQUIREMENTS AND IN PARTICULAR THE 'BLUE BOOK' (MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION), PRODUCED BY LANDCOM AND COUNCILS POLICIES. THESE MEASURES ARE TO BE INSPECTED AND MAINTAINED ON A DAILY BASIS.
3. THE CONTRACTOR SHALL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS INSTRUCTED IN THE DRAWINGS AND ADHERE TO ALL REGULATORY AUTHORITY REQUIREMENTS.
4. THE CONTRACTOR SHALL INFORM ALL SUB CONTRACTORS OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION TO DOWNSTREAM LANDS AND WATERWAYS.
5. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE SHALL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE;
   - 5.1. CONSTRUCT TEMPORARY STABILISED SITE ACCESS INCLUSIVE OF SHAKE DOWN / WASH PAD.
   - 5.2. INSTALL ALL TEMPORARY SEDIMENT FENCES AND BARRIER FENCES. WHERE FENCES ADJACENT EACH OTHER, THE SEDIMENT FENCE CAN BE INCORPORATED INTO THE BARRIER FENCE.
   - 5.3. INSTALL SEDIMENT CONTROL MEASURES AS OUTLINED ON THE APPROVED PLANS.
6. UNDERTAKE SITE DEVELOPMENT WORKS SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF MINIMUM WORKABLE SIZE.
7. AT ALL TIMES AND IN PARTICULAR DURING WINDY AND DRY WEATHER, LARGE UNPROTECTED AREAS WILL BE STABILISED / KEPT MOIST (NOT WET) TO KEEP DUST UNDER CONTROL ENSURING CONFORMITY TO REGULATORY AUTHORITY REQUIREMENTS.
8. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) SHALL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
9. WATER SHALL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS THE CATCHMENT AREA HAS BEEN STABILISED AND/OR ANY LIKELY SEDIMENT BEEN FILTERED OUT.
10. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES SHALL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE STABILISED / REHABILITATED.
11. ALLOW FOR GRASS STABILISATION OF EXPOSED AREAS, OPEN CHANNELS AND ROCK BATTERS DURING ALL PHASES OF CONSTRUCTION.
12. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED TO ENSURE THAT THEY OPERATE EFFECTIVELY. REPAIRS AND/OR MAINTENANCE SHALL BE UNDERTAKEN REGULARLY AND AS REQUIRED, PARTICULARLY FOLLOWING RAIN EVENTS.
13. RECEPTORS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER SHALL BE DISPOSED OF IN ACCORDANCE WITH REGULATORY AUTHORITY REQUIREMENTS. CONTRACTOR TO PAY ALL FEES AND PROVIDE EVIDENCE OF SAFE DISPOSAL.
14. IF A TEMPORARY SEDIMENT BASIN IS REQUIRED, ENSURE SAFE BATTER SLOPES IN ACCORDANCE WITH THE GEOTECHNICAL REPORT. MAINTAIN ADEQUATE STORAGE VOLUME IN ACCORDANCE WITH PLANS. TEMPORARY PUMP 'CLEAN FLOCCULATED' WATER TO AUTHORITIES STORMWATER SYSTEM. ENSURE WHOLE DISTURBED SITE RUN-OFF IS DIRECTED TO TEMPORARY SEDIMENT BASIN.

EARTHWORKS

1. AT THE COMMENCEMENT OF FILLING OPERATIONS FOR BULK EARTHWORKS A GEOTECHNICAL ENGINEER IS TO VISIT THE SITE & CONFIRM THE SUITABILITY OF THE METHODOLOGY OF ACHIEVING THE REQUIRED COMPACTION EARTHWORKS REQUIREMENTS.
2. STRIP TOPSOIL, VEGETABLE MATTER AND RUBBLE TO EXPOSE NATURALLY OCCURRING MATERIAL AND STOCKPILE ON SITE AS DIRECTED BY THE SUPERINTENDENT.
3. WHERE FILLING IS REQUIRED TO ACHIEVE DESIGN SUBGRADE, PROOF ROLL EXPOSED NATURAL SURFACE WITH A MINIMUM OF TEN PASSES OF A VIBRATING ROLLER (MINIMUM STATIC WEIGHT OF 10 TONNES) IN THE PRESENCE OF THE SUPERINTENDENT OR CERTIFYING ENGINEER.
4. THE CONTRACTOR IS TO ALLOW FOR A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO PROVIDE ADVICE AND CERTIFICATION OF ANY WORKS ASSOCIATED WITH TREATING OR MANAGING UNSUITABLE GROUND CONDITIONS THROUGHOUT THE CONTRACT (e.g. STABILITY OF EXCAVATIONS, POOR SUBGRADE, THE EXISTING QUARRY AREA etc).
5. ALL SOFT, WET OR UNSUITABLE MATERIAL IS TO BE REMOVED AS DIRECTED BY THE SUPERINTENDENT AND REPLACED WITH APPROVED MATERIAL SATISFYING THE REQUIREMENTS BELOW.
6. PROVIDE CERTIFICATES VERIFYING THE QUALITY OF IMPORTED MATERIAL FOR THE SUPERINTENDENTS APPROVAL.
7. ALL FILL MATERIAL SHALL BE PLACED IN MAXIMUM 200mm THICK LAYERS (LOOSE) AND COMPACTED AT OPTIMUM MOISTURE CONTENT (+ OR - 2%) TO ACHIEVE A DRY DENSITY DETERMINED IN ACCORDANCE WITH AS1289.2.1.1, AS1289.5.7.1 AND AS1289.5.8.8 OF NOT LESS THAN THE FOLLOWING STANDARD MINIMUM DRY DENSITY;

LOCATION	COMPACTION REQUIREMENT
LANDSCAPED AREAS	98% SMDD
ROADS	100% SMDD (IN ACCORDANCE WITH COUNCIL SPECIFICATIONS)
PAVED AREAS	100% SMDD (IN ACCORDANCE WITH COUNCIL SPECIFICATIONS)

8. TESTING OF THE SUBGRADE SHALL BE CARRIED OUT BY AN APPROVED N.A.T.A. REGISTERED LABORATORY AT THE CONTRACTORS EXPENSE UNLESS AGREED DIFFERENTLY WITH THE PRINCIPAL.
9. ALLOW THE FOLLOWING COMPACTION TESTING BY N.A.T.A. REGISTERED LABORATORY FOR PLATFORMS AND FILL LAYERS IN ACCORDANCE WITH THE LATEST VERSION OF AS3798. (MINIMUM 3 TESTS PER LAYER) OR 1 TEST PER MATERIAL TYPE PER 2500sq.m OR 1 TEST.
10. WHERE TEST RESULTS ARE BELOW THE SPECIFIED COMPACTION, RECOMPACT (TYNING FIRST AS NECESSARY) AND RETEST UNTIL SPECIFIED COMPACTION STANDARDS ARE ACHIEVED, OTHERWISE SUBGRADE REPLACEMENT IS REQUIRED IF COMPACTION STANDARDS ARE NOT ACHIEVED.
11. ALLOW FOR EXCAVATION IN ALL MATERIALS AS FOUND U.N.O. NO ADDITIONAL PAYMENTS WILL BE MADE FOR EXCAVATION IN WET OR HARD GROUND.
12. WHERE THERE IS INSUFFICIENT EXCAVATED MATERIAL SUITABLE FOR FILLING OR SUBGRADE REPLACEMENT, THE CONTRACTOR IS TO ALLOW TO IMPORT FILL. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING;
   - 12.1. BE OF VIRGIN EXCAVATED NATURAL MATERIAL OR
   - 12.2. CONTRACTOR TO PROVIDE EVIDENCE IMPORT IS SUITABLE FOR USE
   - 12.3. PLASTICITY INDEX BETWEEN 2-15% AND CBR > 8
   - 12.4. FREE FROM ORGANIC AND PERISHABLE MATTER
   - 12.5. MAXIMUM SIZE 50mm, PASSING 75 MICRON SIEVE (<25%)
13. THE CONTRACTOR SHALL PROGRAM THE EARTHWORKS OPERATION SO THAT THE WORKING AREAS ARE ADEQUATELY DRAINED DURING THE PERIOD OF CONSTRUCTION. THE SURFACE SHALL BE GRADED AND SEALED OFF TO REMOVE DEPRESSIONS, ROLLERS MARKS AND SIMILAR WHICH WOULD ALLOW WATER TO POND AND PENETRATE THE UNDERLYING MATERIAL. ANY DAMAGE RESULTING FROM THE CONTRACTOR NOT OBSERVING THESE REQUIREMENTS SHALL BE RECTIFIED AT THEIR COST.
14. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE AND MAINTAIN THE INTEGRITY OF ALL SERVICES, CONDUITS AND PIPES DURING CONSTRUCTION, SPECIFICALLY DURING THE BACKFILLING AND COMPACTION PROCEDURE. ANY AND ALL DAMAGE TO NEW OR EXISTING SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST.

DEEP EXCAVATIONS

15. PRIOR TO THE COMMENCEMENT OF EXCAVATION WORKS GREATER THAN 1.5m IN DEPTH, THE CONTRACTOR SHALL OBTAIN THE SERVICES OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO DETERMINE THE STABILITY OF MATERIAL BEING EXCAVATED AND BENCHING REQUIREMENTS / MINIMUM BATTER SLOPES.
16. THE CONTRACTOR MUST PROVIDE THE SUPERINTENDENT AND OR THE DESIGN ENGINEER WITH A COPY OF THE GEOTECHNICAL ENGINEERS REPORT PRIOR TO PRACTICAL COMPLETION.
17. THE CONTRACTOR IS TO PROVIDE SAFETY BARRIERS, FENCING AND THE LIKE IN ACCORDANCE WITH OH&S AND REGULATORY AUTHORITY REQUIREMENTS AND TO ENSURE THE WORK SITE IS SAFE AT ALL TIMES.

LANDSCAPING

1. REFER TO DRAWINGS BY OTHERS FOR DETAILS OF PROPOSED LANDSCAPING TREATMENT AND TREE PROTECTION REQUIREMENTS

STORMWATER DRAINAGE

1. ALL PIPES SHALL BE CLASS 2 RUBBER-RING JOINTED RCP U.N.O. WHERE uPVC PIPES HAVE BEEN SPECIFIED, THE FOLLOWING CLASS PIPEWORK IS TO BE ADOPTED U.N.O. ø100mm OR LESS TO BE CLASS 'SN10' AND ABOVE ø100mm TO BE CLASS 'SN8'. CLASS 4 PIPES ARE TO BE USED WHERE COVER OVER THE PIPE IS BELOW 600mm AND BENEATH A TRAFFICABLE PAVEMENT.
2. uPVC STORMWATER LINES PASSING UNDER FLOOR SLABS TO BE CONCRETE ENCASED.
3. FRC PIPES EQUAL TO THAT OF THE STEEL REINFORCED CONCRETE PIPE CLASS SPECIFIED ON THE DRAWINGS MAY BE USED SUBJECT TO APPROVAL FROM THE SUPERINTENDENT.
4. ALL PIPE ARE TO BE LAID AT 1.0% MIN GRADE U.N.O.
5. COVERS
   - 5.1. USE HOT DIPPED GALVANISED COVERS AND GRATES COMPLYING WITH RELEVANT COUNCIL AND AUSTRALIAN STANDARDS.
   - 5.2. ALL COVERS AND GRATES TO BE POSITIONED IN A FRAME AND MANUFACTURED AS A UNIT.
   - 5.3. ALL COVERS AND GRATES TO BE FITTING WITH POSITIVE COVER LIFTING KEYS
   - 5.4. OBTAIN SUPERINTENDENTS APPROVAL FOR THE USE OF CAST IRON SOLID COVERS AND GRATES. CAST IRON SOLID COVERS (IF APPROVED) TO CONSIST OF CROSS-WEBBED, CELLULAR CONSTRUCTION WITH THE RIBS UPPERMOST TO ALLOW INFILLING WITH CONCRETE. INSTALL POSITIVE COVER LIFTING KEYS AND PLASTIC PLUGS.
   - 5.5. UNLESS DETAILED OR SPECIFIED OTHERWISE, COVERS AND GRATES TO BE CLASS 'D' IN VEHICULAR PAVEMENTS AND CLASS 'B' ELSEWHERE.
   - 5.6. ALL GRATED TRENCH DRAINS SHOULD BE 'CLASS D' CAST IRON WITHIN VEHICULAR PAVEMENTS AND CLASS 'B' HEEL SAFE WITHIN PEDESTRIAN PAVEMENTS.
   - 5.7. UNLESS DOCUMENTED OTHERWISE, HEELSAFE LIDS ARE TO BE USED IN ALL PEDESTRIAN ACCESSIBLE AREAS.
6. ALL PIPE BENDS, JUNCTIONS, ETC ARE TO BE PROVIDED USING PURPOSE MADE FITTINGS OR STORMWATER PITS.
7. ALL CONNECTIONS TO EXISTING DRAINAGE STRUCTURES SHALL BE MADE IN A TRADESMAN-LIKE MANNER AND CEMENT RENDERED TO ENSURE A SMOOTH FINISH.
8. ENSURE PIPEWORK DOES NOT PROTRUDE BEYOND THE INSIDE FACE OF THE PIT WALL. PIPEWORK IS TO FINISH FLUSH WITH INTERNAL WALL (UNLESS OTHERWISE NOTED OR DETAILED). CONNECTION TO BE RENDERED AND MADE NEAT ON THE INSIDE FACE OF THE PIT
9. THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL FITTINGS AND SPECIALS INCLUDING VARIOUS PIPE ADAPTORS TO ENSURE PROPER CONNECTION BETWEEN DISSIMILAR PIPEWORK.
10. U.N.O. MATERIAL USED FOR BEDDING OF PIPES SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED AND FREE OF ORGANIC AND CLAY MATERIAL.
11. INSTALLATION SHALL BE U.N.O TYPE HS2 UNDER ROADS AND H2 UNDER GENERAL AREAS IN ACCORDANCE WITH AS3725.
12. THE CONTRACTOR SHALL ENSURE AND PROTECT THE INTEGRITY OF ALL STORMWATER PIPES DURING CONSTRUCTION. ANY AND ALL DAMAGE TO THESE PIPES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AND AT NO EXTRA COST TO THE CONTRACT.
13. NOTE THAT THE PIT COVER LEVEL NOMINATED IN GUTTERS ARE TO THE INVERT OF THE GUTTER WHICH ARE 40mm LOWER THAN THE PAVEMENT LEVEL AT LIP OF GUTTER. REFER KERB DETAILS FOR CONFIRMATION.
14. SUBSOIL DRAINAGE
15. ø100mm SUBSOIL DRAINAGE LINES WITH NON-WOVEN GEOTEXTILE FILTER SOCK SURROUND SHALL BE CONNECTED TO A STORMWATER DRAINAGE PIT (AT MIN 1% LONGITUDINAL GRADE) AND PROVIDED IN THE FOLLOWING LOCATIONS;
   - 15.1. THE HIGH SIDE OF PROPOSED TRAFFICKED PAVEMENT AREAS.
   - 15.2. ALL PLANTER AND TREE BEDS PROPOSED ADJACENT TO PAVEMENT AREAS.
   - 15.3. BEHIND RETAINING WALLS (IN ACCORDANCE WITH RETAINING WALL DETAILS).
   - 15.4. UPSTREAM OF STORMWATER PITS
   - 15.5. BENEATH FLEXIBLE PAVEMENT ALONG A SAG PROFILE
   - 15.6. ALL OTHER AREAS SHOWN ON DRAWINGS.
   - 15.7. CONTRACTOR IS TO MAKE ALLOWANCE IN BOTH TENDER AND CONSTRUCTION COSTING TO ALLOW FOR SUBSURFACE DRAINAGE BEHIND ALL RETAINING WALLS / ABOVE LOCATIONS AND TO MAKE CONNECTION TO STORMWATER SYSTEM.
   - 15.8. THE PRINCIPLE CONTRACTOR IS TO ALLOW TO CONNECT ALL SUBSOIL FROM LANDSCAPING WORKS TO CIVIL STORMWATER PITS INCLUDING BUT NOT LIMITED TO AT THE BASE OF PROPOSED NEW TREES. REFER TO LANDSCAPE ARCHITECT DOCUMENTATION FOR LOCATIONS.
16. WHERE SUBSOIL DRAINAGE PASSES BENEATH BUILDINGS / PAVED AREAS AND/OR PAVEMENTS. CONTRACTOR TO ENSURE ø100mm CLASS 'SN10' uPVC DRAINAGE LINE IS USED AND THAT PROPRIETARY FITTINGS ARE USED TO RECONNECT SUBSOIL DRAINAGE LINE.
17. THE CONTRACTOR SHALL INSTALL INSPECTION OPENINGS / CLEAROUTS TO ALL SUBSOIL DRAINAGE LINES AND DOWNPIPE LINES AS SPECIFIED ON DRAWINGS AND IN ACCORDANCE WITH COUNCIL SPECIFICATIONS. HOWEVER AS A MINIMUM THEY ARE TO BE PLACED AT MAXIMUM 30m CENTRES AND AT ALL UPSTREAM ENDPOINTS.
18. PROVIDE 3.0m LENGTH OF ø100 SUBSOIL DRAINAGE LINE WRAPPED IN NON-WOVEN GEOTEXTILE FILTER FABRIC TO THE UPSTREAM SIDE OF STORMWATER PITS, LAID IN STORMWATER PIPE TRENCHES AND CONNECTED TO DRAINAGE PIT.

STORMWATER DRAINAGE (CONTINUED)

19. IN AREAS WHERE DUMPED / HAND PLACED ROCK IS USED AS A MEANS OF SCOUR PROTECTION, CONTRACTOR IS TO EXCAVATE A MINIMUM OF 100mm FROM PROPOSED SURFACE, LEVEL AND COMPACT SUBGRADE AS SPECIFIED. ROCK TO THEN BE PLACED ON GEOTEXTILE FILTER FABRIC A34.
20. THE CONTRACTOR IS TO ENSURE THAT A MINIMUM 150mm CLEARANCE IS PROVIDED BETWEEN THE INTERNAL FACE OF PIPE AND ADJACENT INTERNAL PIT WALLS.
21. WHERE TRENCHES ARE IN ROCK, THE PIPE SHALL BE BEDDED ON A MIN 50mm CONCRETE BED (OR 75mm THICK BED OF 12mm BLUE METAL) UNDER THE BARREL OF THE PIPE. THE PIPE COLLAR AT NO POINT SHALL BEAR ON THE ROCK. (E.G. CLEAN 5-12mm AGGREGATE).
22. PRINCIPLE CONTRACTOR TO ALLOW TO DRAIN ELECTRICAL AND COMMUNICATION PITS TO STORMWATER INFRASTRUCTURE IN ACCORDANCE WITH CIVIL ENGINEERING REQUIREMENTS AND ELECTRICAL ENGINEERING REQUIREMENTS.

PRECAST STORMWATER PITS

1. THE USE OF PRE-CAST STORMWATER DRAINAGE PITS IS NOT ACCEPTED WITHOUT CONFIRMATION BETWEEN NORTHROP ENGINEERS AND THE CONTRACTOR REGARDING QUALITY CONTROL AND CERTIFICATION OF FINISHES.
2. REFER MANUFACTURERS SPECIFICATIONS FOR INSTALLATION GUIDELINES.
3. PRECAST PIT TO BE PLACED ON MINIMUM 150mm THICK CONCRETE PAD AND BED MINIMUM 50mm WHILST CONCRETE IS STILL PARTIALLY WET.
4. ENSURE PENETRATION IS CORED THROUGH PIT FACE TO ALLOW CONNECTION AND IS NOT OVERSIZED.
5. ENSURE A SEALED FINISH AT PIPE CONNECTIONS BY HAND-APPLYING MINIMUM 150mm THICK CONCRETE AROUND PIPE AT THE EXTERNAL FACE OF THE PIT. ENSURE CONCRETE DOES NOT AFFECT THE INTEGRITY OF THE SUBSOIL DRAINAGE CONNECTED TO THE PIT.
6. ENSURE A SMOOTH SEALED FINISH AT PIPE CONNECTIONS BY HAND APPLYING CONCRETE AROUND THE PIPE ON THE INTERNAL FACE OF THE PIT TO FILL IN ANY VOIDS CREATED WHEN PENETRATION FOR THE PIPE WAS CORED.
7. ENSURE PIPEWORK DOES NOT PROTRUDE BEYOND THE INSIDE FACE OF THE PIT WALL. PIPEWORK IS TO FINISH FLUSH WITH INTERNAL WALL (UNLESS OTHERWISE NOTED OR DETAILED). CONNECTION TO BE RENDERED AND MADE NEAT ON THE INSIDE FACE OF THE PIT.
8. ENSURE THE OUTLET PIPE IS CONNECTED AT THE INVERT LEVEL OF THE PIT TO DRAIN. ALTERNATIVELY FILL THE BASE OF THE PIT WITH MASS CONCRETE (MIN 50mm THICK) OR APPROVED GROUTING COMPOUND (LESS THAN 50mm THICK) TO DRAIN.
9. PROVIDE CONCRETE BENCHING TO SIDES OF PIT TO SUIT PIPE DIAMETER. HEIGHT TO MATCH MINIMUM 1/3 PIPE DIAMETER.

SIGNAGE AND LINEMARKING

1. ALL SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH AUSTRALIAN STANDARDS 1742 / TfNSW STANDARDS AND SPECIFICATIONS.
2. LINE MARKING AND PAINT SHALL BE IN ACCORDANCE WITH AS1742.3 AND TfNSW STANDARDS.
3. PAINT SHALL BE TYPE 3 CLASS 'A' AND THE COLOUR SHALL BE WHITE AND NOT SUBJECT TO DISCOLOURATION BY BITUMEN FROM ROAD SURFACE. ALL PAINT TO BE APPLIED BY MECHANICAL SPRAYER. LINE MARKING SHALL BE APPLIED AT A WET THICKNESS OF BETWEEN 0.35mm AND 0.40mm
4. PAINT SHALL BE APPLIED AT A WET THICKNESS OF BETWEEN 0.35mm AND 0.40mm.
5. CARPARK LINEMARKING TO BE 80mm WIDE.
6. WHEEL STOPS TO BE PROVIDED FOR PARKING SPOTS ADJACENT TO A WALL WITHIN 1.1m OF THE FACE OF KERB IN ACCORDANCE WITH AS1428.1
7. REFER TO AUSTROADS FOR REMOVAL OF LINEMARKING.

SITEWORKS

1. ALL WORKS TO BE IN ACCORDANCE WITH RELEVANT LOCAL COUNCIL / REGULATORY AUTHORITIES REQUIREMENTS, ALL SPECIFICATIONS AND AUSTRALIAN STANDARDS. CONFLICTS BETWEEN SAID DOCUMENTS SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.
2. THE CONTRACTOR IS TO REVIEW THE DRAWINGS PRIOR TO PRICING AND COMMENCEMENT AND REPORT ANY DISCREPANCIES TO NORTHROP.
3. ANY PRODUCTS SPECIFIED OR USED TO BE VERIFIED BY THE CONTRACTOR AS BEING SAFE AND APPROPRIATE FOR USE. NORTHROP DO NOT TAKE ANY RESPONSIBILITY FOR THE USE OF UNSAFE PRODUCTS
4. THE CONTRACTOR IS TO DESIGN, OBTAIN APPROVALS AND CARRY OUT REQUIRED TEMPORARY TRAFFIC CONTROL PROCEDURES DURING CONSTRUCTION IN ACCORDANCE WITH ALL REGULATORY AUTHORITIES, INCLUSIVE OF LOCAL COUNCIL REGULATIONS AND REQUIREMENTS.
5. THE CONTRACTOR IS TO OBTAIN ALL AUTHORITY APPROVALS AS REQUIRED PRIOR TO COMMENCEMENT OF WORKS.
6. RESTORE ALL PAVED, COVERED, GRASSED AND LANDSCAPED AREAS TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT ON COMPLETION OF WORKS. WHERE PLANTING OF NEW GRASS IS NECESSARY REFER TO LANDSCAPE ARCHITECT AND / OR ARCHITECT DOCUMENTATION.
7. ON COMPLETION OF ANY TRENCHING WORKS, ALL DISTURBED AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT, INCLUDING KERBS, FOOTPATHS, CONCRETE AREAS, GRAVEL, GRASSED AREAS AND ROAD PAVEMENTS.
8. THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR PRIOR TO COMMENCEMENT OF WORKS.THE CONTRACTOR IS TO ENSURE THAT SURVEY BOUNDARIES ARE DERIVED FROM A CADASTRAL SURVEY RATHER THAN A DETAIL SURVEY.
9. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS ONSITE PRIOR TO LODGMENT OF TENDER AND ONSITE WORKS. THE PRICE AS TENDERED SHALL BE INCLUSIVE OF ALL WORKS SHOWN ON THE TENDER PROJECT DRAWINGS. ADDITIONAL PAYMENTS FOR WORKS SHOWN ON THE TENDER PROJECT DRAWINGS WILL NOT BE APPROVED.
10. DO NOT OBTAIN DIMENSIONS BY SCALING DRAWINGS.
11. IN CASE OF DOUBT OR DISCREPANCY REFER TO SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
12. WHERE NEW WORKS ABUT EXISTING THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED. MAKE SMOOTH TRANSITION TO EXISTING FEATURES AND MAKE GOOD WHERE JOINED.
13. TRENCHES THROUGH EXISTING ROAD AND CONCRETE PAVEMENTS SHALL BE SAWCUT TO FULL DEPTH OF CONCRETE AND A MIN 50mm IN BITUMINOUS PAVING.
14. ALL CIVIL ENGINEERING DESIGN HAS BEEN DOCUMENTED UNDER THE ASSUMPTION THAT ALL NECESSARY SITE CONTAMINATION REMEDIATION WORKS HAVE BEEN SATISFACTORILY COMPLETED (IF APPLICABLE) AND THAT THE SITE IS NOT AFFECTED BY ANY SOIL STRATA OR GROUNDWATER TABLE CONTAMINATION.
15. NOTES ON DETAILS PROVIDED TAKE PRECEDENCE OVER SPECIFICATION NOTES UNLESS IN CONTRADICTION WITH COUNCIL/AUTHORITY SPECIFICATIONS/DETAILS. CONTRACTOR TO CONSULT WITH NORTHROP FOR ANY DISCREPANCIES.
16. IF THE CONTRACTOR DISCOVERS HAZARDOUS/CONTAMINATED MATERIAL THE CONTRACTOR SHALL CONSULT WITH AN ENVIRONMENTAL SPECIALIST.
17. THE CONTRACTOR IS RESPONSIBLE FOR DEALING WITH COMMUN

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CITY OF PARRAMATTA COUNCIL DEVELOPMENT GUIDELINES .THE AFOREMENTIONED GUIDELINES INCLUSIVE OF ALL SPECIFICATIONS TAKE PRECEDENCE OVER NOTES PROVIDED BELOW.

ENGINEERING CERTIFICATION

1. TO CERTIFY THE CONSTRUCTED CIVIL WORKS, A QUALIFIED EXPERIENCED ENGINEER IS TO VISIT THE SITE TO OBSERVE CONSTRUCTION TECHNIQUES AND VARIOUS ELEMENTS THAT MAY BE CONCEALED WHEN THE WORKS ARE COMPLETE.

2. THIS SPECIFICATION ALLOWS FOR CERTIFICATION OF WORKS CONTROLLED BY A PRIVATE CERTIFIER FOR LAND DEVELOPMENT WORKS. THIS SPECIFICATION DOES NOT COVER CERTIFICATION REQUIREMENTS FOR AUTHORITIES SUCH AS COUNCIL, TfNSW OR WATER NSW. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND PROVIDE ALL PROJECT SPECIFIC CONSTRUCTION COMPLIANCE (WORKS AS EXECUTED) INFORMATION TO THE SATISFACTION OF THE STAKEHOLDER / AUTHORITY. DISCREPANCIES BETWEEN THIS SPECIFICATION AND SPECIFICATIONS OF OTHER EXTERNAL STAKEHOLDERS / AUTHORITIES IS TO BE REPORTED TO THE SUPERINTENDENT FOR CLARIFICATION.

3. THE CONTRACTOR IS TO AGREE WITH THE ENGINEER AN APPROPRIATE SITE VISIT SCHEDULE AND FEE ARRANGEMENT PRIOR TO COMMENCEMENT OF THE WORKS. THE CONTRACTOR SHALL ENSURE THAT THE ENGINEER CAN SAFELY ACCESS ALL CIVIL ELEMENTS TO BE REVIEWED. SITE VISITS ARE CONDUCTED DURING NORMAL BUSINESS HOURS. WE REQUIRE TWO (2) WORKING DAY NOTICE FOR ANY SITE VISIT.

4. TO PROVIDE CERTIFICATION THE ENGINEER MUST VISIT THE SITE TO OBSERVE.
   - 4.1. PAVEMENTS
     - 4.1.1. POOR SUBGRADE CONDITIONS
     - 4.1.2. PROOF ROLLING OF SUB-GRADE
     - 4.1.3. PLACEMENT OF SUB-BASE COURSE, BASE COURSE AND WEARING COURSE.
     - 4.1.4. PLACEMENT OF STEEL REINFORCEMENT , DOWELS AND JOINT CRADLES PRIOR TO POURING OF CONCRETE
   - 4.2. EARTHWORKS
     - 4.2.1. TOPSOIL STRIP
     - 4.2.2. EARTHWORKS BATTER
     - 4.2.3. FILLING
   - 4.3. STORMWATER DRAINAGE
     - 4.3.1. DRAINAGE TRENCHES PRIOR TO BACKFILLING
     - 4.3.2. LEGAL POINT OF CONNECTION PRIOR TO BACKFILLING
     - 4.3.3. ANY OTHER DRAINAGE STRUCTURE THAT MAY BE CONCEALED DURING THE COURSE OF THE WORKS
   - 4.4. CONCRETE STRUCTURES
     - 4.4.1. PLACEMENT OF ANY STEEL REINFORCEMENT PRIOR TO CONSTRUCTION.

5. THE CONTRACTOR SHALL PROVIDE SURVEYED LEVELS, PREPARED BY A QUALIFIED SURVEYOR FOR SUBGRADE, SUB-BASE COURSE, BASE COURSE AND WEARING COURSE.

6. THE CONTRACTOR SHALL PROVIDE WORKS AS EXECUTED (WAE) DOCUMENTATION PREPARED BY A QUALIFIED PRACTISING SURVEYOR. THE WAE DRAWINGS SHALL CLEARLY SHOW, STORMWATER GRATE/ COVER LEVELS, STORMWATER PIT INVERT LEVELS AND CORRESPONDING INVERT LEVELS OF ANY INCOMING OR OUTGOING PIPES, DIAMETER OF ALL PIPES, DIMENSIONS AND VOLUME OF ON-SITE DETENTION FACILITIES, INVERT LEVELS OF ORIFICE PLATES, OVERFLOW WEIRS, BASE OF TANK FINISHED LEVELS OF PAVEMENTS. THE WAE SHALL SHOW WHERE THE SIZE OR ALIGNMENT OF CIVIL ENGINEERING ELEMENTS WHEN THEY DEVIATE FROM THE DESIGN DOCUMENTATION.

7. THE WAE DRAWINGS SHALL BE STAMPED WITH THE FOLLOWING STATEMENT "THESE WAE DRAWINGS HAVE BEEN PREPARED BY [COMPANY NAME] AND ARE A TRUE AND ACCURATE REPRESENTATION OF THE CONSTRUCTED WORKS". EACH DRAWING SHALL BE SIGNED AND DATED BY THE SURVEYOR WHO PREPARED THE DRAWINGS.

   THESE WAE DRAWINGS HAVE BEEN PREPARED BY [COMPANY NAME] AND ARE A TRUE AND ACCURATE REPRESENTATION OF THE CONSTRUCTED WORKS.

   SIGNED..... DATE.....

   NAME.....

   POSITION.....

8. WAE SHALL BE PROVIDED IN BOTH AUTOCAD AND PDF FORMAT. NORTHROP CONSULTING ENGINEERS WILL PROVIDE ENGINEERING PLANS TO THE CONTRACTOR IN AUTOCAD FORMAT TO AID PREPARATION OF WAE DOCUMENTATION.

9. IF THE WORKS ARE SUBJECT TO APPROVAL BY THE UPPER PARRAMATTA RIVER CATCHMENT TRUST (UPRCT) THE CONTRACTOR IS TO ABIDE BY THE UPRCT APPROVAL CHECKLIST.

10. CONTRACTOR IS TO UNDERTAKE A CCTV INSPECTION OF ALL STORMWATER DRAINAGE PIPELINES AND PROVIDE TO THE ENGINEER FOR APPROVAL.

11. THE CONTRACTOR SHALL PROVIDE ALL RELEVANT TEST CERTIFICATES PROGRESSIVELY THROUGHOUT THE DURATION OF THE WORKS. ALL TEST CERTIFICATES SHALL BE PREPARED BY A NATA REGISTERED LABORATORY. TEST CERTIFICATES ARE REQUIRED FOR PROOF ROLLING, SUBGRADE COMPACTION, COMPACTION OF PAVEMENT LAYERS, COMPACTION OF FILLING OPERATIONS, CONCRETE SLUMP TEST, AND CONCRETE STRENGTH TESTS. THE CONTRACT SHALL PROVIDE ALL RELEVANT VALIDATIONS BY A GEOTECHNICAL ENGINEER FOR ALL IMPORTED FILL

12. EACH TEST CERTIFICATE WILL NOMINATE THE DATE AND TIME OF THE TEST AND PROVIDE A LOCATION OF WHERE THE TEST SAMPLE WAS TAKEN FROM.

13. THE CONTRACTOR SHALL ARRANGE FOR THE ENGINEER TO CONDUCT A FINAL VISIT TO REVIEW OF THE CONSTRUCTED WORKS. THIS WILL REVIEW WILL NOT TAKE PLACE UNTIL THE WAE DOCUMENTATION AND RELEVANT TEST CERTIFICATES HAVE BEEN RECEIVED.

14. IF DEFECTIVE OR INCOMPLETE WORK IS FOUND DURING THE FINAL INSPECTION ANOTHER INSPECTION MAY BE REQUIRED AT THE CONTRACTORS EXPENSE TO VERIFY THE RECTIFICATION WORKS HAVE BEEN COMPLETED.

DRAWN: R.GILL DESIGNED: N. GRINTER JOB MANAGER: N. GRINTER VERIFIER: .

BITUMEN SEALING

1. PAVEMENT PREPARATION
   - 1.1. THE SURFACE TO BE SEALED SHALL BE DRY AND BROOMED BEFORE COMMENCEMENT OF WORK TO ENSURE COMPLETE REMOVAL OF ALL SUPERFICIAL, FOREIGN OR LOOSE MATTER.
   - 1.2. IF APPROVED BY THE MANAGING CONTRACTOR, ALL DEPRESSIONS OR UNEVEN AREAS ARE TO BE TACK-COATED AND BROUGHT TO GENERAL LEVEL OF PAVEMENT WITH ASPHALT CONCRETE BEFORE SEALING COMMENCES.

2. MATERIALS
   - 2.1. BINDER SHALL BE CLASS 170 TO AS 2008 OR APPROVED PROPRIETARY MATERIAL FOR PRIMING AND PRIME SEALING.
   - 2.2. AGGREGATE SHAPE, DURABILITY AND WET TO DRY STRENGTH SHALL COMPLY TO AS2758 FOR CLASS 'N' AGGREGATES. A 20kg SAMPLE TO BE APPROVED BY THE MANAGING CONTRACTOR PRIOR TO USE.
   - 2.3. AGGREGATES SHALL BE DELIVERED UNIFORMLY PRECOATED, EXCESSIVE PRECOATING WILL RESULT IN AGGREGATES BEING REJECTED.
   - 2.4. FOR TWO COAT FLUSH SEALS, THE SIZE OF THE AGGREGATE FOR THE SECOND COAT, WHILE NORMALLY HALF THAT OF THE FIRST COAT, SHALL BE DIMENSIONALLY COMPATIBLE WITH THAT OF THE FIRST COAT.
   - 2.5. PRECOATING AGENTS SHALL BE COMPATIBLE WITH THE AGGREGATES AND BINDER TO BE USED.

3. DESIGN
   - 3.1. DESIGN OF SPRAYED BITUMINOUS SEALS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE AUSTROADS (NAASRA) PUBLICATION "PRINCIPLES AND PRACTICE OF BITUMINOUS SURFACING, VOLUME 1 – SPRAYED WORK".
   - 3.2. WHERE NOT INDICATED ON THE DRAWINGS, PRIMES AND PRIMER SEALS SHALL BE DESIGNED TO REMAIN INTACT UNTIL FINAL SEALING TAKES PLACE, HAVING REGARD FOR THE TRAFFIC AND CLIMATIC CONDITIONS.
   - 3.3. UNLESS OTHERWISE SPECIFIED, BINDER APPLICATION RATES SHALL BE SELECTED TO FILL 85% OF THE THEORETICAL VOIDS OF THE MAT.

4. BITUMEN FLUSH SEALING
   - 4.1. BITUMEN FLUSH SEALS SHALL BE EITHER SINGLE OR DOUBLE COAT AS SHOWN ON THE DRAWINGS. eg 14/7 INDICATES A DOUBLE COAT FLUSH SEAL USING TWO APPLICATIONS OF BITUMEN AND AGGREGATE. THE FIRST AGGREGATE LAYER BEING OF 14mm NOMINAL SIZE, THE SECOND 7mm.
   - 4.2. COVER AGGREGATE SHALL BE SPREAD IMMEDIATELY AFTER SPRAYING OF BINDER. IN NO CASE SHALL SPREADING BE DELAYED MORE THAN 8 MINUTES,

5. RECORDS
   - 5.1. ALL SPRAY RECORDS AND AGGREGATE SUPPLY TONNAGE RECEIPTS SHALL BE RETAINED AND PASSED ON TO THE CONSULTING ENGINEER AS PART OF QUALITY ASSURANCE PROCEDURES.
   - 5.2. GENERALLY FLUSH SEALING SHALL BE CARRIED OUT COMPLETE AND IN ACCORDANCE WITH THE RELEVANT TfNSW STANDARD.

ASPHALTIC CONCRETE

1. GENERAL
   - 1.1. ALL ASPHALTIC CONCRETE (AC) WORK TO BE PREPARED AND CARRIED OUT IN ACCORDANCE WITH GOOD ASPHALTIC PAVING PRACTICE AS DESCRIBED IN AS2150-2005 "ASPHALT (HOT-MIXED) PAVING - GUIDE TO GOOD PRACTICE" AND CURRENT TfNSW SPECIFICATIONS.

2. PAVEMENT PREPARATION
   - 2.1. THE FINISHED PAVEMENT SURFACE TO BE SEALED SHALL BE WITHIN +/- 2% OF THE OPTIMUM AND BROOMED BEFORE COMMENCEMENT OF WORK TO ENSURE COMPLETE REMOVAL OF ALL SUPERFICIAL FOREIGN MATTER.
   - 2.2. PRIME ALL SURFACES TO BE SEALED. ALLOW PRIME TO SETTLE FOR A MINIMUM OF 3 DAYS BEFORE APPLYING TACK COAT AND ASPHALT
   - 2.3. SWEEP PRIMED SURFACES BEFORE APPLYING TACK COAT.
   - 2.4. ALL DEPRESSIONS OR UNEVEN AREAS ARE TO BE TACK-COATED AND BROUGHT UP TO GENERAL LEVEL OF PAVEMENT WITH ASPHALTIC CONCRETE BEFORE LAYING OF MAIN COURSE.
   - 2.5. ALL DEFECTS IN THE BASE COURSE INCLUDING CRACKS, SURFACE DEFORMATION AND THE LIKE SHALL BE REPAIRED AS DIRECTED BY THE SUPERINTENDENT PRIOR TO PLACEMENT OF TACK COAT AND/OR AC COURSES.

3. PLACEMENTS
   - 3.1. ALL ASPHALT SHALL BE PLACED UTILISING APPROVED MECHANICAL PAVING MACHINES. DO NOT HAND PLACE ASPHALT WITHOUT PRIOR APPROVAL FROM ENGINEER.

4. JOINTS
   - 4.1. THE DENSITY AND SURFACE FINISH AT JOINTS SHALL BE SIMILAR TO THOSE OF THE REMAINDER OF THE LAYER.

5. COMPACTION
   - 5.1. ALL COMPACTION SHALL BE UNDERTAKEN USING SELF PROPELLED ROLLERS.
   - 5.2. INITIAL ROLLING SHALL BE COMPLETED BEFORE THE MIX TEMPERATURE FALLS BELOW 105°C USING A STEEL DRUM ROLLER HAVING A MINIMUM WEIGHT OF 8 TONNES AND A MAXIMUM UNIT LOAD ON THE REAR DRUM EQUIVALENT TO 55kN/m WIDTH OF DRUM.
   - 5.3. SECONDARY ROLLING SHALL BE COMPLETED BEFORE THE MIX TEMPERATURE FALLS BELOW 80°C USING A PNEUMATIC TYRED ROLLER OF AT LEAST 10 TONNES MASS. A MINIMUM TYRE PRESSURE OF 550kPA AND A MINIMUM TOTAL LOAD OF 1 TONNE ON EACH TYRE.
   - 5.4. ROLLED SURFACES SHALL BE SMOOTH AND FREE OF UNDULATIONS. BONY AND/OR UNEVEN SURFACES WILL BE REJECTED.
   - 5.5. PROVIDE 2 No. MINIMUM COMPACTION TESTS.

6. FINISHED SURFACE PROPERTIES
   - 6.1. FINISHED SURFACES SHALL BE SMOOTH, DENSE AND TRUE OF SHAPE AND SHALL NOT VARY MORE THAN;
     - 6.1.1. 3mm FROM THE SPECIFIED PLAN LEVEL AT ANY POINT.
     - 6.1.2. 3mm FROM THE BOTTOM OF A STRAIGHT EDGE LAID TRANSVERSELY.
     - 6.1.3. 5mm FROM THE BOTTOM OF A STRAIGHT EDGE LAID LONGITUDINALLY.
     - 6.1.4. MINUS 0 TO PLUS 2mm ADJACENT TO OTHER ELEMENTS SUCH AS KERBS AND THE LIKE TO AVOID POOLING OF SURFACE WATER.
     - 6.1.5. MINUS 0 FROM THE SPECIFIED THICKNESS.

7. DO NOT STORE PLANT EQUIPMENT OR TRAFFIC NEWLY LAID ASPHALTIC CONCRETE PAVEMENTS WITHOUT PRIOR APPROVAL FROM THE ENGINEER.

8. DO NOT APPLY MARKING PAINTS UNTIL ASPHALT HAS CURED IN ACCORDANCE WITH PAINT MANUFACTURERS SPECIFICATIONS.

PAVEMENTS

ALL PAVEMENT MATERIALS SHALL COMPLY WITH CURRENT TfNSW SPECIFICATIONS. PROVIDE MECHANICAL ANALYSIS FOR EACH BATCH OF PAVEMENT MATERIAL TO ENSURE CONFORMITY.

1. COMPACTION STANDARDS

BASE	98% MODIFIED MAXIMUM DRY DENSITY
SUBBASE	98% MODIFIED MAXIMUM DRY DENSITY
SUBGRADE	100% STANDARD MAXIMUM DRY DENSITY

2. THE CONTRACTOR SHALL CONFIRM THE DESIGN CBR WITH A MINIMUM OF 3 TESTS TAKEN AT SUBGRADE LEVEL. WHERE DISCREPANCY IS FOUND, CONTACT THE DESIGN ENGINEER.

3. ALLOW FOR COMPACTION TESTING BY A N.A.T.A. REGISTERED LABORATORY FOR BASE LAYER, SUBBASE LAYER AND SUBGRADE LAYER IN ACCORDANCE WITH THE LATEST VERSION OF AS3798 FOR PAVEMENTS (MINIMUM 2 TESTS PER LAYER). ALLOW FOR AT LEAST TWO SUCCESSFUL COMPACTION TESTS IN EACH LAYER.

4. MATCH NEW PAVEMENTS NEATLY AND FLUSH WITH EXISTING

5. AFTER BASE IS APPROVED, SWEEP CLEAN AND PRIME AT NOMINAL RATE OF 1.0L PER 1.0 sq.m.

6. PAVEMENT HOLD POINTS
   - 6.1. SUB-GRADE PROOF ROLL PRIOR TO SET-UP AND FORM FOR CONCRETE POUR.
   - 6.2. INSPECTION OF FORMWORK / STEEL PRIOR TO CONCRETE POUR.

CONCRETE PAVEMENTS

1. THIS SECTION REFERS TO CIVIL CONCRETE WORKS AND DOES NOT INCLUDE STRUCTURAL ELEMENTS SUCH AS BUILDINGS, BELOW GROUND STRUCTURES OR RETAINING WALLS.

2. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.

3. CONCRETE QUALITY AND REINFORCING COVER
   ALL REQUIREMENTS OF THE CURRENT ACSE CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

ELEMENT	CONCRETE STRENGTH f'c (MPa)	SPECIFIED SLUMP	NOMINAL AGGREGATE SIZE	MAX. 56 DAY DRYING SHRINKAGE	COVER (mm)
KERBS AND PATHS	25	60	20	650microns	TOP 40
PITS AND VEHICULAR PAVEMENTS	32	80	20	650microns	TOP 40

4. CONCRETE PROPERTIES SHALL BE VARIED FROM NORMAL CLASS AS FOLLOWS
   - 4.1. MINIMUM CEMENT CONTENT 250 kg/m³
   - 4.2. MAXIMUM 56 DAY SHRINKAGE STRAIN = AS NOMINATED ABOVE
   - 4.3. PRIOR TO COMMENCEMENT CONCRETE SUPPLIER TO PROVIDE DRYING SHRINKAGE TEST RESULTS FROM PRODUCTION ASSESSMENT AS EVIDENCE THAT SPECIFIED DRYING SHRINKAGE LIMITS CAN BE ACHIEVED USING NORMAL MIX DESIGN.

5. ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS. PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1m CENTRES BOTH WAYS. BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.

6. CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL.

7. PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379. TEST CYLINDERS ARE TO BE KEPT ON SITE.

8. ALL COMPRESSIVE STRENGTH TEST REPORTS SHALL BE SUBMITTED TO THE CIVIL ENGINEER FOR REVIEW.

9. ALL CONCRETE IS TO BE CONTINUOUSLY CURED FOR A MINIMUM PERIOD OF 10 DAYS AFTER PLACING . CURING TO COMMENCE IMMEDIATELY AFTER FINISHING. SPRAY ON CURING COMPOUNDS TO COMPLY WITH AS3799.

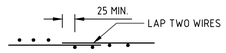
10. PLACE CONCRETE CONTINUOUSLY BETWEEN CONSTRUCTION JOINTS SHOWN ON PLAN. DO NOT BREAK OR INTERRUPT SUCCESSIVE POURS SUCH THAT COLD JOINTS OCCUR. ANY REVISIONS OR ADDITIONS TO CONSTRUCTION JOINTS SHOWN ON PLAN REQUIRE APPROVAL FROM THE CIVIL ENGINEER.

11. FALLS IN SLAB AS SHOWN ON PLAN MAINTAIN MINIMUM SLAB THICKNESS AS SHOWN.

12. NO ADMIXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY THE DESIGN ENGINEER.

13. THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS.

14. FABRIC SHALL BE LAPPED IN ACCORDANCE WITH THE FOLLOWING DETAIL:



FOLLOWING THE FABRIC SYMBOL SL IS THE REFERENCE NUMBER FOR FABRIC TO AS1304.

15. ALL PENETRATIONS TO HAVE 2/N12 TRIMMER BARS TOP AND BOTTOM TO EACH FACE U.N.O. EXTEND TRIMMERS 700 BEYOND PENETRATION. MAINTAIN 40mm COVER TOP AND BOTTOM.

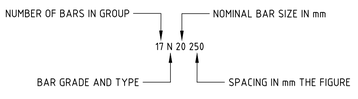
16. FORMWORK CLASS SHALL BE IN ACCORDANCE WITH AS3600.

17. SURFACE FINISHES:

ELEMENT	FORMWORK CLASS
STORMWATER PIT	OFF FORM
PAVEMENTS	MACHINE FLOAT OR BROOM FINISH
KERBS	STEEL FLOAT OR TROWEL

AUTHORITY SPECIFICATIONS TAKE PRECEDENCE

18. REINFORCEMENT SYMBOLS:
    - N DENOTES GRADE 450 N BARS TO AS1302 GRADE N
    - R DENOTES 230 R HOT ROLLED PLAIN BARS TO AS1302
    - SL DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS1304



CONCRETE CURING

19. THE CURING PROCESS FOR NEW CONCRETE IS TO INCORPORATE THE FOLLOWING ASPECTS, GENERALLY AS ORDERED;
    - 19.1. SPRAY CURING COMPOUND
    - 19.2. SAWCUT JOINTS AS LOCATED AND SPECIFIED AS SOON AS CURING PERMITS.

    COVER NEW PAVING WITH HESSIAN AND BLACK PLASTIC SHEETS TAPED AT JOINTS ON COMPLETION OF SAWCUTTING. NOTE COVERING IS TO EXTENT MIN 5m BEYOND PAVEMENT BEING CURED. OVER ADJOINING (EXISTING) PAVEMENT AREAS, MAINTAIN CURING AS SPECIFIED.

PAVEMENT JOINTS

1. PROVIDE 10mm ABLEFLEX BETWEEN NEW CONCRETE WORKS AND EXISTING STRUCTURES.

2. LOCAL AUTHORITY REQUIREMENTS SHALL TAKE PRECEDENCE WITHIN THE PUBLIC ROAD RESERVE.

3. DOWELS TO BE PLACED ON PROPRIETARY CRADLES TO ENSURE CORRECT SPACING AND ALIGNMENT.

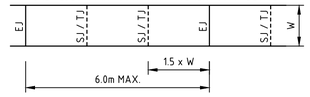
4. PEDESTRIAN PAVEMENTS
   ALL PEDESTRIAN PAVEMENTS ARE TO BE JOINTED AS FOLLOWS U.N.O. ON THE DESIGN DRAWINGS.

5. EXPANSION JOINTS ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX. 6.0m CENTRES.

6. WEAKENED PLANE JOINTS (SAWN OR TOOL JOINTS) ARE TO BE LOCATED AT A MAX. SPACING OF 1.5m x WIDTH OF THE PAVEMENT.

7. WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND OR ADJACENT PAVEMENT JOINTS.

8. TYPICAL PEDESTRIAN FOOTPATH PAVEMENT JOINT DETAIL

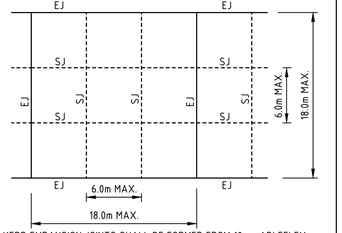


9. VEHICULAR AND OTHER PAVEMENTS
   ALL VEHICULAR PAVEMENTS TO BE JOINTED AS FOLLOWS U.N.O. ON THE DESIGN DRAWINGS.

10. TIED KEYED CONSTRUCTION JOINTS SHOULD GENERALLY BE LOCATED LONGITUDINALLY AT A MAX. OF 6.0m CENTRES.

11. SAWN JOINTS SHOULD GENERALLY BE LOCATED LATERALLY AT A MAX. OF 6.0m CENTRES WITH DOWELED EXPANSION JOINTS AT MAX. 18.0m CENTRES.

12. TYPICAL VEHICULAR PAVEMENT JOINT DETAIL.



13. KERB EXPANSION JOINTS SHALL BE FORMED FROM 10mm ABLEFLEX FOR FULL DEPTH OF SECTION.
14. KERB EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, TANGENT POINTS OF CURVES / CORNERS AND AT 12m MAX CENTRES.
15. KERB TOOLED JOINTS TO BE MIN 3mm WIDE AND LOCATED AT MAX 3m CENTRES.
16. INTEGRAL KERB JOINTS SHALL MATCH THE LOCATION OF PAVEMENT JOINTS.

CONCRETE

1. CARRY OUT ALL CONCRETE WORK IN ACCORDANCE WITH AS3600 AND NATSPEC CONCRETE STANDARDS.

2. CONCRETE PROPERTIES AND COVER TO REINFORCING:

ELEMENT	CONCRETE STRENGTH f'c (MPa)	MAX. 56 DAY DRYING SHRINKAGE	COVER (mm)	
SLABS ON GROUND	25	650microns	TOP 40	BTM 40

   MAXIMUM AGGREGATE SIZE = 20mm U.N.O.
   SLUMP DURING PLACING = 75mm
   EXPOSURE CLASSIFICATION = B1
   NO ADMIXTURES SHALL BE USED IN CONCRETE MIX UNLESS APPROVED BY STRUCTURAL ENGINEER IN WRITING.

3. CONCRETE PROPERTIES FOR SLABS AND BEAMS SHALL BE VARIED FROM NORMAL CLASS AS FOLLOWS:
   - MINIMUM CEMENT CONTENT 250kg/cu.m.
   - PRIOR TO COMMENCEMENT CONCRETE SUPPLIER TO PROVIDE DRYING SHRINKAGE TEST

   RESULTS FROM PRODUCTION ASSESSMENT AS EVIDENCE THAT SPECIFIED DRYING SHRINKAGE LIMITS CAN BE ACHIEVED USING NORMAL MIX DESIGN.

4. SUBMIT FOR APPROVAL THE FOLLOWING TO THE STRUCTURAL ENGINEER:
   - CURING PROCEDURE (PVA MEMBRANES NOT PERMITTED)
   - STRIPPING PROCEDURE
   - DETAILS AND LOCATION OF CAST IN SERVICES.
   - CONDUITS, PENETRATIONS AND CONSTRUCTION JOINT LOCATIONS

5. ALL CONCRETE MIXES SHALL BE DESIGNED BY A RECOGNISED TESTING LAB AND SUBMITTED FOR REVIEW BY THE STRUCTURAL ENGINEER.

6. ALL COMPRESSIVE STRENGTH TEST REPORTS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW.

7. PROJECT CONTROL TESTING SHALL BE CARRIED OUT ON ALL CONCRETE IN ACCORDANCE WITH AS1379. TEST CYLINDERS ARE TO BE KEPT ON SITE.

CONCRETE (cont.)

8. FOR TENDER PURPOSES ASSUME MINIMUM STRIPPING TIMES AND EXTENT OF BACK PROPPING AS PER AS3610-1995 SECTION 5.0 AND AS PER GENERAL NOTES FOR FORMWORK AND PROPPING.

9. FORMWORK FINISH CLASSIFICATION TO AS3600:

ELEMENT	CLASS
INGROUND FOOTINGS	5
RETAINING WALLS	5 EARTH FACE
RETAINING WALLS	3 EXPOSED FACE
COLUMNS	2
BEAMS AND SLABS	2

10. SURFACE FINISHES:
    - COLUMNS AND WALLS OFF FORM

11. COMPACT ALL CONCRETE INCLUDING FOOTINGS AND SLABS, USING MECHANICAL VIBRATORS.

12. PLACE CONCRETE CONTINUOUSLY BETWEEN CONSTRUCTION JOINTS SHOWN ON PLAN. DO NOT BREAK OR INTERRUPT SUCCESSIVE POURS SUCH THAT COLD JOINTS OCCUR. ANY REVISIONS OR ADDITIONS TO CONSTRUCTION JOINTS SHOWN ON PLAN REQUIRE APPROVAL FROM THE STRUCTURAL ENGINEER.

13. CONCRETE PROFILES:
    - BEAM DEPTHS ARE WRITTEN FIRST AND INCLUDE THE SLAB THICKNESS.
    - SIZES OF CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.
    - NO HOLES, CHASES OR EMBEDMENT OF PIPES OTHER THAN SHOWN IN THE STRUCTURAL DRAWINGS SHALL BE MADE IN CONCRETE MEMBERS WITHOUT THE PRIOR WRITTEN APPROVAL OF THE STRUCTURAL ENGINEER.
    - PROVIDE DRIP GROOVES AT ALL EXPOSED EDGES, CHAMFERS, DRIP GROOVES, REGLETS ETC TO BE TO ARCHITECTS DETAILS.

14. ALL PENETRATIONS TO HAVE 2-N16 TRIMMER BARS TOP AND BOTTOM TO EACH FACE U.N.O. EXTEND TRIMMERS 600 BEYOND PENETRATION.

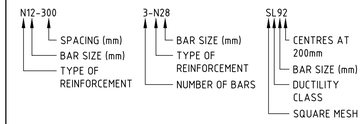
15. SETDOWNS OR FALLS IN FLOOR SURFACES ARE NOT PERMITTED UNLESS SHOWN ON DRAWINGS. MAINTAIN MINIMUM SLAB THICKNESS SHOWN ON PLAN WHERE FALLS OCCUR.

16. REINFORCEMENT GRADE AND NOTATION:

SYMBOL	BAR SHAPE	STRENGTH GRADE (MPa)	DUCTILITY CLASS	TO COMPLY WITH AUST. STANDARD
N	DEFORMED RIB BAR	500	NORMAL	AS4671
R	PLAIN ROUND BAR	250	NORMAL	AS4671
RL	RECTANGULAR MESH OF DEFORMED RIB BAR	500	LOW	AS4671
SL	SQUARE MESH OF DEFORMED RIB BAR	500	LOW	AS4671
L-TM	TRENCH MESH	500	LOW	AS4671

    ALL REINFORCING BARS SHALL BE GRADE D500N TO AS4671 AND ALL MESH SHALL BE GRADE 500L TO AS4671 U.N.O. CLASS L REINFORCEMENT SHALL NOT BE USED U.N.O.

    REINFORCEMENT LABELS:



17. REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY, AND NOT NECESSARILY IN TRUE PROJECTION. BARS SHOWN ARE INDICATIVE ONLY AND LENGTHS MAY VARY. BEAM ELEVATIONS TAKE PRECEDENCE OVER SECTIONS. SLAB PLANS TAKE PRECEDENCE OVER SECTIONS. REFER TO SECTIONS FOR EXTRA BARS THAT MAY BE REQUIRED.

18. USE ONLY ALL PLASTIC OR CONCRETE CHAIRS AT EXTERNAL SURFACES.

19. SITE BENDING OF REINFORCEMENT BARS SHALL BE DONE WITHOUT HEATING USING A RE-BENDING TOOL. THE BARS SHALL BE RE-BENT AGAINST A FLAT SURFACE OR A PIN WITH A DIAMETER NOT LESS THAN THE MINIMUM PIN SIZE PRESCRIBED IN AS3600-2001.

20. SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN POSITIONS SHOWN ON THE STRUCTURAL DRAWINGS OR IN POSITIONS OTHERWISE APPROVED IN WRITING BY THE STRUCTURAL ENGINEER. LAPS SHALL BE IN ACCORDANCE WITH AS3600 SECTION 13 AND NOT LESS THAN THE DEVELOPMENT LENGTH FOR EACH BAR.

21. FOR LAPS IN MESH REFER TO SLAB ON GROUND NOTES.

22. WELDING OF REINFORCEMENT SHALL NOT BE PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER

23. AT EXTERNALLY EXPOSED SURFACES NO METALLIC ITEMS INCLUDING FORM BOLTS, FORM SPACERS, METALLIC BAR CHAIRS AND TIE WIRE ARE TO BE PLACED IN THE COVER ZONE.

24. ALL REINFORCEMENT, ANCHOR BOLTS AND OTHER CONCRETE INSERTS SHALL BE WELL SECURED IN POSITION AND INSPECTED BY THE STRUCTURAL ENGINEER PRIOR TO PLACING CONCRETE.

25. HOLD DOWN BOLTS SHALL BE HOT DIPPED GALVANISED.

26. U.N.O, ALL MASONRY ANCHORS INTO CONCRETE SHALL BE RAMSET TRUBOLTS (LONGEST VERSION) OR APPROVED EQUIVALENT. BOLTS SHALL BE GALVANISED WHERE THEY ARE ADJOINING NON FERROUS OR PREPAINTED MEMBERS. PROVIDE STAINLESS STEEL BOLTS FOR ALL EXTERNAL CONDITIONS, OR WHERE EXPOSED TO THE WEATHER.

FOR CONSTRUCTION CERTIFICATE

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR SCHEMATIC DESIGN	RG		NG	19.04.24
02	ISSUED FOR CC1	AS		JG	25.10.24
03	ISSUED FOR CONSTRUCTION CERTIFICATE	MM		JG	14.11.24

CLIENT
KANE

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LEGEND

- SITE BOUNDARY LINE
- ADJACENT BOUNDARY LINE
- PROPOSED BUILDING FOOTPRINT
- DESIGN FOOTPRINT
- EXTERNAL WORKS
- EXISTING ELECTRICITY
- EXISTING TELSTRA
- EXISTING GAS
- EXISTING SEWER
- EXISTING WATER
- EXISTING CONTOURS
- SEDIMENT FENCE
- SECURITY FENCE
- SECURITY GATE
- WIRE MESH AND GRAVEL SEDIMENT FILTER
- GEOTEXTILE INLET FILTER TRAPS
- STRAWBALE FILTER
- DRAINAGE SWALE
- CATTLE GRID
- STABILISED SITE ACCESS ALL WEATHER ACCESS
- STOCKPILE
- SEDIMENT BASIN
- SEPARATE WORKS

GENERAL NOTES:

1. REFER SPECIFICATIONS NOTES FOR SEDIMENT AND SOIL EROSION CONTROL GENERAL REQUIREMENTS.
2. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
3. ALL SEDIMENT AND SOIL EROSION CONTROL MEASURES TO BE INSTALLED IN ACCORDANCE WITH THE 'BLUE BOOK'. CONTRACTOR TO ENSURE THESE MEASURES ARE IN PLACE AND MAINTAINED AT ALL TIMES DURING CONSTRUCTION WORKS.
4. CONTRACTOR TO PROVIDE 'WIRE MESH AND GRAVEL SEDIMENT FILTER' TO ALL PAVED / ROAD AREAS (BOTH PROPOSED AND EXISTING) IN ACCORDANCE WITH THE 'BLUE BOOK'.
5. CONTRACTOR TO PROVIDE 'GEOTEXTILE INLET FILTER TRAPS' TO ALL STORMWATER DRAINAGE INLETS (BOTH PROPOSED AND EXISTING) IN ACCORDANCE WITH THE 'BLUE BOOK'
6. SEDIMENT BASIN CALCS (FOR PARISH)
   - SOIL TYPE F
   - SITE AREA = 6,740m²
   - SETTING ZONE VOLUME = 97.38³
   - SEDIMENT STORAGE = 48.69m³
   - TOTAL BASIN VOLUME = 146.069m³
7. SEDIMENT BASIN CALCS (FOR GLA)
   - SOIL TYPE F
   - SITE AREA = 7,636m²
   - SETTING ZONE VOLUME = 110.325m³
   - SEDIMENT STORAGE = 55.162m³
   - TOTAL BASIN VOLUME = 165.487m³

DRAWN: R.GILL
DESIGNED: N. GRINTER
JOB MANAGER: N. GRINTER
VERIFIER: .

FOR CONSTRUCTION CERTIFICATE

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR SCHEMATIC DESIGN	RG		NG	19.04.24
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CLIENT: KANE

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SCALE 1:500@A1 — 0 5 10 15 20 25m

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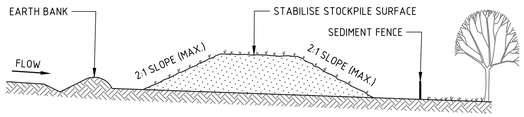
PROJECT: WESTMEAD CATHOLIC COMMUNITY
PROJECT ONE - STAGE 1
DARCY ROAD, WESTMEAD

DRAWING TITLE: SCHEMATIC DESIGN PACKAGE
CONCEPT SEDIMENT AND EROSION CONTROL PLAN

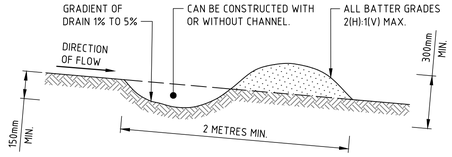
JOB NUMBER: 192734
DRAWING NUMBER: WCCGLA-CVE-DWG-DDC02.01
REVISION: 03
DRAWING SHEET SIZE = A1



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

STOCKPILE

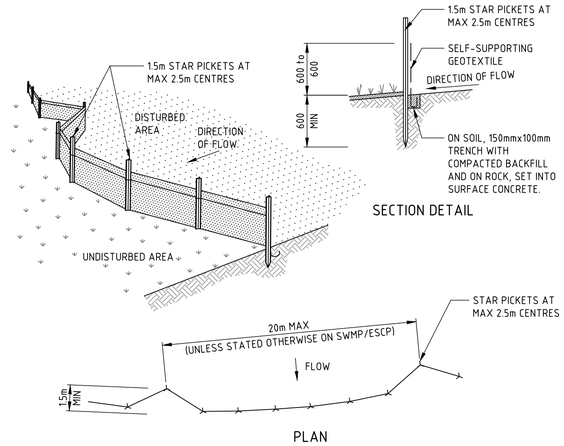


CONSTRUCTION NOTES

1. BUILD WITH GRADIENTS BETWEEN 1 AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

NOTE: ONLY TO BE USED AS TEMPORARY BANK
WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

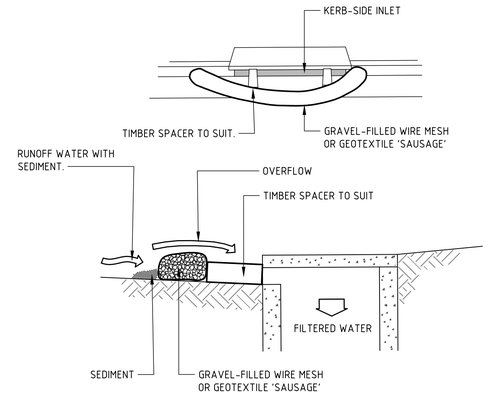
DRAINAGE SWALE - LOW FLOW



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

SEDIMENT FENCE

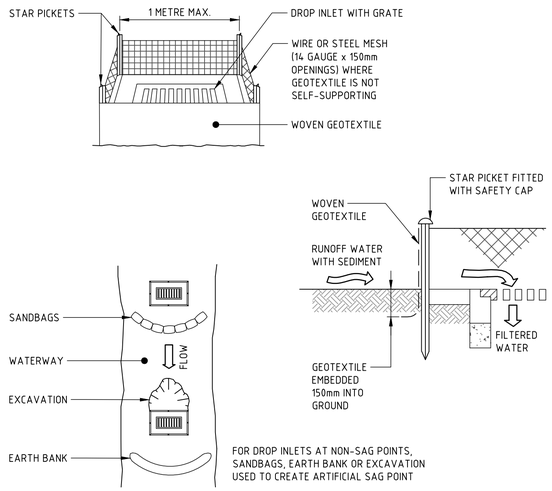


NOTE:THIS PRACTICE ONLY TO BE USED WHERE SPECIFIED IN APPROVED SWMP/ESCP.

CONSTRUCTION NOTES

1. INSTALL FILTERS TO KERB INLETS ONLY AT SAG POINTS.
2. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
3. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
4. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
5. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
6. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY FIRMLY ABUT EACH OTHER AND SEDIMENT-LADEN WATERS CANNOT PASS BETWEEN.

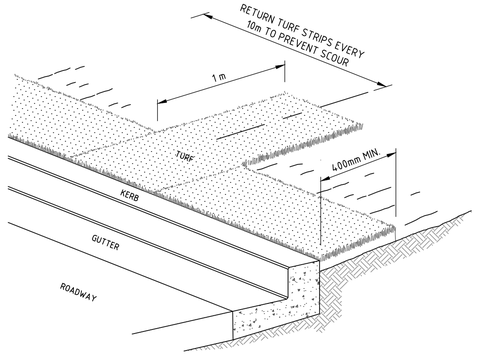
WIRE MESH AND GRAVEL SEDIMENT FILTER



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

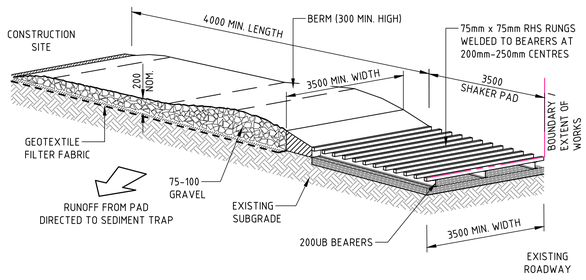
GEOTEXTILE INLET FILTER TRAPS



CONSTRUCTION NOTES

1. INSTALL A 400mm MINIMUM WIDE ROLL OF TURF ON THE FOOTPATH NEXT TO THE KERB AND AT THE SAME LEVEL AS THE TOP OF THE KERB.
2. LAY 1.4m LONG TURF STRIPS NORMAL TO THE KERB EVERY 10m.
3. REHABILITATE DISTURBED SOIL BEHIND THE TURF STRIP FOLLOWING THE ESCP/SWMP.

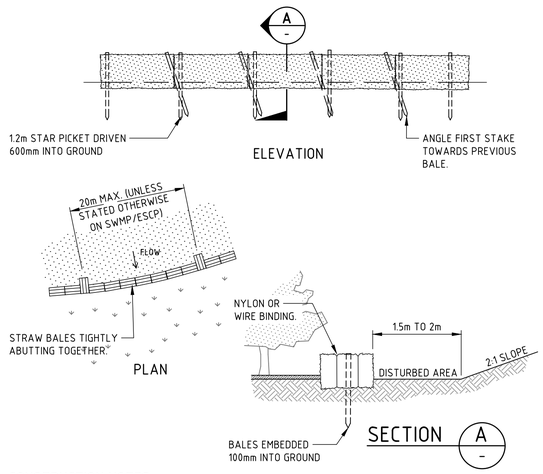
KERBSIDE TURF STRIP



CONSTRUCTION NOTES

1. THE TEMPORARY ACCESS SHALL BE MAINTAINED IN A CONDITION THAT PREVENTS TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS OF WAY,
   - THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL GRAVEL AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT,
2. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS OF WAY MUST BE REMOVED IMMEDIATELY.
3. INSTALL BARRIER ON EITHER SIDE OF SHAKER PAD. TO ENSURE VEHICLES ARE GUIDED ON TO THE PAD.
4. INVERT OF SHAKER PAD TO BE DRAINED VIA AGRICULTURAL PIPE WRAPPED IN GEOTEXTILE FABRIC.

STABILISED SITE ACCESS



CONSTRUCTION NOTES

1. CONSTRUCT THE STRAW BALE FILTER AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE.
2. PLACE BALES LENGTHWISE IN A ROW WITH ENDS TIGHTLY ABUTTING. USE STRAW TO FILL ANY GAPS BETWEEN BALES. STRAWS ARE TO BE PLACED PARALLEL TO GROUND.
3. ENSURE THAT THE MAXIMUM HEIGHT OF THE FILTER IS ONE BALE.
4. EMBED EACH BALE IN THE GROUND 75mm TO 100mm AND ANCHOR WITH TWO 1.2 METRE STAR PICKETS OR STAKES. ANGLE THE FIRST STAR PICKET OR STAKE IN EACH BALE TOWARDS THE PREVIOUSLY LAID BALE. DRIVE THEM 600mm INTO THE GROUND AND, IF POSSIBLE, FLUSH WITH THE TOP OF THE BALES. WHERE STAR PICKETS ARE USED AND THEY PROTRUDE ABOVE THE BALES, ENSURE THEY ARE FITTED WITH SAFETY CAPS.
5. WHERE A STRAW BALE FILTER IS CONSTRUCTED DOWNSLOPE FROM A DISTURBED BATTER, ENSURE THE BALES ARE PLACED 1 TO 2 METRES DOWNSLOPE FROM THE TOE.
6. ESTABLISH A MAINTENANCE PROGRAM THAT ENSURES THE INTEGRITY OF THE BALES IS RETAINED - THEY COULD REQUIRE REPLACEMENT EACH TWO TO FOUR MONTHS.

STRAW BALE FILTER

FOR CONSTRUCTION CERTIFICATE

VERIFIER: .
JOB MANAGER: N. GRINTER
DESIGNED: N. GRINTER
DRAWN: R.GILL

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR SCHEMATIC DESIGN	RG		NG	19.04.24
02	ISSUED FOR CC1	AS		JG	25.10.24
03	ISSUED FOR CONSTRUCTION CERTIFICATE	MM		JG	14.11.24

CLIENT: KANE

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Sydney
Level 11 345 George Street, Sydney NSW 2000
Ph (02) 9241 4188 Fax (02) 9241 4324
Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT: **WESTMEAD CATHOLIC COMMUNITY PROJECT ONE - STAGE 1**

DARCY ROAD, WESTMEAD

DRAWING TITLE: **SCHEMATIC DESIGN PACKAGE**

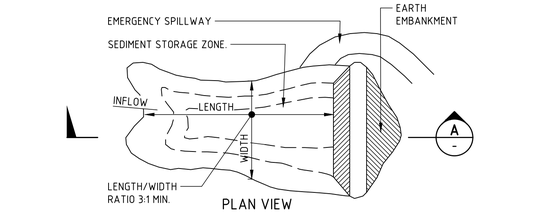
SEDIMENT AND EROSION CONTROL DETAILS - SHEET 01

JOB NUMBER: **192734**

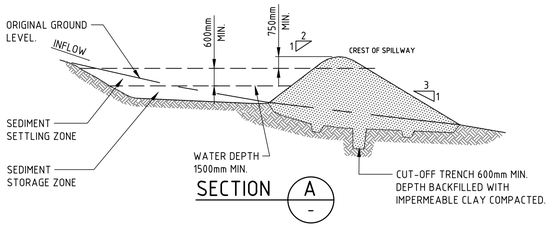
DRAWING NUMBER: **WCCGLA-CVE-DWG-DDC02.11**

REVISION: **03**

DRAWING SHEET SIZE = A1



PLAN VIEW



SECTION

CONSTRUCTION NOTES

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT-OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTRELINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95 PER CENT STANDARD PROCTOR DENSITY.
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP.
7. CONSTRUCT THE EMERGENCY SPILLWAY.
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP.

(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

SEDIMENT BASIN

DRAWN: R.GILL DESIGNED: N. GRINTER JOB MANAGER: N. GRINTER VERIFIER: .

FOR CONSTRUCTION CERTIFICATE

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR CONSTRUCTION CERTIFICATE	MM		JG	14.11.24

CLIENT: KANE

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PROJECT: WESTMEAD CATHOLIC COMMUNITY PROJECT ONE - STAGE 1

DARCY ROAD, WESTMEAD

DRAWING TITLE: SCHEMATIC DESIGN PACKAGE

SEDIMENT AND EROSION CONTROL DETAILS - SHEET 02

JOB NUMBER: 192734

DRAWING NUMBER: WCCGLA-CVE-DWG-DDC02.12

REVISION: 01

DRAWING SHEET SIZE = A1

Appendix B – Sediment Basin Calculations

Parameter	Adopted value		
Total area (ha)	0.7636		
Soil Texture Group	F	See 1) Soil Texture groups	(Clay)
Design rainfall depth (days)	5	See 2) Rainfall depth (days)	
Design rainfall depth (percentille)	80	See 3) Rainfall depth (percentille)	
x-day, y-percentile rainfall event	25.8	See Sheet x-day-y-p%	
Cv	0.56	See 4) Cv and Soil hydrological groups	
Settling zone volume (m^3)	110.325	(calculated)	
Sediment storage volume (m^3)	55.162	(calculated)	
Total basin volume (m^3)	**165.487**	(calculated)	

V = settling zone + sediment storage zone

Settling Zone Type D/F = 10 x Cv x A x R (y %ile, 5 day)

where:
- 10 is a unit conversion factor
- Cv is a volumetric runoff coefficient, defined as that proportion of rainfall that runs off as stormwater[13]
- A is the catchment area of the basin (hectares)
- R(y %ile, 5 day) is the 5-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. This figure can be determined from Appendix L. Rainfall depths corresponding to management periods more and less than 5 days can be adopted, as site characteristics allow and as detailed previously

1) Soil Texture Group

Source: The Blue Book, Volume 1, 2004. Page 6-12.

Table 6.1 Summary of selected sediment basin types and design criteria

Soil Type	Soil characteristics	Treatment process	Basin design capacity	
			Settling zone	Sediment storage zone
Type D (dispersible)	10 percent or more of the soil materials are dispersible. Particle size is irrelevant	Aided flocculation in wet basins	Capacity to contain all runoff expected from the y percentile, x-day rainfall depth where, depending on the sensitivity of the receiving waters and/or the duration that the structure is in use: x is 2, 5, 10 or 20-days y is the 75th, 80th, 85th or 90th percentile	Normally taken as 50 percent of the capacity of the settling zone. However, it can be taken as two months soil loss as calculated by the RUSLE
Type C (coarse)	Less than 33 percent finer than 0.02 mm and less than 10 percent of the soil materials are dispersible	Rapid settling in wet or dry basins	Surface area of 4,100 $m^2/m^3/sec$ in the 3-month ARI flow, minimum depth of 0.6m, and length:width ratio of >3:1	Normally taken as 100 percent of the capacity of the settling zone. However, it can be taken as two months soil loss as calculated by the RUSLE
Type F (fine)	33 percent or more of the particles are finer than 0.02 mm and less than 10 percent of the soil materials are dispersible	Slow settling in wet basins	Capacity to contain all runoff expected from the y percentile, x-day rainfall depth where, depending on the sensitivity of the receiving waters and/or the duration that the structure is in use: x varies between 2 and 20 days y is the 75th, 80th, 85th or 90th percentile	Normally taken as 50 percent of the capacity of the settling zone. However, it can be taken as two months soil loss as calculated by the RUSLE

2) Rainfall depth (days)

Source: The Blue Book, Volume 1, 2004. Page 6-15.

A **5-day** rainfall depth can be adopted as standard in the design of the settling zone where the soils being disturbed are Type D or Type F. This assumes that five days or less are required following a rainfall event to achieve effective flocculation if necessary, settling and subsequent discharge of the supernatant stormwater (Appendix E and Section 6.3.3(d)).
In certain conditions, basins can be designed for rainfall depths and management periods of between 2 and 20 days, to accommodate a range of site constraints and opportunities that may be present :

(i) Where the site area is insufficient to allow building structures as required for the y-percentile 5-day criterion, a 2, 3 or 4-day rainfall depth can be adopted providing flocculation, settlement and discharge can be achieved in that time. However, this will usually require the use of a special range of flocculants and specialised techniques that will achieve sufficiently fast settling (Section E4.2). Many such flocculants can cause environmental harm if not managed properly and the plans for sediment control must also include a detailed plan of management of these.
(ii) Where site conditions permit the construction of extremely large structures, a 6 to 20-day rainfall depth can be adopted. These large structures allow longer periods for reuse (e.g. dust suppression) or flocculation, settling and discharge.

3) Design rainfall depth (percentille)

Source: The Blue Book, Volume 1, 2004. Page 6-21.

Unless Council's Stormwater Management Plan states differently:[11]
(i) on most sites the 75th percentile storm depth is recommended for use if the duration of disturbance is likely to be six months or less, while the 80th percentile storm depth is recommended if the duration of disturbance is likely to be more than six months;
(ii) where receiving waters are considered particularly sensitive, either by the development proponent/designer, local council or other consent authority, a higher level of protection can be provided, e.g.: the 80th percentile storm depth is recommended for use if the duration of disturbance is likely to be six months or less, while the 85th percentile storm depth is recommended if the duration of disturbance is likely to be more than six months.
Longer term land disturbances, such as waste depots, extractive sites and some road construction activities, warrant

4) Cv

Source: The Blue Book, Volume 1, 2004. Appendix F, Page F-4.

Table F2. Runoff coefficients (Cv) for volumetric data in disturbed catchments (adapted from USDA, 1996)

Soil Hydrologic Group	Design Rainfall depth (mm)							Runoff potential
	<20	21-25	26-30	31–40	41-50	51-60	61-80	
A	0.01	0.05	0.08	0.15	0.22	0.28	0.37	very low
B	0.10	0.19	0.25	0.34	0.42	0.48	0.57	low to moderate
C	0.25	0.35	0.42	0.51	0.58	0.63	0.70	moderate to high
D	0.39	0.50	0.56	0.64	0.69	0.74	0.79	high

Where the Soil Hydrologic Group is not known and/or cannot be found out without an additional soil survey (but see Appendix C), adopting a default volumetric runoff coefficient of 0.5 is reasonable. However, higher values should be considered for high-density development or other sites that can be subject to very high levels of surface sealing (e.g. wheel compaction). Alternatively, lower values can be adopted where a significant proportion of the site is to remain undisturbed (i.e. vegetated), if that value is properly justified. However, the correct Soil Hydrologic Group should be determined on all sites where design is to greater than the standard 85th percentile, x-day rainfall depth and/or where the receiving waters are deemed to be highly or extremely sensitive.

Soil hydrological group

A	Group A – very low runoff potential. Water moves into and through these soil materials relatively quickly, when thoroughly wetted. Usually, they consist of deep (>1.0 metres), well-drained sandy loams, sands or gravels. They shed runoff only in extreme storm events.
B	Group B – low to moderate runoff potential. Water moves into and through these soil materials at a moderate rate when thoroughly wetted. Usually, they consist of moderately deep (>0.5 metres), well-drained soils with medium, loamy textures or clay loams with moderate structure. They shed runoff only infrequently.
C	Group C – moderate to high runoff potential. Water moves into and through these soil materials at slow to moderate rates when thoroughly wetted. Usually, they consist of soils that have: - moderately fine (clay loam) to fine (clay) texture - weak to moderate structure and/or - a layer near the surface that impedes free downward movement of water. They regularly shed runoff from moderate rainfall events.
D	Group D – very high runoff potential. Water moves into and through these soils very slowly when thoroughly wetted. Usually, they consist of soils: that are fine-textured (clay), poorly structured, surface-sealed or have high shrink/swell properties, and/or with a permanent high watertable, and/or with a layer near the surface that is nearly impervious. They shed runoff from most rainfall events.

Parameter	Adopted value		
Total area (ha)	0.674		
Soil Texture Group	F	See 1) Soil Texture groups	(Clay)
Design rainfall depth (days)	5	See 2) Rainfall depth (days)	
Design rainfall depth (percentille)	80	See 3) Rainfall depth (percentille)	
x-day, y-percentile rainfall event	25.8	See Sheet x-day-y-p%	
Cv	0.56	See 4) Cv and Soil hydrological groups	
Settling zone volume (m^3)	97.380	(calculated)	
Sediment storage volume (m^3)	48.690	(calculated)	
Total basin volume (m^3)	**146.069**	(calculated)	

V = settling zone + sediment storage zone

Settling Zone Type D/F = 10 x Cv x A x R (y %ile, 5 day)

where:
- 10 is a unit conversion factor
- Cv is a volumetric runoff coefficient, defined as that proportion of rainfall that runs off as stormwater[13]
- A is the catchment area of the basin (hectares)
- R(y %ile, 5 day) is the 5-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. This figure can be determined from Appendix L. Rainfall depths corresponding to management periods more and less than 5 days can be adopted, as site characteristics allow and as detailed previously

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Appendix C – CV

James Gilligan

Principal | Sydney Civil Manager | Senior Civil Engineer

BE (Civil) MIEAust CPEng NER

James is a Principal at Northrop and a Senior Civil Engineer with over 17 years' experience managing and delivering buildings and complex civil infrastructure projects requiring design from the concept phase through to construction and post construction stages.

James has particular experience in project management and contract administration. James' technical background includes civil design of utilities, earthworks, stormwater and roads for subdivision and buildings projects across all types of development including Health, Education, Residential, Commercial & Industrial.

Project Experience

Urban Redevelopment

- University of Wollongong Health and Wellbeing Precinct
- St Leonards South Precinct
- Frasers Central Park, Broadway
- Tailors Walk, Pemberton Street, Botany
- 150 Epping Road, Lane Cove
- Glebe Affordable Housing Project, Glebe

Public Domain and Open Spaces

- Blacktown International Centre for Training Excellence
- Croom Regional Sporting Complex, Croom
- Twin Creeks Golf Club, Luddenham
- Elara Neighbourhood Centre, Elara
- Hurstville Bus Interchange, Hurstville
- Windsor Station Bus Interchange, Windsor

Infrastructure / Utilities Coordination

- Northwest Rail Link
- Sydney International Airport – Stage 2B
- Southern Sydney Freight Line

Health

- Nepean Private Hospital
- The George Centre, Gledswood Hills
- Westmead Mental Health Facility
- Cumberland West Mental Health Facility
- Manly Adolescent and Young Adult Hospice
- B22 Mental Health, Blacktown
- Blacktown Forensic Mental Health Unit
- Tumut Hospital Peer Review

Commercial / Industrial

- Goodman Interchange Park, Eastern Creek
- Goodman Oakdale Peer Reviews
- Sydney Business Park Warehouses, Marsden Park
- ESR Horsley Logistics Park Peer Reviews
- Erskine Park Industrial Estate Warehouses
- Kingsford Smith Distribution Centre, Mascot
- Blum Australia Warehouse, Hoxton Park

Education

- Edmondson Park Public School
- Galungara Public School
- Jordan Springs Public School
- Catherine Field Public School
- East Leppington Public School
- Estella Public School
- Westmead Catholic College, Westmead
- St Joseph's College, Hunters Hill
- Barker College Junior School and Early Learning Centre - Waitara
- Meadowbank TAFE - Multi-Trades and Digital Technology Hub
- Kingswood TAFE – Institute of Applied Technology for Construction
- Western Sydney University Subdivision, Westmead

Aged Care

- Zhiva Living, Dural
- Uniting, Marion Street Leichhardt
- Uniting, Norton Street Leichhardt
- Bupa, Sutherland

Appendix D – Consultation Record

Appendix E – Geotechnical and Hydrogeological Assessment

Catholic Education Diocese of Parramatta C/- WINIM Developments Pty Ltd

Preliminary Geotechnical and Hydrogeological Assessment: WCC Stage 1 - 2 Darcy Road, Westmead NSW

P1907547JR02V02
February 2020

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Martens & Associates Pty Ltd derived the data in this report primarily from a number of sources which may include for example site inspections, correspondence regarding the proposal, examination of records in the public domain, interviews with individuals with information about the site or the project, and field explorations conducted on the dates indicated. The passage of time, manifestation of latent conditions or impacts of future events may require further examination / exploration of the site and subsequent data analyses, together with a re-evaluation of the findings, observations and conclusions expressed in this report.

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Document and Distribution Status

Author(s)	Reviewer(s)	Project Manager	Signature
Shaun van Kal	Ralph Erni	Jeffrey Fulton	

Revision No.	Description	Status	Release Date	Document Location			
				File Copy	Catholic Education Diocese of Parramatta C/- WINIM Developments Pty Ltd		
1	Preliminary Geotechnical and Hydrogeological Assessment	Draft	12.02.2020	1E,1P,1H	1P		
2	Preliminary Geotechnical and Hydrogeological Assessment	Final	21.02.2020	1E,1P,1H	1P		

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All enquiries regarding this project are to be directed to the Project Manager.

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Abbreviations

ABC – Allowable bearing capacity

BH – Borehole

CBD – Central Business District

CEDP – Catholic Education Diocese of Parramatta

CFA – Continuous flight auger

DA – Development application

DBYD – Dial Before You Dig

DCP – Dynamic cone penetrometer

DoP – Diocese of Parramatta

DP – Deposited plan

IA – Investigation Area

KN - Kilonewtons

kN/m^3 – Kilonewtons per cubic metre

kPa – Kilopascal

LGA – Local government area

MA – Martens & Associates Pty Ltd

mAHD – Metres Australian height datum

mbgl – Metres below ground level

MPa - Megapascal

SSD – State Significant Development

WCC – Westmead Catholic Community

1 Introduction

1.1 Overview

This report supports a State Significant Development Application for the Westmead Catholic Community (WCC) Site at 2 Darcy Road, Westmead.

The WCC project seeks to meet the needs of the growing population within the region by providing upgraded school facilities for Mother Teresa and Sacred Heart Primary Schools, as well as a new Parish church. WCC is a collaboration between Catholic Education Diocese of Parramatta (CEDP), the Diocese of Parramatta (DoP), the Sisters of Mercy and the Marist Brothers Province of Australia.

As the proposal is for the purposes of alterations and additions to an existing school and has a capital investment value in excess of $20 million, it is a State Significant Development (SSD) for the purposes of the Environmental Planning and Assessment 1979 (the Act). The Parish church is also an SSD under clause 8(2) (a) of State Environmental Planning Policy (State and Regional Development) 2011 as it forms part of the proposal, which comprises a single integrated development with significant functional links between the education and church uses.

1.2 The Site

The WCC Site is located within the Parramatta local government area (LGA). It is approximately 2 km to the north-west of the Parramatta CBD and approximately 300 m to the west of Westmead Train Station.

The WCC Site has an area of approximately 12 ha and a frontage of approximately 430 m to Darcy Road. It consists of two lots, which are legally described as: Lot 1 in DP1095407, which is owned by the Trustees of the Roman Catholic Church of Parramatta; and Lot 1 in DP1211982, which is under the ownership of the Trustees of the Marist Brothers.

The WCC Site is bound by:

- Darcy Road to the north followed by the Westmead Health and Education Precinct comprising the Westmead Hospital, Westmead Private Hospital and the Western Sydney University Medical Research Institutes.
- The T1 North Shore & Western / T5 Cumberland train lines to the south.
- The Western Sydney University Westmead Campus to the east.

- Residential land use to the west.

The locational context of the WCC Site is shown in Figure 1.

The Westmead Health and Education Precinct, the WCC Site and the surrounding residential land collectively form part of the recently nominated Westmead Priority Precinct Area.

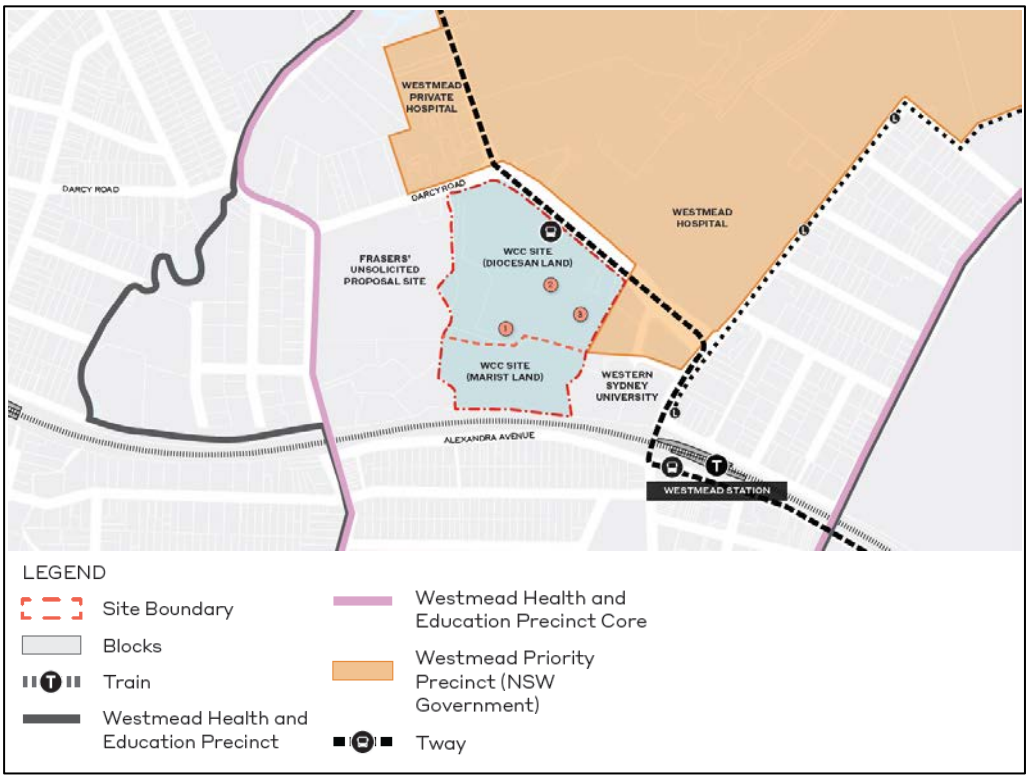

Figure 1: Location Plan

1.3 Existing Development

The WCC Site currently contains three separate schools:

- The Catherine McAuley Westmead Catholic High School for girls which predominantly occupies the northern part.
- The Parramatta Marist High School for boys which occupies the eastern part.
- The Mother Teresa Primary School occupies part of the Catherine McAuley Westmead High School building in the centre.
- The southern portion contains open sports fields associated with the Parramatta Marist High School.

The existing Brothers' residence is located in the north-eastern corner of the WCC Site. An at-grade car park occupies the western part of the WCC Site, to the north of the sports fields. Collectively, the three schools currently accommodate approximately 2,637 students and 190 staff.

1.4 The Proposed Site Development

The SSD application will seek approval for:

- A primary school with capacity for approximately 1,680 students to provide expanded facilities for the existing Mother Teresa Primary School and to replace the existing Sacred Heart Primary School at Ralph Street.
- A new Parish church.
- A Catholic early learning centre (fit-out within an existing building).
- New landscaping.

The area to be redeveloped (the site) is located within the WCC site (Diocesan Land) at 2 Darcy Road, Westmead NSW as shown in Map GE01, Map Set MS02-R01, Attachment A.

2 Investigation Area and Scope of Works

The focus of this preliminary geotechnical and hydrogeological assessment is the proposed K-6 school building and church building, to be located within the north western corner of the site [the investigation area (IA)]. The IA is shown in Map GE01, Map Set MS02-R01, Attachment A. The proposed development details and investigation scope are summarised in Table 1.

Table 1: Summary of the proposed development and investigation scope.

Item	Details
Proposed Development	The proposed development is to consist of: o A new 6-level K-6 building with a lift. Maximum column loads of 6000 kN are anticipated. The building is to have a ground floor slab at RL 20.5 m above Australian Height Datum (mAHD) (Alleanza Architecture, 2020a). The lift pit is anticipated to extend to a depth of 3 m below the finished ground floor level (RL 17.5 mAHD). o A new single level church building with finished ground floor slab level at RL 19.9 mAHD (Alleanza Architecture, 2020b). o A plinth, supporting a Crucifix, of approximately 14 m height. o Flexible pavements for car park areas and access roads. o Rigid (concrete) pavements around the new buildings.
Site Description	At the time of the geotechnical investigation, the IA consisted of: o Grassed sports fields in the north-west with mature trees along the northern site boundary. o Demountable school buildings and artificial turf outdoor play area in the south. o Netball court in the north-east. o Concrete footpaths.
Surrounding Land Uses	The surrounding land use is as follows: o Darcy Road to the north of the site followed by Westmead Hospital to the northeast of Darcy Road. o School buildings, netball courts and car park to the east. o Car park and raised walkway over a pond to the south and south-west of the site. o A site access road to the west of the site followed by a small unnamed creek to the west of the access road. The creek was dry at the time of the geotechnical investigation and is considered to be a spatially intermittent creek.
Investigation Scope of Work	In accordance with the scope of works outlined in MA quotation P1907547BC01V03, dated 16 December 2019, the field investigation conducted from 9 January 2020 to 18 January 2020 included: o Review of available mapping literature. o Review of DBYD survey plans and clearance of borehole locations of underground services. o A walkover inspection of the site to review local geology, soil exposures, surface hydrology, topography and drainage. o Drilling of 11 augered boreholes to between 4.0 to 7.3 metres below ground level (mbgl) or prior TC-bit refusal on bedrock. o Advancement of three of the boreholes (BH105, BH109 and BH110) using rock coring methods to a maximum depth of 13.0 mbgl.

Item	Details
	o Dynamic Cone Penetrometer (DCP) tests at the borehole locations to assess the near-surface soil consistency or relative density. o Collection and laboratory testing of 3 samples for Atterberg limits and linear shrinkage. o Point load testing of 6 collected rock core samples. The investigation locations are shown in Map GE02, Map Set MS02-R01, in Attachment A.

3 Site Details and Subsurface Conditions

3.1 Site Details

Table 2 summarises the general site details considered relevant to the investigation and proposed development.

Table 2: Summary of site details and conditions.

Element	Description/Detail
Topography	The site forms part of the Blacktown landscape characterized by gently undulating rises with local relief up to 30 m and slopes usually greater than 5 % (Hazelton et al, 2010). The site is located on a hill side that originally fell with a gentle gradient towards the north-west. The area occupied by grassed sports field in northern and north-western part of the site has been filled between 1.5 m and 3.6 m above the existing ground levels along Darcy Road to raise ground levels. Embankments along the northern and north-western property boundaries and along the eastern side of the site access road that fall with an approximately 1V: 3H gradient down towards Darcy Road and the site access road. The base of the embankment is supported by a retaining wall typically between 0.5 m and 1.5 m high. The retaining wall appears to be in good condition with no obvious signs of deterioration. An embankment is also present between the access road and the creek. The embankment falls between 1V:2H and 1V:3H towards the creek. A stagnant pond is present approximately 40 m to the southwest of the IA.
Site Elevation	Ground levels across the site range between 19.2 mAHD in the north-west to 20.3 mAHD in the south-east [Vince Morgan (Surveyors) Pty Ltd, 2019].
Site Aspect	North-west
Typical Site Slope	Less than 5 % across the proposed development area.
Site Drainage	Via overland flow towards the north-west and buried stormwater drains located throughout the site.
Expected Geology Soil and Landscape	The site is underlain by Ashfield Shale comprising dark-grey to black sideritic claystone, siltstone and fine sandstone-siltstone laminite (Clark & Jones, 1991). The north-east to south-west trending Coastal Lineament fault line is mapped approximately 400 m to the north-west of the site. The site is underlain by Blacktown landscape soils that are generally shallow to moderately deep (greater than 1.0 m) and generally comprise clay associated with the Wianamatta Group, Bringelly and Ashfield Shale (Hazelton et al, 2010).
Historical development	The 1943 aerial photographs indicate that the site consisted of pasture with scattered tree cover. An unnamed meandering creek is visible in the western part of the site (Land and Property Information, 2020). By 2003 the site had been developed with school buildings in the southern part of the site. Sports fields and courts are visible in the northern part of the site with trees along the northern site boundary (Google Earth, 2020a). The creek alignment had also been changed to accommodate the development. The 2005 aerial photograph of the site shows the construction of the site access road (Google Earth, 2020b). It appears that the road was constructed by cutting into the north-west part of the school property to the existing ground levels along Darcy Road.

Regrading of the embankments along the northern and north-western site boundaries and the construction of retaining walls associated with the widening of Darcy Road appears to have taken place between 1 October 2005 and 21 September 2006 (Google Earth 2020c and 2020d).

A school building is present in the east of the site in late-2011 (Google Earth 2020e).

By 2012 some of the school buildings in the southern part of the site have been replaced with an outdoor play area (Google Earth, 2020f).

The site has largely remained unchanged since 2012.

3.2 Subsurface Conditions

3.2.1 Previous Geotechnical and Environmental Investigations

Jeffrey & Katauskas Ltd (J&K) and Environmental Investigation Services (EIS) undertook a combined geotechnical and preliminary environmental investigation in November 2008 of the area to the south and east of the IA for proposed new school buildings and carpark (J & K, 2008 and EIS, 2008). The key findings of the combined investigation include:

- Fill of variable composition underlies the area investigated to depths ranging from 0.2 m to 2.6 mbgl.
- Natural medium plasticity silty clay is present beneath much of the area and ranges in thickness from 0.8 m to 2.7 m.
- Weathered shale was encountered at depths ranging between 2.2 mbgl to 5.0 mbgl.
- The near surface shale is very low strength, increasing to medium to high strength with depth.
- Groundwater was measured at depths ranging from 2.6 mbgl to 4.4 mbgl.
- Sources of potential soil and groundwater contamination identified by EIS include potentially contaminated imported fill material, demolition of former structures in the central-west and south-east sections of the area investigated, and potential use of pesticides in the southern section of the area investigated

The approximate locations of the J&K boreholes are indicated in Map GE02 Map Set MS01-R01, Attachment A. Copies of the J&K borehole logs are provided in Attachment F.

3.2.2 Subsurface Conditions – Church and Crucifix

Based on the former J&K / EIS investigation and MA's investigation results, the following generalised subsurface units are expected to underlie the area of the proposed Church and Crucifix:

Unit A: Fill consisting predominantly of clay with some gravel, sand and silt. The fill material and conditions vary across the area of the proposed building and is considered as "uncontrolled" fill. The fill extends to depths ranging from 2.5 mbgl to 3.8 mbgl, increasing from south-east to north-west. The fill is expected to be site-won excavated material from the construction of the buildings in the eastern part of the site.

Unit B: Alluvium: medium to high plasticity clay with silt and silty clay, with lesser amounts of low to medium plasticity silt. The alluvium is generally soft or firm with some stiff to very stiff layers and is between 0.9 m and 1.8 m thick, likely increasing towards the north-west. The alluvium has an organic odour.

Unit C: Residual Soil: medium to high plasticity clay and clay with silt, stiff to hard. The residual soil profile is in excess of 3.2 m thick.

Unit D1: Highly weathered, very low to low strength shale was encountered in borehole BH103 at a depth of 7.1 mbgl and was proven to 7.3 mbgl. The depth to rock appears to increase towards the north-west. The highly weathered shale is inferred to be Class V shale in accordance with Pells et al (1998).

Unit D2: Medium to high strength shale is expected to be located below depths of between 8.0 mbgl and 9.0 mbgl.

Groundwater inflows were observed at depths ranging from 3.2 mbgl to 4.5 mbgl (RL 16.8 mAHD to 15.2 mAHD).

Encountered conditions are described in more detail on the borehole logs (BH101 to BH103) in Attachment B and associated explanatory notes in Attachment H. For DCP test results refer to Attachment C.

3.2.3 Subsurface Conditions – K-6 Building

Based on the former J&K / EIS investigation and MA's investigation results, the following generalised subsurface units are expected to underlie the area of the proposed K-6 School building:

Unit A: Fill consisting predominantly of clay with some gravel, sand and silt. The fill material and conditions vary across the area of

the proposed building and is considered as "uncontrolled" fill. The fill extends to depths ranging from 1.6 mbgl in the east to 3.4 mbgl in the west. The fill is expected to be site-won excavated material from the construction of the buildings in the eastern part of the site.

Unit B: Alluvium: medium to high plasticity clay with silt and silty clay with lesser amounts of low to medium plasticity silt. The alluvium is generally soft to firm with some stiff to very stiff layers and is between 0.4 m and 1.8 m thick increasing westwards towards the creek and over an inferred drainage depression extending northeast – southwest across the area of the proposed building.

Unit C: Residual soil: medium to high plasticity clay and clay with silt, stiff to hard. The residual soil is between 1.5 m and 4 m thick.

Unit D1: Shale and claystone: highly weathered, very low to low strength. The highly weathered shale and claystone is between 2.6 m and 3.9 m thick and inferred to be Class V shale in accordance with Pells et al (1998).

Unit D2: Medium strength shale, thinly laminated, slightly weathered, with high strength layers. The slightly weathered shale was proven to a depth of 13 mbgl. Shearing of the shale is evident from a number of steeply inclined fractures encountered within boreholes BH105, BH109 and BH110 at depths of between 9.0 mbgl and 9.5 mbgl. The shearing is likely associated with the Coastal Lineament fault. The slightly weathered, medium strength shale is inferred to be Class II shale in accordance with Pells et al (1998).

Groundwater inflows were observed at depths ranging from 2.4 mbgl to 7.1 mbgl (RL 17.9 mAHD to 13.2 mAHD).

Encountered conditions are described in more detail on the borehole logs (BH104 to BH111) in Attachment B and associated explanatory notes in Attachment H.

4 Hydrogeological Assessment

4.1 NSW Department of Primary Industries Bore Search

A review of the NSW Department of Primary Industries Water (DPIW) real time groundwater bore database revealed that there is one groundwater monitoring bore within 500 m of the subject site (BOM, 2020). The borehole, reference number GW108378, is located approximately 415 m north-east of the site along the bank of the Toongabbie Creek. The borehole was drilled for industrial purposes, possibly for the abstraction of potable groundwater. A groundwater depth of 23 mbgl was recorded in this borehole.

4.2 Groundwater Observations

A summary of groundwater inflows encountered during the drilling of the boreholes is provided in Table 3.

Table 3: Summary of groundwater inflow levels.

Location	Geology	Groundwater Inflows	
		Depth (mBGL)	RL (mAHD)
BH101	Alluvium	4.5	15.20
BH102	Alluvium	3.2	16.80
BH103	Alluvium	3.4	16.75
BH104	Fill	2.9	17.5
BH105	Alluvium	2.6	17.80
BH106	N/A [2]	NIL [1]	N/A [2]
BH106A	Shale	7.1	13.20
BH107	Claystone	5.5	14.65
BH108	Alluvium	2.9	17.35
BH109	Fill	2.4	17.90
BH110	Fill	2.7	17.70
BH111	Residual soil (near rock interface)	3.1	17.3

Notes:

1. Not encountered during auger drilling.
2. Not applicable

A summary of groundwater level readings following completion of borehole drilling is provided in Table 4.

Table 4: Summary of standing groundwater levels.

Location	Date	Groundwater levels		Geology
		Depth (mBGL)	RL (mAHD)	
BH101	18.01.2020	4.29	15.41	Alluvium
BH104	14.01.2020	2.90	17.50	Fill
	18.01.2020	2.90	17.50	
BH107	13.01.2020	4.70	15.45	Claystone
BH109	13.01.2020	2.00	18.30	Fill
BH111	08.01.2020	6.50	13.90	Shale

A groundwater monitoring well was constructed in BH106A (MW01) with a slotted screen extending from 3.0 mbgl to 7.2 mbgl. A summary of groundwater level measurements is provided in Table 5.

Table 5: Summary of groundwater level measurements at MW01.

Geology	Date	Groundwater Level	
		Depth (mBGL)	RL (mAHD)
Shale	18.01.2020	4.45	15.95
	06.02.2020	4.52	15.88

4.3 Conclusions

The groundwater observations indicate the presence of two groundwater bearing zones:

1) A shallow perched groundwater within the fill and alluvium at depths of between 2.0 mbgl and 4.29 mbgl (RL 18.3 mAHD and RL 15.41 mAHD respectively).

2) A deeper groundwater level within the shale and the residual soil close to the rock interface at depths of between 3.1 mbgl and 7.1 mbgl (RL 17.3AHD and 13.2m AHD respectively).

The groundwater is anticipated to be the result of:

- The penetration of surface water run-off into the ground.
- Lateral movement of groundwater from upslope areas to the south and south-east of the IA.
- Surface water seepage through the ground from the pond to the south-west of the IA.

It is anticipated that the groundwater flows across the site towards the north-west. Groundwater levels are expected to reduce towards the north-west. Flow rates are anticipated to be low, increasing following intense or prolonged periods of precipitation.

The excavation for the lift shaft should not intercept the permanent groundwater. The proposed development is anticipated to have no impact on the permanent groundwater level and no drawdown effects are foreseen. Minor perched groundwater seepages may be controlled using sump and pump methods to keep the excavation reasonably dry during construction.

5 Salinity and Acid Sulphate Soils Assessment

5.1 Documented Salinity Risk Potential

The NSW Office of Environment and Heritage (2020) indicates that the site is located within the Blacktown soil landscape and that the site is located in an area of high salinity potential.

5.2 Signs of Potential Saline Soils

No obvious signs of saline conditions were observed:

- Vegetation growth appeared healthy and uninhibited.
- No water marks or salt crystals were observed on the ground surface.
- Site surface drainage appeared generally good.
- No evidence of concentrated surface erosion was observed.

5.3 Laboratory Test Results

Laboratory test results for preliminary salinity classification are summarised in Table 6. Laboratory test certificates are provided in Attachment E.

Table 6: Salinity test results.

Sample ID [1]	Material [2]	Soil Type	$EC_{(1:5)}$ (dS/m)	EC_e (dS/m) [3]	Salinity Classification [4]
7547/BH101/0.5	Heavy Clay	Fill	0.12	0.72	Non-saline
7547/BH101/2.0	Heavy Clay	Fill	0.30	1.80	Non-saline
7547/BH101/4.0	Heavy Clay	Alluvium	0.27	1.62	Non-saline
7547/BH101/6.0	Heavy Clay	Residual	0.24	1.44	Non-saline
7547/BH103/1.0	Heavy Clay	Fill	0.24	1.44	Non-saline
7547/BH103/3.0	Heavy Clay	Alluvium	0.07	0.4	Non-saline
7547/BH103/5.0	Heavy Clay	Residual	0.36	2.16	Slightly saline
7547/BH105/2.0	Heavy Clay	Residual	0.44	2.64	Slightly saline
7547/BH105/4.0-4.45	Heavy Clay	Residual	0.36	2.16	Slightly saline
7547/BH106a/1.0	Heavy Clay	Fill	0.40	2.40	Slightly saline
7547/BH106a/4.0	Heavy Clay	Residual	0.35	2.10	Slightly saline

Sample ID [1]	Material [2]	Soil Type	$EC_{(1:5)}$ (dS/m)	EC_e (dS/m) [3]	Salinity Classification [4]
7547/BH106a/4.0	Heavy Clay	Residual	0.38	2.28	Slightly saline
7547/BH106a/6.0	Heavy Clay	Residual	0.55	3.30	Slightly saline
7547/BH108/3.5	Heavy Clay	Alluvium	0.05	0.31	Non-saline
7547/BH108/5.4	Heavy Clay	Residual	0.56	3.36	Slightly saline
7547/BH111/0.5	Heavy Clay	Fill	0.09	0.52	Non-saline
7547/BH111/2.5	Heavy Clay	Residual	0.18	1.08	Non-saline
7547/BH111/3.5	Heavy Clay	Residual	0.15	0.90	Non-saline

Notes:

1. Borehole#/Depth (mbgl).
2. Based on Soil Texture Group in Table 6.1 in DLWC (2002).
3. Based on EC to EC_e multiplication factors from Table 6.1 in DLWC (2002).
4. Based on Table 6.2 of DLWC (2002) where EC_e <2 dS/m = non-saline, EC_e of 2-4 dS/m = slightly saline, EC_e of 4-8 dS/m = moderately saline, EC_e of 8-16 dS/m = very saline and EC_e of >16 dS/m = highly saline.

5.4 Conclusions and Recommendations

The alluvium is categorised as non-saline while the fill and residual soil are categorised as non-saline to slightly saline. Saline soil management strategies are considered not to be required.

5.5 Acid Sulphate Soils (ASS)

The site is mapped as not impacted by ASS risk (NSW Department of Environment & Heritage, 2020). Considering site elevation, topographic, and geology maps and encountered subsurface conditions, it is expected that the alluvium, residual soil and rock profiles are not associated with ASS. Further site investigations for an ASS assessment or preparation of an ASS management plan (ASSMP) are considered not to be required.

6 Geotechnical Assessment

6.1 Laboratory Point Load Testing

Laboratory point load strength index test results are summarised in Table 7. Rock core photographs are provided in Attachment D for reference. The laboratory test certificate is provided in Attachment E.

Table 7: Point load strength index test results

Borehole	Sample Depth (mbgl)	Point Load Strength Index $I_{s(50)}$ (MPa) [3]		UCS [1] (MPa)	Rock Strength [2]
		Diametral	Axial		
BH105	9.00 – 9.12	0.75	0.49	9.8	Medium
	11.12 – 11.27	0.94	1.7	34	High
BH109	9.12 – 9.27	1.1	1.1	22	High
	10.37 – 10.49	0.73	0.66	13.2	Medium
BH110	9.34 – 9.50	0.72	0.67	13.4	Medium
	11.8 – 12.00	1.1	2.0	40	High

Notes:

1. Unconfined Compressive Strength of intact material, assuming UCS = 20 x $I_{s(50)}$.
2. Strength classification based on AS1726 (2017).
3. MPa – Megapascal.

The test results and observations during rock coring confirm that the bedrock at the IA generally consists of medium strength shale below a depth of 9.0 mbgl, with some high strength layers. In addition to this, it is anticipated that some low strength layers of shale may also be present below 9.0 mbgl.

It should be considered that testing was carried out on selective relatively intact rock core samples. Intact core samples of the shale above a depth of 9.0 mbgl could not be collected or tested due to the high degree of fracturing and the highly weathered nature of the rock. The highly fractured nature of the shale above a depth of 9.0 mbgl is likely due to shearing associated with the Coastal Lineament fault mapped approximately 400 m to the north-west of the site. The highly fractured rock increased penetration of groundwater causing the high degree of weathering of the shale to a depth of 9.0 mbgl.

Engineering properties of the rock mass will be impacted by the presence of defects in the rock profile, including weathered, sheared and fractured zones.

6.2 Atterberg Limits and Linear Shrinkage Testing

Laboratory Atterberg and linear shrinkage test results are summarised in Table 8. The laboratory test certificate is provided in Attachment E.

Table 8: Atterberg Limits and Linear Shrinkage Test Results.

Sample ID [1]	Material	Atterberg Limits (%) [2]			LS (%) [2]	Plasticity Classification
		LL	PL	PI		
7547/103/3.0	Silty CLAY	39	16	23	10	Medium
7547/103/4.0	Clay with silt	55	17	38	16.5	High
7547/106A/3.0–4.0	Clay with silt	65	17	48	18.5	High

Notes:

1. Project#/Borehole#/Depth (mBGL).
2. LL = Liquid limit, PL= Plastic limit, PI=Plasticity index, LS = Linear shrinkage

Laboratory test results indicate that the tested soil samples are of medium to high plasticity with a high degree of reactivity, which may result in high ground movement due to soil moisture changes.

6.3 Exposure Classification

Exposure classification test results are summarised in Table 9. The laboratory test certificates are provided in Attachment E.

Table 9: Exposure classification test results.

Sample ID [1]	Material	EC_e (dS/m) [2]	pH	Sulphate (SO_4) (mg/kg)	Exposure Classification		
					AS 2159 [3]	AS 2159 [4]	AS 3600 [5]
7547/BH101/0.5	Clay	0.12	8.4	<10	Non-aggressive	Non-aggressive	A1
7547/BH101/2.0	Clay	0.30	5.7	370	Non-aggressive	Non-aggressive	A1
7547/BH101/4.0	Clay	0.27	8.3	270	Non-aggressive	Non-aggressive	A1
7547/BH101/6.0	Clay	0.24	7.6	140	Non-aggressive	Non-aggressive	A1
7547/BH103/1.0	Clay	0.24	7.9	170	Non-aggressive	Non-aggressive	A1
7547/BH103/3.0	Clay	0.07	6.7	64	Non-aggressive	Non-aggressive	A1
7547/BH103/5.0	Clay	0.36	5.9	190	Non-aggressive	Non-aggressive	A1
7547/BH105/2.0	Clay	0.44	6.5	490	Non-aggressive	Non-aggressive	A1

Sample ID [1]	Material	EC_e (dS/m) [2]	pH	Sulphate (SO_4) (mg/kg)	Exposure Classification		
					AS 2159 [3]	AS 2159 [4]	AS 3600 [5]
7547/BH105/4.0-4.45	Clay	0.36	5.5	87	Mild	Non-aggressive	A2
7547/BH106a/1.0	Clay	0.40	7.5	500	Non-aggressive	Non-aggressive	A1
7547/BH106a/4.0	Clay	0.35	5.1	79	Mild	Non-aggressive	A2
7547/BH106a/4.0	Clay	0.38	5.1	76	Mild	Non-aggressive	A2
7547/BH106a/6.0	Clay	0.55	5.6	160	Non-aggressive	Mild	A1
7547/BH108/3.5	Clay	0.05	6.5	<10	Non-aggressive	Non-aggressive	A1
7547/BH108/5.4	Clay	0.56	6	160	Non-aggressive	Mild	A1
7547/BH111/0.5	Clay	0.09	6.9	59	Non-aggressive	Non-aggressive	A1
7547/BH111/2.5	Clay	0.18	5.3	20	Mild	Non-aggressive	A2

Notes:

1. Project#/Borehole#/Depth (mBGL).
2. From Column 5, Table 6.
3. Exposure classification for concrete piles in soil based on Table 6.4.2(C) of AS 2159-2009.
4. Exposure classification for steel piles in soil based on Table 6.5.2(C) of AS 2159-2009.
5. Exposure classification for buried reinforced concrete based on Tables 4.8.1 and 4.8.2 of AS 3600-2018.

In accordance with AS2159 (2009), an exposure classification of 'mild' should be adopted for buried concrete and steel piles. In accordance with AS3600 (2018), an exposure classification of 'A2' should be adopted for shallow concrete footings.

6.4 Earthquake Site Subsoil Class

The site is assessed to be a class 'C_e (shallow soil site)' in accordance with AS 1170.4 (2007). An earthquake Hazard Factor (z) of 0.08 may be adopted for this site.

6.5 Preliminary Material Properties

Preliminary material properties inferred from observations during borehole drilling, such as auger penetration resistance, DCP test results, rock condition and point load test results as well as engineering judgement are summarised in Table 10.

Table 10: Preliminary material properties.

Layer	$Y_{in-situ}$ [1] (kN/m³)	UCS [2] (MPa)	c_u [3] (kPa)	c' [4] (kPa)	Ø' [5] (deg)	E' [6] (MPa)	K_0 [7]	K_a [8]	K_p [9]
Unit A: Fill: Clay (uncontrolled).	17	NA [10]	50	4	26	8	0.56	0.39	2.56
Unit B: Alluvium: soft to firm, medium to high plasticity clay.	16	NA [10]	10	2	22	2	0.63	0.46	2.2
Unit C: Residual: stiff to hard, medium to high plasticity clay and clay with silt.	17	NA [10]	75 - 200	4 - 6	26 - 30	15 - 60	0.56 – 0.50	0.39 – 0.33	2.56 – 3.00
Unit D1: Highly weathered, very low to low strength, highly fractured, shale (Class V Shale [11]).	22	0.5	NA [10]	20	28	50	NA [10]	NA [10]	NA [10]
Unit D2: Slightly weathered to fresh, medium strength shale (Class II Shale [11]).	23	9	NA [10]	150	32	1000	NA [10]	NA [10]	NA [10]

Notes:

1. Material in-situ unit weight (kN/m³), based on visual assessment (±10 %).
2. Unconfined Compressive Strength of rock.
3. Undrained shear strength of cohesive soils.
4. Drained cohesion.
5. Effective internal friction angle (±2˚) estimate, assuming drained conditions.
6. Effective elastic modulus (±10 %) estimate.
7. Earth pressure coefficient at rest.
8. Active earth pressure coefficient.
9. Passive earth pressure coefficient.
10. Not applicable.
11. Classification according to Pells et al (1998).

6.6 Risk of Slope Instability

No evidence of former land instability could be observed within the site and surrounding land during the site walkover survey. Boreholes have identified potentially sheared zones within the rock indicative of former and now relict of early movements.

The risk of potential slope instability, such as landslide or soil creep, is considered to be very low subject to the recommendations in this report and the adoption of relevant engineering standards and guidelines. A detailed slope risk assessment in accordance with the Australian

Geomechanics Society's Landslide Risk Management Guidelines (2007) was not undertaken.

7 Preliminary Pavement Thickness Design

7.1 Design Parameters

7.1.1 Traffic Loading

A traffic loading of 5 x 10^4 Equivalent Standard Axles (ESA) was adopted for design of the proposed internal road and carpark areas in accordance with Austroads (2012).

7.1.2 California Bearing Ratio (CBR) Value

Based on the near surface soils encountered, a CBR value of between 1% and 3% is to be expected.

The Australian Road Research Board (1989) advises that a minimum CBR value of 3% is to be adopted for preliminary design purposes. In order to adopt a CBR value of 3%, subgrade improvement or replacement with a suitable engineered fill may be required.

CBR testing is recommended to provide reliable information regarding the subgrade conditions across the proposed pavement areas for the detailed design of the site.

7.2 Subgrade Preparation

The subgrade is to be trimmed and treated to at least 300 mm depth by either:

- Removal and replacement with approved granular fill under geotechnical engineer's direction;
- Undertake in-situ stabilisation with cement / lime or similar binding agent; or
- Mixing the existing subgrade material with granular material to achieve a minimum 3 % CBR for subgrade.

Disposal of excavated material off site, if required, should be carried out in accordance with NSW EPA (2014) Waste Classification Guidelines.

Density testing of the upper 300 mm of subgrade and placed fill should be carried out at a minimum rate of one test per 500 m^3 distributed reasonably evenly throughout full depth and area (refer Table 8.1 of AS3798). Minimum relative density of the subgrade shall be 100 % Maximum Dry Density (MDD) at a standard compactive effort within 2 % of optimum moisture content (OMC).

7.3 Preliminary Flexible Pavement Thickness

A flexible pavement is considered to be suitable for the site. Table 11 presents recommended flexible pavement material thicknesses for the proposed internal road.

Table 11: Preliminary flexible pavement material thickness design for CBR 3 %.

Road Type	Total Thickness (mm) [1]	Layer	Thickness (mm)	Materials
Private roads	400 (including pavement surfacing)	Pavement Surfacing	50	AC10
		Base	150 [1]	DGB20
		Sub-base	200 [1]	CSS40 or DGS40

Notes:

1. Total thickness of granular portion (i.e. base + sub-base) was adopted from Figure 12.2 Austroads (2017).

7.4 Preliminary Rigid Pavement Thickness

Rigid pavements may be considered for lightly trafficked roads on the site. Table 12 presents recommended preliminary rigid pavement material thicknesses for the proposed internal road.

Table 12: Preliminary rigid pavement material thickness design for CBR 3 %.

Pavement Composition	Total Thickness (mm) [1]	
	With concrete shoulders	Without concrete shoulders
Continuously reinforced concrete basecourse	165	180
Subbase	125	125
Minimum steel reinforcing fabric size	SL 92	
Min. concrete compressive strength	32 MPa	

Notes:

1. Total thickness of granular portion (i.e. base + concrete base) was adopted from Figures 12.14 and 12.15 Austroads (2017).

7.5 Placement and Testing of Pavement Material

Pavement materials shall be placed in layers (when compacted) not thicker than 200 mm or less than 100 mm. Pavement materials shall be compacted to the following condition:

- Sub-base - Minimum 98 % MDD at modified compactive effort (±2% OMC).

- Base - Minimum 98% MDD at modified compactive effort (±2% OMC).

Compaction testing shall be undertaken by a NATA accredited laboratory in accordance with Council requirements and industry standards. Testing should be carried out at a rate of 1 per 50 linear metres of road, or per 250 m^2, whichever is the greater, with a minimum of 2 tests in any one length. Each pavement layer shall be proof rolled under Geotechnical Engineers' supervision. Subsequent pavement layers shall not be placed prior to approval of underlying layer by the Geotechnical Engineer.

8 Geotechnical Recommendations

8.1 General Recommendations

General geotechnical recommendations for the proposed development are provided in Attachment G. Additional recommendations are provided in the following sections.

8.2 Key Geotechnical Constraints

The site is considered suitable for the proposed development. However, the following key geotechnical constraints should to be considered during the detailed design and construction phases:

- The IA is underlain by a layer of fill between 1.6 m and 3.8 m thick. The fill was likely placed under uncontrolled conditions considering the material condition variability and absence of compliance testing data. The fill cannot be relied on as a foundation and is likely to be susceptible to high ground movements (shrinking and/or swelling) due to soil moisture changes and loading. The fill in the north western part of the AI is not suitable for increased loading as this may induce settlement and instability of the embankment and retaining wall.

- The perched groundwater levels at depths of between 2.0 mbgl and 4.29 mbgl (RL 18.3 mAHD and RL 15.41 mAHD respectively) within the fill and alluvium are anticipated to be variable due to the presence of drainage depressions channelling the water into the western and north-western parts of the IA. Groundwater levels are also anticipated to be impacted by the water levels in the creek and pond to the west and south-west.

- The soft to firm alluvium is not considered suitable as a foundation material as it is liable to settlement under increased loading and decomposition of organic material.

- The near-surface fill material is anticipated to give low CBR values in the order of 3%.

- The rock is highly weathered and sheared to a depth of 9.0 mbgl.

8.3 Site Classification

The site is classified as a "P" site in accordance with AS 2870 (2011) due to the presence of uncontrolled fill which is considered unsuitable as a foundation. The design should consider the possible impacts of perched ephemeral groundwater, surface water infiltration, surface water

ponding, and nearby vegetation (present and future) on the site classification.

8.4 Excavations

The proposed excavation for the K-6 building lift pit will encounter a soil profile comprising a variable thickness of fill overlying alluvium and residual soil of variable thickness and conditions. It is anticipated that the soils can be readily excavated using conventional tracked earthmoving equipment. The excavation will require support for excavation beyond a depth of 1.0 mbgl. This may be in the form of a bored pile wall with shotcrete infill panels, sheet pile walls or temporary I-beams and timber infill panels. Alternately, excavations may be battered to a temporary gradient of 1H: 1V provided there is sufficient space to remain outside of the zone of influence of adjacent structures. The zone of influence is defined as a 45-degee line extending downwards from the base of structures.

8.5 Reuse of Site-won Material

Excavated fill material is considered to be suitable for replacement as general fill provided it is free of substances with the potential to cause contamination. The preliminary site investigation undertaken by MA indicates that the site is considered to generally have a low risk of localised or broad scale contamination (MA, 2020). The alluvium is not considered suitable for reuse as it is anticipated to be water logged and contains organic material that is liable to decompose. The residual soil is considered suitable for reuse as a general fill.

Should filling be required to raise subgrade levels, the use of site-won excavated residual soils (unsuitable material and medium to high and high plasticity clay excluded) may be considered, subject to implementing stringent moisture conditioning and compaction controls. The use of medium to high or high plasticity clay will require treatment, as discussed above. Alternatively, suitable granular fill, approved for use by a Geotechnical Engineer, may be adopted.

8.6 Temporary Work Platforms

The near surface soils are liable to loss of strength upon wetting and are therefore assessed to be of poorly trafficable. It is recommended that a layer of crushed stone or recycled concrete be placed across the site in areas that are to be trafficked by construction plant to minimise erosion and dust formation. Additionally, it may be necessary to undertake an assessment of the site to establish the suitability of the sub-surface condition should plant with high ground bearing pressures (for instance cranes or large piling rigs) be required.

8.7 Allowable Bearing Capacity

Table 13 presents preliminary design parameters that may be adopted for footing design.

Table 13: Preliminary footing design parameters.

Layer [5]		Piles [1]	
		UBC [2,4]	USF [3,4]
Unit C:	Residual soil: clay stiff to hard.	450	10
Unit D1:	Shale Class V	2000	75
Unit D2:	Shale: Class II	15000	500

Notes:

1. Assuming bored cast in-situ pile.
2. Ultimate end bearing capacity (kPa) for piles embedded at least 0.5 m or 1 pile diameter, whichever is greater, into the material unit, subject to confirmation on-site by a geotechnical engineer of inferred foundation conditions.
3. Ultimate skin friction (kPa) below 1 m depth for bored pile in compression, assuming intimate contact between pile and foundation material and a pile sidewall roughness of R2.
4. Design needs to consider negative shaft friction due to the depth of fill present beneath the AI. A reduction factor of Øg = 0.4 should be adopted in accordance with AS2159 (2009) to limit settlement to an acceptable level for conventional building structures (< 1% of minimum footing width) considering a limited on-site pile testing regime. Shaft friction should be reduced by 25 % if the concrete is not poured immediately after completion of the pile bore.
5. Units A and B are excluded from this table as these are not considered suitable as foundations.

The ground conditions beneath the AI are assessed to be suitable for conventional bored piles. The piles may need to be cased to prevent collapse of the soft to firm fill and alluvium where groundwater is present.

8.7.1 Church and Crucifix

The near-surface soils beneath the area of the proposed church and crucifix are not considered suitable for shallow footings. End bearing piles, founded in residual soil or underlying rock, should be adopted. Preliminary pile design parameters are provided in Table 13.

8.7.2 K-6 Building

Due to the expected high column loads (6000 kN), the K-6 building is to be supported by end bearing piles founded in the slightly weathered, medium strength shale (Class II). Preliminary pile design parameters are provided in Table 13.

8.8 Site Preparation

In the event that lightly loaded floor slabs are to be raised above existing ground levels, it is recommended that unsuitable material such as the existing fill material is excavated to a depth of 0.3 mbgl. Suitable

engineered fill material should be placed in accordance with AS 3798-2007 to raise the site to the required levels. Prior to placement of the engineered fill, the sub-grade should be proof rolled and any soft spots or unsuitable material removed. Engineered fill should be compacted in layers no greater than 300 mm thick to achieve a density index of 70%. A minimum depth of 0.5 m of engineered fill beneath floor slabs is recommended for a 50 kPa allowable bearing capacity.

8.9 Site Drainage

The near-surface soils underlying the AI are prone to loss of strength and swell when wet. Surface water run-off should be diverted away from the proposed building platform, pavements and existing or new retaining walls. Ponding and infiltration of surface water should the prevented to limit the impact of associated soil softening beneath the building footings.

The near-surface soils are considered unsuitable for stormwater infiltration systems. However, the clay soils may be suitable for lining of stormwater detention basins. Further testing should be undertaken for verification.

8.10 Exclusion zones

To prevent damage to the existing retaining walls, it is recommended that exclusion zones be set out in the early stages of construction. It is recommended that the exclusion zone should be at least 2 m width from the slope crest on the northern and north-western site boundaries and along the access road to prevent damage to the retaining wall or instability of the fill slopes. No heavy plant, equipment or soil stock piles should be placed within this exclusion zone. The exclusion zones should be maintained and observed for the duration of construction.

8.11 Construction Monitoring and Inspections

Construction Monitoring and Inspection recommendations are provided in Table 14.

Table 14: Recommended inspection/monitoring requirements during site works.

Scope of Works	Frequency/Duration	Who to Complete
Observance and maintenance of exclusion zones in the northern and north-western parts of the site above the embankment and retaining wall.	Throughout the construction phase	Builder
Inspect exposed material at subgrade level to verify suitability as subgrade for new pavements and further fill placement.	Prior to placement of engineered fill	MA [1]

Scope of Works	Frequency/Duration	Who to Complete
Inspect exposed material at foundation level to verify suitability as foundation prior to pile construction.	Prior to reinforcement set-up and concrete placement	MA [1]
Monitor sedimentation downslope of excavated areas.	During and after rainfall events	Builder
Monitor sediment and erosion control structures to assess the adequacy and for removal of built up spoil.	After rainfall events	Builder
Monitor groundwater seepage/inflow into the excavation for the proposed lift pit excavation, if encountered, to assess the stability of exposed materials and adequacy of temporary drainage provision.	When encountered	MA [1]

Notes:

[1] MA= Martens and Associates engineer

The contractor will also need to take into consideration:

- The potential presence of high strength shale layers below 9.0 mbgl.
- The depth to medium strength shale decreases towards the west and northwest.
- Presence of water in piles may cause softening of the foundation material, therefore concrete will need to be placed immediately following pile boring using a tremie and adequate cleaning o pile base.
- Pile holes should be cased through the fill and soft alluvium.

8.12 Further Geotechnical Investigations

It is recommended that additional geotechnical investigations be undertaken to confirm the ground conditions for detailed design purposes. The geotechnical investigation should include:

I. Boreholes drilled using auger drilling methods to V-bit bit refusal on bedrock followed by rock coring to confirm our assessed conditions and to recover at least 3 m of medium strength rock below design foundation level.

II. In-situ testing including Standard Penetration Tests and DCP's to confirm the preliminary soil strength parameters.

III. Collection and lab testing of at least 2 CBR samples for pavement designs.

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Attachment A – Geotechnical Investigation Plans

0 40 80 120 160 200 m

1:4000 @ A4

Map Title / Figure:

Site Plan

GE01	Map
2 Darcy Road, Westmead, NSW	Site
Preliminary Geotechnical and Hydrogeological Assessment	Project
SSD Application	Sub-Project
Catholic Education Diocese of Parramatta	Client
13/02/2020	Date

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Environment | Water | Geotechnics | Civil | Projects

Project No: P1907547 Model: P1907547QGIS02 Projection: MGA Map Set: MS02-R01

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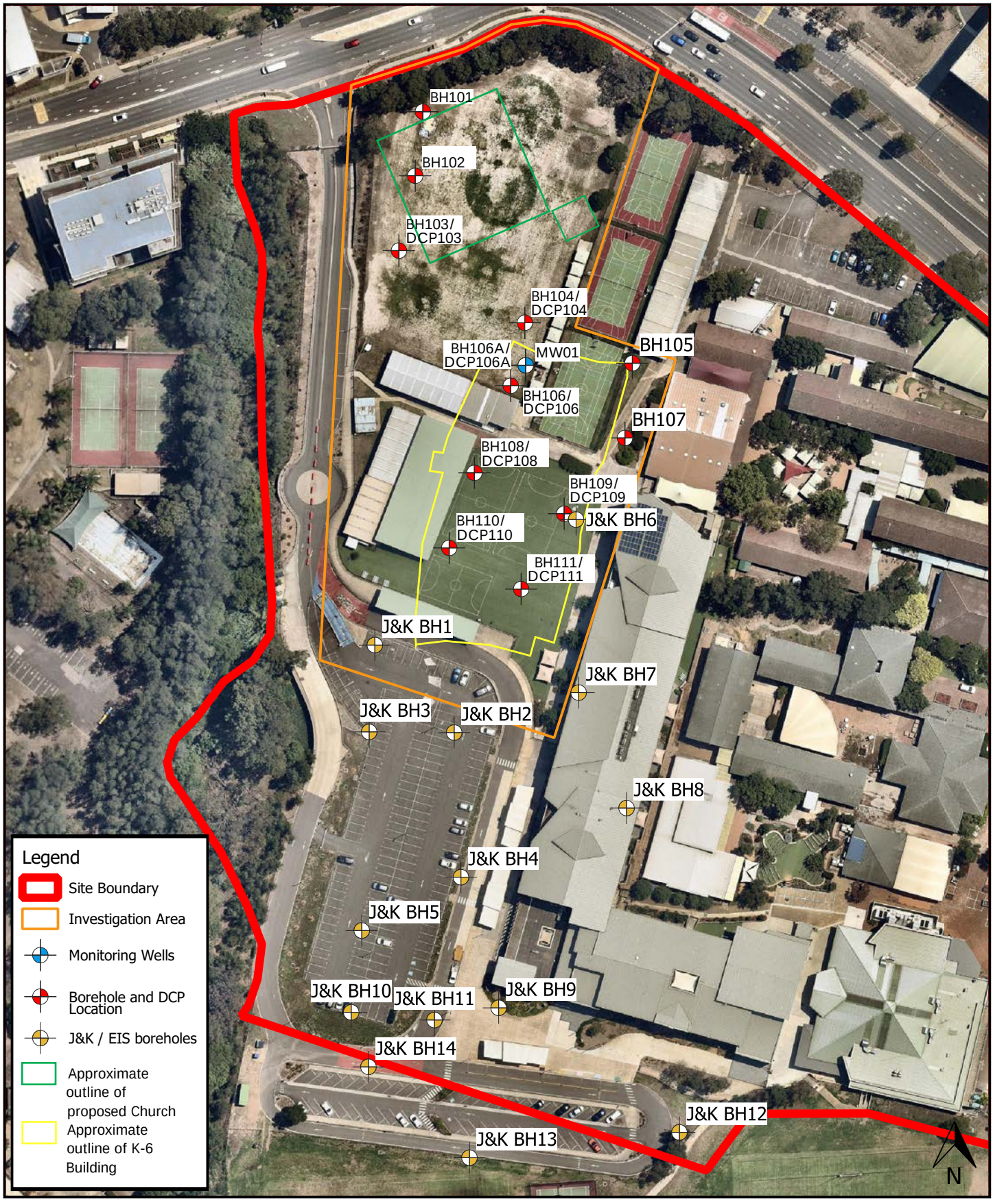

0 10 20 30 40 50 m

1:1500 @ A4

Map Title / Figure:

Geotechnical Investigation Plan

GE02	Map
2 Darcy Raod, Westmead, NSW	Site
Preliminary Geotechnical and Hydrogeological Assessment	Project
SSD Application	Sub-Project
Catholic Diocese of Parramatta	Client
13/02/2020	Date

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Project No: P1907547 Model: P1907547QGIS02 Projection: MGA Map Set: MS02-R01

Attachment B – Test Borehole Logs

CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	15/01/2020	COMPLETED	15/01/2020	**REF BH101**
PROJECT	Geotechnical Investigation		LOGGED	SVK	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD ute-mounted hydraulic dril rig	EASTING	150.983306	RL SURFACE	19.7 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.20 m depth	NORTHING	-33.803722	ASPECT	Flat	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T				19.70				SP	FILL: SAND; fine to medium grained; pale brown; trace silt and clay; poorly graded; poorly compacted.	D	L	FILL
				0.30								
				19.40	0.1/S/1 D 0.10 m			CL-CI	FILL: CLAY; low to medium plasticity; brown; with gravel; sand and silt; well graded; appears well compacted.			
	H				0.5/S/1 D 0.50 m							
			1		1/S/1 D 1.00 m					D	VSt - H	
				1.50								
				18.20				CH	FILL: CLAY; high plasticity; red-brown and brown; with gravel; sand and silt; poorly graded; appears moderately compacted.			
	L		2		2/S/1 D 2.00 m							
	H									M (<PL)	St - VSt	
	M		3		3/S/1 D 3.00 m							
	H											
				3.80								
				15.90				CI - CH	CLAY; medium to high plasticity; grey-brown; with silt; trace sand; fine grained well rounded gravel.			ALLUVIUM
			4		4/S/1 D 4.00 m					M (<PL)	F	
	M	18/01/20										
	L		5		5/S/1 D 5.00 m					M (>>PL)	S	5.00: Organic Odour
				5.60								
				14.10				CH	CLAY; high plasticity; grey-brown and grey; with silt; trace ironstone nodules.			RESIDUAL SOIL
	M		6		6/S/1 D 6.00 m						St	
										M (<PL)		
				6.60								
				13.10					From 6.6m - 7.2m inferred hard (inferred extremely weathered rock).			6.60: Inferred extremely weathered rock to 7.0 m.
	H		7								VSt - H	
				7.20								
									Hole Terminated at 7.20 m (Target depth reached)			

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P1907547BH101-BH119V01.GPJ <<DrawingFile>> 12/02/2020 16:59 8.30.004 Datgel Lab and In Situ Tool - DGD | Lib: Martens 2.00 2016-11-13 Prj: Martens 2.00 2016-11-13

CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	15/01/2020	COMPLETED	15/01/2020	**REF BH102**
PROJECT	Geotechnical Investigation		LOGGED	SVK	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD ute-mounted hydraulic dril rig	EASTING	150.983278	RL SURFACE	20 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.00 m depth	NORTHING	-33.803889	ASPECT	Flat	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V				20.00	0.1/S/1 D 0.10 m			CL-CI	FILL: Sandy CLAY; low to medium plasticity; brown; with silt; trace gravel; poorly graded; appears to be well compacted.			FILL
					0.3/S/1 D 0.30 m						VSt	
					0.5/S/1 D 0.50 m							
				0.70								
	H			19.30				CL	FILL: Gravelly CLAY; low plasticity; brown; with sand; trace silt; poorly graded; appears well compacted.			0.80: V-bit refusal.
			1		1/S/1 D 1.00 m							
				1.20								
				18.80				CL	FILL: CLAY; low plasticity; brown; with sand and gravel; trace silt; poorly graded; appears to be moderately compacted.	D		
	L		2		2/S/1 D 2.00 m							
				2.50							St	
				17.50				CI-CH	CLAY; medium to high plasticity; grey; with silt; trace sand and fine well rounded gravel.			ALLUVIUM 2.50: Organic colour.
										M (>PL)		
			3		3/S/1 D 3.00 m							
AD/T	M	15/01/20								M (>>PL)		
			4		4/S/1 D 4.00 m							
				4.30								
				15.70				CI-CH	CLAY; medium to high plasticity; red-brown; with silt; trace ironstone nodules.	M (>PL)		RESIDUAL SOIL
			5		5/S/1 ES 5.00 m						VSt	
	H									M (<PL)		
			6		6/S/1 D 6.00 m							
											H	
			7	*7.00*	7/S/1 D 7.00 m				Hole Terminated at 7.00 m (Target depth reached)			

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	15/01/2020	COMPLETED	15/01/2020	**REF BH103**
PROJECT	Geotechnical Investigation		LOGGED	SVK	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD ute-mounted hydraulic dril rig	EASTING	150.983222	RL SURFACE	20.15 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.30 m depth	NORTHING	-33.804083	ASPECT	Flat	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				20.15								
AD/V	H			0.30	0.1/S/1 D 0.10 m			CL	FILL: Sandy CLAY; low plasticity; brown; with silt; trace fine to medium gravel; poorly graded; poorly compacted.			FILL
				19.85				CI-CH	FILL: Gravelly CLAY; medium to high plasticity; brown; with sand and silt; trace fine to medium gravels; poorly graded; appears well compacted.		VSt	
				0.70	0.5/S/1 D 0.50 m							
				19.45				CI-CH	FILL: CLAY; medium to high plasticity; grey-brown; with silt and sand; fine to coarse gravels; poorly graded; appears to be well compacted; from 1.5m appears moderately to poory compacted.	D		0.70: V-bit refusal.
AD/T	M		1		1.0/S/1 D 1.00 m						St	
			2		2.0/S/1 D 2.00 m					M	F	
				2.80								
				17.35				CI-CH	Silty CLAY; medium to high plasticity; grey; trace sand; fine to medium gravels.			ALLUVIUM
AD/V	L	▽	3		3.0/S/1 D 3.00 m						S	
				3.90						M (>>PL)		
				16.25								RESIDUAL SOIL
			4		4.0/S/1 D 4.00 m			CI-CH	CLAY; medium to high plasticity; red-brown and grey; with silt; trace ironstone nodules.	M (>PL)	F	
			5		5.0/S/1 D 5.00 m							5.00: V-bit refusal on ironstone nodules.
AD/T	H		6		6.0/S/1 D 6.00 m					M (<PL)	VSt - H	
			7	7.10	7.0/S/1 D 7.00 m							
				13.05					SHALE; thinly laminated; highly weathered; inferred very low to low strength; with clay seams.			WEATHERED ROCK
				7.30					Hole Terminated at 7.30 m (Target depth reached)			

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	14/01/2020	COMPLETED	14/01/2020	**REF BH104**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983655	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.00 m depth	NORTHING	-33.804101	ASPECT	West	SLOPE <3%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V	H			20.40	0.1/S/1 D 0.10 m			SM	FILL: Silty SAND; fine grained; dark grey and brown.	D	VSt - H	FILL
				0.20								
	H			20.20				ML	FILL: Sandy SILT; low plasticity; red-brown; fine grained sand.			
				0.40	0.4/S/1 D 0.40 m			ML	FILL: Gravelly Sandy SILT; low plasticity; grey and brown; claystone gravels; fine to medium grained.		St	0.40: V-bit refusal.
	M			*0.70*								
				19.70				CI	FILL: Silty CLAY; medium plasticity; brown and red-brown; trace ironstone,coal and claystone gravels.	M (<<PL)		
	H		1		1.0/S/1 D 1.00 m						VSt - H	
	M				1.7-1.9/S/1 D 1.70 m						St	
			2		2.0/S/1 D 2.00 m					M (<PL)		
				2.60								
				17.80	2.7-3.0/S/1 D 2.70 m				Brown, grey and red-brown.			
		14/01/20	3		3.0/S/1 D 3.00 m					M (=PL)		2.90: Water measured at 1 hour after drilling.
				3.40								
AD/T	L			17.00	3.5-3.8/S/1 D 3.50 m			CI-CH	Silty CLAY; medium to high plasticity; olive and red-brown.		F	ALLUVIUM
				3.80								
				16.60				CI-CH	CLAY; medium to high plasticity; grey and orange-red; trace subrounded ironstone gravels.			RESIDUAL SOIL
			4		4.0/S/1 D 4.00 m							
										M (<PL)		
					4.80 m							4.80: Possible extremely weathered rock to 5.8 m.
			5		5.0/S/1 D 5.00 m						VSt - H	
				5.80								
	H			14.60					CLAYSTONE; dark grey; distinctly weathered; inferred very low strength to low strength.			WEATHERED ROCK
			6		6.0/R/1 D 6.00 m							
				7.00								
			7		7.0/S/1 D 7.00 m				Hole Terminated at 7.00 m (Target depth reached)			

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	13/01/2020	COMPLETED	13/01/2020	**REF BH105**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 1 OF 3
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983942	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 11.70 m depth	NORTHING	-33.804402	ASPECT	Southeast	SLOPE 5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V	H		1	20.40	0.1/S/1 D 0.10 m			ML	FILL: Sandy Clayey SILT; low to medium plasticity; red-brown; trace subangular ironstone; plastic wrapping; well compacted.		VSt - H	FILL
				0.40								
				20.00	0.5/S/1 D 0.50 m			CI-CH	FILL: Silty CLAY; medium to high plasticity; red-brown and brown; trace brick fragments; well compacted.			
			1		1.0/S/1 D 1.00 m					M (<<PL)	St - VSt	
				1.50								
				18.90					Red-brown and dark grey; poorly compacted.			1.50: Drilling fluids used.
			2		2.0/S/1 D 2.00 m							
				2.40								
	L	▽		18.00	SPT 2.50-2.95 m 3,3,3 N=6 1 2.5-2.95/S/1 D 2.50 m 2.60 m			CI-CH	Silty CLAY; medium to high plasticity; brown, grey, red and orange; trace ash and thin roots.	M (<PL) to M (=PL)	F	ALLUVIUM 2.60: Possible water inflow .
			3									
				3.50								
				16.90	3.6-3.8/S/1 D 3.60 m 3.70 m			CI-CH	CLAY; medium to high plasticity; red, grey and orange.			RESIDUAL SOIL
				3.80								
				16.60					Grey and orange.			
	M		4		SPT 4.00-4.45 m 7,9,14 N=23 2 4.0-4.45/S/1 D 4.00 m 4.20 m					M (<PL)	VSt	
				4.40								
				16.00					Trace subangular to subrounded ironstone gravels; grey, orange and red.			
	H									M (<<PL)		4.80: inferred extremely weathered rock to 5.0 m
				5.00								
			5	15.40					CLAYSTONE; dark grey; highly weathered; inferred very low to low strength.			WEATHERED ROCK 5.00: V-bit refusal.
	M		6									
			7									
				7.30								
									Continued as Cored Borehole			

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PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 2 OF 3
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983942	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 11.70 m depth	NORTHING	-33.804402	ASPECT	Southeast	SLOPE 5%

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	*DEPTH* RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				1							
				2							
				3							
				4							
				5							
				6							
				7							
					7.30		Continuation from non-cored borehole				
NMLC		75	7 (26)		13.10		SHALE; thinly laminated; grey and brown.	HW		7.45-7.94: JT, 65 - 70°, Pl 7.49-7.72: JT, 50 - 70°, Pl	

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	13/01/2020	COMPLETED	13/01/2020	**REF BH105**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 3 OF 3
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983942	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 11.70 m depth	NORTHING	-33.804402	ASPECT	Southeast	SLOPE 5%

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	*DEPTH* RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC		75	7 (26)	8			SHALE; thinly laminated; grey and brown.	HW			
					8.36 12.04		No Core.				
					8.70 11.70		SHALE; thinly laminated; dark grey.	SW		8.72: DB 8.79: BP 8.83-8.85: Clay 8.90: BP, 0 - 10°, Clay, Pl, RF 8.91: BP, 0 - 10°, Clay, Pl, RF 8.93: JT, 20 - 30°, Clay, UN, RF 8.94: BP, 0 - 10°, Clay, Pl, RF 8.96: JT, 20 - 30°, Clay, UN, RF 9.00: DB 9.11: BP, 0 - 10°, Clay, Pl, RF 9.13: BP, 0 - 10°, Clay, Pl, RF 9.17: BP, 0 - 10°, Clay, Pl, RF 9.27: DB 9.28: BP, 0 - 10°, Clay, Pl, RF 9.44: JT, 20°, Pl 9.47: DB 9.72: DB 9.92: DB 10.00: DB 10.04: DB 10.21: DB 10.44: DB 10.86: DB 11.00: DB 11.10: BP, 0 - 10°, Clay, Pl, RF 11.11: BP, 0 - 10°, Clay, Pl, RF 11.28: DB 11.46: JT, 5 - 10°, CN, Pl 11.48: BP, 0 - 10°, Clay, Pl, RF 11.49: BP, 0 - 10°, Clay, Pl, RF	
		100	73 (95)	9 10 11							
					11.70 8.70		Hole Terminated at 11.70 m (Target depth reached)				
				12 13 14 15							

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	13/01/2020	COMPLETED	13/01/2020	**REF BH106**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD ute-mounted hydraulic dril rig	EASTING	150.983569	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.50 m depth	NORTHING	-33.804438	ASPECT	South	SLOPE <3%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V	M	Not Encountered		20.40	0.1/S/1 D 0.10 m 0.1/S/Dup02 D 0.10 m			SM	FILL: Silty SAND; fine grained; dark grey; trace subangular to subrounded igneous and siltstone gravels; appears well compacted.	D	St	FILL
				0.30								
				20.10				ML	FILL: Sandy SILT; low plasticity; brown; fine to medium grained sand; trace ironstone gravels; appears well compacted.			
				0.60	0.5/S/Dup03 D 0.50 m							
AD/T	H			19.80				CL-CI	FILL: Sandy Silty CLAY; low to medium plasticity; brown; fine to medium grained; trace glass shards; appears well compacted.	M (<<PL)	St - H	0.60: V-bit refusal.
			1		1.0/S/Dup04 D 1.00 m							
				1.50					Hole Terminated at 1.50 m			1.50: Borehole terminated. TC-bit refusal on possible concrete.
			2									
			3									
			4									
			5									
			6									
			7									

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	15/01/2020	COMPLETED	15/01/2020	**REF BH106A**
PROJECT	Geotechnical Investigation		LOGGED	SVK	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD ute-mounted hydraulic dril rig	EASTING	150.983571	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.20 m depth	NORTHING	-33.804412	ASPECT	Flat	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V	H		0	20.40	0.1/S/1 D 0.10 m			SP	FILL: SAND; fine to coarse grained; grey-brown; with silt and clay; poorly graded; appears well compacted.		L	FILL
				0.30								
				20.10	0.5/S/1 D 0.50 m			CL-CI	FILL: CLAY; low to medium plasticity; brown; with sand and silt; poorly graded; appears moderately compacted.	D	H	
				0.90								0.75: V-bit refusal.
			1	19.50	1.0/S/1 D 1.00 m			CI-CH	FILL: CLAY; medium to high plasticity; red-brown and brown; with silt and sand; trace gravels; poorly graded; appears well compacted.			
	M									M (<PL)	St - VSt	
			2		2.0/S/1 D 2.00 m							
				2.40								
	L			18.00				ML	SILT; low to medium plasticity; grey; with clay; trace sand; trace fine, well rounded gravels.	M (<LL)	F - St	ALLUVIUM
			3	*3.00*								
	M			17.40				CI-CH	CLAY; medium to high plasticity; red-brown and grey; with silt; trace ironstone nodules.		VSt	RESIDUAL SOIL
AD/T			4		4.0/S/1 D 4.00 m							
	H										H	
										M (<PL)		
			5		5.0/S/1 D 5.00 m							
	M-H										VSt - H	
				5.80								
				14.60					SHALE; thinly laminated; extremely to highly weathered; dark grey; inferred very low strength.			WEATHERED ROCK
			6		6.0/S/1 D 6.00 m							
	H	15/01/20	7									
				7.20								7.10: Seepage.
									Hole Terminated at 7.20 m (Target depth reached)			

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	15/01/2020	COMPLETED	15/01/2020	**REF BH106A/ MW01**
PROJECT	Geotechnical Investigation		LOGGED	SVK	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983571	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.20 m depth	NORTHING	-33.804412	ASPECT	Flat	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID MW01 Static Water Level
AD/V	H			20.40	0.1/S/1 D 0.10 m			SP	FILL: SAND; fine to coarse grained; grey-brown; with silt and clay; poorly graded; appears well compacted.		L	Concrete
				0.30 20.10								
	H				0.5/S/1 D 0.50 m			CL-CI	FILL: CLAY; low to medium plasticity; brown; with sand and silt; poorly graded; appears moderately compacted.	D	H	
				0.90 19.50								
			1		1.0/S/1 D 1.00 m			CI-CH	FILL: CLAY; medium to high plasticity; red-brown and brown; with silt and sand; trace gravels; poorly graded; appears well compacted.			Cuttings
	M									M (<PL)	St - VSt	
			2		2.0/S/1 D 2.00 m							Casing
				2.40 18.00				ML	SILT; low to medium plasticity; grey; with clay; trace sand; trace fine, well rounded gravels.	M (<LL)	F - St	
	L											Bentonite
			3	*3.00* 17.40				CI-CH	CLAY; medium to high plasticity; red-brown and grey; with silt; trace ironstone nodules.		VSt	
	M											
AD/T			4		4.0/S/1 D 4.00 m						H	Screen
	H											
			5		5.0/S/1 D 5.00 m					M (<PL)	VSt - H	Sand
	M-H											
				5.80 14.60					SHALE; thinly laminated; extremely to highly weathered; dark grey; inferred very low strength.			
			6		6.0/S/1 D 6.00 m							
	H											
			7	*7.20*					Hole Terminated at 7.20 m (Target depth reached)			

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Engineering Log - TEST

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	13/01/2020	COMPLETED	13/01/2020	**REF BH107**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983889	RL SURFACE	20.15 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 6.30 m depth	NORTHING	-33.804618	ASPECT	West	SLOPE 5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V	M		1	20.15 *0.20* 19.95 *0.80* 19.35 *1.30* 18.85 *1.50* 18.65 *1.80* 18.35	0.1/S/1 D 0.10 m 0.5/S/1 D 0.50 m 1.0/S/1 D 1.00 m 1.5-1.8/S/1 D 1.50 m		SM CI-CH ML CI CI-CH	FILL: Silty SAND; fine to medium grained; brown and grey; trace concrete fragments. FILL: CLAY; medium to high plasticity; red-brown; trace subangular siltstone gravels; brick fragments; moderately to well compacted. Red and grey. FILL: Sandy SILT; low plasticity; brown and dark brown; trace glass fragments; rounded quartz gravels. FILL: Silty CLAY; medium plasticity; grey to brown; trace coal; roots and subrounded ironstone gravels. CLAY; medium to high plasticity; grey, red-orange; trace rounded to subangular ironstone gravels.	D M (<<PL) M (<PL)	VSt H VSt H	FILL 0.00: From 0-0.2m; well compacted. 0.20: From 0.2-1.8m; moderately to well compacted. 1.50: V-bit refusal. Possible residual RESIDUAL SOIL 2.60: Inferred extremely weathered rock.
AD/T	H	13/01/20	2 3 4 5 6	*3.80* 16.35 *5.20* 14.95 *5.50* 14.65 *6.30*	2.0/S/Dup01 D 2.00 m 3.0/S/1 D 3.00 m 4.0/R/1 D 4.00 m 5.0/R/1 D 5.00 m 6.0/R/1 D 6.00 m				CLAYSTONE; grey; highly weathered; inferred very low to low strength. Red-brown SHALE; dark grey; highly weathered; inferred very low to low strength.			WEATHERED ROCK
			7						Hole Terminated at 6.30 m (Target depth reached)			

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Engineering Log - BOREHOLE

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	09/01/2020	COMPLETED	09/01/2020	**REF BH108**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 1 OF 1
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983455	RL SURFACE	20.25 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 7.00 m depth	NORTHING	-33.804653	ASPECT	Northeast	SLOPE <3%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				0.10 20.15	0.1/S/1 D 0.10 m			SP CI	FILL: Silty Gravelly SAND; fine to medium grained; brown; subangular to angular brick fragments; with igneous gravels.	D	D	FILL
	M			0.50 19.75	0.5/S/1 D 0.50 m				FILL: Silty CLAY; medium plasticity; brown and red-brown; with subangular igneous gravels; with fine to medium grained sand.	M (<<PL)	VSt	
					0.6-0.9/S/1 D 0.60 m			CI-CH	FILL: CLAY; medium to high plasticity; red, red-brown, grey and orange; with silt; and subrounded ironstone gravels.			
	L		1		1.0/S/1 D 1.00 m					M (<PL)	F - VSt	
				1.80 18.45	1.8/R/1 D 1.80 m				With subangular siltstone gravels and cobbles.			
	M		2		2.0/S/1 D 2.00 m							
				2.20 18.05				CI	FILL: Silty CLAY; medium plasticity; dark grey and brown; trace igneous gravels.	M (<PL) to M (=PL)		
	L				2.4/S/1 D 2.40 m 2.4-2.5/S/1 D 2.40 m							
AD/V				2.70 17.55				CI-CH	Silty CLAY; medium to high plasticity; grey, brown, red-brown and orange.			ALLUVIUM 2.70: Possible alluvium/residual soil.
		09/01/20	3		3.2-3.5/S/1 D 3.20 m						St - VSt	
	M				3.4/S/1 D 3.40 m 3.5/S/1 D 3.50 m							
				3.80 16.45				CH	CLAY; high plasticity; red, grey and orange; trace rounded ironstone gravels.			RESIDUAL SOIL
			4		4.2-4.4/S/1 D 4.20 m					M (<PL)		
					4.5/S/1 D 4.50 m						VSt - H	
			5									
	H			5.50 14.75	5.4/S/1 D 5.40 m				SHALE; dark grey and grey; distinctly weathered; inferred very low strength.			WEATHERED ROCK 5.50: V-bit refusal.
AD/T			6		6.0-7.0/R/1 D 6.00 m							
			7	7.00					Hole Terminated at 7.00 m (Target depth reached)			

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	09/01/2020	COMPLETED	09/01/2020	**REF BH109**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 1 OF 3
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983711	RL SURFACE	20.3 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 11.56 m depth	NORTHING	-33.804726	ASPECT	Northeast	SLOPE <3%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V				20.30								
				0.20	0.1/S/1 D 0.10 m			SP	FILL: Silty Gravelly SAND; fine to medium grained; brown; with subangular to angular brick, igneous and concrete gravel.	D	D	FILL
				20.10				CI	FILL: Silty CLAY; medium plasticity; grey, brown, red-brown and orange; with subangular igneous gravels; claystone gravels.	M (<<PL)		
					0.5/S/1 D 0.50 m							
			1		1.0/S/1 D 1.00 m						VSt	
	L									M (<PL)		
		09/01/20		*1.70*								
				18.60				CI-CH	FILL: CLAY; medium to high plasticity; dark grey; trace angular to subangular shale gravels.			
			2		2.0/S/1 D 2.00 m					M (=PL)	F - St	
		10/01/2020		*2.40*								
				17.90				CH	CLAY; high plasticity; grey, red and orange.			RESIDUAL SOIL
					SPT 2.50-2.95 m 3,4,6 N=10							2.50: Water was observed on side of SPT. Inferred perched in fill over residual soil.
					2.5-2.95/S/1 D 2.50 m 2.60 m							
			3									
	M									M (<PL)	St	
	H			*4.00*							H	3.90: Inferred extremely weathered rock.
AD/T			4	16.30					SHALE/CLAYSTONE; grey; highly weathered; inferred very low strength.			WEATHERED ROCK 4.00: V-bit refusal.
	M				4.5-4.8/R/1 D 4.50-4.80 m							
			5									
	H											
			6	*6.00*					Continued as Cored Borehole			
			7									

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	09/01/2020	COMPLETED	09/01/2020	**REF BH109**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 2 OF 3
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983711	RL SURFACE	20.3 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 11.56 m depth	NORTHING	-33.804726	ASPECT	Northeast	SLOPE <3%

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	*DEPTH* RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				1							
				2							
				3							
				4							
				5							
				6	*6.00*		Continuation from non-cored borehole				
		100	12 (26)	7	14.30		SHALE; thinly laminated; brown and dark grey; fractures 0-10mm spacing.	HW		6.00-6.95: SZ, Possible sheared zone. 6.11-6.13: DS, 20mm 6.13: DS, 5mm 6.14-7.70: JTSet >18, 20 - 25°, Pl, Sm, Spacing 10mm-400mm 6.24: DS, 10mm 6.27-6.31: DS, 40mm 6.49: DS, 2mm 6.58: DS, 2mm 6.61: DS, 2mm 6.64: DS, 1mm 6.78-6.94: JTSet 2, 65 - 70°, Pl, Ro 7.30-7.65: JTSet 2, 60 - 70°, Pl, Ro	

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	09/01/2020	COMPLETED	09/01/2020	**REF BH109**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 3 OF 3
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983711	RL SURFACE	20.3 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 11.56 m depth	NORTHING	-33.804726	ASPECT	Northeast	SLOPE <3%

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	*DEPTH* RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
					7.85 12.45		SHALE; thinly laminated; dark grey.	HW / SW		7.63: DS, 10mm 7.74: DS, 5mm 7.78-7.82: DS, 40mm 7.88: DS, 2mm 8.00: DB 8.00-8.05: DS, 50mm 8.05-8.15: JT, 70 - 80°, UN, RF 8.12: DS, 5mm 8.15: DS, 2mm 8.19: BP, 0 - 10°, Pl, RF, Tight clay lined 8.20-8.22: FZ, 10 - 20°, Pl, RF, 95 mm aperture, clay filled. 8.22-8.40: FZ, 70 - 80°, Pl, RF, tight, clean 8.23: BP, 0 - 10°, Pl, RF, Tight clay lined 8.26: BP, 0 - 10°, Pl, RF, Tight clay lined 8.36: BP, 0 - 10°, Pl, RF, Tight clay lined 8.50: DB 8.51-8.53: FZ, 60 - 70°, Pl, RF, Tight, clay lined 8.53-8.54: DS, 10mm 8.54: FZ, 20°, Pl, RF, Tight, clay lined 8.57: FZ, 20°, Pl, RF, Tight, clay lined 8.60-8.74: FZ, 90°, Pl, RF, Tight, clay lined 8.61: FZ, 10 - 20°, Pl, RF, Tight, clean 8.74: FZ, 30 - 40°, Pl, RF, Tight, clean 8.80: DB 8.85: DB 8.87: DB 8.92-9.70: JT, 10 - 50°, Pl, RF, 80 mm to 300 mm spacing. 9.00: DB 9.12: DB 9.70: DB 9.86: DB 9.97: DB 10.00: DB 10.06: FZ, 50°, Pl, RF, Tight, clean 10.19: DB 10.38: DB 10.49: DB 10.62-10.74: FZ, 60 - 90°, Pl, RF, Tight, clean 10.66: DB 10.74: DB 10.86-10.96: JT, 70 - 80°, UN, RF 10.96: DB 11.00: DB 11.06: JT, 40 - 50°, Pl, RF 11.16: DB 11.26: DB 11.27: FZ, 70 - 80°, Pl, RF, Tight, clean 11.33: DB 11.40: DB 11.53: DB	
		100	12 (26)	8							
		100	85 (95)	9 10 11							
					11.56 8.74		Hole Terminated at 11.56 m (Target depth reached)				
				12 13 14 15							

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	08/01/2020	COMPLETED	08/01/2020	**REF BH110**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 1 OF 3
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.98335	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 13.00 m depth	NORTHING	-33.804923	ASPECT	Southeast	SLOPE <2%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V	H			20.40	0.1/S/1 D 0.10 m			SP	FILL: Silty Gravelly SAND; fine to medium grained; brown; subangular to angular gravels consisting of brick, concrete and igneous rock.	D	VD	FILL
				0.60	0.5/S/1 D 0.50 m							
				19.80				CI	FILL: Silty CLAY; medium plasticity; grey, brown, orange and red; with subangular sandstone, shale and igneous granules; trace coal.		VSt	
			1		1.0/S/1 D 1.00 m							
	M				1.2-1.5/S/1 D 1.20 m					M (<<PL)	St	
					1.5/S/1 D 1.50 m							
			2		2.0/S/1 D 2.00 m						VSt	
				2.35	2.3/S/1 D 2.30 m							
AD/T	H			*2.50*	2.4/S/1 D 2.40 m				FILL: SANDSTONE; Cobble/Boulder.			2.35: V-bit refusal.
				17.90	SPT 2.50-2.95 m 6,4,5 N=9			CI	FILL: Silty CLAY; medium plasticity; grey and brown; with subrounded to subangular concrete and igneous fragments/granules.			
	M	▽			2.5/S/1 D 2.50 m					M (<PL)	St	2.70: Water measured
			3		2.5-2.95/S/1 D 2.50 m							
				3.20								
AD/V				17.20				CI-CH	Silty CLAY; medium to high plasticity; grey and orange; trace roots (1mm)			ALLUVIUM
	L		4		SPT 4.00-4.45 m 2,3,3 N=6					M (=PL)	F	
					4.0-4.45/s/1 D 4.00 m							
					4.4-4.45/S/1 D 4.40 m							
					4.8/S/1 D 4.80 m							
				5.00								
			5	15.40				CI-CH	CLAY; medium to high plasticity; grey, orange and red; trace ironstone rich layers / ironstone fragments.			RESIDUAL SOIL
					SPT 5.50-5.95 m 3,12,18 N=30							
	M				5.5-5.95/S/1 D 5.50 m					M (<PL)	VSt - H	
			6									
	H				6.5/S/1 D 6.50 m					M (<<PL)	H	6.50: Inferred extremely weathered rock
				6.70								
AD/T				13.70					SHALE; dark brown and dark grey; distinctly weathered; inferred low strength.			WEATHERED ROCK 6.70: V-bit refusal.
	M		7									
				7.50								
									Continued as Cored Borehole			

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Engineering Log - BOREHOLE

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CLIENT	Catholic Education Diocese of Parramatta	COMMENCED	08/01/2020	COMPLETED	08/01/2020	**REF BH110**	
PROJECT	Geotechnical Investigation	LOGGED	DI	CHECKED	RE	Sheet 2 OF 3	
SITE	2 Darcy Rd, Westmead, NSW	GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547	
EQUIPMENT	4WD truck-mounted hydraulic drill rig	EASTING	150.98335	RL SURFACE	20.4 m	DATUM	AHD
EXCAVATION DIMENSIONS	Ø100 mm x 13.00 m depth	NORTHING	-33.804923	ASPECT	Southeast	SLOPE	<2%

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	*DEPTH* RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				1							
				2							
				3							
				4							
				5							
				6							
				7							
					7.50		Continuation from non-cored borehole				
		100	0 (30)		12.90		SHALE; thinly laminated; brown.	HW		7.50-8.38: FZ, Highly fractured, fractures generally 5 - 20 mm spacings.	

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CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	08/01/2020	COMPLETED	08/01/2020	**REF BH110**
PROJECT	Geotechnical Investigation		LOGGED	DI	CHECKED	RE	Sheet 3 OF 3
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.98335	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 13.00 m depth	NORTHING	-33.804923	ASPECT	Southeast	SLOPE <2%

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	*DEPTH* RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC		100	0 (30)	8			SHALE; thinly laminated; brown.	HW			
					8.38 12.02		NO CORE.				
		0	0 (0)	9	*9.20*						
					9.35 11.05		SHALE; thinly laminated; brown and dark grey.	HW		9.20-9.35: FZ, Highly fractured, fractures generally 5 - 20 mm spacings.	
		87	83 (85)	10			SHALE; thinly laminated; dark grey.	SW		9.51: DB 9.55-9.56: FZ, 40 - 50°, Clay VNR, Pl, RF 9.66: DB 9.70: BP, 0°, Clay VNR, Pl, RF 9.71: BP, 0°, Clay VNR, Pl, RF 9.81: DB 9.91: DB 10.00: DB 10.11-10.15: JTset 2, 40 - 50°, Clay VNR, Pl, RF 10.12: DB 10.23: DB 10.30: DB 10.35: DB 10.49: DB 10.57: DB	
		100	100 (100)	11	*10.60* 9.80		LAMINITE: thinly laminated to thinly bedded; grey and dark grey (interbedded shale, siltstone and fine grained sandstone)			11.78: DB 11.80: DB 12.00: DB 12.04: DB 12.11: DB 12.32: DB 12.59: DB 12.83: DB 12.91: BP, 0°, Clay VNR, Pl, RF	
				12							
				13	*13.00* 7.40		Hole Terminated at 13.00 m (Target depth reached)				
				14							
				15							

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

MARTENS 2.00 LIB.GLB Log MARTENS CORED BOREHOLE P1907547BH101-BH119V01.GPJ <<DrawingFile>> 12/02/2020 17:05 8.30.004 Datgel Lab and In Situ Tool - DGD | Lib: Martens 2.00 2016-11-13 Prj: Martens 2.00 2016-11-13

CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	08/01/2020	COMPLETED	08/01/2010	**REF BH111**
PROJECT	Geotechnical Investigation		LOGGED	DI / SVK	CHECKED	RE	Sheet 1 OF 2
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983632	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 9.20 m depth	NORTHING	-33.805028	ASPECT	Flat	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/V				20.40								
				0.20	0.1/S/1 D 0.10 m			SP	FILL: Gravelly Clayey SAND; medium grained; brown; with igneous gravels.	D	D	FILL
				20.20	0.20 m			CH	FILL: CLAY; high plasticity; grey and red; trace igneous gravels.			
				0.40								
				20.00	0.5/S/1 D 0.50 m			CI-CH	FILL: Silty CLAY; medium to high plasticity; brown, grey, red and orange; trace shale; with subangular igneous and brick fragments.	M (<<PL)	VSt	
	L											
											St	
			1		1.0/S/1 D 1.00 m					M (<PL)		
				1.20								
				19.20				CL	FILL: Silty CLAY; low plasticity; grey and brown; trace ironstone and shale gravels.	M (=PL)	S - F	
				1.60	1.5/S/1 D 1.50 m							
				18.80				CL-CI	Silty CLAY; low to medium plasticity; red-brown; trace ironstone gravels.			RESIDUAL SOIL
	L-M		2		2.0/S/1 D 2.00 m						St	
				2.30	2.2-2.5/S/1 D 2.20 m							
				18.10	2.40 m			CI-CH	CLAY; medium to high plasticity; red, grey and yellow-orange; with silt.	M (<PL)		
	M			*2.60*	2.5/S/1 D 2.50 m							
				17.80					Tree roots (20mm to 30mm diameter).			
	M-H		3								VSt - H	3.10: Water found on auger; slight seepage.
				3.40								
				17.00	3.5/R/1 D 3.50 m				CLAYSTONE; grey; inferred very low strength; highly weathered; (possible siltstone/claystone).			WEATHERED ROCK
	H			*3.80*								
AD/T		Not Encountered		16.60					Inferred very low to low strength.			3.80: V-bit refusal.
			4									
	M				4.5/R/1 D 4.50 m							
			5									
				5.20								
				15.20					CLAYSTONE/SHALE; grey and dark grey; inferred low strength; extremely weathered to highly weathered.			
					5.5/R/1 D 5.50 m							
			6									
	H			*6.50*								
		08/01/20		13.90					SHALE; dark grey; inferred very low strength; highly weathered.			
			7									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P1907547BH101-BH119V01.GPJ <<DrawingFile>> 12/02/2020 17:01 8.30.004 Datgel Lab and In Situ Tool - DGD | Lib: Martens 2.00 2016-11-13 Prj: Martens 2.00 2016-11-13

CLIENT	Catholic Education Diocese of Parramatta		COMMENCED	08/01/2020	COMPLETED	08/01/2010	**REF BH111**
PROJECT	Geotechnical Investigation		LOGGED	DI / SVK	CHECKED	RE	Sheet 2 OF 2
SITE	2 Darcy Rd, Westmead, NSW		GEOLOGY	Ashfield Shale	VEGETATION	Grass	PROJECT NO. P1907547
EQUIPMENT		4WD truck-mounted hydraulic drill rig	EASTING	150.983632	RL SURFACE	20.4 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 9.20 m depth	NORTHING	-33.805028	ASPECT	Flat	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	H	Not Encountered	8		8.5-90/R/1 D 8.50 m				SHALE; dark grey; inferred very low strength; highly weathered.			
			9	*9.20*					Hole Terminated at 9.20 m (Target depth reached)			9.20: TC-bit refusal on inferred low to medium strength shale.
			10									
			11									
			12									
			13									
			14									
			15									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

MARTENS 2.00 LIB.GLB Log MARTENS BOREHOLE P1907547BH101-BH119V01.GPJ <<DrawingFile>> 12/02/2020 17:01 8.30.004 Datgel Lab and In Situ Tool - DGD | Lib: Martens 2.00 2016-11-13 Prj: Martens 2.00 2016-11-13

Attachment C – DCP 'N' Counts

Dynamic Cone Penetrometer Test Log Summary

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Site	2 Darcy Road, Westmead NSW	**DCP Group Reference**	P1907096JS01
Client	Catholic Education Diocese of Parramatta C/- WINIM Developments Pty Ltd	**Log Date**	13.01.2020 - 18.01.2020
Logged by	DI & SvK		
Checked by	RE		
Comments	DCP tests commenced at 50 mm below ground level.		

TEST DATA

Depth Interval (m)	DCP102	DCP103	DCP104	DCP105	DCP106	DCP106A	DCP107	
0.15	19	-	12	13	17	21	16	
0.30	38 for 140 mm	-	32	23	Terminated due to high N count at 0.2 m (30 for 50 mm).	Terminated due to high N count at 0.23 m (30 for 80 mm).	24	
0.45	Terminated due to double bouncing at 0.44 m.	-	Terminated due to high N count at 0.35 m	16			27	
0.60		-		17			28	
0.75		-		29			21	
0.90		-		26			21	
1.05		-		15			15	
1.20		-		15			16	
1.35		-		14			13	
1.50		-		10			17	
1.65		-		11			25	
1.80		-		10			18	
1.95		-		11			15	
2.10		-		11			13	
2.25		-		16			10	
2.40		1		16			12	
2.55		1		9			13	
2.70		2		Terminated at target depth			16	
2.85		4					18	
3.00		5					20	
3.15		4					28	
3.30		6					35	
3.45		8					Terminated due to high N count at 3.35 m.	
3.60		9						
3.75		11						
3.90		12						
4.05		17						
4.20		16						
4.35		17						
4.50		18						
4.65		19						
4.80		28						
4.95		24						
5.10		32						
		Terminated due to high N count at 5.1 m.						

Dynamic Cone Penetrometer Test Log Summary

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Site	2 Darcy Road, Westmead NSW	**DCP Group Reference**	P1907096JS01
Client	Catholic Education Diocese of Parramatta C/- WINIM Developments Pty Ltd	**Log Date**	13.01.2020 - 18.01.2020
Logged by	DI & SvK		
Checked by	RE		
Comments	DCP tests commenced 50 mm below ground level.		

TEST DATA

Depth Interval (m)	DCP108	DCP109	DCP110	DCP111				
0.15	-	-	36	-				
0.30	22	12	35	11				
0.45	14	12	15	15				
0.60	9	12	9	12				
0.75	7	13	9	7				
0.90	4	9	9	4				
1.05	5	8	6	5				
1.20	5	7	6	2				
1.35	3	7	6	2				
1.50	5	8	4	1				
1.65	12	9	6	7				
1.80	12	4	5	6				
1.95	11	5	6	8				
2.10	7	6	7	11				
2.25	4	7	8	10				
2.40	6	10	31 for 100 mm.	9				
2.55	15	12	Terminated due to double bouncing at 2.35m.	11				
2.70	Terminated at target depth	Terminated due to double bouncing at 2.6m.		17				
2.85				27				
3.00				32				
3.15				42				
3.30				Terminated due to high N count at 3.2m.				
3.45								
3.60								
3.75								
3.90								
4.05								
4.20								
4.35								
4.50								
4.65								
4.80								
4.95								
5.10								

Attachment D – Rock Core Photographs

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Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	SvK	**PHOTO OF ROCK CORE (BH105 Box 1 of 1)** **WCC Stage 1 - 2 Darcy Road, Westmead NSW**	Drawing: **FIGURE 2**
Approved:	RE		
Date:	21.02.2020		
Scale:	NA		File No: P1907547JR02V02

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	SvK	**PHOTO OF ROCK CORE (BH109 Box 1 of 2)** **WCC Stage 1 - 2 Darcy Road, Westmead NSW**	Drawing: **FIGURE 3**
Approved:	RE		
Date:	21.02.2020		
Scale:	NA		File No: P1907547JR02V02

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	SvK	**PHOTO OF ROCK CORE (BH109 Box 2 of 2)** **WCC Stage 1 - 2 Darcy Road, Westmead NSW**	Drawing: **FIGURE 4**
Approved:	RE		
Date:	21.02.2020		
Scale:	NA		File No: P1907547JR02V02

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	SvK	**PHOTO OF ROCK CORE (BH110 Box 1 of 2)** **WCC Stage 1 - 2 Darcy Road, Westmead NSW**	Drawing: **FIGURE 5**
Approved:	RE		
Date:	21.02.2020		File No: P1907547JR02V02
Scale:	NA		

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	SvK	**PHOTO OF ROCK CORE (BH110 Box 2 of 2)** **WCC Stage 1 - 2 Darcy Road, Westmead NSW**	Drawing: **FIGURE 6**
Approved:	RE		
Date:	21.02.2020		
Scale:	NA		File No: P1907547JR02V02

Attachment E – Laboratory Analytical Certificates

resource laboratories
AGGREGATE, ROCK, AND SOIL TESTING
ABN: 25 131 532 020
Sydney: 12/1 Boden Road Seven Hills NSW 2147 | PO Box 45 Pendle Hill NSW 2145
Ph: (02) 9674 7711 | **Fax:** (02) 9674 7755 | **Email:** info@resourcelab.com.au

Test Report

Customer: Martens & Associates Pty Ltd
Project: P1907547
Location: 2 Darcy Road, Westmead, NSW

Job number: 20-0002
Report number: 2
Page: 1 of 1

Soil Index Properties

Sampling method: Tested as received

Test method(s): AS 1289.1.1, 2.1.1, 3.1.1, 3.2.1, 3.3.1 .3.4.1

	Results				
Laboratory sample no.	20732	20733	20739		
Customer sample no.	7547/BH103/ 3.0m	7547/BH106/ 3.0-4.0m	7547/BH119/ 0.2-0.5m		
Date sampled	08-18/01/2020	08-18/01/2020	18/01/2020		
Material description	silty CLAY, trace of gravel, dark brown/dark grey	silty CLAY, red/grey	silty CLAY, trace of gravel, yellow-brown/red/grey		
Liquid limit (%)	39	65	74		
Plastic limit (%)	16	17	23		
Plasticity index (%)	23	48	51		
Linear shrinkage (%)	10.0	18.5	13.5		
Cracking / Curling / Crumbling	Cracking and curling	Cracking and curling	Curling		
Sample history	Air dried	Air dried	Air dried		
Preparation	Dry sieved	Dry sieved	Dry sieved		

Approved Signatory: E. Maldonado **Date:** 31/01/2020

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025 - Testing.

NATA Accredited Laboratory Number: **17062**

resource laboratories
AGGREGATE, ROCK, AND SOIL TESTING
ABN: 25 131 532 020
Sydney: 12/1 Boden Road Seven Hills NSW 2147 | PO Box 45 Pendle Hill NSW 2145
Ph: (02) 9674 7711 | **Fax:** (02) 9674 7755 | **Email:** info@resourcelab.com.au

Test Report

Customer: Martens & Associates Pty Ltd
Job number: 20-0002
Project: P1907547
Report number: 4
Location: 2 Darcy Road, Westmead, NSW
Page: 1 of 1

Soil Index Properties

Sampling method: Tested as received
Test method(s): AS 1289.1.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 .3.4.1

	Results				
Laboratory sample no.	20743				
Customer sample no.	7547/BH103/4.0m				
Date sampled	08-18/01/2020				
Material description	silty CLAY, trace of gravel, brown/ grey/yellow-brown				
Liquid limit (%)	55				
Plastic limit (%)	17				
Plasticity index (%)	38				
Linear shrinkage (%)	16.5				
Cracking / Curling / Crumbling	Curling				
Sample history	Air dried				
Preparation	Dry sieved				

Approved Signatory: C. Greely **Date:** 03/02/2020

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NATA Accredited Laboratory Number: **17062**

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Sydney: 12/1 Boden Road Seven Hills NSW 2147 | PO Box 45 Pendle Hill NSW 2145
Ph: (02) 9674 7711 | **Fax:** (02) 9674 7755 | **Email:** info@resourcelab.com.au

Test Report

Customer: Martens & Associates Pty Ltd
Project: P1907547
Location: 2 Darcy Road, Westmead, NSW

Job number: 20-0002
Report number: 3

Point Load Strength Index

Sampling method: Tested as received
Test method(s): AS 4133.4.1 Clause 3.2, 3.3

	Results				
Laboratory sample no.	20744	20745	20746	20747	20748
Customer sample no.	7547/BH105/ 9.00-9.12m	7547/BH105/ 11.12-11.27m	7547/BH109/ 9.12-9.27m	7547/BH109/ 10.37-10.49m	7547/BH110/ 9.34-9.50m
Sample depth	9.00-9.12m	11.12-11.27m	9.12-9.27m	10.37-10.49m	9.34-9.50m
Date sampled	08-18/01/2020	08-18/01/2020	08-18/01/2020	08-18/01/2020	08-18/01/2020
Date tested	30/01/2020	30/01/2020	30/01/2020	30/01/2020	30/01/2020
Lithological description	SHALE	LAMINITE	SHALE	SHALE	SHALE
Diametral					
Moisture content condition	Moist	Moist	Moist	Moist	Moist
Nature of weakness planes	Laminated	Laminated	Laminated	Laminated	Laminated
Specimen size					
Length (mm)	110.0	150.0	165.0	115.0	157.0
Diameter (mm)	51.5	51.5	51.6	51.6	51.5
I_s (MPa)	**0.74**	**0.93**	**1.1**	**0.72**	**0.71**
$I_{s(50)}$ (MPa)	**0.75**	**0.94**	**1.1**	**0.73**	**0.72**
Failure mode	Parallel to Laminae	Parallel to Laminae	Parallel to Laminae	Parallel to Laminae	Parallel to Laminae
Axial					
Moisture content condition	Moist	Moist	Moist	Moist	Moist
Nature of weakness planes	Laminated	Laminated	Laminated	Laminated	Laminated
Specimen size					
Height (mm)	39.2	43.6	41.2	43.0	43.1
Diameter (mm)	51.5	51.5	51.6	51.6	51.5
I_s (MPa)	**0.49**	**1.7**	**1.0**	**0.64**	**0.65**
$I_{s(50)}$ (MPa)	**0.49**	**1.7**	**1.1**	**0.66**	**0.67**
Failure mode	Perpendicular to Laminae	Perpendicular to Laminae	Perpendicular to Laminae	Perpendicular to Laminae	Perpendicular to Laminae

Notes:

Approved Signatory: C. Greely **Date:** 03/02/2020

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NATA Accredited Laboratory Number: **17062**

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Ph: (02) 9674 7711 | Fax: (02) 9674 7755 | Email: info@resourcelab.com.au

Test Report

Customer: Martens & Associates Pty Ltd
Project: P1907547
Location: 2 Darcy Road, Westmead, NSW

Job number: 20-0002
Report number: 3

Point Load Strength Index

Sampling method: Tested as received
Test method(s): AS 4133.4.1 Clause 3.2, 3.3

	Results				
Laboratory sample no.	20749	20750	20751		
Customer sample no.	7547/BH110/ 11.80-12.00m	7547/BH115/ 3.28-3.40m	7547/BH115/ 6.25-6.37m		
Sample depth	11.80-12.00m	3.28-3.40m	6.25-6.37m		
Date sampled	08-18/01/2020	08-18/01/2020	08-18/01/2020		
Date tested	30/01/2020	30/01/2020	30/01/2020		
Lithological description	LAMINITE	SHALE	LAMINITE		
Diametral					
Moisture content condition	Moist	Moist	Moist		
Nature of weakness planes	Laminated	Laminated	Laminated		
Specimen size					
Length (mm)	187.0	59.0	125.0		
Diameter (mm)	51.6	50.5	50.2		
I_s (MPa)	**1.1**	**0.098**	**1.1**		
$I_{s(50)}$ (MPa)	**1.1**	**0.098**	**1.1**		
Failure mode	Parallel to Laminae	Parallel to Laminae	Parallel to Laminae		
Axial					
Moisture content condition	Moist	Moist	Moist		
Nature of weakness planes	Laminated	Laminated	Laminated		
Specimen size					
Height (mm)	39.4	31.8	33.8		
Diameter (mm)	51.6	50.5	50.2		
I_s (MPa)	**2.0**	**0.15**	**1.4**		
$I_{s(50)}$ (MPa)	**2.0**	**0.14**	**1.3**		
Failure mode	Perpendicular to Laminae	Perpendicular to Laminae	Perpendicular to Laminae		

Notes:

Approved Signatory: C. Greely **Date:** 03/02/2020

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

CERTIFICATE OF ANALYSIS 234892-A

Client Details

Client	Martens & Associates Pty Ltd
Attention	Jeff Fulton, Robert Mehaffey, William Xu
Address	Suite 201, 20 George St, Hornsby, NSW, 2077

Sample Details

Your Reference	**P1907547COC03V01**
Number of Samples	88 Soil
Date samples received	20/01/2020
Date completed instructions received	20/01/2020

Analysis Details

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

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

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

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

Report Details

Date results requested by	28/01/2020
Date of Issue	28/01/2020

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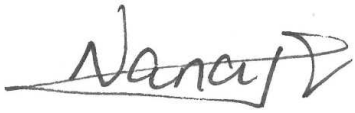
Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		234892-A-2	234892-A-4	234892-A-5	234892-A-6	234892-A-13
Your Reference	UNITS	BH101/0.5	BH101/2.0	BH101/4.0	BH101/6.0	BH103/1.0
Date Sampled		08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
Date analysed	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
pH 1:5 soil:water	pH Units	8.4	5.7	8.3	7.6	7.9
Electrical Conductivity 1:5 soil:water	µS/cm	120	300	270	240	240
Sulphate, SO4 1:5 soil:water	mg/kg	<10	370	270	140	170

Misc Inorg - Soil						
Our Reference		234892-A-14	234892-A-15	234892-A-24	234892-A-25	234892-A-28
Your Reference	UNITS	BH103/3.0	BH103/5.0	BH105/2.0	BH105/4.0-4.45	BH106a/1.0
Date Sampled		08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
Date analysed	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
pH 1:5 soil:water	pH Units	6.7	5.9	6.5	5.5	7.5
Electrical Conductivity 1:5 soil:water	µS/cm	66	360	440	360	400
Sulphate, SO4 1:5 soil:water	mg/kg	64	190	490	87	500

Misc Inorg - Soil						
Our Reference		234892-A-30	234892-A-31	234892-A-43	234892-A-44	234892-A-50
Your Reference	UNITS	BH106a/4.0	BH106a/6.0	BH108/3.5	BH108/5.4	BH111/0.5
Date Sampled		08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
Date analysed	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
pH 1:5 soil:water	pH Units	5.1	5.6	6.5	6.0	6.9
Electrical Conductivity 1:5 soil:water	µS/cm	350	550	52	560	87
Sulphate, SO4 1:5 soil:water	mg/kg	79	160	<10	160	59

Misc Inorg - Soil						
Our Reference		234892-A-53	234892-A-56	234892-A-57	234892-A-58	234892-A-65
Your Reference	UNITS	BH111/2.5	BH112/1.0	BH112/1.5	BH112/2.5	BH114/1.0
Date Sampled		08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
Date analysed	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
pH 1:5 soil:water	pH Units	5.3	5.3	5.6	5.3	6.6
Electrical Conductivity 1:5 soil:water	µS/cm	180	98	97	230	120
Sulphate, SO4 1:5 soil:water	mg/kg	20	76	80	150	120

Misc Inorg - Soil					
Our Reference		234892-A-68	234892-A-69	234892-A-73	234892-A-87
Your Reference	UNITS	BH115/0.5	BH115/1.0	BH118/0.1	BH111/3.5
Date Sampled		08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020	08/01/2020 - 18/01/2020
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020
Date analysed	-	23/01/2020	23/01/2020	23/01/2020	23/01/2020
pH 1:5 soil:water	pH Units	5.0	4.8	6.4	7.3
Electrical Conductivity 1:5 soil:water	µS/cm	290	180	57	150
Sulphate, SO4 1:5 soil:water	mg/kg	160	24	21	39

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	234892-A-4
Date prepared	-			23/01/2020	2	23/01/2020	23/01/2020		23/01/2020	23/01/2020
Date analysed	-			23/01/2020	2	23/01/2020	23/01/2020		23/01/2020	23/01/2020
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	2	8.4	8.3	1	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	2	120	120	0	109	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	2	<10	<10	0	94	#

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	234892-A-69
Date prepared	-			[NT]	30	23/01/2020	23/01/2020		23/01/2020	23/01/2020
Date analysed	-			[NT]	30	23/01/2020	23/01/2020		23/01/2020	23/01/2020
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	30	5.1	5.1	0	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	30	350	380	8	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	30	79	76	4	101	117

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

MISC_INORG:

Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Attachment F – J&K / EIS Borehole Logs

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Borehole No. 1 1/1

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.0m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
					N = 20 8,11,9	0			FILL: Silty clay, medium plasticity, light grey and brown, with shale gravel.	MC≈PL			GRASS COVER APPEARS WELL COMPACTED
					N = 11 6,5,6	1							
▼ ON COMPLETION & AFTER 6 HRS						2		CL	SILTY CLAY: medium plasticity, brown, with a trace of ironstone gravel.	MC≈PL	H	>600 >600 >600	
					N = 4 2,2,2	3			SILTY CLAY: medium plasticity, grey and light brown, with a trace of organic material and ironstone gravel.	MC>PL	St	150 200 160	
					N = 23 7,8,15	4		CL-CH	SILTY CLAY: medium to high plasticity, grey and brown, with a trace of ironstone gravel.	MC≈PL	VSt	350 380 320	
						5							
						6			END OF BOREHOLE AT 6.0m				
						7							

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BOREHOLE LOG

Borehole No. 2 1/1

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.0m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			ASPHALTIC CONCRETE: 100mm.t				
								-	FILL: Gravelly silty sand, fine to medium grained, light brown, igneous gravel with brick fragments.	D	-	-	APPEARS MODERATELY COMPACTED
					N = 6 4,4,2				FILL: Silty clay, medium plasticity, grey and light brown, with a trace of gravel and organic material.	MC > PL			
						1							
					N = 8 2,3,5								
						2		CL-CH	SILTY CLAY: medium to high plasticity, orange brown and grey, with a trace of ironstone gravel.	MC≈PL	(St-VSt)	-	RESIDUAL
					N = 18 5,6,12	3					VSt	200 300 270	
▼ ON COMPLETION & AFTER 6.5 HRS						4		-	SHALE: grey.	DW	VL-L	-	LOW 'TC' BIT RESISTANCE
						5							
											L-M		LOW TO MODERATE RESISTANCE
						6			END OF BOREHOLE AT 6.0m				
						7							

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Borehole No. 3 1/2

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 19.4m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: M.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING					SPT 20/50mm REFUSAL	0			ASPHALTIC CONCRETE: 120mm.t				
								-	FILL: Gravelly sand, fine to medium grained, brown and grey, with brick fragments.	D-M	-	-	APPEARS WELL COMPACTED
						1			FILL: Sandy clay, medium plasticity, brown, grey and dark grey, with a trace of shale and igneous gravel and brick fragments.	MC≈PL			APPEARS POORLY COMPACTED
▼ ON COMPLETION OF CORING & AFTER 2 HRS					N = 6 2,3,3	2							
								CL	SILTY CLAY: medium plasticity, red brown mottled orange and grey, with fine to medium grained ironstone gravel.	MC > PL	VSt-H	-	
					N = 26 6,10,13	3						350 300	
						4			as above, but grey.	MC < PL	H		VERY LOW 'TC' BIT RESISTANCE
					N = 36 5,11,25							>600 >600 >600	
						5		-	SHALE: grey and orange brown.	XW-DW	EL-VL	-	
						6			REFER TO CORED BOREHOLE LOG				
						7							

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Job No: 22466ZH BH3 START CORING AT 5.82m
5
5.82m
CORE LOSS 0.18m
6
7
8
9
10
END AT 10.65m

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Borehole No. 3 2/2

CORED BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Core Size:** NMLC **R.L. Surface:** ≈ 19.4m

Date: 15-11-08 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK300 **Bearing:** - **Logged/Checked by:** M.P./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		5		START CORING AT 5.82m					
				CORE LOSS 0.18m					
FULL RET-URN		6		SHALE: dark grey, with laminae bedded at 0-2°.	XW DW	EL VL			- Cr, 230mm.t - XWS, 160mm.t
		7							- Cr, 460mm.t - XWS, 20mm.t - Cr, 160mm.t
		8							- Cr, 80mm.t - Cr, 420mm.t
		9			FR	M-H	×		- J, 15°, P, S, IS
		10					× × ×		- J, 30°, Un, S - CS, 0°, 5mm.t
				END OF BOREHOLE AT 10.65m					
		11							

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BOREHOLE LOG

Borehole No. 4 1/1

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.8m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLET -ION			■		N = 10 4,5,5	0		-	ASPHALTIC CONCRETE: 100mm.t				
									FILL: Gravelly silty sand, fine to medium grained, grey, with igneous gravel.	M	-	-	
						1			FILL: Silty clay, medium plasticity, grey and brown, with a trace of shale, igneous and ironstone gravel.	MC≈PL			APPEARS MODERATELY TO WELL COMPACTED
									END OF BOREHOLE AT 1.5m				
						2							
						3							
						4							
						5							
						6							
						7							

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Borehole No. **5** 1/2

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK300 **R.L. Surface:** ≈ 20.5m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: M.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING					N = 11 11,6,5	0			FILL: Sandy silty clay, medium plasticity, brown, with brick and tile fragments and metal and plastic inclusions.	MC < PL			GRASS COVER APPEARS MODERATELY COMPACTED
▼ ON COMPLETION OF CORING & AFTER 3 HRS					N = 4 2,2,2	1			FILL: Silty clay, medium plasticity, grey mottled red and orange brown, with fine to medium grained ironstone gravel.	MC > PL		270 330 270	APPEARS POORLY COMPACTED
					N = 18 5,8,10	2		CL	SILTY CLAY: medium plasticity, brown mottled red brown, with a trace of ash.	MC > PL	VSt -H	-	RESIDUAL
						3						370 530 520	
						4			SILTY CLAY: medium plasticity, grey, with fine to medium grained ironstone gravel.	MC < PL	H		
					N = 31 5,12,19	5		-	SHALE: grey and brown, with iron indurated bands.	XW	EL	>600 >600 >600	
										DW	VL-L		VERY LOW 'TC' BIT RESISTANCE
						6			REFER TO CORED BOREHOLE LOG				
						7							

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Job No: 22466ZH · BH5 START CORING AT 5·96m
C.L 0.04
6
7
8
END OF BH AT 8·96m

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CORED BOREHOLE LOG

Borehole No. **5** 2/2

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA
Project: PROPOSED NEW BUILDINGS AND CARPARK
Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Core Size:** NMLC **R.L. Surface:** ≈ 20.5m
Date: 15-11-08 **Inclination:** VERTICAL **Datum:** AHD
Drill Type: JK300 **Bearing:** - **Logged/Checked by:** M.P./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT SPACING (mm) 600 300 100 50 30 10	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		5		START CORING AT 5.96m					
FULL RET-URN		6		CORE LOSS 0.04m SHALE: dark grey, with occasional brown bands, bedded at 0-2°.	DW	L-M	×		- Cr, 310mm.t MULTIPLE XWS UP TO 10mm.t CS, 0°, 25mm.t - Cr, 50mm.t - CS, 2mm.t - Cr, 180mm.t - J, 40°, P, S - Cr, 350mm.t
		7					×		
					SW	H	×		- XWS, 130mm.t - Cr, 110mm.t
		8					×		- J, 45°, P, S, IS - Be, 0°, P, S, IS - XWS, 20mm.t - XWS, 20mm.t - CS, 0°, 5mm.t - CS, 0°, 2mm.t - CS, 0°, 2mm.t - Be, 0°, P, S, IS - CS, 0°, 2mm.t - Cr, 30mm.t - XWS, 2mm.t - Be, 0-5°, Un, S, IS
		9		END OF BOREHOLE AT 8.95m					50mm DIA. PVC STANDPIPE INSTALLED TO 9m DEPTH, MACHINE SLOTTED FROM 3m TO 9M DEPTH, BACKFILLED WITH 2mm SAND FROM 1m TO 9m AND BENTONITE COLLAR FROM 0m TO 1m. FINISHED WITH GATIC COVER SET IN CONCRETE
		10							
		11							

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Borehole No. **6** 1/2

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK300 **R.L. Surface:** ≈ 20.5m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: M.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING					N = 17 5,6,11	0			FILL: Sandy gravel, fine to medium grained, grey, igneous.	M			
						1			FILL: Clayey gravel, fine to coarse grained, brown, with concrete, shale and sand.				APPEARS WELL COMPACTED
					N = 3 2,2,1				FILL: Sandy gravelly clay, medium plasticity, brown and grey.	MC≈PL			APPEARS POORLY COMPACTED
▼ ON COMPLETION & AFTER 1 HR						2		CL	SILTY CLAY: medium plasticity, grey mottled orange brown.	MC > PL	VSt -H	-	RESIDUAL
					N = 11 3,4,7	3						300 240 570 340	
						4		-	SHALE: grey.	XW	EL	-	VERY LOW 'TC' BIT RESISTANCE
										DW	M		MODERATE RESISTANCE
						5					VL		VERY LOW RESISTANCE
													LOW TO MODERATE RESISTANCE
						6			REFER TO CORED BOREHOLE LOG				
						7							

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Job No: 22466ZH BH6 START CORING AT 5.84m
6
7
8
9
C.L.
0.06
END AT 9.62m

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Borehole No. **6** 2/2

CORED BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Core Size:** NMLC **R.L. Surface:** ≈ 20.5m

Date: 15-11-08 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK300 **Bearing:** - **Logged/Checked by:** M.P./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		5		START CORING AT 5.84m					
		6		SHALE: dark brown and grey.	XW	EL			
		7			DW	L			- Cr, 150mm.t
FULL RET -URN				CORE LOSS 0.06m SHALE: dark grey.	DW Fr	L-M M-H	×		- CS, 25mm.t - 6xBe, 0-5°, P, S, IS - Cr, 15mm.t
		8					×		- CS, 5°, 2mm.t
							×		- J, 15°, P, S, IS
		9					×		- J, 45°, Un, S - J, 20°, P, S
							×		- J, 50°, P, S
		10		END OF BOREHOLE AT 9.62m					
		11							

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Borehole No. 7 1/2

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.4m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION					N = 11 5,3,8	0			FILL: Gravelly silty clay, medium plasticity, light grey and brown, with shale and ironstone gravel.	MC < PL			GRASS COVER
					N = 13 5,7,6	1							
						2		CL	SILTY CLAY: medium plasticity, orange brown and grey, with a trace of ironstone gravel.	MC≈PL	H	420 480 460	RESIDUAL
▼ AFTER 3.5 HRS						3		-	SHALE: light grey, with clay bands.	DW	VL-L	-	LOW 'TC' BIT RESISTANCE
						4			SHALE: grey and dark grey.		L		LOW TO MODERATE RESISTANCE
						5				SW	L-M		MODERATE RESISTANCE
						6					M-H		MODERATE TO HIGH RESISTANCE
						7							

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Borehole No. 7 2/2

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.4m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
				■					SHALE: dark grey.	SW	M-H		HIGH RESISTANCE
						8			END OF BOREHOLE AT 7.5m				50mm DIA. PVC STANDPIPE INSTALLED TO 6m DEPTH, MACHINE SLOTTED FROM 3m TO 6m DEPTH, BACKFILLED WITH 2mm SAND 1m TO 9m, BENTONITE COLLAR FROM 0m TO 1m. FINISHED WITH GATIC COVER SET IN CONCRETE
						9							
						10							
						11							
						12							
						13							
						14							

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Borehole No. 8 1/2

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 21.0m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: M.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING					N = 8 6,4,4	0			FILL: Silty clay, medium plasticity, brown and grey, with a trace of root fibres and shale gravel.	MC < PL		>600 >600	GRASS COVER
						1		CL	SILTY CLAY: medium plasticity, brown mottled red brown.	MC≈PL	H		
▼ ON COMPLETION OF CORING & AFTER 0.5 HRS					N = 16 3,6,10	2			SILTY CLAY: medium plasticity, grey mottled orange and red brown, with a trace of ironstone gravel.			580 >600 >600	
					N > 24 13,24/ 150mm REFUSAL	3		-	SHALE: grey and brown, with iron indurated bands.	XW-DW	EL-VL	- >600 >600 >600	BANDED VERY LOW 'TC' BIT RESISTANCE
						4			SHALE: dark grey and brown.	SW	M		MODERATE RESISTANCE
									REFER TO CORED BOREHOLE LOG				
						5							
						6							
						7							

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Job No:22466ZH BH8 START CORING AT 4.24m
4
5
6
7
END AT 7.08m

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CORED BOREHOLE LOG

Borehole No. 8 2/2

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA
Project: PROPOSED NEW BUILDINGS AND CARPARK
Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH | **Core Size:** NMLC | **R.L. Surface:** ≈ 21.0m
Date: 15-11-08 | **Inclination:** VERTICAL | **Datum:** AHD
Drill Type: JK300 | **Bearing:** - | **Logged/Checked by:** M.P./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS: DEFECT SPACING (mm) 500 300 100 50 30 10	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		4		START CORING AT 4.24m					
FULL RET-URN		5		SHALE: dark grey and dark brown, with light grey and brown laminae, bedded at 0-5°.	DW	M-H			- XWS, 8mm.t - XWS, 7mm.t - XWS, 10mm.t - J, 40-60°, Un, S - J, Un, S - Cr, 50mm.t - Cr, 100mm.t - Cr, 20mm.t - J, 35°, P, S
		6		SHALE: dark grey, with light grey laminae, bedded at 0-5°.	SW	H			- J, 10-20°, Un, S
		7		END OF BOREHOLE AT 7.08m					
		8							
		9							
		10							

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Borehole No. **9** 1/1

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.8m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			ASPHALTIC CONCRETE: 100mm.t				
								-	FILL: Gravelly silty sand, fine to medium grained, grey, igneous gravel.	M	-	-	
					N = 7 1,3,4	1			FILL: Silty clay, medium plasticity, grey and light brown, with a trace of shale and ironstone gravel.	MC≈PL			APPEARS MODERATELY COMPACTED
								CL	SILTY CLAY: medium plasticity, grey mottled orange brown, with a trace of ironstone gravel.	MC≈PL	H	-	RESIDUAL
					N = 14 3,5,9	2						420 410 430	
						3		-	SHALE: light grey, with clay bands.	DW	L	-	LOW 'TC' BIT RESISTANCE
						4					M		
▼ AFTER 3.5 HRS						5			SHALE: dark grey.	SW	H		HIGH RESISTANCE
						6			END OF BOREHOLE AT 6.0m				
						7							

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Borehole No. **10** 1/1

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.7m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			■		N = 38 12,19,19	0			FILL: Silty sandy clay, medium plasticity, light brown, with igneous and sandstone gravel and bitumen fragments.	MC < PL			GRASS COVER APPEARS WELL COMPACTED
						1							
									END OF BOREHOLE AT 1.5m				
						2							
						3							
						4							
						5							
						6							
						7							

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BOREHOLE LOG

Borehole No. 11
1/1

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA
Project: PROPOSED NEW BUILDINGS AND CARPARK
Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH
Date: 15-11-08
Method: SPIRAL AUGER JK350
Logged/Checked by: J.P./
R.L. Surface: ≈ 20.5m
Datum: AHD

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 50mm.t				
									FILL: Gravelly silty sand, fine to medium grained, light brown, with sandstone and igneous gravel.	M	-	-	
					N = 8 3,4,4	1			FILL: Silty clay, medium plasticity, grey and brown, with sandstone and ironstone gravel.	MC≈PL			APPEARS MODERATELY COMPACTED
									END OF BOREHOLE AT 1.5m				
						2							
						3							
						4							
						5							
						6							
						7							

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Borehole No. **12** 1/1

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 21.8n

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			■			0			FILL: Silty clay, medium plasticity, grey and brown, with shale and igneous gravel.	MC < PL			GRASS COVER
			■					CL		MC < PL	H	-	RESIDUAL
			■		N = 23 11,13,10				SILTY CLAY: medium plasticity, grey and brown, with shale and ironstone gravel.			>600 >600 >600	
						1							
									END OF BOREHOLE AT 1.5m				
						2							
						3							
						4							
						5							
						6							
						7							

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Borehole No. 13 1/1

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.9m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION					N = 16 6,8,8	0			FILL: Silty clay, medium plasticity, light brown, with shale, sandstone and ironstone gravel.	MC < PL			GRASS COVER APPEARS WELL COMPACTED
						1							
									END OF BOREHOLE AT 1.5m				
						2							
						3							
						4							
						5							
						6							
						7							

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Borehole No. **14** 1/1

BOREHOLE LOG

Client: CATHOLIC EDUCATION OFFICE PARRAMATTA

Project: PROPOSED NEW BUILDINGS AND CARPARK

Location: WESTMEAD CATHOLIC PRECINCT, DARCY ROAD, WESTMEAD, NSW

Job No. 22466ZH **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 20.5m

Date: 15-11-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION			■		N = 16 6,8,8	0			FILL: Silty clay, medium plasticity, grey and brown, with ironstone gravel.	MC < PL			GRASS COVER APPEARS MODERATELY COMPACTED
						1							
									END OF BOREHOLE AT 1.5m				
						2							
						3							
						4							
						5							
						6							
						7							

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REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, the SAA Site Investigation Code. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (eg sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose	less than 4
Loose	4 – 10
Medium dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 – 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 – 400
Hard	Greater than 400
Friable	Strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'Shale' is used to describe thinly bedded to laminated siltstone.

SAMPLING

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

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All except test pits, hand auger drilling and portable dynamic cone penetrometers require the use of a mechanical drilling rig which is commonly mounted on a truck chassis.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as hard clay, gravel or ironstone, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock fragments. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses are determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the top end of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" – Test F3.1.

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

The test results are reported in the following form:

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

  N = 13
  4, 6, 7

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

  N>30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

A modification to the SPT test is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as "N_c" on the borehole logs, together with the number of blows per 150mm penetration.

Static Cone Penetrometer Testing and Interpretation: Cone penetrometer testing (sometimes referred to as a Dutch Cone) described in this report has been carried out using an Electronic Friction Cone Penetrometer (EFCP). The test is described in Australian Standard 1289, Test F5.1.

In the tests, a 35mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between EFCP and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of EFCP values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a sliding hammer and counting the blows for successive 100mm increments of penetration.

Two relatively similar tests are used:

- Cone penetrometer (commonly known as the Scala Penetrometer) – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS1289, Test F3.2). The test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various Road Authorities.
- Perth sand penetrometer – a 16mm diameter flat ended rod is driven with a 9kg hammer, dropping 600mm (AS1289, Test F3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or 'reverted' chemically if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after stabilising at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg bricks, steel etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 *'Methods of Testing Soil for Engineering Purposes'*. Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty storey building). If this happens, the company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

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

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document *'Guidelines for the Provision of Geotechnical Information in Tender Documents'*, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. License to use the documents may be revoked without notice if the Client is in breach of any objection to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer.

SITE INSPECTION

The company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to

ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or

iii) full time engineering presence on site.

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS

SOIL

FILL

TOPSOIL

CLAY (CL, CH)

SILT (ML, MH)

SAND (SP, SW)

GRAVEL (GP, GW)

SANDY CLAY (CL, CH)

SILTY CLAY (CL, CH)

CLAYEY SAND (SC)

SILTY SAND (SM)

GRAVELLY CLAY (CL, CH)

CLAYEY GRAVEL (GC)

SANDY SILT (ML)

PEAT AND ORGANIC SOILS

ROCK

CONGLOMERATE

SANDSTONE

SHALE

SILTSTONE, MUDSTONE, CLAYSTONE

LIMESTONE

PHYLLITE, SCHIST

TUFF

GRANITE, GABBRO

DOLERITE, DIORITE

BASALT, ANDESITE

QUARTZITE

DEFECTS AND INCLUSIONS

CLAY SEAM

SHEARED OR CRUSHED SEAM

BRECCIATED OR SHATTERED SEAM/ZONE

IRONSTONE GRAVEL

ORGANIC MATERIAL

OTHER MATERIALS

CONCRETE

BITUMINOUS CONCRETE, COAL

COLLUVIUM

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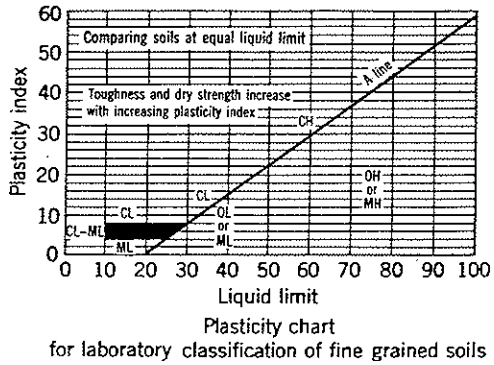
UNIFIED SOIL CLASSIFICATION TABLE

Field Identification Procedures (Excluding particles larger than 75 μm and basing fractions on estimated weights)						Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils: More than half of material is *larger* than 75 μm sieve size[b] (The 75 μm sieve size is about the smallest particle visible to naked eye)	Gravels: More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes			*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand*, gravelly; about 20% hard, angular gravel particles 12 mm maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than 75 μm sieve size) coarse grained soils are classified as follows: Less than 5% — *GW, GP, SW, SP* More than 12% — *GM, GC, SM, SC* 5% to 12% — *Borderline* cases requiring use of dual symbols Use grain size curve in identifying the fractions as given under field identification $C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing			*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for *GW*
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)			*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)			*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits above "A" line, with *PI* greater than 7
	Sands: More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes			*SW*	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing			*SP*	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for *SW*
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)			*SM*	Silty sands, poorly graded sand-silt mixtures		Atterberg limits below "A" line or *PI* less than 5 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
			Plastic fines (for identification procedures, see *CL* below)			*SC*	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits below "A" line with *PI* greater than 7
Fine-grained soils: More than half of material is *smaller* than 75 μm sieve size	Identification Procedures on Fraction Smaller than 380 μm Sieve Size		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)				
	Silts and clays: liquid limit less than 50		None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)	
			Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity		
	Silts and clays: liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays		
			Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity		
Highly Organic Soils			Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils		



Plasticity chart
for laboratory classification of fine grained soils

NOTE: 1) Soils possessing characteristics of two groups are designated by combinations of group symbols (e.g. GW-GC, well graded gravel-sand mixture with clay fines).

2) Soils with liquid limits of the order of 35 to 50 may be visually classified as being of medium plasticity.

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LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record		Standing water level. Time delay following completion of drilling may be shown.
		Extent of borehole collapse shortly after drilling.
		Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	ES	Soil sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos screening.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	Soil sample taken over depth indicated, for salinity analysis.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'R' as noted below.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25	Vane shear reading in kPa of Undrained Shear Strength.
	PID = 100	Photoionisation detector reading in ppm (Soil sample headspace test).
Moisture Condition (Cohesive Soils)	MC>PL	Moisture content estimated to be greater than plastic limit.
	MC≈PL	Moisture content estimated to be approximately equal to plastic limit.
	MC<PL	Moisture content estimated to be less than plastic limit.
(Cohesionless Soils)	D	DRY - runs freely through fingers.
	M	MOIST - does not run freely but no free water visible on soil surface.
	W	WET - free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS	VERY SOFT - Unconfined compressive strength less than 25kPa
	S	SOFT - Unconfined compressive strength 25-50kPa
	F	FIRM - Unconfined compressive strength 50-100kPa
	St	STIFF - Unconfined compressive strength 100-200kPa
	VSt	VERY STIFF - Unconfined compressive strength 200-400kPa
	H	HARD - Unconfined compressive strength greater than 400kPa
	( )	Bracketed symbol indicates estimated consistency based on tactile examination or other tests.
Density Index/ Relative Density (Cohesionless Soils)		**Density Index (Id) Range (%)** / **SPT 'N' Value Range (Blows/300mm)**
	VL	Very Loose <15 0-4
	L	Loose 15-35 4-10
	MD	Medium Dense 35-65 10-30
	D	Dense 65-85 30-50
	VD	Very Dense >85 >50
	( )	Bracketed symbol indicates estimated density based on ease of drilling or other tests.
Hand Penetrometer Readings	300 250	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten carbide wing bit.
	T 60	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.

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A8N 17 003 550 801

LOG SYMBOLS

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered rock	XW	Rock is weathered to such an extent that it has "soil" properties, ie it either disintegrates or can be remoulded, in water.
Distinctly weathered rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly weathered rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh rock	FR	Rock shows no sign of decomposition or staining.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Journal of Rock Mechanics, Mining, Science and Geomechanics. Abstract Volume 22, No 2, 1985.

TERM	SYMBOL	Is (50) MPa	FIELD GUIDE
Extremely Low:	EL	0.03	Easily remoulded by hand to a material with soil properties.
Very Low:	VL	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.
Low:	L	0.3	A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
Medium Strength:	M	1	A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
High:	H	3	A piece of core 150mm long x 50mm dia. core cannot be broken by hand, can be slightly scratched or scored with knife; rock rings under hammer.
Very High:	VH	10	A piece of core 150mm long x 50mm dia. may be broken with hand-held pick after more than one blow. Cannot be scratched with pen knife; rock rings under hammer.
Extremely High:	EH		A piece of core 150mm long x 50mm dia. is very difficult to break with hand-held hammer. Rings when struck with a hammer.

ABBREVIATIONS USED IN DEFECT DESCRIPTION

ABBREVIATION	DESCRIPTION	NOTES
Be	Bedding Plane Parting	Defect orientations measured relative to the normal to the long core axis (ie relative to horizontal for vertical holes)
CS	Clay Seam	
J	Joint	
P	Planar	
Un	Undulating	
S	Smooth	
R	Rough	
IS	Ironstained	
XWS	Extremely Weathered Seam	
Cr	Crushed Seam	
60t	Thickness of defect in millimetres	

Attachment G – General Geotechnical Recommendations

Geotechnical Recommendations

Important Recommendations About Your Site (1 of 2)

These general geotechnical recommendations have been prepared by Martens to help you deliver a safe work site, to comply with your obligations, and to deliver your project. Not all are necessarily relevant to this report but are included as general reference. Any specific recommendations made in the report will override these recommendations.

Batter Slopes

Excavations in soil and extremely low to very low strength rock exceeding 0.75 m depth should be battered back at grades of no greater than 1 Vertical (V) : 2 Horizontal (H) for temporary slopes (unsupported for less than 1 month) and 1 V : 3 H for longer term unsupported slopes.

Vertical excavation may be carried out in medium or higher strength rock, where encountered, subject to inspection and confirmation by a geotechnical engineer. Long term and short term unsupported batters should be protected against erosion and rock weathering due to, for example, stormwater run-off.

Batter angles may need to be revised depending on the presence of bedding partings or adversely oriented joints in the exposed rock, and are subject to on-site inspection and confirmation by a geotechnical engineer. Unsupported excavations deeper than 1.0 m should be assessed by a geotechnical engineer for slope instability risk.

Any excavated rock faces should be inspected during construction by a geotechnical engineer to determine whether any additional support, such as rock bolts or shotcrete, is required.

Earthworks

Earthworks should be carried out following removal of any unsuitable materials and in accordance with AS3798 (2007). A qualified geotechnical engineer should inspect the condition of prepared surfaces to assess suitability as foundation for future fill placement or load application.

Earthworks inspections and compliance testing should be carried out in accordance with Sections 5 and 8 of AS3798 (2007), with testing to be carried out by a National Association of Testing Authorities (NATA) accredited testing laboratory.

Excavations

All excavation work should be completed with reference to the *Work Health and Safety (Excavation Work) Code of Practice (2015)*, by Safe Work Australia. Excavations into rock may be undertaken as follows:

1. Extremely low to low strength rock - conventional hydraulic earthmoving equipment.

2. Medium strength or stronger rock - hydraulic earthmoving equipment with rock hammer or ripping tyne attachment.

Exposed rock faces and loose boulders should be monitored to assess risk of block / boulder movement, particularly as a result of excavation vibrations.

Fill

Subject to any specific recommendations provided in this report, any fill imported to site is to comprise approved material with maximum particle size of two thirds the final layer thickness. Fill should be placed in horizontal layers of not more than 300 mm loose thickness, however, the layer thickness should be appropriate for the adopted compaction plant.

Foundations

All exposed foundations should be inspected by a geotechnical engineer prior to footing construction to confirm encountered conditions satisfy design assumptions and that the base of all excavations is free from loose or softened material and water. Water that has ponded in the base of excavations and any resultant softened material is to be removed prior to footing construction.

Footings should be constructed with minimal delay following excavation. If a delay in construction is anticipated, we recommend placing a concrete blinding layer of at least 50 mm thickness in shallow footings or mass concrete in piers / piles to protect exposed foundations.

A geotechnical engineer should confirm any design bearing capacity values, by further assessment during construction, as necessary.

Shoring - Anchors

Where there is a requirement for either soil or rock anchors, or soil nailing, and these structures penetrate past a property boundary, appropriate permission from the adjoining land owner must be obtained prior to the installation of these structures.

Shoring - Permanent

Permanent shoring techniques may be used as an alternative to temporary shoring. The design of such structures should be in accordance with the findings of this report and any further testing recommended by this report. Permanent shoring may include [but not be limited to] reinforced block work walls, contiguous and semi contiguous pile walls, secant pile walls and soldier pile walls with or without reinforced shotcrete infill panels. The choice of shoring system will depend on the type of structure, project budget and site specific geotechnical conditions.

Permanent shoring systems are to be engineer designed and backfilled with suitable granular

material and free-draining drainage material. Backfill should be placed in maximum 100 mm thick layers compacted using a hand operated compactor. Care should be taken to ensure excessive compaction stresses are not transferred to retaining walls.

Shoring design should consider any surcharge loading from sloping / raised ground behind shoring structures, live loads, new structures, construction equipment, backfill compaction and static water pressures. All shoring systems shall be provided with adequate foundation designs.

Suitable drainage measures, such as geotextile enclosed 100 mm agricultural pipes embedded in free-draining gravel, should be included to redirect water that may collect behind the shoring structure to a suitable discharge point.

Shoring - Temporary

In the absence of providing acceptable excavation batters, excavations should be supported by suitably designed and installed temporary shoring / retaining structures to limit lateral deflection of excavation faces and associated ground surface settlements.

Soil Erosion Control

Removal of any soil overburden should be performed in a manner that reduces the risk of sedimentation occurring in any formal stormwater drainage system, on neighbouring land and in receiving waters. Where possible, this may be achieved by one or more of the following means:

1. Maintain vegetation where possible
2. Disturb minimal areas during excavation
3. Revegetate disturbed areas if possible

All spoil on site should be properly controlled by erosion control measures to prevent transportation of sediments off-site. Appropriate soil erosion control methods in accordance with Landcom (2004) shall be required.

Trafficability and Access

Consideration should be given to the impact of the proposed works and site subsurface conditions on trafficability within the site e.g. wet clay soils will lead to poor trafficability by tyred plant or vehicles.

Where site access is likely to be affected by any site works, construction staging should be organised such that any impacts on adequate access are minimised as best as possible.

Vibration Management

Where excavation is to be extended into medium or higher strength rock, care will be required when using a rock hammer to limit potential structural distress from excavation-induced vibrations where nearby structures may be affected by the works.

To limit vibrations, we recommend limiting rock hammer size and set frequency, and setting the hammer parallel to bedding planes and along defect planes, where possible, or as advised by a geotechnical engineer. We recommend limiting vibration peak particle velocities (PPV) caused by construction equipment or resulting from excavation at the site to 5 mm/s (AS 2187.2, 2006, Appendix J).

Waste – Spoil and Water

Soil to be disposed off-site should be classified in accordance with the relevant State Authority guidelines and requirements.

Any collected waste stormwater or groundwater should also be tested prior to discharge to ensure contaminant levels (where applicable) are appropriate for the nominated discharge location.

MA can complete the necessary classification and testing if required. Time allowance should be made for such testing in the construction program.

Water Management - Groundwater

If the proposed works are likely to intersect ephemeral or permanent groundwater levels, the management of any potential acid soil drainage should be considered. If groundwater tables are likely to be lowered, this should be further discussed with the relevant State Government Agency.

Water Management – Surface Water

All surface runoff should be diverted away from excavation areas during construction works and prevented from accumulating in areas surrounding any retaining structures, footings or the base of excavations.

Any collected surface water should be discharged into a suitable Council approved drainage system and not adversely impact downslope surface and subsurface conditions.

All site discharges should be passed through a filter material prior to release. Sump and pump methods will generally be suitable for collection and removal of accumulated surface water within any excavations.

Contingency Plan

In the event that proposed development works cause an adverse impact on geotechnical hazards, overall site stability or adjacent properties, the following actions are to be undertaken:

1. Works shall cease immediately.
2. The nature of the impact shall be documented and the reason(s) for the adverse impact investigated.
3. A qualified geotechnical engineer should be consulted to provide further advice in relation to the issue.

Attachment H – Notes Relating To This Report

Information

Important Information About Your Report (1 of 2)

These notes have been prepared by Martens to help you interpret and understand the limitations of your report. Not all are necessarily relevant to all reports but are included as general reference.

Engineering Reports - Limitations

The recommendations presented in this report are based on limited investigations and include specific issues to be addressed during various phases of the project. If the recommendations presented in this report are not implemented in full, the general recommendations may become inapplicable and Martens & Associates accept no responsibility whatsoever for the performance of the works undertaken.

Occasionally, sub-surface conditions between and below the completed boreholes or other tests may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact Martens & Associates.

Relative ground surface levels at borehole locations may not be accurate and should be verified by on-site survey.

Engineering Reports – Project Specific Criteria

Engineering reports are prepared by qualified personnel. They are based on information obtained, on current engineering standards of interpretation and analysis, and on the basis of your unique project specific requirements as understood by Martens. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the Client.

Where the report has been prepared for a specific design proposal (e.g. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (e.g. to a twenty storey building). Your report should not be relied upon, if there are changes to the project, without first asking Martens to assess how factors, which changed subsequent to the date of the report, affect the report's recommendations. Martens will not accept responsibility for problems that may occur due to design changes, if not consulted.

Engineering Reports – Recommendations

Your report is based on the assumption that site conditions, as may be revealed through selective point sampling, are indicative of actual conditions throughout an area. This assumption often cannot be substantiated until project implementation has commenced. Therefore your site investigation report recommendations should only be regarded as preliminary.

Only Martens, who prepared the report, are fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report, there is a risk that the report will be misinterpreted and Martens cannot be held responsible for such misinterpretation.

Engineering Reports – Use for Tendering Purposes

Where information obtained from investigations is provided for tendering purposes, Martens recommend that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document.

Martens would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Engineering Reports – Data

The report as a whole presents the findings of a site assessment and should not be copied in part or altered in any way.

Logs, figures, drawings *etc* are customarily included in a Martens report and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel), desktop studies and laboratory evaluation of field samples. These data should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Engineering Reports – Other Projects

To avoid misuse of the information contained in your report it is recommended that you confer with Martens before passing your report on to another party who may not be familiar with the background and purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Subsurface Conditions - General

Every care is taken with the report in relation to interpretation of subsurface conditions, discussion of geotechnical aspects, relevant standards and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions - the potential will depend partly on test point

(eg. excavation or borehole) spacing and sampling frequency, which are often limited by project imposed budgetary constraints.

- Changes in guidelines, standards and policy or interpretation of guidelines, standards and policy by statutory authorities.

- The actions of contractors responding to commercial pressures.

- Actual conditions differing somewhat from those inferred to exist, because no professional, no matter how qualified, can reveal precisely what is hidden by earth, rock and time.

  The actual interface between logged materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

If these conditions occur, Martens will be pleased to assist with investigation or providing advice to resolve the matter.

Subsurface Conditions - Changes

Natural processes and the activity of man create subsurface conditions. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Reports are based on conditions which existed at the time of the subsurface exploration / assessment.

Decisions should not be based on a report whose adequacy may have been affected by time. If an extended period of time has elapsed since the report was prepared, consult Martens to be advised how time may have impacted on the project.

Subsurface Conditions - Site Anomalies

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

Report Use by Other Design Professionals

To avoid potentially costly misinterpretations when other design professionals develop their plans based on a Martens report, retain Martens to work with other project professionals affected by the report. This may involve Martens explaining the report design implications and then reviewing plans and specifications produced to see how they have incorporated the report findings.

Subsurface Conditions – Geo-environmental Issues

Your report generally does not relate to any findings, conclusions, or recommendations about the potential for hazardous or contaminated materials existing at the site unless specifically required to do so as part of Martens' proposal for works.

Specific sampling guidelines and specialist equipment, techniques and personnel are typically used to perform geo-environmental or site contamination assessments. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Martens for information relating to such matters.

Responsibility

Geo-environmental reporting relies on interpretation of factual information based on professional judgment and opinion and has an inherent level of uncertainty attached to it and is typically far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded.

To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Martens to other parties but are included to identify where Martens' responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Martens closely and do not hesitate to ask any questions you may have.

Site Inspections

Martens will always be pleased to provide engineering inspection services for aspects of work to which this report relates. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site. Martens is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction.

Soil Data

Explanation of Terms (1 of 3)

Definitions

In engineering terms, soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material does not exhibit any visible rock properties and can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

The methods of description and classification of soils and rocks used in this report are typically based on Australian Standard 1726 and the Unified Soil Classification System (USCS) – refer Soil Data Explanation of Terms (2 of 3). In general, descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions.

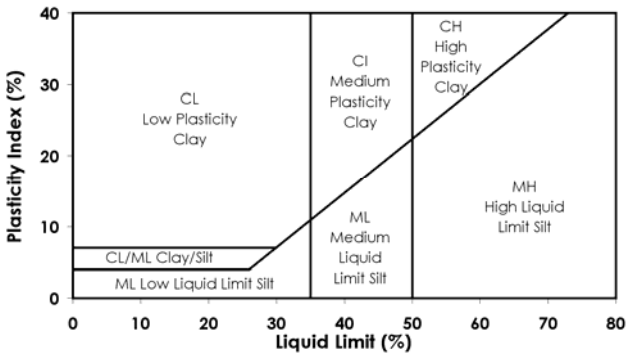
Particle Size

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (e.g. sandy CLAY). Unless otherwise stated, particle size is described in accordance with the following table.

Division	Subdivision	Size (mm)
BOULDERS		>200
COBBLES		63 to 200
GRAVEL	Coarse	20 to 63
	Medium	6 to 20
	Fine	2.36 to 6
SAND	Coarse	0.6 to 2.36
	Medium	0.2 to 0.6
	Fine	0.075 to 0.2
SILT		0.002 to 0.075
CLAY		< 0.002

Plasticity Properties

Plasticity properties of cohesive soils can be assessed in the field by tactile properties or by laboratory procedures.



Moisture Condition

Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.
Moist	Soil feels cool and damp and is darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist but with free water forming on hands when handled.

Consistency of Cohesive Soils

Cohesive soils refer to predominantly clay materials.

Term	C_u (kPa)	Approx. SPT "N"	Field Guide
Very Soft	<12	2	A finger can be pushed well into the soil with little effort. Sample extrudes between fingers when squeezed in fist.
Soft	12 - 25	2 – 4	A finger can be pushed into the soil to about 25mm depth. Easily moulded in fingers.
Firm	25 - 50	4 – 8	The soil can be indented about 5mm with the thumb, but not penetrated. Can be moulded by strong pressure in the figures.
Stiff	50 - 100	8 – 15	The surface of the soil can be indented with the thumb, but not penetrated. Cannot be moulded by fingers.
Very Stiff	100 - 200	15 – 30	The surface of the soil can be marked, but not indented with thumb pressure. Difficult to cut with a knife. Thumbnail can readily indent.
Hard	> 200	> 30	The surface of the soil can be marked only with the thumbnail. Brittle. Tends to break into fragments.
Friable	-	-	Crumbles or powders when scraped by thumbnail.

Density of Granular Soils

Non-cohesive soils are classified on the basis of relative density, generally from standard penetration test (SPT) or Dutch cone penetrometer test (CPT) results as below:

Relative Density	%	SPT 'N' Value* (blows/300mm)	CPT Cone Value (q_c MPa)
Very loose	< 15	< 5	< 2
Loose	15 - 35	5 - 10	2 - 5
Medium dense	35 - 65	10 - 30	5 - 15
Dense	65 - 85	30 - 50	15 - 25
Very dense	> 85	> 50	> 25

* Values may be subject to corrections for overburden pressures and equipment type.

Minor Components

Minor components in soils may be present and readily detectable, but have little bearing on general geotechnical classification. Terms include:

Term	Assessment	Proportion of Minor component In:
Trace of	Presence just detectable by feel or eye. Soil properties little or no different to general properties of primary component.	Coarse grained soils: < 5 % Fine grained soils: < 15 %
With some	Presence easily detectable by feel or eye. Soil properties little different to general properties of primary component.	Coarse grained soils: 5 – 12 % Fine grained soils: 15 – 30 %

Soil Data

Explanation of Terms (2 of 3)

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Symbols for Soils and Other

SOILS

COBBLES/BOULDERS

GRAVEL (GP OR GW)

SILTY GRAVEL (GM)

CLAYEY GRAVEL (GC)

SAND (SP OR SW)

SILTY SAND (SM)

CLAYEY SAND (SC)

SILT (ML OR MH)

ORGANIC SILT (OH)

CLAY (CL, CI OR CH)

SILTY CLAY

SANDY CLAY

PEAT

TOPSOIL

OTHER

FILL

TALUS

ASPHALT

CONCRETE

Unified Soil Classification Scheme (USCS)

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 63 mm and basing fractions on estimated mass)					USCS	Primary Name
COARSE GRAINED SOILS More than 50 % of material less than 63 mm is larger than 0.075 mm	(A 0.075 mm particle is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than 2.0 mm.	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	Gravel
				Predominantly one size or a range of sizes with more intermediate sizes missing	GP	Gravel
			GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)	GM	Silty Gravel
				Plastic fines (for identification procedures see CL below)	GC	Clayey Gravel
		SANDS More than half of coarse fraction is smaller than 2.0 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of intermediate sizes missing.	SW	Sand
				Predominantly one size or a range of sizes with some intermediate sizes missing	SP	Sand
			SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)	SM	Silty Sand
				Plastic fines (for identification procedures see CL below)	SC	Clayey Sand

FINE GRAINED SOILS More than 50 % of material less than 63 mm is smaller than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS < 0.2 MM					
	DRY STRENGTH (Crushing Characteristics)	DILATANCY	TOUGHNESS	DESCRIPTION	USCS	Primary Name
	None to Low	Quick to Slow	None	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	ML	Silt
	Medium to High	None	Medium	Inorganic clays of low to medium plasticity [1], gravely clays, sandy clays, silty clays, lean clays	CL [2]	Clay
	Low to Medium	Slow to Very Slow	Low	Organic slits and organic silty clays of low plasticity	OL	Organic Silt
	Low to Medium	Slow to Very Slow	Low to Medium	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	MH	Silt
	High	None	High	Inorganic clays of high plasticity, fat clays	CH	Clay
	Medium to High	None	Low to Medium	Organic clays of medium to high plasticity	OH	Organic Silt
HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture				Pt	Peat

Notes:

1. Low Plasticity – Liquid Limit W_L < 35 % Medium Plasticity – Liquid limit W_L 35 to 60 % High Plasticity - Liquid limit W_L > 60 %.
2. CI may be adopted for clay of medium plasticity to distinguish from clay of low plasticity.

Soil Data

Explanation of Terms (3 of 3)

Soil Agricultural Classification Scheme

In some situations, such as where soils are to be used for effluent disposal purposes, soils are often more appropriately classified in terms of traditional agricultural classification schemes. Where a Martens report provides agricultural classifications, these are undertaken in accordance with descriptions by Northcote, K.H. (1979) *The factual key for the recognition of Australian Soils*, Rellim Technical Publications, NSW, p 26 - 28.

Symbol	Field Texture Grade	Behaviour of moist bolus	Ribbon length	Clay content (%)
S	Sand	Coherence nil to very slight; cannot be moulded; single grains adhere to fingers	0 mm	< 5
LS	Loamy sand	Slight coherence; discolours fingers with dark organic stain	6.35 mm	5
CLS	Clayey sand	Slight coherence; sticky when wet; many sand grains stick to fingers; discolours fingers with clay stain	6.35mm - 1.3cm	5 - 10
SL	Sandy loam	Bolus just coherent but very sandy to touch; dominant sand grains are of medium size and are readily visible	1.3 - 2.5	10 - 15
FSL	Fine sandy loam	Bolus coherent; fine sand can be felt and heard	1.3 - 2.5	10 - 20
SCL$^-$	Light sandy clay loam	Bolus strongly coherent but sandy to touch, sand grains dominantly medium size and easily visible	2.0	15 - 20
L	Loam	Bolus coherent and rather spongy; smooth feel when manipulated but no obvious sandiness or silkiness; may be somewhat greasy to the touch if much organic matter present	2.5	25
Lfsy	Loam, fine sandy	Bolus coherent and slightly spongy; fine sand can be felt and heard when manipulated	2.5	25
SiL	Silt loam	Coherent bolus, very smooth to silky when manipulated	2.5	25 + > 25 silt
SCL	Sandy clay loam	Strongly coherent bolus sandy to touch; medium size sand grains visible in a finer matrix	2.5 - 3.8	20 - 30
CL	Clay loam	Coherent plastic bolus; smooth to manipulate	3.8 - 5.0	30 - 35
SiCL	Silty clay loam	Coherent smooth bolus; plastic and silky to touch	3.8 - 5.0	30- 35 + > 25 silt
FSCL	Fine sandy clay loam	Coherent bolus; fine sand can be felt and heard	3.8 - 5.0	30 - 35
SC	Sandy clay	Plastic bolus; fine to medium sized sands can be seen, felt or heard in a clayey matrix	5.0 - 7.5	35 - 40
SiC	Silty clay	Plastic bolus; smooth and silky	5.0 - 7.5	35 - 40 + > 25 silt
LC	Light clay	Plastic bolus; smooth to touch; slight resistance to shearing	5.0 - 7.5	35 - 40
LMC	Light medium clay	Plastic bolus; smooth to touch, slightly greater resistance to shearing than LC	7.5	40 - 45
MC	Medium clay	Smooth plastic bolus, handles like plasticine and can be moulded into rods without fracture, some resistance to shearing	> 7.5	45 - 55
HC	Heavy clay	Smooth plastic bolus; handles like stiff plasticine; can be moulded into rods without fracture; firm resistance to shearing	> 7.5	> 50

Rock Data

Explanation of Terms (1 of 2)

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Symbols for Rock

SEDIMENTARY ROCK

BRECCIA

CONGLOMERATE

CONGLOMERATIC SANDSTONE

SANDSTONE/QUARTZITE

SILTSTONE

MUDSTONE/CLAYSTONE

SHALE

COAL

LIMESTONE

LITHIC TUFF

IGNEOUS ROCK

GRANITE

DOLERITE/BASALT

METAMORPHIC ROCK

SLATE, PHYLLITE, SCHIST

GNEISS

METASANDSTONE

METASILTSTONE

METAMUDSTONE

Definitions

Descriptive terms used for Rock by Martens are based on AS1726 and encompass rock substance, defects and mass.

Rock Substance In geotechnical engineering terms, rock substance is any naturally occurring aggregate of minerals and organic matter which cannot be disintegrated or remoulded by hand in air or water. Other material is described using soil descriptive terms. Rock substance is effectively homogeneous and may be isotropic or anisotropic.

Rock Defect Discontinuity or break in the continuity of a substance or substances.

Rock Mass Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.

Degree of Weathering

Rock weathering is defined as the degree of decline in rock structure and grain property and can be determined in the field.

Term	Symbol	Definition
Residual soil[1]	Rs	Soil derived from the weathering of rock. The mass structure and substance fabric are no longer evident. There is a large change in volume but the soil has not been significantly transported.
Extremely weathered[1]	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly weathered[2]	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decrease compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original rock substance is no longer recognisable.
Moderately weathered[2]	MW	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
Slightly weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh	FR	Rock substance unaffected by weathering

Notes:
1 The term "Distinctly Weathered" (DW) may be used to cover the range of substance weathering between EW and SW.
2 Rs and EW material is described using soil descriptive terms.

Rock Strength

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the loading. The test procedure is described by the International Society of Rock Mechanics.

Term	Is (50) MPa	Field Guide	Symbol
Very low	>0.03 ≤0.1	May be crumbled in the hand. Sandstone is 'sugary' and friable.	VL
Low	>0.1 ≤0.3	A piece of core 150mm long x 50mm diameter may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	L
Medium	>0.3 ≤1.0	A piece of core 150mm long x 50mm diameter can be broken by hand with considerable difficulty. Readily scored with a knife.	M
High	>1 ≤3	A piece of core 150mm long x 50mm diameter cannot be broken by unaided hands, can be slightly scratched or scored with a knife.	H
Very high	>3 ≤10	A piece of core 150mm long x 50mm diameter may be broken readily with hand held hammer. Cannot be scratched with pen knife.	VH
Extremely high	>10	A piece of core 150mm long x 50mm diameter is difficult to break with hand held hammer. Rings when struck with a hammer.	EH

Rock Data

Explanation of Terms (2 of 2)

Degree of Fracturing

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude fractures such as drilling breaks (DB) or handling breaks (HB).

Term	Description
Fragmented	The core is comprised primarily of fragments of length less than 20 mm, and mostly of width less than core diameter.
Highly fractured	Core lengths are generally less than 20 mm to 40 mm with occasional fragments.
Fractured	Core lengths are mainly 30 mm to 100 mm with occasional shorter and longer sections.
Slightly fractured	Core lengths are generally 300 mm to 1000 mm, with occasional longer sections and sections of 100 mm to 300 mm.
Unbroken	The core does not contain any fractures.

Rock Core Recovery

TCR = Total Core Recovery

$$= \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100\%$$

SCR = Solid Core Recovery

$$= \frac{\sum \text{Length of cylindrical core recovered}}{\text{Length of core run}} \times 100\%$$

RQD = Rock Quality Designation

$$= \frac{\sum \text{Axial lengths of core} > 100\,\text{mm long}}{\text{Length of core run}} \times 100\%$$

Rock Strength Tests

▼ Point load strength Index (Is50) - axial test (MPa)

► Point load strength Index (Is50) - diametral test (MPa)

● Unconfined compressive strength (UCS) (MPa)

Defect Type Abbreviations and Descriptions

Defect Type (with inclination given)

BP	Bedding plane parting
FL	Foliation
CL	Cleavage
JT	Joint
FC	Fracture
SZ/SS	Sheared zone/ seam (Fault)
CZ/CS	Crushed zone/ seam
DZ/DS	Decomposed zone/ seam
FZ	Fractured Zone
IS	Infilled seam
VN	Vein
CO	Contact
HB	Handling break
DB	Drilling break

Planarity

Pl	Planar
Cu	Curved
Un	Undulating
St	Stepped
Ir	Irregular
Dis	Discontinuous

Roughness

Pol	Polished
Sl	Slickensided
Sm	Smooth
Ro	Rough
VR	Very rough

Thickness

Zone	> 100 mm
Seam	> 2 mm < 100 mm
Plane	< 2 mm

Coating or Filling

Cn	Clean
Sn	Stain
Ct	Coating
Vnr	Veneer
Fe	Iron Oxide
X	Carbonaceous
Qz	Quartzite
MU	Unidentified mineral

Inclination

Inclination of defect is measured from perpendicular to and down the core axis.
Direction of defect is measured clockwise (looking down core) from magnetic north.

Test, Drill and Excavation Methods

Explanation of Terms (1 of 3)

Sampling

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

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

Undisturbed samples may be taken by pushing a thin-walled sampling tube, e.g. U_{50} (50 mm internal diameter thin walled tube), into soils and withdrawing a soil sample in a relatively undisturbed state. Such samples yield information on structure and strength and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils. Other sampling methods may be used. Details of the type and method of sampling are given in the report.

Drilling / Excavation Methods

The following is a brief summary of drilling and excavation methods currently adopted by the Company and some comments on their use and application.

Hand Excavation - in some situations, excavation using hand tools, such as mattock and spade, may be required due to limited site access or shallow soil profiles.

Hand Auger - the hole is advanced by pushing and rotating either a sand or clay auger, generally 75-100 mm in diameter, into the ground. The penetration depth is usually limited to the length of the auger pole; however extender pieces can be added to lengthen this.

Test Pits - these are excavated with a backhoe or a tracked excavator, allowing close examination of the in-situ soils and, if it is safe to descend into the pit, collection of bulk disturbed samples. The depth of penetration is limited to about 3 m for a backhoe and up to 6 m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Large Diameter Auger (e.g. Pengo) - the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube sampling.

Continuous Sample Drilling (Push Tube) - the hole is advanced by pushing a 50 - 100 mm diameter socket into the ground and withdrawing it at intervals to extrude the sample. This is the most reliable method of drilling in soils, since moisture content is unchanged and soil structure, strength *etc.* is only marginally affected.

Continuous Spiral Flight Augers - the hole is advanced using 90 - 115 mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface or, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling - the hole is advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from 'feel' and rate of penetration.

Rotary Mud Drilling - similar to rotary drilling, but using drilling mud as a circulating fluid. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg. from SPT).

Continuous Core Drilling - a continuous core sample is obtained using a diamond tipped core barrel of usually 50 mm internal diameter. Provided full core recovery is achieved (not always possible in very weak or fractured rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation.

In-situ Testing and Interpretation

Cone Penetrometer Testing (CPT)

Cone penetrometer testing (sometimes referred to as Dutch Cone) described in this report has been carried out using an electrical friction cone penetrometer.

The test is described in AS 1289.6.5.1-1999 (R2013). In the test, a 35 mm diameter rod with a cone tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system.

Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the push rod centre to an amplifier and recorder unit mounted on the control truck. As penetration occurs (at a rate of approximately 20 mm per second) the information is output on continuous chart recorders. The plotted results given in this report have been traced from the original records. The information provided on the charts comprises:

(i) Cone resistance (q_c) - the actual end bearing force divided by the cross sectional area of the cone, expressed in MPa.

(ii) Sleeve friction (q_f) - the frictional force of the sleeve divided by the surface area, expressed in kPa.

(iii) Friction ratio - the ratio of sleeve friction to cone resistance, expressed in percent.

There are two scales available for measurement of cone resistance. The lower (A) scale (0 - 5 MPa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main (B) scale (0 - 50 MPa) is less sensitive and is shown as a full line.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1 % - 2 % are commonly encountered in sands and very soft clays rising to 4 % - 10 % in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:

$$q_c \text{ (MPa)} = (0.4 \text{ to } 0.6)\ N \text{ (blows/300 mm)}$$

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:

$$q_c = (12 \text{ to } 18)\ C_u$$

Interpretation of CPT values can also be made to allow estimation of modulus or compressibility values to allow calculation of foundation settlements.

Inferred stratification as shown on the attached reports is assessed from the cone and friction traces and from experience and information from nearby boreholes *etc.* This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties, and where precise information on soil classification is required, direct drilling and sampling may be preferable.

Standard Penetration Testing (SPT)

Standard penetration tests are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength and also of obtaining a relatively undisturbed sample.

The test procedure is described in AS 1289.6.3.1-2004. The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm penetration depth increments and the 'N' value is taken as the number of blows for the last two 150 mm depth increments (300 mm total penetration). In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued. The test results are reported in the following form:

(i) Where full 450 mm penetration is obtained with successive blow counts for each 150 mm of say 4, 6 and 7 blows:

as 4, 6, 7
N = 13

(ii) Where the test is discontinued, short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm

as 15, 30/40 mm.

The results of the tests can be related empirically to the engineering properties of the soil. Occasionally, the test method is used to obtain samples in 50 mm diameter thin walled sample tubes in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

Dynamic Cone (Hand) Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150mm increments of penetration. Normally, there is a depth limitation of 1.2m but this may be extended in certain conditions by the use of extension rods. Two relatively similar tests are used.

Perth sand penetrometer (PSP) - a 16 mm diameter flat ended rod is driven with a 9 kg hammer, dropping 600 mm. The test, described in AS 1289.6.3.3-1997 (R2013), was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

Cone penetrometer (DCP) - sometimes known as the Scala Penetrometer, a 16 mm rod with a 20 mm diameter cone end is driven with a 9 kg hammer dropping 510 mm. The test, described in AS 1289.6.3.2-1997 (R2013), was developed initially for pavement sub-grade investigations, with correlations of the test results with California Bearing Ratio published by various Road Authorities.

Pocket Penetrometers

The pocket (hand) penetrometer (PP) is typically a light weight spring hand operated device with a stainless steel loading piston, used to estimate unconfined compressive strength, q_u, (UCS in kPa) of a fine grained soil in field conditions. In use, the free end of the piston is pressed into the soil at a uniform penetration rate until a line, engraved near the piston tip, reaches the soil surface level. The reading is taken from a gradation scale, which is attached to the piston via a built-in spring mechanism and calibrated to kilograms per square centimetre (kPa) UCS. The UCS measurements are used to evaluate consistency of the soil in the field moisture condition. The results may be used to assess the undrained shear strength, C_u, of fine grained soil using the approximate relationship:

$$q_u = 2 \times C_u.$$

It should be noted that accuracy of the results may be influenced by condition variations at selected test surfaces. Also, the readings obtained from the PP test are based on a small area of penetration and could give misleading results. They should not replace laboratory test results. The use of the results from this test is typically limited to an assessment of consistency of the soil in the field and not used directly for design of foundations.

Test Pit / Borehole Logs

Test pit / borehole log(s) presented herein are an engineering and / or geological interpretation of the subsurface conditions. Their reliability will depend to some extent on frequency of sampling and methods of excavation / drilling. Ideally, continuous undisturbed sampling or excavation / core drilling will provide the most reliable assessment but this is not always practicable, or possible to justify on economic grounds. In any case, the test pit / borehole logs represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of test pits / boreholes, the frequency of sampling and the possibility of other than 'straight line' variation between the test pits / boreholes.

Laboratory Testing

Laboratory testing is carried out in accordance with AS 1289 Methods of Testing Soil for Engineering Purposes. Details of the test procedure used are given on the individual report forms.

Ground Water

Where ground water levels are measured in boreholes, there are several potential problems:

- In low permeability soils, ground water although present, may enter the hole slowly, or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent prior weather changes. They may not be the same at the time of construction as are indicated in the report.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water observations are to be made.

More reliable measurements can be made by installing standpipes, which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Test, Drill and Excavation Methods

Explanation of Terms (3 of 3)

DRILLING / EXCAVATION METHOD

HA	Hand Auger	RD	Rotary Blade or Drag Bit	NQ	Diamond Core - 47 mm
AD/V	Auger Drilling with V-bit	RT	Rotary Tricone bit	NMLC	Diamond Core – 51.9 mm
AD/T	Auger Drilling with TC-Bit	RAB	Rotary Air Blast	HQ	Diamond Core – 63.5 mm
AS	Auger Screwing	RC	Reverse Circulation	HMLC	Diamond Core – 63.5 mm
HSA	Hollow Stem Auger	CT	Cable Tool Rig	DT	Diatube Coring
S	Excavated by Hand Spade	PT	Push Tube	NDD	Non-destructive digging
BH	Tractor Mounted Backhoe	PC	Percussion	PQ	Diamond Core - 83 mm
JET	Jetting	E	Tracked Hydraulic Excavator	X	Existing Excavation

SUPPORT

Nil	No support	S	Shotcrete	RB	Rock Bolt
C	Casing	Sh	Shoring	SN	Soil Nail
WB	Wash bore with Blade or Bailer	WR	Wash bore with Roller	T	Timbering

WATER

▽ Water level at date shown

▷ Water inflow

◁ Partial water loss

◀ Complete water loss

GROUNDWATER NOT OBSERVED (NO)	The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.
GROUNDWATER NOT ENCOUNTERED (NX)	The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

PENETRATION / EXCAVATION RESISTANCE

L	Low resistance: Rapid penetration possible with little effort from the equipment used.
M	Medium resistance: Excavation possible at an acceptable rate with moderate effort from the equipment used.
H	High resistance: Further penetration possible at slow rate & requires significant effort equipment.
R	Refusal/ Practical Refusal. No further progress possible without risk of damage/ unacceptable wear to digging implement / machine.

These assessments are subjective and dependent on many factors, including equipment power, weight, condition of excavation or drilling tools, and operator experience.

SAMPLING

D	Small disturbed sample	W	Water Sample	C	Core sample
B	Bulk disturbed sample	G	Gas Sample	CONC	Concrete Core

U63 Thin walled tube sample - number indicates nominal undisturbed sample diameter in millimetres

TESTING

SPT 4,7,11 N=18	Standard Penetration Test to AS1289.6.3.1-2004 4,7,11 = Blows per 150mm. 'N' = Recorded blows per 300mm penetration following 150mm seating
DCP	Dynamic Cone Penetration test to AS1289.6.3.2-1997. 'n' = Recorded blows per 150mm penetration

Notes:

RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB 30/80mm	Hammer double bouncing on anvil after 80 mm penetration
N=18	Where practical refusal occurs, report blows and penetration for that interval

CPT	Static cone penetration test
CPTu	CPT with pore pressure (u) measurement
PP	Pocket penetrometer test expressed as instrument reading (kPa)
FP	Field permeability test over section noted
VS	Field vane shear test expressed as uncorrected shear strength (sv = peak value, sr = residual value)
PM	Pressuremeter test over section noted
PID	Photoionisation Detector reading in ppm
WPT	Water pressure tests

SOIL DESCRIPTION

Density		Consistency		Moisture	
VL	Very loose	VS	Very soft	D	Dry
L	Loose	S	Soft	M	Moist
MD	Medium dense	F	Firm	W	Wet
D	Dense	St	Stiff	Wp	Plastic limit
VD	Very dense	VSt	Very stiff	Wl	Liquid limit
		H	Hard		

ROCK DESCRIPTION

Strength		Weathering	
VL	Very low	EW	Extremely weathered
L	Low	HW	Highly weathered
M	Medium	MW	Moderately weathered
H	High	SW	Slightly weathered
VH	Very high	FR	Fresh
EH	Extremely high		

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NORTHROP

f) Flood Emergency Response Sub-Plan

NORTHROP

CIVIL

Construction Flood Emergency Response Sub-Plan

for

Westmead Catholic Community GLA Building, Westmead, NSW 2145

for Kane Constructions Pty Ltd

SY192734 / 13 November 2024 / Version 2

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Report details

Project: Westmead Catholic Community GLA Building

2 Darcy Road, Westmead, NSW 2145

Project Ref: SY192734_E02

File Location: O:\5 Pre-July 24 Projects\Sydney\2019 jobs\192734 -08 - WCC Carpark\C-Correspondence and Reports\C-Civil\Outgoing\SY192734_E02_Construction_FERSP_[1].docx

Revision History

Revision	Report Status	Prepared	Reviewed	Issue Date
1	For Approval	L Gitzel	L Gitzel	25/10/2024
2	For Approval	L Gitzel	L Gitzel	13/11/2024

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Kane Constructions Pty Ltd.

The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

Except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

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The report was prepared on the dates shown and is based on the conditions and information received at the time of preparation. It makes no comment or assertions on the structures or their ability to withstand flooding or flood forces.

This report should be read in full, with reference made to all sources. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. Northrop does not purport to give legal advice or financial advice. Appropriate specialist advice should be obtained where required.

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Flood Response Summary

The following provides a summary of the findings of this Flood Emergency Response Sub-Plan including a summary of the flood behaviour, floor levels with respect to the flood behaviour, the recommended flood response actions, and the recommended on-site and off-site flood refuge locations.

Flood Levels

Table 1 – Summary of Approx. Flood Levels (GLA Building)

Event	5% AEP	1% AEP	PMF
Flood Level (mAHD)	17.46	17.63	18.97

Floor Levels

Table 2 - Internal Floor Levels

Floor	Level (m AHD)	Relationship to Flood Levels
Ground Floor	20.5	Above 1% AEP and PMF
Level 1	24.3	Above 1% AEP and PMF
Level 2	29.0	Above 1% AEP and PMF
Level 3	33.0	Above 1% AEP and PMF
Level 4	38.0	Above 1% AEP and PMF
Level 5	42.0	Above 1% AEP and PMF
Roof	46.0	Above 1% AEP and PMF

Flood Response Actions

Table 3 – Flood Response Actions Summary

WHEN	WHAT	BY WHO
Prior to Flooding	Assemble **Floodsafe Emergency Kit**	Site Manager / WHS Officer
	Check Floodsafe Kit every month	Site Manager / WHS Officer
	Coordinate **Flood Emergency Response Drills** monthly	Site Manager / WHS Officer
	Sign up and maintain **Parramatta Flood Warning Service** and **Hazards Near Me App** subscriptions.	Site Manager / WHS Officer Flood Wardens
	Monitor weather situation via BOM and Hazard Watch websites at 9am and 4pm every afternoon.	Site Manager / WHS Officer Flood Wardens
	Inductions for new Staff to include flood risk associated with the subject site and evacuation procedure.	Site Manager / WHS Officer
Site Closure (prior to opening)	**Receive Moderate or Major Flood Warning from Parramatta Flood Warning Service** And works have not yet commenced for the day.	Site Manager / WHS Officer
	Make decision to close the site	Site Manager / WHS Officer
	Notify staff and visitors to not attend site.	Site Manager / WHS Officer
	Wait it out until flood water subsided and given all clear from emergency services / deactivation of flood warning.	All
Complete Site Closure (Evacuation)	**Receive Moderate or Major Flood Warning from Parramatta Flood Warning Service.** Works have **commenced** for the day and sufficient warning **time is available for evacuation** prior to rainfall.	Site Manager / WHS Officer
	Activate evacuation procedure and alert via handheld loudspeaker / airhorn / site alarm.	Site Manager / WHS Officer
	Make decision to close the site and evacuate **Initiate Closure Procedures.**	Site Manager / WHS Officer
	Flood wardens to direct all staff and visitors towards the nominated Emergency Assembly Point and clear the site.	Flood Wardens
	Clear work site and ensure everyone has moved to Emergency Assembly Point	Flood Wardens
	Perform roll call to make sure everyone is accounted for. Advise staff of the emergency procedures.	Site Manager / WHS Officer

	All staff and visitors are to return home if safe to do so.	All
	Notify expected visitors to not attend the site and to remain where they are / seek refuge in accordance with advice from emergency services.	Site Manager / WHS Officer
	Continue to monitor flood warnings in case flood conditions worsen. If conditions worsen quickly, evacuation should cease, and onsite refuge be sought.	Site Manager / WHS Officer
Onsite Refuge	**Receive Moderate or Major Flood Warning from Parramatta Flood Warning Service.** Rainfall has commenced and / or insufficient time to evacuate and / or unable to return home.	Site Manager / WHS Officer Flood Wardens
	Activate on-site refuge procedure and alert via handheld loudspeaker / airhorn / site alarm.	Site Manager / WHS Officer
	Make decision to Close facility and seek refuge onsite	Site Manager / WHS Officer
	Flood wardens to direct all staff and visitors towards the nominated Emergency Assembly Point and clear the site.	Flood Wardens
	Communicate site closure to all users.	Site Manager / WHS Officer
	Perform **Roll Call** and confirm all staff and visitors are accounted for.	Site Manager / WHS Officer
	Staff and visitors to remain at the nominated Emergency Assembly Point. Do not attempt to gain access to the site and do not attempt to use lifts.	All
	Notify the Police & SES of the decision to close the facility and remain on-site.	Site Manager / WHS Officer
	Maintain regular communication with staff and visitors	Site Manager / WHS Officer
	Wait it out at nominated refuge point until flood water subsided.	All
	Do not attempt to leave the refuge point or to walk or drive through floodwater. If stranded on-site and water inundates floor level, call 000 immediately.	Site Manager / WHS Officer
Once Risk has Passed / After a Flood	Check all services and structural stability of building.	Qualified persons
	Return to operation.	Site Manager / WHS Officer

Key Personnel

Table 4 – Key Personal Summary

Person Organisation	Name	Number
Site Manager / WHS Officer		
Deputy Flood Warden		
First Aid Officer		
SES	-	132 500
Police / Fire / Ambulance	-	000

On-site Emergency Assembly Point

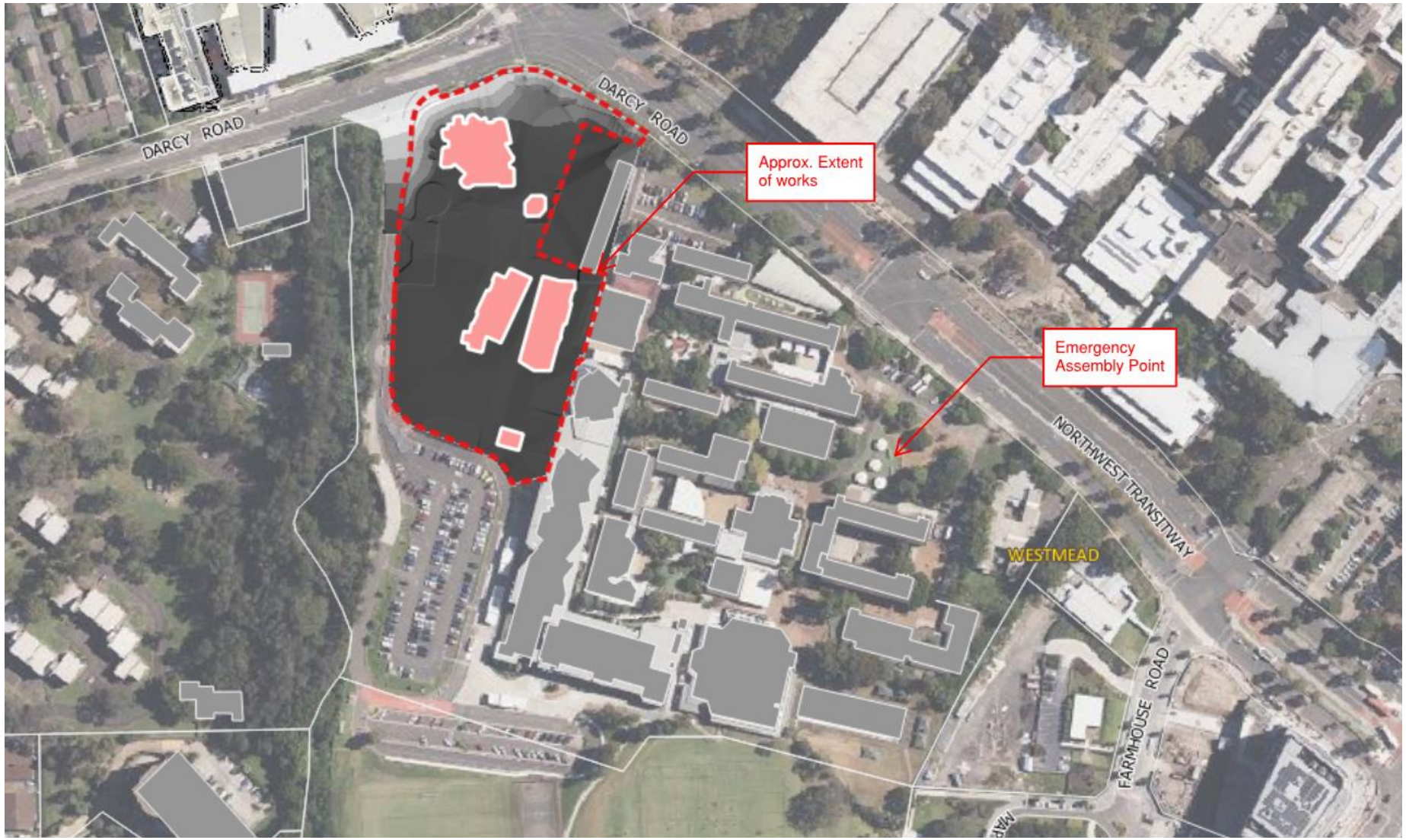

Figure 1 – Emergency Assembly Point

Introduction

Northrop Consulting Engineers have been engaged by Kane Constructions Pty Ltd to prepare an Construction Flood Emergency Response Sub-Plan (CFERSP) for the proposed Westmead Catholic Community GLA Building located at 2 Darcy Road, Westmead (the subject site).

This report has been prepared in response to the Condition of Consent C18 and C30 reproduced below:

Condition C18

a) *Be prepared by a suitably qualified and experienced person(s);*
b) *Address the provisions of the Floodplain Risk Management Guideines (EESG);*
c) *Includes details of:*
    i. *The flood emergency responses for both construction and operation phases of the development*
    ii. *Predicted flood levels*
    iii. *Flood warning time and flood notification*
    iv. *Assembly points and evacuation routes*
    v. *Evacuation and refuge protocols; and*
    vi. *Awareness training for employees, contractors and students*

Condition C30

> *Prior to the commencement of any construction, the Certifier must be satisfied that all floor levels must be no lower than the Probable Maximum Flood Level plus the required freeboard.*

It is anticipated this FERSP will be updated at prior to Construction and Operation and ongoing as noted in the Revisions of this FERSP section contained below.

This FERSP has been prepared with consideration to:

- The Department of Planning, Housing and Industry (DPIE) Draft Shelter-In-Place Guideline (2023)
- City of Parramatta Council Flood Certificate (FL/82/2024)
- City of Parramatta Council Development Control Plan 2023 in particular Part 5 Environmental Management – Section 5.1.1 – Flood Warning and Emergency Response Planning.

Note that flood information presented herein is expected to be updated following completion of the Detailed Flood Modelling currently being prepared for the subject site. This FERP should be updated following completion of the modelling and prior to commencement of construction so that the full site flood risk can be recognised.

Contained herein is a description of the subject site, study methodology and information used to prepare this report, a summary of the likely flood behaviour, recommendations for flood preparation and recommended response actions during a flood event.

Subject Site

The subject site is located at 2 Darcy Road, Westmead, otherwise known as the 'Westmead Catholic Community School. The focus of this report is the GLA building which is located in the north-western portion of the subject site.

The subject site is burdened by an unnamed creek that travels along the western boundary of the site, flowing in a northerly direction across Darcy Road before ending at its confluence with Toongabbie

Creek. Flows are derived by the upstream Westmead catchment which extend south of the subject site, towards M J Bennet Reserve and the Great Western Motorway.

A subject site locality plan is presented below in Figure 2.

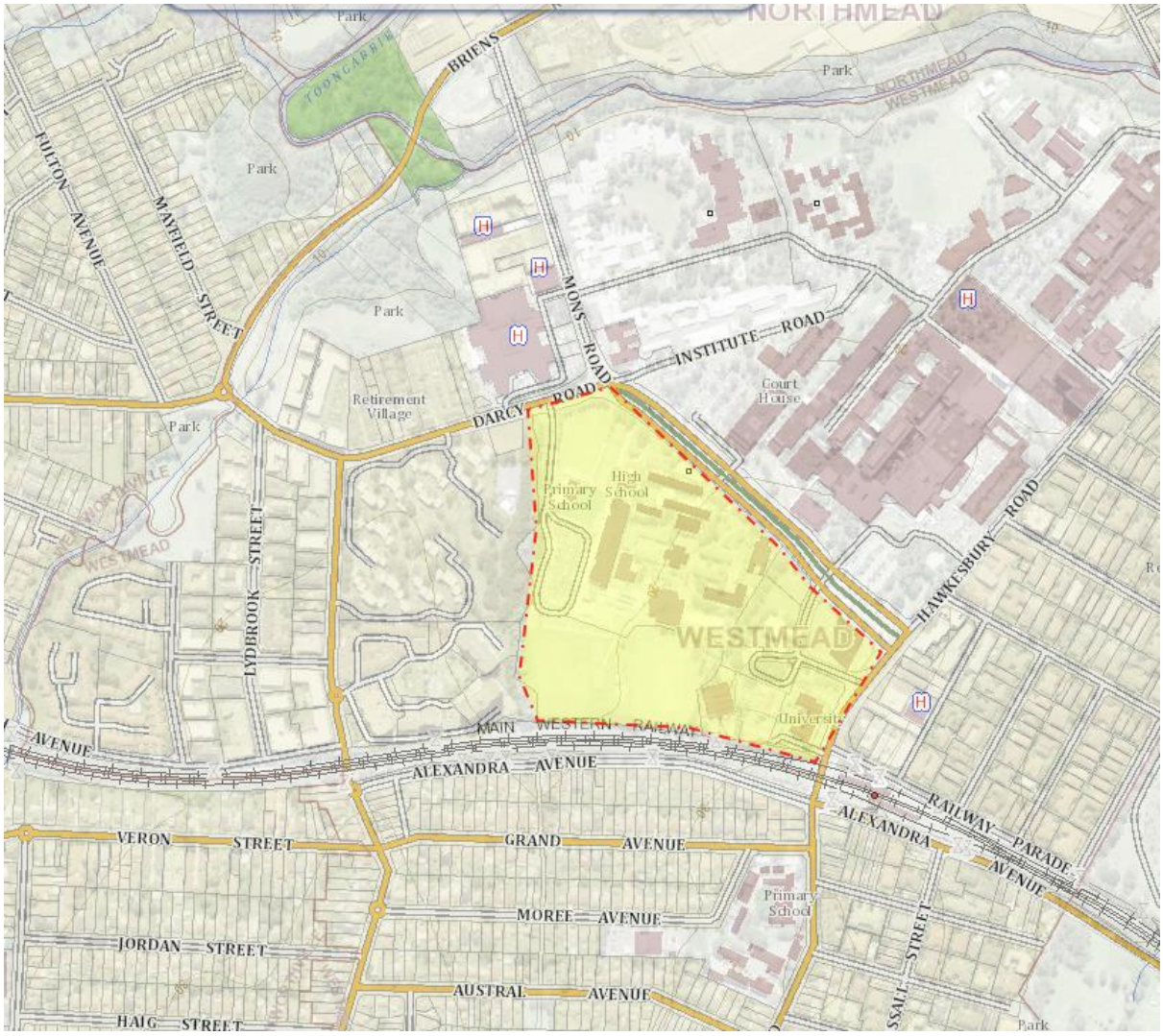

Figure 2 - Locality Plan (obtained from SIX Maps www.maps.six.nsw.gov.au)

This Flood Emergency Response Sub-Plan (FERSP) has been prepared to:

- Promote satisfactory awareness of expected flood behaviour and flood risks associated with the subject site.
- Nominate roles and responsibilities when preparing for and responding to a flood emergency.
- Identify measures to monitor weather forecasts and highlight warning systems available.
- Provide education and awareness material for training programs with respect to flooding of the subject site.
- Identify potential evacuation and evasion procedures including evacuation routes and flood refuge opportunities.

Methodology and Available Data

This plan was developed based on the flood information contained within the City of Parramatta Council Flood Certificate (FL/82/2024) dated the 19th of April 2024. Additional information with respect to the flood behaviour for the subject site has been obtained from the following locations:

- Parramatta River Flood Study prepared by Stantec and dated the 13th of June 2024.
- Council's Online interactive flood information portal (https://www.cityofparramatta.nsw.gov.au/environment/floodsmart-parramatta/know-your-flood-risk

The expected flood behaviour for the subject site is based on the above flood information and is summarised in the **Flood Behaviour** section of this plan.

A review of the Bureau of Meteorology (BoM) and State Emergency Service (SES) guidelines and Parramatta Council Website have been undertaken to report on the likely warning types described in the **Flood and Evacuation Warnings** section of this plan.

Consideration has been given to the personnel most likely to be on-site and responsible for flood emergency response. This is outlined in the **Flood Response Personnel** section of this plan.

Analysis of the site and nearby topography, in combination with the likely flood behaviour has informed the assembly points, evacuation routes and on-site refuge points nominated in the **Assembly Point and Evacuation Routes** and **Floor Levels and On-site Refuge** sections of this plan.

Contact numbers for relevant emergency response agencies and the proposed local evacuation centre are noted in the **Emergency Contact** section of this plan.

Finally, a review of the City of Parramatta Council Development Control Plan and aforementioned flood studies, NSW State Flood Plan, Emergency Business Continuity Plan and the Departments Draft Shelter-In-Place guidelines (2023) have contributed to the recommended preparation and response actions outlined in the **Flood Response Preparation** and **Flood Response Actions** sections of this plan.

Flood Behaviour

Flood Source and Behaviour

Flooding of the site and the surrounding properties is expected to be derived by local overland flow from the upstream Westmead catchment. During both the 1% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF), flows are expected to come from the south and run down the unnamed creek along the western boundary of the subject site.

During the 1% AEP and PMF deep fast flowing flood water is expected in the unnamed creek along the western boundary. During these events, there is also the potential for overland flooding across the site. It is important that users of the facility do not attempt to evacuate during the peak of these events as there is the potential for hazardous flow behaviour on the subject site and across the regional road network.

Due to the high urbanisation of the upstream catchment, a quick response time is expected following commencement of rainfall. The Parramatta River Flood Study (Stantec, 2024) suggests that the critical duration in the vicinity of the subject area ranges from the 15 minutes to one-hour duration and as such, the peak is expected to occur within an hour, following the commencement of rainfall.

Peak Flood Levels, Depth and Velocities

Peak flood levels and extent across the site have been obtained from the City of Parramatta Council Flood Certificate (FL/82/2024) which is consistent with the flood information that was available at the time of approval. The below **Figure 3**presents the 5%, 1% AEP and PMF design storm events and levels.

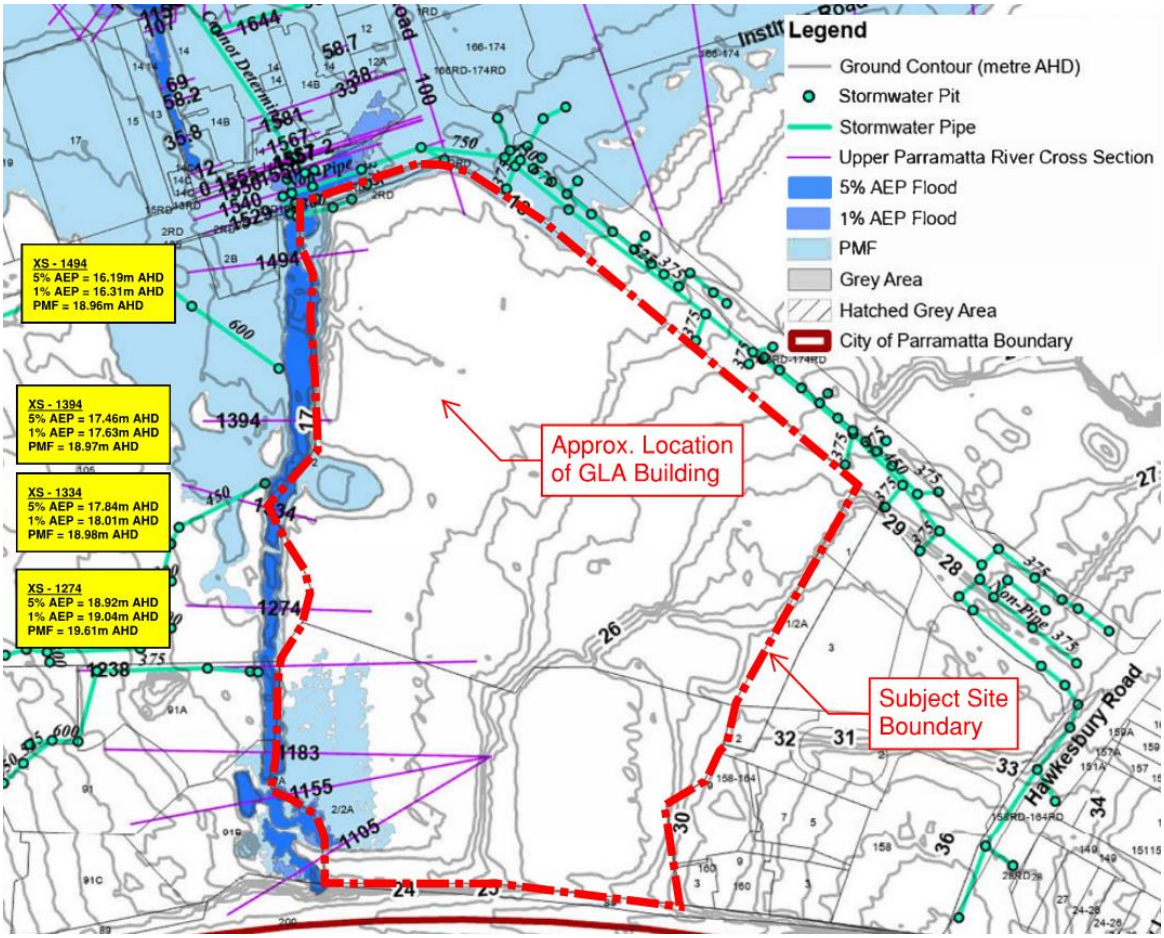

Figure 3 - Flood Extents and Levels

Peak flood levels in the vicinity of the GLA can be summarised by Cross Section 1394 as summarised by the City of Parramatta Council Flood Certificate (FL/82/2024). These are reproduced in **Table 5** below.

It is important to note that the events defined in the below Table 5 are rare to extreme events which are not expected to occur every time it rains. The 1% AEP is commonly referred to as the "100-year flood event" while, the PMF has a nominal Annual Exceedance Probability of 1 in 10 million.

Table 5 – Peak Flood levels

Event	Flood Level (m AHD)
5% AEP	17.46
1% AEP	17.63
PMF	18.97

It is possible access / egress to and from the site may remain possible during the peak of the 1% AEP or PMF, however, evacuation is not recommended during the peak of these flood events due to the potential for the broader road network to be compromised.

Flood Hazard and Risk to Property and Life

The City of Parramatta Council Flood Certificate (FL/82/2024) presents the expected flood behaviour at the subject site.

Hazard categories are based on the categories presented in the Floodplain Development Manual (DPHI, 2005), in particular the Provisional Hazard Categorisations presented in the below **Figure 4**. Low hazard is typically considered safe for large vehicles (not small) while high hazard becomes dangerous for buildings, potentially impacting structural capacity for standard construction methods.

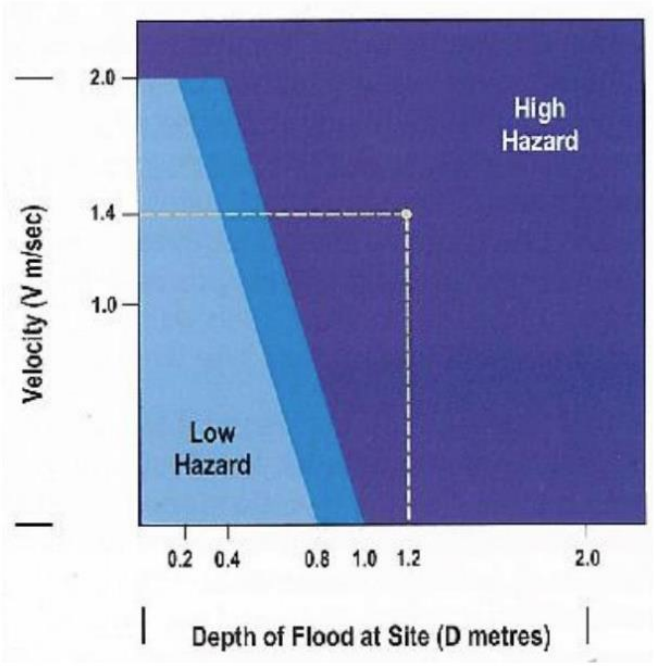

Figure 4 - Flood Hazard Categories (FPDM, 2005)

The following Figure 5 presents the flood hazard conditions provided in the Parramatta Council Flood Certificate (FL/82/2024).

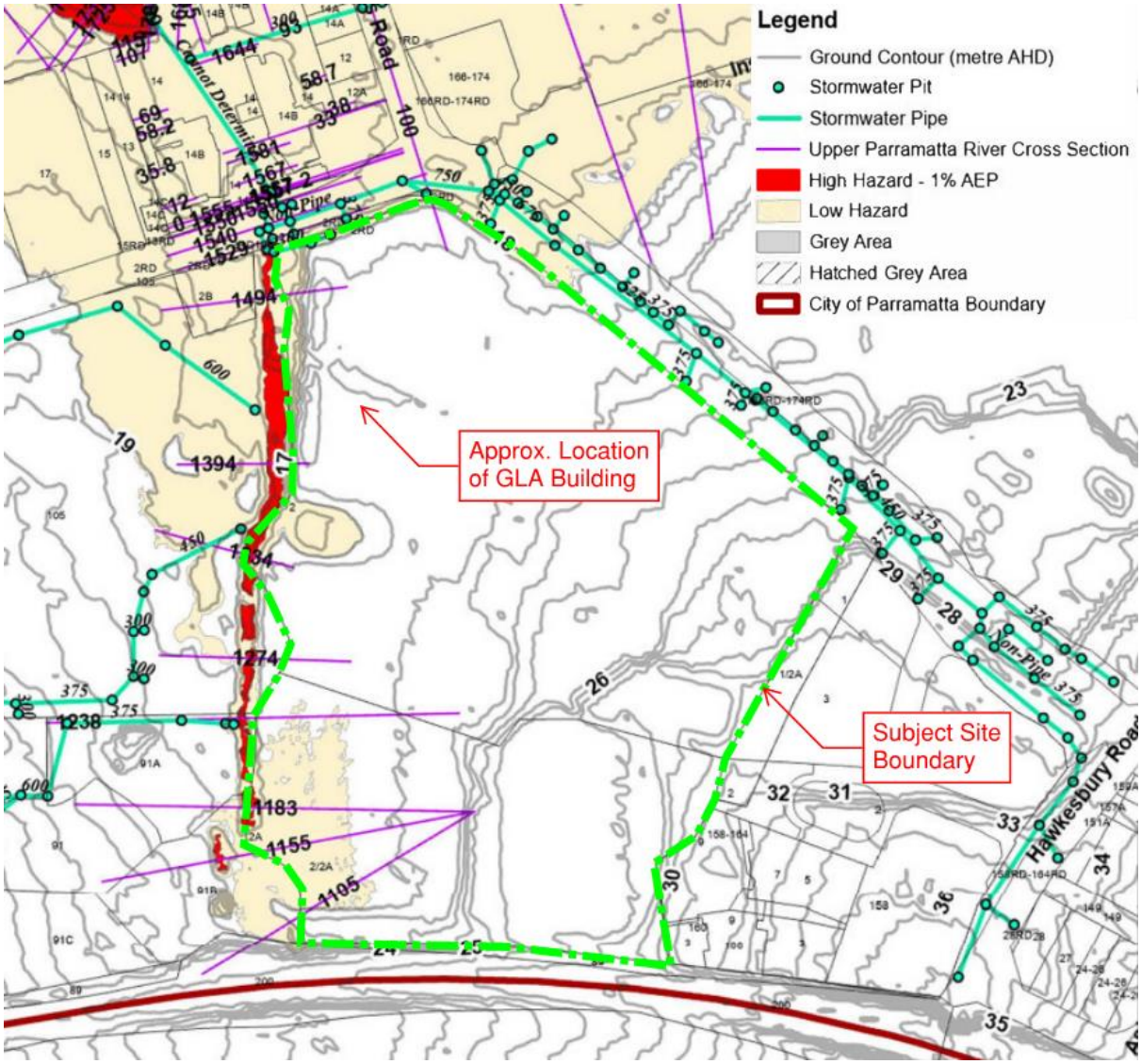

Figure 5 - Flood Hazard Map

City of Parramatta Council Know Your Flood Risk

The City of Parramatta Council Know Your Flood Risk online tool enables users to view the potential flood risk for mapped locations across the Local Government Area. The below **Figure 6** presents the flood risk categories across the site while **Error! Reference source not found.**provides the definition f or each category.

These categories are also linked to Council's FloodSmart warning system, which is discussed in greater detail in the subsequent Flood and Evacuation Warnings section of this report.

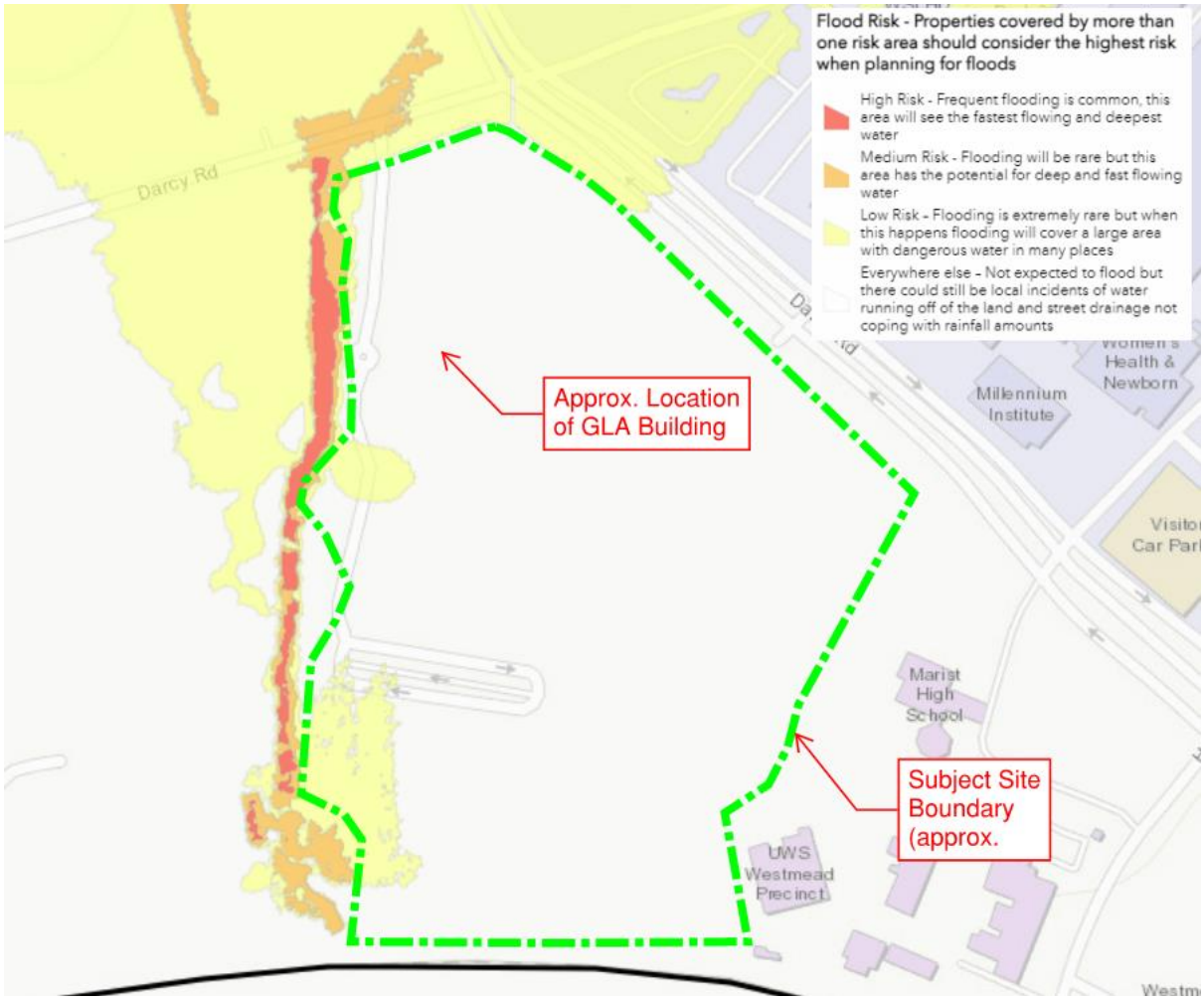

Figure 6 - City of Parramatta Council - Know Your Flood Risk (COPC, 2024)

Risk area	Common description	Technical description
High risk area	• Frequent flooding is common • Near the main river and creeks where water flows during a flood, including overflow from drainage • This area will see the fastest flowing and deepest water and cause a significant risk to life	High hazard flood area within the 1% annual exceedance probability (AEP) (1:100)
Medium risk area	• Frequent flooding will be rare • Where the flood water goes once the creek/river areas overflow • In rare floods these areas have the potential for deep and fast flowing water	Medium and low hazard area in the 1% AEP (1:100)
Low risk area	• Flooding is extremely rare • Generally, away from the river or creek and higher up • If a flood affects these areas it will cover a large area with dangerous water in many places	Area from the 1% AEP (1:100) up to the Probable Maximum Flood
Everywhere else	Not expected to flood but there still could be local incidents water running off the land and of street drainage not coping with rainfall amounts.	Area outside the Probable Maximum Flood. There may still be isolated impacts from local overland flow.

Figure 7 - Definition of Flood Risk Categories

Flood and Evacuation Warnings

A network of rainfall gauge stations is maintained throughout the greater Sydney region. These provide information to the Bureau of Meteorology (BoM) as one source of information informing their flood warning system.

The Bureau should issue one of five types of warnings through local radio, television and through their website *http://www.bom.gov.au*. In addition, the SES may issue a flood bulletin, evacuation warning or evacuation order.

Due to the sensitive nature of this location, it is recommended the nominated Site Manager / WHS Officer register for automatic text and email notifications from Council's FloodSmart Parramatta flood warning system. In addition, the Hazards Near Me App and Bureau of Meteorology Weather App / Website provides information for current flood warnings

Bureau of Meteorology

Severe Weather Warning

Severe weather warnings are issued by the Bureau for potentially dangerous weather conditions. A description of the threat will be included in the warning along with the time for next issue. It is noted that a severe weather warning does not imply that flooding will eventuate. Warnings are generally updated every six hours, or as the event dictates.

This type of warning should be accompanied with predicted extreme rainfall depth, as well as observed values from around the state.

Severe Thunderstorm Warning

A severe thunderstorm warning will be issued if there is strong evidence that a severe thunderstorm will develop, or if a severe thunderstorm is reported. Flash flooding may occur during severe thunderstorms. Warnings are generally updated every three hours or shorter as required.

Flood Alert/ Watch/ Advice

A flood alert / watch / advice is one of the earliest warnings that will be issued by the BoM with advice provided up to four days in advance of the expected onset of flooding (BoM). Although four days warning may be available, they are also occasionally issued during and after the rainfall has occurred, depending on the level of maturity of the flood warning systems and services (BoM).

Generalised Flood Warning

A generalised flood warning is typically more specific than the Flood Alert / Watch / Advice and is issued when flooding is expected to occur in a given area. Three hours warning time is expected from issue of warning to peak flood level as per the "Service Level Specification for Flood Forecasting and Warning Services for New South Wales – Version 3.15" (Bureau of Meteorology, 2024).

Minor/ Moderate/ Severe Flood Warning

A Minor / Moderate / Major Flood Warning typically provides more information than a generalised flood warning and is issued when flooding is expected to occur in a given area. These warnings are usually accompanied by a flood gauge level and timing for the peak to occur.

More detailed flood warning may be issued based on any additional information available. Three hours warning time is expected from issue of warning to peak flood level.

SES Flood Bulletins

The SES distributes Emergency Bulletins to media outlets and agencies in the event of predicted hazardous conditions. The SES Flood Bulletins may contain the following information:

- Current warnings, together with indications of the likely impact of flooding at any predicted heights.
- Current flood heights and flood behaviour.
- Details of conditions and closures of main roads, and
- Advice on safety matters and means of protecting property.

The NSW SES will issue three levels of warnings.

Advice

The SES will issue flood advice acknowledging that an incident has started and informing people to

stay up to date in case the situation changes.

Watch and Act

The SES will issue a Watch and Act warning when flood conditions are changing and the purpose of this warning to prepare for evacuation / isolation or avoid the area that is expected to impact by flooding.

Emergency Warning

The SES will issue an Emergency Warning if evacuation is required. If this occurs evacuation must be undertaken. Broadcast will be via radio/ TV, door knock, automated telephone message or SMS.

All public and commercial radio and television stations should broadcast warnings.

On-Site Emergency Communication

In the event of an emergency, an air horn and handheld loudspeaker is located within the Flood Emergency Kit. These will be used to obtain people's attention and direct them to the emergency assembly point or facilitate evacuation offsite.

Other Warning Types / Resources

Standard Emergency Warning Signal

This signal may be played over radio and television stations to alert communities to Evacuation Warnings Evacuation Orders or Special Warnings or Dam-Failure Warnings.

Early Warning Network Automated Text and Email Services

The Early Warning Network (www.ewn.com.au) filters the above BoM warnings and send texts and emails to notify registered users of an emergency situation.

Hazards Near Me NSW

Recently the NSW SES and NSW Public Works have created a tool called Hazards Near Me App NSW which is both a webpage and Phone Application. The application filters BoM and RFS warnings relevant to the user and may be used by the Facility Manager as an additional resource. The Application is free and allows the user to input a radius of interest for receiving notifications.

Hazard Watch

Similar to the Hazards Near Me phone application, the NSW SES and Australian Federal Government have prepared the HazardWatch portal that filters BoM warnings and provides advice on locations and magnitude of predicted hazards. This resource is also free and can be accessed via a smart phone, tablet or laptop.

City of Parramatta Council Warning Systems

FloodSmart Automatic Warning Service

The City of Parramatta Council offers a free flood warning service the provides early warning messages to residents and businesses within the LGA identifying when flooding may be likely. The service uses the Early Warning Network to coordinate warnings as previously mentioned. It is recommended the Facility Manager and staff register for this service as it is to be used as the primary warning system for the purposes of evacuation.

https://www1.ewn.com.au/parramatta/register.aspx

The warning service is broken up into ten warning areas that cover different communities within the Local Government Area. These ten warning areas are outlined presented in the below Figure 8.

It is recommended that the Site Manager / WHS Officer register to receive warnings provided in the Lower Toongabbie and Wentworthville area (Location 3) and the Westmead and North Parramatta Area (Location 4). These warning areas are the two closest zones to the site and flood warnings issued in these areas are expected to remain appropriate for the subject site.

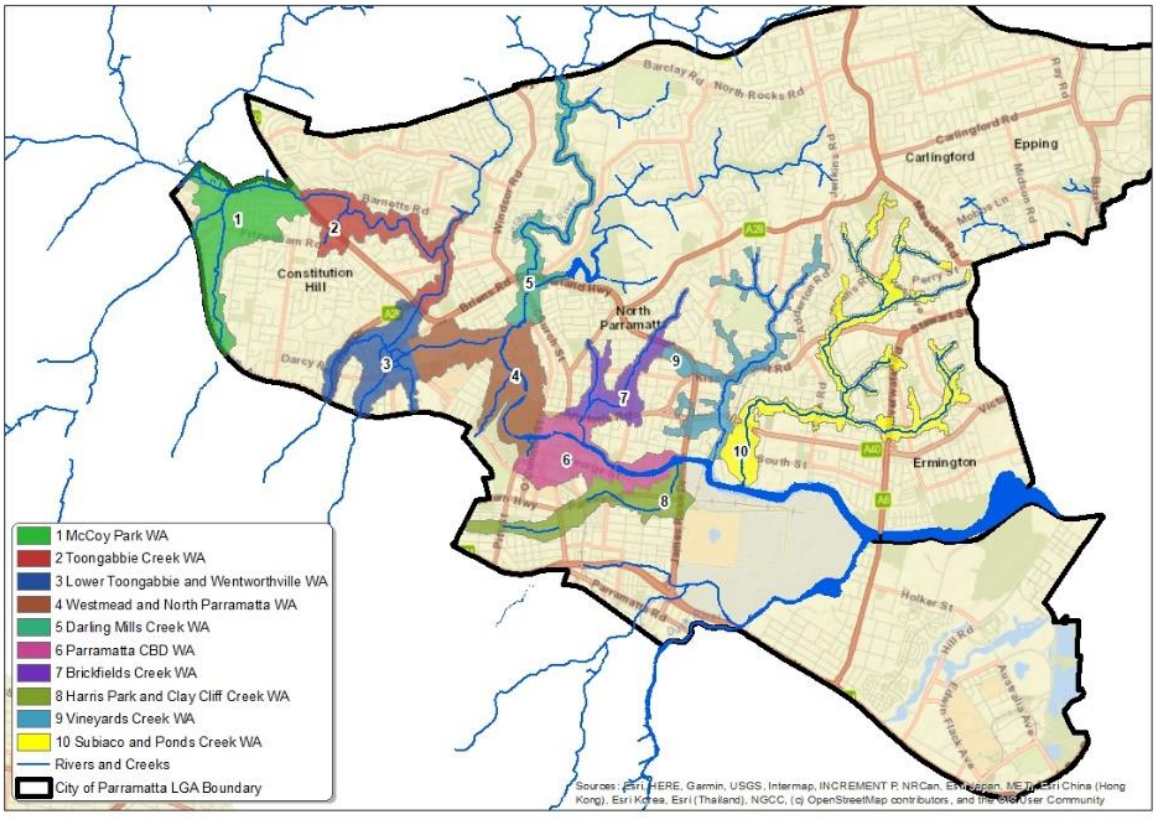

Figure 8 - FloodSmart Parramatta Warning Zones (COPC, 2023)

A summary of the warning types that are expected to be issued by Council's flood warning network is presented in the below Figure 9.

The Parramatta Council FloodSmart Warning Service is linked to the City of Parramatta Council Know Your Flood Risk Categories, as mentioned above. Areas vulnerable to the High Risk Area are expected to flood following receipt of a Minor Flood Warning. Areas that are vulnerable to the High and Medium Risk Areas are expected to flood following receipt of a Moderate Flood Waring while areas vulnerable to Low, Medium and High flood risk are expected to flood following receipt of a Major Flood Warning.

Public information message	**(Parramatta CDB Riverside area only)** Footpaths and footbridges may be flooded - please use alternative travel routes
Minor Flood Warning • High risk areas may experience property flooding.	**Local area conditions** • Risk to life from fast flowing or deep water near the river or creek • Closure of roads most at risk of flooding • Flooding of land near rivers, creeks, low spots and recreational areas • Water levels may be high for many hours
Moderate flood warning • High and Medium risk areas may experience property flooding.	**Local area conditions** • High risk to life from fast-flowing or deep water near the river or creek • Closure of many bridges and roads • Widespread flooding in areas not necessarily near the river • Water levels may be high for many hours
Major flood warning • High, Medium and Low risk areas may experience property flooding	**Local area conditions** • Damage is possible to buildings and infrastructure • Extreme risk to life from fast-lowing deep water even in areas not near the river or creek • Closure of many bridges, roads and transport routes • Widespread deep flooding in many areas not necessarily near the river • Water levels may be high for many hours
No Further Impact	**Local Area Conditions** The local conditions should now be improving: • No further flooding is expected in the next 12 hours • Flood levels will continue to drop However: • There may still be dangerous fast flowing water near the river or creek • Debris and contamination may still cause problems in areas that have been flooded

Figure 9 - Flood Warning Types (COPC, 2023)

City of Parramatta Council Alerts Dashboard

The City of Parramatta Council also provides an Alerts Dashboard which provided real-time updates on current emergencies. In addition to flood emergencies, the Dashboard provides advice with respect to Road conditions and closures, weather warnings, power outages, fires etc. A link to the Dashboard is provided below:

https://alerts.cityofparramatta.nsw.gov.au/

It is recommended that the dashboard be reviewed before evacuating the site to gain advice with respect to current road conditions and closures.

Flood Response Personnel

Summarised in Table 6 below are the facilities nominated emergency personnel, their location and responsibilities in managing flood response.

Table 6 - Flood Response Personnel

	Location	Responsibilities
Chief Flood Warden (Site Manager / WHS Officer)	On-site	• Coordinate flood evacuation drills. • Monitor weather at 4pm daily for upcoming extreme rainfall events. • Receive notifications from the City of Parramatta Council Flood Alert Service. • Decide when Cancellation of activities or Evacuation / Refuge is required. • Communicate Cancellation and Evacuation / Refuge to staff and visitors. • Liaison with SES or Emergency Services personnel if they attend site. • Remain calm and direct visitors and staff through the evacuation procedures.
First Aid Officer	On-site	• Prepare and maintain Flood Emergency Kit. • Prepare and coordinate assistance for staff and visitors with mobility difficulties.
Deputy Chief Flood Warden	On-Site	• Undertake Chief Flood Warden duties when Chief Flood Warden is unavailable. • Maintain calm and direct staff and visitors through the evacuation process.
Flood Wardens	On-Site	• Assist Chief and Deputy Chief Flood Warden with evacuations.
Staff	On-site	• Maintain calm and direct visitors onsite through evacuation or refuge processes.

It is anticipated the Site Manager or Work Health and Safety Officer, who is in charge of emergencies and evacuation at the site will be nominated the role of Chief Flood Warden.

A staff member who is on-site on a regular basis, with first aid training should be nominated the role as the First Aid Officer. Similarly, staff members who are on-site on a regular basis should be nominated the role of Deputy Chief Flood Warden and general Flood Wardens.

It is recommended that at least one Flood Warden is assigned in each section of the site.

All remaining staff are to assist the Flood Wardens with Evacuation / Refuge during a flood emergency.

Emergency Assembly Point

The following Figure 10 presents the nominated **Emergency Assembly Point** for flooding as the courtyard adjacent to the Northwest Transitway**. All staff** are to proceed to this location to receive instruction from the Site Manager / WHS Officer.

The courtyard is expected to remain above PMF flood levels and has direct access to the Northwest Transitway making access / egress from the site possible in the event of an emergency.

It is not recommended to return to the worksite following evacuation as flood behaviour in the vicinity of works have the potential to become hazardous. Similarly, access / egress to / from the site via the Darcy Road in the north-western corner of the site is not expected to be possible during the peak of a major or extreme flood event.

It is the responsibility of the Site Manager / WHS Officer to activate the evacuation procedure with all staff and visitors to evacuate early, prior to rainfall commencing. If rainfall has commenced, staff are to remain in the courtyard until flood water subsides or when given the go ahead from emergency services.

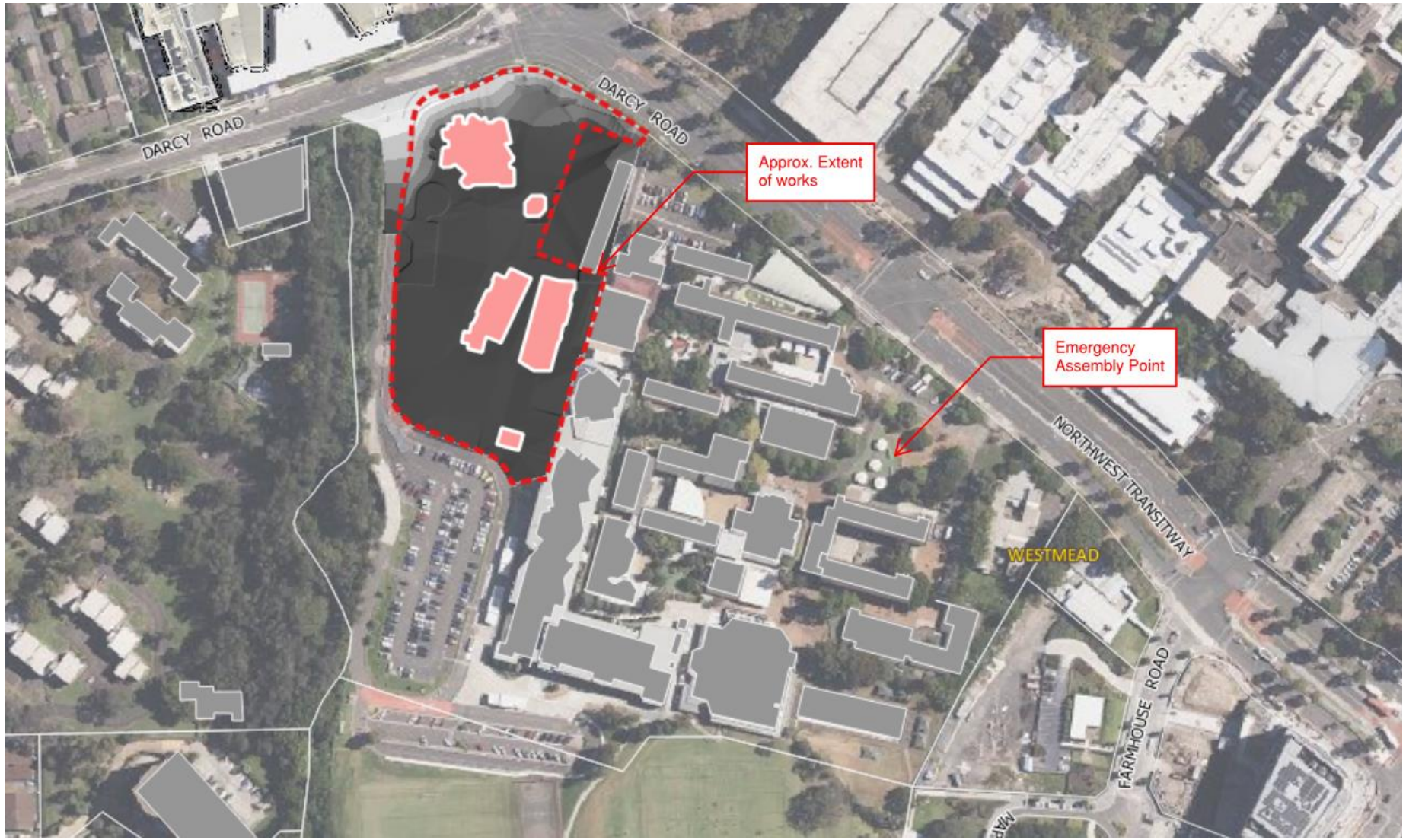

Figure 10 - Flood Emergency Assembly Point

Floor Levels and On-Site Refuge

Floor Levels

The proposed GLA building has six floors (1 ground floor and five upper levels). The level of each floor is presented below in Table 7. The floor levels with respect to the 1% AEP and PMF flood events are also presented in the below Table 7.

Table 7 - Internal Floor Levels

Floor	Level (m AHD)	Relationship to Flood Levels
Ground Floor	20.5	Above 1% AEP
Level 1	24.3	Above 1% AEP and PMF
Level 2	29.0	Above 1% AEP and PMF
Level 3	33.0	Above 1% AEP and PMF
Level 4	38.0	Above 1% AEP and PMF
Level 5	42.0	Above 1% AEP and PMF
Roof	46.0	Above 1% AEP and PMF

On-Site Refuge

In the event where rainfall has commenced or staff and visitors become trapped on-site, refuge may be sought on-site as a means of last resort. In the event where refuge onsite is required, all staff and visitors are to remain within the courtyard.

If construction has reached the point where lifts are operable, they should not be used during a flood emergency. There is the potential for power to be cut during major and extreme weather events and therefore the potential for people to become trapped. Access to the lifts should be restricted during a flood event.

It is recommended that staff and visitors stay remain within the courtyard once rainfall has commenced or if evacuation is impractical. The courtyard is expected to be located above hazardous flood behaviour during the PMF.

Do not try to evacuate by foot or vehicle and never enter rising flood water.

Call the SES on 132 500 if emergency supplies are getting low, or 000 if in a life-threatening situation.

Remember if its flooded, forget it.

Emergency Provisions for Essential Services

It is recommended the following contingency measures be implemented and maintained to facilitate on-site refuge:

- Staff with first aid training on-site at all times during operation.
- Supply of medicines, non-perishable food items and bottled water to withstand isolation for 12 hours.
- Provision for backup generator/s in the event of loss of power.
- Back up provisions in the event where water supply and sewage services are temporarily unavailable.

Do not Drive or Walk through Floodwater.

Remember, If It's Flooded, Forget It!

Emergency Contact

For emergency assistance during flood events, please call the **SES** on **132 500.**

If you are in a life-threatening situation please call **Police, Fire or Ambulance** on **000.**

For road blockages, fallen trees and other local asset issues, please call **The City of Parramatta Council's Hotline** on (02) 9806 5050 or 1300 617 058.

Flood Response Preparation

It is the responsibility of the Site Manager / WHS Officer to prepare the facility for a flood event. This will be achieved through; induction training provided by the builder, nomination of flood wardens, education of flood risks and behaviour, and the preparation and maintenance of a *Floodsafe Emergency Kit.*

The information presented above is a summary of the flood behaviour and considered key to understanding the risks associated with flooding. This should be displayed in conjunction with other emergency information (such as fire, etc.) throughout the site.

Induction training

Induction training is recommended for all new Staff which is to occur on the first day of employment. Induction training should include a site walkover that identifies the expected flood behaviour. The emergency procedures, namely points of assembly and refuge, are also to be relayed to staff during this induction training as well as all additional information contained within this plan.

Records should be kept which detail who has had the training, when they were trained, the name of the trainer as well as reference to the material used in the training course.

Flood Emergency Response Drills

Evacuation drills are designed to increase flood awareness within the centre. These drills are to be undertaken in accordance with the Construction Environmental Management Plan or at least once a month to familiarise staff and facility users of the procedures when responding to a flood event.

It is also an opportunity to outline expected flood levels and dangers of entering flood water. The following link can be used as a resource for evacuating staff and visitors that are mobility impaired: https://www.ses.nsw.gov.au/floodsafe/what-floodsafe-means-for-you/mobility-impaired/.

For new staff it is expected they will be made familiar with the site flooding conditions and made familiar with the emergency procedures and response during the initial site induction.

Floodsafe Emergency Kit

Although the storm event may only last a couple hours, there is the potential for flood water to remain for a longer period following completion of rainfall. As such, enough resources should be contained in the Flood Emergency Kit to ensure anyone trapped on site has enough supplies for up to 24 hours. In the event were resources are getting low, the SES may be contacted to provide a re-supply/evacuation from the facility.

Potential items for a flood emergency kit are outlined at; https://www.ses.nsw.gov.au/floodsafe/prepare-your-home/emergency-kit/. Items outlined on the SES website and some additional items are presented below:

- Drinking water, medicines and non-perishable food items.
- A copy of the site emergency management plan and Construction Environmental Management Plan.
- Chemical register.
- Air horn and hand-held loudspeaker.
- Portable radios with spare batteries.
- Torches with spare batteries.

- Lanterns with spare batteries.
- Two-way radio with spare batteries.
- A first aid kit.
- Candles and waterproof matches.
- Waterproof bag for valuables.
- A copy of emergency numbers.
- Wet weather gear for staff

When leaving or evacuating add the following items:

- **Register** of Staff and Visitors on-site.
- **Sign in book** for visitors and contractors.
- **Individual Health Care Plans** including asthma puffers, diabetes medication, epi pens, etc.
- **Drinking water** and **non-perishable food items**.

The Flood Safe kit should be kept in the site office in a roll trolley suitable for easy deployment in the event of an evacuation / refuge. The contents of the kit and management during a flood event will be the responsibility of each **Site Manager / WHS Officer**.

It is essential that the items recommended for the Floodsafe Emergency Kit be maintained to ensure those seeking refuge on-site are as comfortable as possible during a flood event.

TRIGGER FOR REVIEW AND EDUCATION:

- Monthly checking of the emergency kit to ensure all items are in suitable working order.
- Monthly evacuation drills and reminder of the flood risks.
- Inductions for new staff, highlighting the flood risk associated with the subject site.

BY WHO: Site Manager / WHS Officer

Storage of Construction Materials, Sensitive Goods and Equipment

All Construction Materials, Sensitive Goods and Equipment located within the extent of works which are susceptible to damage from flood water or, if exposed to floodwater would have significant ramifications to the surrounding area, are to be located:

1. In a covered area and bunded with an embankment at least 0.5m high; and
2. Above an RL of 19.0m AHD.

Monitoring of Weather Situation

It is the responsibility of the Site Manager / WHS Officer to monitor the weather situation and be aware if a warning has been issued. This will be achieved through automatic text messages and emails from Council's Flood Alert Service and checking of the local radio stations and the Bureau website.

TRIGGER FOR MONITORING:

- Continuous, 4pm daily

BY WHO: Site Manager / WHS Officer

Signage

Flood warning signage, such as the Flood Response Actions shown at the beginning of this plan is to be placed within the site office and around the site where possible.

It is also recommended that a copy of this Flood Response Summary be placed within each Flood Emergency Kit. All flood warning signage is to be laminated and must identify that the site is flood prone.

It is the responsibility of the Site Manager / WHS Officer to ensure signage is up to date and displayed as recommended above.

Flood Response Actions

Early Site Closure / Cancellation of Operations

In order to minimise the risk to life, it is recommended site be closed on any day where a **Moderate or Major Flood Warning is received from Council's FloodSmart Warning Service**. These warning are equivalent to a 1% AEP flood event or PMF design storm event and present potentially hazardous flood behaviour across the site. Closure is to occur prior to the commencement of operation for the day with staff and visitors to be notified

Closure of the facility should be communicated as early as possible via the various means available to the builder.

If early closure of site upon receipt Flood Warning is not possible, refuge on site is available. Early closure is preferred as it reduces the strain on emergency services during a flood event

Evacuation

In the event where works have commenced for the day, however, rainfall has not yet commenced and there is sufficient time to safely coordinate evacuation, the **primary flood Emergency Response Action** for the site **is evacuation.**

Following receipt of a **Moderate or Major Flood Warning** from Council's FloodSmart Warning Service **and sufficient time is available,** the site is to be **closed and evacuated**. All deliveries and visitors expected to attend the site are to be cancelled and staff are to return home if safe to do so.

Once a **Moderate or Major Flood Warning** is received, and the alarm / notification is made by the Site Manager / WHS Officer, all staff are to proceed to the Emergency Assembly Point as soon as possible

Once at the Emergency Assembly Point, staff are to receive instructions from the Site Manager / WHS Officer.

It is recommended the Site Manager / WHS Officer contact the SES prior to instructing staff of the closure and evacuation of the site. When talking with the SES, it is a good opportunity to seek advice with respect to current flooding and road conditions. Similarly, the Parramatta Council Disaster Dashboard may be used to obtain live information on Road Closures.

The Site Manager / WHS Officer is to coordinate roll call and manage evacuation requirements with the assistance of the Flood Wardens and staff.

It is the responsibility of the Site Manager / WHS Officer to ensure all staff evacuate the site prior to a flood event. In the event where evacuation is not possible, it is unsafe for staff to return home, staff, and visitors are to remain on-site and seek refuge within the courtyard.

Early evacuation reduces the strain on emergency services during a flood event. Evacuation should be undertaken in advance of rainfall occurring or as soon as possible after receiving the Moderate Flood Warning

On-Site Refuge

On-site refuge is recommended if a Moderate or Major flood warning is received from the Council's FloodSmart Warning Service and heavy rainfall has already commenced, works have commenced for the day and evacuation is not feasible.

The procedure for on-site refuge should be carried out as per the following:

- Site Manager / WHS Officer sound alarm via loud speaker to notify staff and visitors of imminent risk.

- Flood Wardens to proceed to the Emergency Assembly Point courtyard and receive instruction from the Site Manager / WHS Officer
- Site is to be evacuated with flood wardens to clear the area before proceeding to the courtyard.
- All remaining staff and visitors to remain within the courtyard and wait it out until flood water subsides / given all clear from emergency services.

It is strongly recommended that in the event of a flood, the elevators are not used due to the potential for centralised power supply to be cut.

Should you become isolated on-site, move to the courtyard and do not try to evacuate by foot or by vehicle and never enter rising flood water.

Call the SES on 132 500 if emergency supplies are getting low, or 000 if in a life-threatening situation. Remember if its flooded, forget it.

Flood Emergency Response Summary

The aim is to eliminate/reduce the risk to life by removing as many staff and visitors from the floodplain prior to the commencement of rainfall, provided there is enough time for them to return home or to a safe place of residence.

The Site Manager / WHS Officer is responsible for reviewing the weather forecasts daily and notifying facility users and staff of the decision to close the facility or seek refuge on-site.

When a warning is received, consideration should be given to (if time permits):

- Cancelling services and appointments for the day of the event.
- Blocking floor wastes and toilets on the Ground Floor Level.
- Securing / relocating objects that are likely to float and cause damage.
- Turning off mains power, water and gas and other hazardous materials around the site.
- Relocating chemicals above the predicted water level (i.e. onto Level 1 or above)
- Moving vehicles away from the site where possible.

If time permits the evacuation / refuge procedure should generally as follow:

- **Site Manager / WHS Officer** to **Sound** alarm using air horn.
- **Site Manager / WHS Officer** to the **Emergency Assembly Point.**
- **Flood Wardens to clear the site and direct all remaining staff and visitors to the courtyard.**
- **Site Manager / WHS Officer** to contact the **SES to receive instruction / coordinate decision to evacuate / refuge on-site.**
- **Roll call** to ensure everyone is accounted for.
- **Return home** if it is safe to do so and wait out the storm event.
- **If unable to return home:**
    - **Staff and Visitors to seek refuge within the courtyard until given the all clear by emergency services.**

- **If evacuating the facility, leave signage undercover** and notify **Service/Police/ SES** that evacuation has occurred.

TRIGGERS FOR CLOSURE / EVACUATION / ON-SITE REFUGE:

- Following receipt of a **Moderate or Major flood warning** from **Council's FloodSmart Warning Service.**

RESPONSIBLE FOR THE DECISION: Site Manager / WHS Officer

Emergency Services Attending Site

It is noted self-motivated evacuation, such as that proposed in this plan, reduces strain on emergency services. There is a possibility that emergency services such as Police, Fire, Ambulance or SES may attend site and assume control from the Site Manager / WHS Officer. Once this has occurred, they are in control of the site and any response operations.

TRIGGERS FOR EMERGENCY SERVICES TAKE CONTROL:

- Police, Fire, Ambulance or SES attending site.

RESPONSIBLE FOR THE DECISION; Site Manager / WHS Officer

After a Flood

Once a Final Flood Warning or SES "All Clear" has been received:

- A thorough check of services such as electricity, sewer, water and gas should be undertaken by qualified persons.
- Advice should be sought from a suitably qualified engineer as to the structural integrity of buildings prior to their use.
- Personal protective equipment should be worn during the clean-up and disinfectant used.

TRIGGER FOR RETURN:

- All clear given by SES or emergency services and building inspected by representatives appointed by the department of education.

BY WHO: SES, Emergency services, Site Manager / WHS Officer

Revision of this Flood Evacuation Plan

This plan should be revised prior to Construction to capture updated flood modelling currently being prepared at the site.

Furthermore, this plan should be revised if there are revisions to the Parramatta River Flood Study (Stantec, 2024) to capture changes in the catchment since the last study.

Notwithstanding the above, this plan shall be **revised every three years** or when there is a major operational change or flood event.

Revisions should be undertaken by a suitably qualified flood emergency response consultant.

Conclusion

The subject site is affected by flooding caused by overland flow from the upstream catchment. A review of the proposed development has been undertaken in conjunction with the expected flood behaviour and it was concluded that:

- **Proposed Finished Floor Levels are positioned above the PMF plus 500mm freeboard**. This is based on the flood levels that are presented in Council's Flood Certificate (FL/82/2024).
- **Nominated flood wardens** will provide adequate direction in flood emergencies.
- **Cancellation of operations** is preferable prior to major and extreme events to eliminate community exposure to flood hazards and in the event where school has not yet commenced.
- If works have commenced for the day, **evacuation well in advance of a predicted major or extreme event** is preferable with staff and visitors recommended to return home and wait out the flood event.
- If staff and visitors are unable to return home, on-site refuge is available in the courtyard noted in **Figure 10**.
- Through adoption of this plan, the proposed development adequately minimises the flood risks associated with the subject site. The recommendations contained herein assist in managing the risk to life of the staff, facility users and visitors to the subject site.

References

SES	(2024)	*Flood Disaster Website* accessed from: https://www.ses.nsw.gov.au/disaster-tabs-header/flood/ 4 October 2024
SES	(2023)	*Emergency Business Continuity Plan* accessed from: https://www.smallbusiness.nsw.gov.au/sites/default/files/2023-11/16370_SBC%20Prepare%20for%20the%20unexpected%20ACCESSIBLE.pdf October 2024
SES	(2024)	*Flood Planning for the Mobility impaired* accessed from: https://www.ses.nsw.gov.au/floodsafe/what-floodsafe-means-for-you/mobility-impaired/ October 2024
Bureau of Meteorology	(2024)	Service Level Specification for Flood Forecasting and Warning Services for New South Wales – Version 3.15 accessed from: http://www.bom.gov.au/nsw/NSW_SLS_Current.pdf October 2024
Parramatta Council	(2024)	Flood Information Certificate (FL/82/2024) dated the 19th of April 2024
Parramatta Council	(2023)	The City of Parramatta Council Know your Flood Risk accessed from: https://www.cityofparramatta.nsw.gov.au/environment/floodsmart-parramatta/know-your-flood-risk Accessed October 2024
Parramatta Council	(2023)	Flood Warning Service Accessed from: https://www.cityofparramatta.nsw.gov.au/environment/floodsmart-parramatta/flood-warning-service
Stantec	(2024)	Parramatta River Flood Study: https://www.cityofparramatta.nsw.gov.au/flooding/2024-parramatta-river-flood-study/full-report October 2024

NORTHROP

CIVIL

Operational Flood Emergency Response Sub-Plan

for

Westmead Catholic Community GLA Building, Westmead, NSW 2145

for Kane Constructions Pty Ltd

SY192734 / 13 November 2024 / Version 2

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Report details

Project: Westmead Catholic Community GLA Building

2 Darcy Road, Westmead, NSW 2145

Project Ref: SY192734_E01

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Revision History

Revision	Report Status	Prepared	Reviewed	Issue Date
1	For Approval	L Gitzel	L Gitzel	25/10/2024
2	For Approval	L Gitzel	L Gitzel	13/11/2024

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Kane Constructions Pty Ltd.

The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

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This report should be read in full, with reference made to all sources. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. Northrop does not purport to give legal advice or financial advice. Appropriate specialist advice should be obtained where required.

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Flood Response Summary

The following provides a summary of the findings of this Flood Emergency Response Sub-Plan including a summary of the flood behaviour, floor levels with respect to the flood behaviour, the recommended flood response actions, and the recommended on-site and off-site flood refuge locations.

Flood Levels

Table 1 – Summary of Approx. Flood Levels (GLA Building)

Event	5% AEP	1% AEP	PMF
Flood Level (mAHD)	17.46	17.63	18.97

Floor Levels

Table 2 - Internal Floor Levels

Floor	Level (m AHD)	Relationship to Flood Levels
Ground Floor	20.5	Above 1% AEP and PMF
Level 1	24.3	Above 1% AEP and PMF
Level 2	29.0	Above 1% AEP and PMF
Level 3	33.0	Above 1% AEP and PMF
Level 4	38.0	Above 1% AEP and PMF
Level 5	42.0	Above 1% AEP and PMF
Roof	46.0	Above 1% AEP and PMF

Flood Response Actions

Table 3 – Flood Response Actions Summary

WHEN	WHAT	BY WHO
Prior to Flooding	Assemble **Floodsafe Emergency Kit**	Chief Flood Warden
	Check Floodsafe Kit every three months	Chief Flood Warden
	Coordinate **Flood Emergency Response Drills** twice per year (minimum)	Chief Flood Warden
	Sign up and maintain **Parramatta Flood Warning Service** and **Hazards Near Me App** subscriptions.	Chief Flood Warden Flood Wardens
	Monitor weather situation via BOM and Hazard Watch websites at 9am and 4pm every afternoon.	Chief Flood Warden Flood Wardens
	Inductions for new Staff to include flood risk associated with the subject site and evacuation procedure.	Chief Flood Warden
Site Closure (prior to opening)	**Receive Moderate or Major Flood Warning from Parramatta Flood Warning Service** And school has not yet commenced for the day.	Chief Flood Warden
	Make decision that School is Closed/Cancelled	Chief Flood Warden
	Notify parents via **NSW Education Parent App (or equivalent)** and instruct to keep children at home.	Chief Flood Warden
Complete Site Closure (Evacuation)	**Receive Moderate or Major Flood Warning from Parramatta Flood Warning Service.** School **has commenced** for the day and sufficient warning **time is available for evacuation** prior to rainfall.	Chief Flood Warden
	Activate evacuation procedure and alert over the PA System.	Chief Flood Warden
	Make decision to Close facility and evacuate **Initiate Closure Procedures.**	Chief Flood Warden
	Flood wardens to coordinate alternative supervision of class and proceed to Emergency Assembly Point to receive instruction from Chief Flood Warden.	Staff Flood Wardens
	Communicate site closure to all users. This may be via radios / loudspeaker. Chief Flood Warden to notify Flood Wardens. Flood Wardens to notify remaining staff members onsite.	Flood Wardens
	Notify parents via NSW Education Parent App	Staff
	All staff and students onsite to be sent home and parents to be notified to collect.	All
	Notify expected visitors to not attend the site and to remain where they are / seek refuge in accordance with advice from emergency services.	Chief Flood Warden

	Continue to monitor flood warnings in case flood conditions worsen. If conditions worsen quickly, evacuation should cease, and onsite refuge be sought.	Chief Flood Warden
Onsite Refuge	**Receive Moderate or Major Flood Warning from Parramatta Flood Warning Service.** Rainfall has commenced and / or insufficient time to evacuate and / or unable to return home.	Chief Flood Warden Flood Wardens
	Activate on-site refuge procedure and sound the alert over the PA System.	Chief Flood Warden
	Make decision to Close facility and seek refuge onsite	Chief Flood Warden
	Flood wardens to coordinate alternative supervision of class and proceed to Emergency Assembly Point to receive instruction from Chief Flood Warden.	Flood Wardens
	Communicate site closure to all users. This may be via radios / loudspeaker. Chief Flood Warden to notify Flood Wardens. Flood Wardens to notify remaining staff members onsite.	Flood Wardens
	Notify parents via NSW Education Parent App	Staff
	Staff and students to on Ground Floor Level to proceed into upper levels (Level 1 and above). Remaining staff, students and visitors to remain in upper levels of the facility (Level 1 and above).	Staff
	Ground floor flood wardens to **Ground Floor.**	Flood Warden
	Perform **Roll Call** and confirm all students are accounted for.	Staff
	Seek refuge within the upper levels of the facility. Do not attempt to gain access to lower levels and do not attempt to use lifts.	All
	Notify the Police & SES of the decision to close the facility and remain on-site.	Chief Flood Warden
	Maintain regular communication with staff, students and visitors	Chief Flood Warden
	Wait it out at nominated refuge point until flood water subsided.	All
	Do not attempt to exit the facility or to walk or drive through floodwater. If stranded on-site and water inundates floor level, call 000 immediately.	Chief Flood Warden
Once Risk has Passed / After a Flood	Check all services and structural stability of building.	Qualified persons
	Return to operation.	Chief Flood Warden

Key Personnel

Table 4 – Key Personal Summary

Person Organisation	Name	Number
Chief Flood Warden		
Deputy Flood Warden		
First Aid Officer		
SES	-	132 500
Police / Fire / Ambulance	-	000

On-site Emergency Assembly Point

Figure 1 – Level 2 Emergency Assembly Point

Introduction

Northrop Consulting Engineers have been engaged by Kane Constructions Pty Ltd to prepare an Operational Flood Emergency Response Sub-Plan (OFERSP) for the proposed Westmead Catholic Community GLA Building located at 2 Darcy Road, Westmead (the subject site).

This report has been prepared in response to the Condition of Consent C18 and C30 reproduced below:

Condition C18

a) *Be prepared by a suitably qualified and experienced person(s);*
b) *Address the provisions of the Floodplain Risk Management Guideines (EESG);*
c) *Includes details of:*
    i. *The flood emergency responses for both construction and operation phases of the development*
    ii. *Predicted flood levels*
    iii. *Flood warning time and flood notification*
    iv. *Assembly points and evacuation routes*
    v. *Evacuation and refuge protocols; and*
    vi. *Awareness training for employees, contractors and students*

Condition C30

> *Prior to the commencement of any construction, the Certifier must be satisfied that all floor levels must be no lower than the Probable Maximum Flood Level plus the required freeboard.*

It is anticipated this FERSP will be updated at prior to Construction and Operation and ongoing as noted in the Revisions of this FERSP section contained below.

This FERSP has been prepared with consideration to:

- The Department of Planning, Housing and Industry (DPIE) Draft Shelter-In-Place Guideline (2023)
- City of Parramatta Council Flood Certificate (FL/82/2024)
- City of Parramatta Council Development Control Plan 2023 in particular Part 5 Environmental Management – Section 5.1.1 – Flood Warning and Emergency Response Planning.

Note that flood information presented herein is expected to be updated following completion of the Detailed Flood Modelling currently being prepared for the subject site. This FERP should be updated following completion of the modelling and prior to commencement of construction so that the full site flood risk can be recognised.

Contained herein is a description of the subject site, study methodology and information used to prepare this report, a summary of the likely flood behaviour, recommendations for flood preparation and recommended response actions during a flood event.

Subject Site

The subject site is located at 2 Darcy Road, Westmead, otherwise known as the 'Westmead Catholic Community School. The focus of this report is the GLA building which is located in the north-western portion of the subject site.

The subject site is burdened by an unnamed creek that travels along the western boundary of the site, flowing in a northerly direction across Darcy Road before ending at its confluence with Toongabbie

Creek. Flows are derived by the upstream Westmead catchment which extend south of the subject site, towards M J Bennet Reserve and the Great Western Motorway.

A subject site locality plan is presented below in Figure 2.

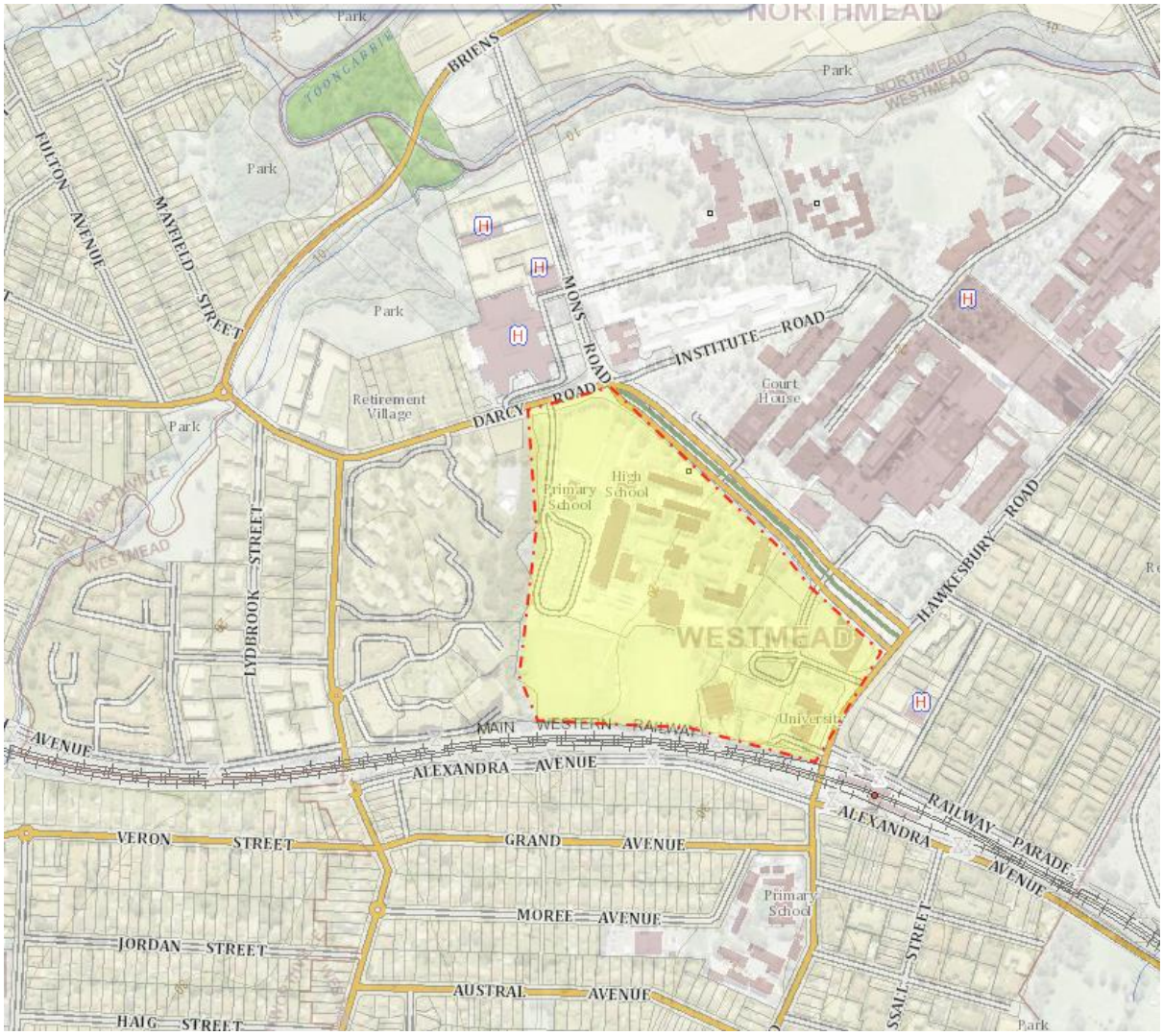

Figure 2 - Locality Plan (obtained from SIX Maps www.maps.six.nsw.gov.au)

This Flood Emergency Response Sub-Plan (FERSP) has been prepared to:

- Promote satisfactory awareness of expected flood behaviour and flood risks associated with the subject site.
- Nominate roles and responsibilities when preparing for and responding to a flood emergency.
- Identify measures to monitor weather forecasts and highlight warning systems available.
- Provide education and awareness material for training programs with respect to flooding of the subject site.
- Identify potential evacuation and evasion procedures including evacuation routes and flood refuge opportunities.

Methodology and Available Data

This plan was developed based on the flood information contained within the City of Parramatta Council Flood Certificate (FL/82/2024) dated the 19th of April 2024. Additional information with respect to the flood behaviour for the subject site has been obtained from the following locations:

- Parramatta River Flood Study prepared by Stantec and dated the 13th of June 2024.
- Council's Online interactive flood information portal (https://www.cityofparramatta.nsw.gov.au/environment/floodsmart-parramatta/know-your-flood-risk

The expected flood behaviour for the subject site is based on the above flood information and is summarised in the **Flood Behaviour** section of this plan.

A review of the Bureau of Meteorology (BoM) and State Emergency Service (SES) guidelines and Parramatta Council Website have been undertaken to report on the likely warning types described in the **Flood and Evacuation Warnings** section of this plan.

Consideration has been given to the personnel most likely to be on-site and responsible for flood emergency response. This is outlined in the **Flood Response Personnel** section of this plan.

Analysis of the site and nearby topography, in combination with the likely flood behaviour has informed the assembly points, evacuation routes and on-site refuge points nominated in the **Assembly Point and Evacuation Routes** and **Floor Levels and On-site Refuge** sections of this plan.

Contact numbers for relevant emergency response agencies and the proposed local evacuation centre are noted in the **Emergency Contact** section of this plan.

Finally, a review of the City of Parramatta Council Development Control Plan and aforementioned flood studies, NSW State Flood Plan, Emergency Business Continuity Plan and the Departments Draft Shelter-In-Place guidelines (2023) have contributed to the recommended preparation and response actions outlined in the **Flood Response Preparation** and **Flood Response Actions** sections of this plan.

Flood Behaviour

Flood Source and Behaviour

Flooding of the site and the surrounding properties is expected to be derived by local overland flow from the upstream Westmead catchment. During both the 1% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF), flows are expected to come from the south and run down the unnamed creek along the western boundary of the subject site.

During the 1% AEP and PMF deep fast flowing flood water is expected in the unnamed creek along the western boundary. During these events, there is also the potential for overland flooding across the site. It is important that users of the facility do not attempt to evacuate during the peak of these events as there is the potential for hazardous flow behaviour on the subject site and across the regional road network.

Due to the high urbanisation of the upstream catchment, a quick response time is expected following commencement of rainfall. The Parramatta River Flood Study (Stantec, 2024) suggests that the critical duration in the vicinity of the subject area ranges from the 15 minutes to one-hour duration and as such, the peak is expected to occur within an hour, following the commencement of rainfall.

Peak Flood Levels, Depth and Velocities

Peak flood levels and extent across the site have been obtained from the City of Parramatta Council Flood Certificate (FL/82/2024) which is consistent with the flood information that was available at the time of approval. The below **Figure 3**presents the 5%, 1% AEP and PMF design storm events and levels.

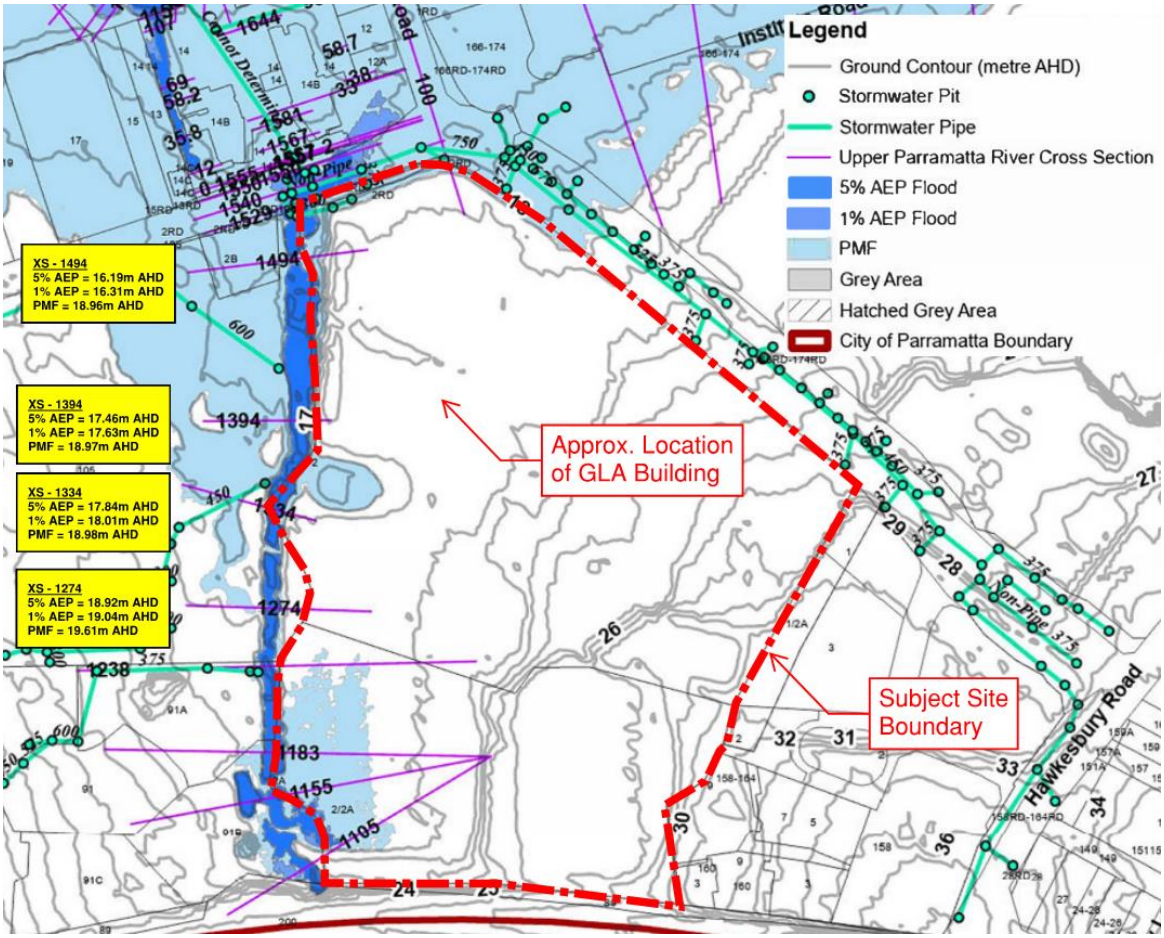

Figure 3 - Flood Extents and Levels

Peak flood levels in the vicinity of the GLA can be summarised by Cross Section 1394 as summarised by the City of Parramatta Council Flood Certificate (FL/82/2024). These are reproduced in **Table 5** below.

It is important to note that the events defined in the below Table 5 are rare to extreme events which are not expected to occur every time it rains. The 1% AEP is commonly referred to as the "100-year flood event" while, the PMF has a nominal Annual Exceedance Probability of 1 in 10 million.

Table 5 – Peak Flood levels

Event	Flood Level (m AHD)
5% AEP	17.46
1% AEP	17.63
PMF	18.97

It is possible evacuation from the site may remain possible during the 1% AEP or PMF, although it is not recommended during the peak of these flood events due to the potential for the broader road network to be compromised.

Flood Hazard and Risk to Property and Life

The City of Parramatta Council Flood Certificate (FL/82/2024) presents the expected flood behaviour at the subject site.

Hazard categories are based on the categories presented in the Floodplain Development Manual (DPHI, 2005), in particular the Provisional Hazard Categorisations presented in the below **Figure 4**. Low hazard is typically considered safe for large vehicles (not small) while high hazard becomes dangerous for buildings, potentially impacting structural capacity for standard construction methods.

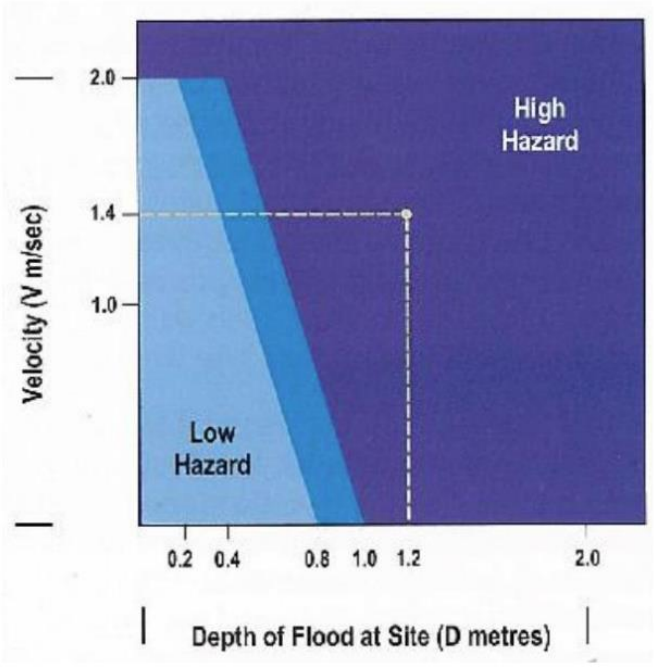

Figure 4 - Flood Hazard Categories (FPDM, 2005)

The following Figure 5 presents the flood hazard conditions provided in the Parramatta Council Flood Certificate (FL/82/2024).

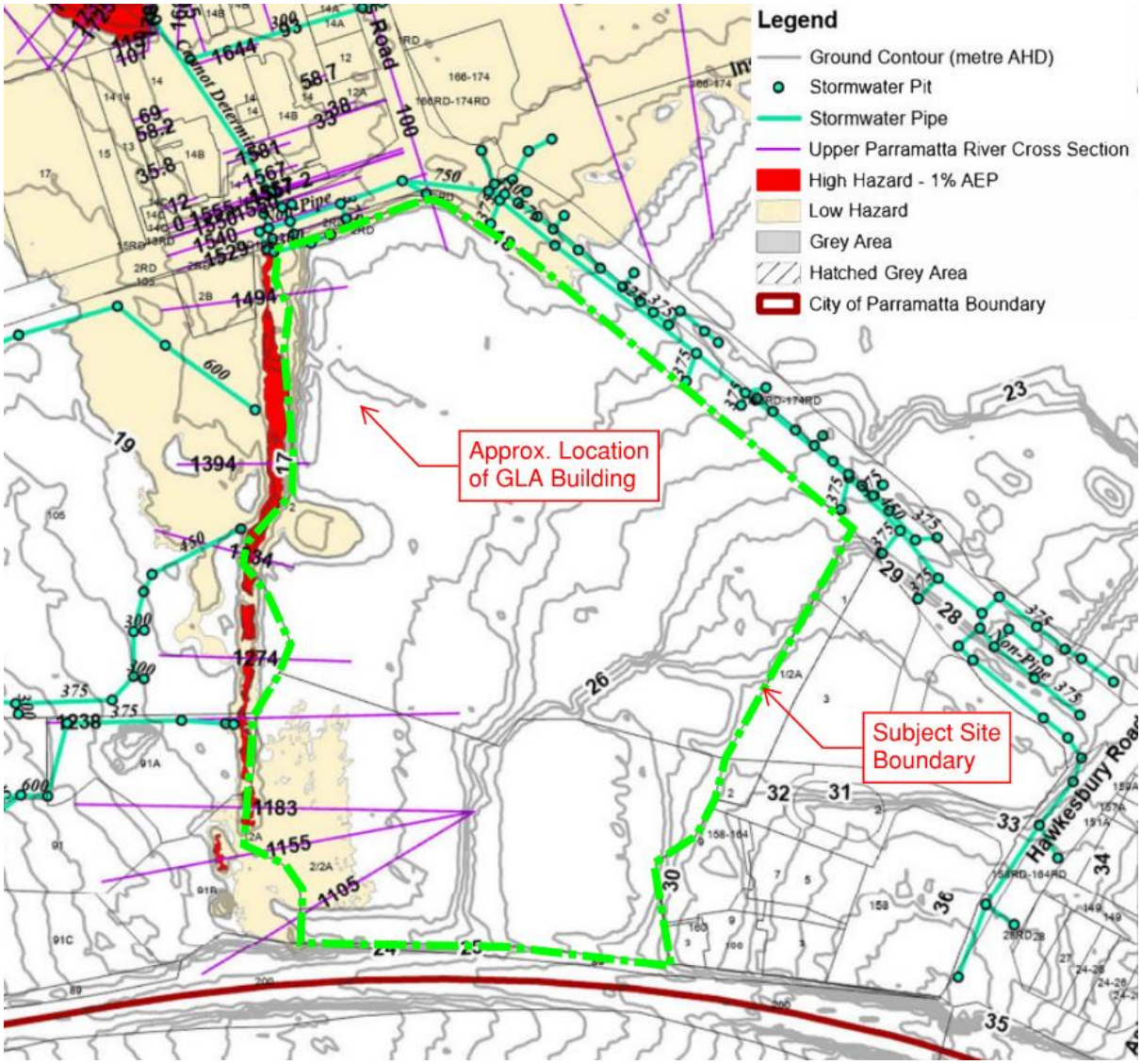

Figure 5 - Flood Hazard Map

City of Parramatta Council Know Your Flood Risk

The City of Parramatta Council Know Your Flood Risk online tool enables users to view the potential flood risk for mapped locations across the Local Government Area. The below **Figure 6** presents the flood risk categories across the site while **Error! Reference source not found.**provides the definition f or each category.

These categories are also linked to Council's FloodSmart warning system, which is discussed in greater detail in the subsequent Flood and Evacuation Warnings section of this report.

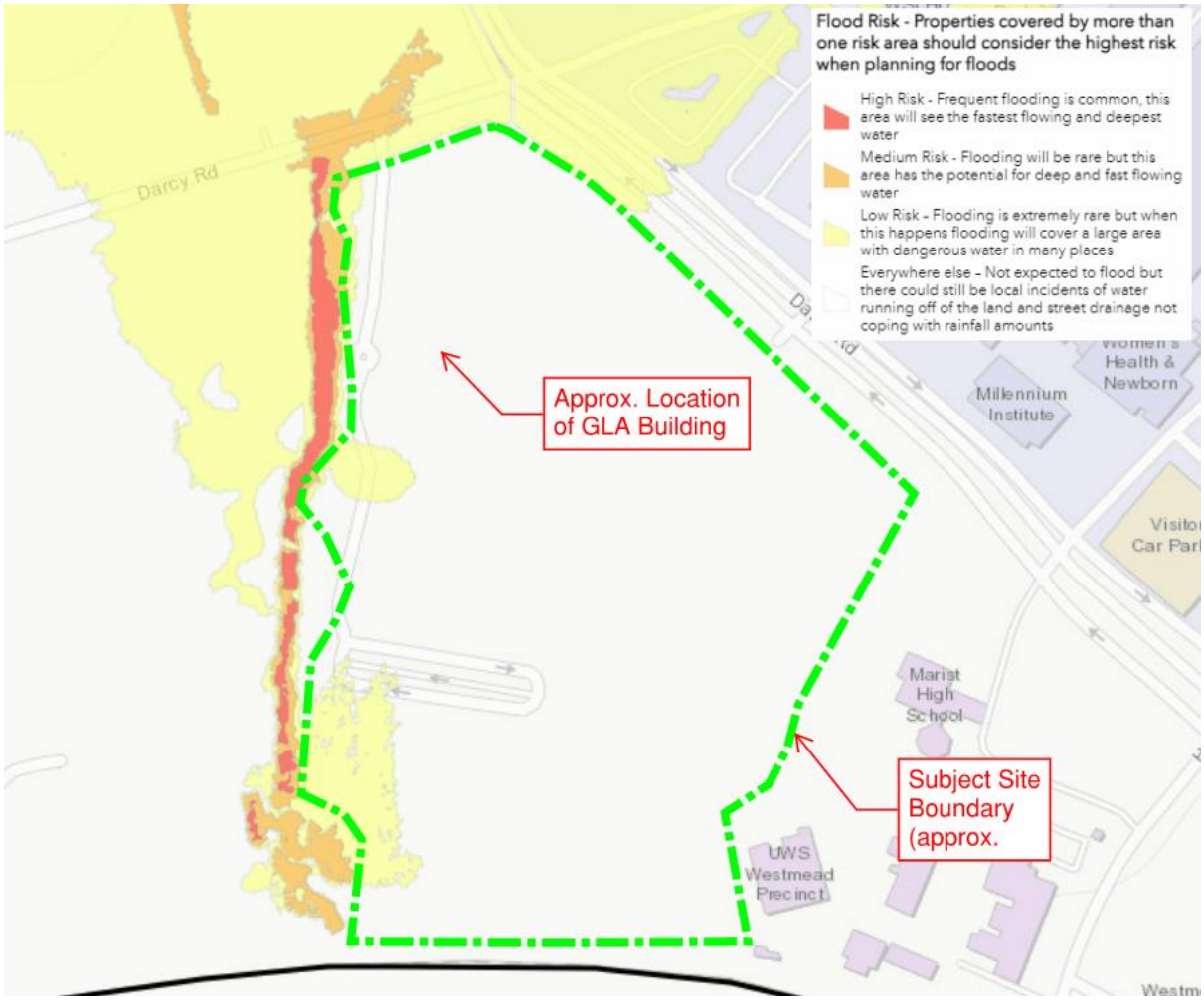

Figure 6 - City of Parramatta Council - Know Your Flood Risk (COPC, 2024)

Risk area	Common description	Technical description
High risk area	• Frequent flooding is common • Near the main river and creeks where water flows during a flood, including overflow from drainage • This area will see the fastest flowing and deepest water and cause a significant risk to life	High hazard flood area within the 1% annual exceedance probability (AEP) (1:100)
Medium risk area	• Frequent flooding will be rare • Where the flood water goes once the creek/river areas overflow • In rare floods these areas have the potential for deep and fast flowing water	Medium and low hazard area in the 1% AEP (1:100)
Low risk area	• Flooding is extremely rare • Generally, away from the river or creek and higher up • If a flood affects these areas it will cover a large area with dangerous water in many places	Area from the 1% AEP (1:100) up to the Probable Maximum Flood
Everywhere else	Not expected to flood but there still could be local incidents water running off the land and of street drainage not coping with rainfall amounts.	Area outside the Probable Maximum Flood. There may still be isolated impacts from local overland flow.

Figure 7 - Definition of Flood Risk Categories

Flood and Evacuation Warnings

A network of rainfall gauge stations is maintained throughout the greater Sydney region. These provide information to the Bureau of Meteorology (BoM) as one source of information informing their flood warning system.

The Bureau should issue one of five types of warnings through local radio, television and through their website *http://www.bom.gov.au*. In addition, the SES may issue a flood bulletin, evacuation warning or evacuation order.

Due to the sensitive nature of this location, it is recommended the nominated Chief Flood Warden register for automatic text and email notifications from Council's FloodSmart Parramatta flood warning system. In addition, the Hazards Near Me App and Bureau of Meteorology Weather App / Website provides information for current flood warnings

Bureau of Meteorology

Severe Weather Warning

Severe weather warnings are issued by the Bureau for potentially dangerous weather conditions. A description of the threat will be included in the warning along with the time for next issue. It is noted that a severe weather warning does not imply that flooding will eventuate. Warnings are generally updated every six hours, or as the event dictates.

This type of warning should be accompanied with predicted extreme rainfall depth, as well as observed values from around the state.

Severe Thunderstorm Warning

A severe thunderstorm warning will be issued if there is strong evidence that a severe thunderstorm will develop, or if a severe thunderstorm is reported. Flash flooding may occur during severe thunderstorms. Warnings are generally updated every three hours or shorter as required.

Flood Alert/ Watch/ Advice

A flood alert / watch / advice is one of the earliest warnings that will be issued by the BoM with advice provided up to four days in advance of the expected onset of flooding (BoM). Although four days warning may be available, they are also occasionally issued during and after the rainfall has occurred, depending on the level of maturity of the flood warning systems and services (BoM).

Generalised Flood Warning

A generalised flood warning is typically more specific than the Flood Alert / Watch / Advice and is issued when flooding is expected to occur in a given area. Three hours warning time is expected from issue of warning to peak flood level as per the "Service Level Specification for Flood Forecasting and Warning Services for New South Wales – Version 3.15" (Bureau of Meteorology, 2024).

Minor/ Moderate/ Severe Flood Warning

A Minor / Moderate / Major Flood Warning typically provides more information than a generalised flood warning and is issued when flooding is expected to occur in a given area. These warnings are usually accompanied by a flood gauge level and timing for the peak to occur.

More detailed flood warning may be issued based on any additional information available. Three hours warning time is expected from issue of warning to peak flood level.

SES Flood Bulletins

The SES distributes Emergency Bulletins to media outlets and agencies in the event of predicted hazardous conditions. The SES Flood Bulletins may contain the following information:

- Current warnings, together with indications of the likely impact of flooding at any predicted heights.
- Current flood heights and flood behaviour.
- Details of conditions and closures of main roads, and
- Advice on safety matters and means of protecting property.

The NSW SES will issue three levels of warnings.

Advice

The SES will issue flood advice acknowledging that an incident has started and informing people to

stay up to date in case the situation changes.

Watch and Act

The SES will issue a Watch and Act warning when flood conditions are changing and the purpose of this warning to prepare for evacuation / isolation or avoid the area that is expected to impact by flooding.

Emergency Warning

The SES will issue an Emergency Warning if evacuation is required. If this occurs evacuation must be undertaken. Broadcast will be via radio/ TV, door knock, automated telephone message or SMS.

All public and commercial radio and television stations should broadcast warnings.

On-Site Emergency Communication

The PA system is recommended it be configured to sound an emergency tone meaning all staff, students and visitors are to respond to the flood emergency. The tone will be tested every three months as a minimum.

Should a PA system be unavailable or inoperable in the event of an emergency, an air horn and handheld loudspeaker is located within the Flood Emergency Kit. These will be used to obtain people's attention and direct them to the emergency assembly point or facilitate evacuation offsite.

Other Warning Types / Resources

Standard Emergency Warning Signal

This signal may be played over radio and television stations to alert communities to Evacuation Warnings Evacuation Orders or Special Warnings or Dam-Failure Warnings.

Early Warning Network Automated Text and Email Services

The Early Warning Network (www.ewn.com.au) filters the above BoM warnings and send texts and emails to notify registered users of an emergency situation.

Hazards Near Me NSW

Recently the NSW SES and NSW Public Works have created a tool called Hazards Near Me App NSW which is both a webpage and Phone Application. The application filters BoM and RFS warnings

relevant to the user and may be used by the Facility Manager as an additional resource. The Application is free and allows the user to input a radius of interest for receiving notifications.

Hazard Watch

Similar to the Hazards Near Me phone application, the NSW SES and Australian Federal Government have prepared the HazardWatch portal that filters BoM warnings and provides advice on locations and magnitude of predicted hazards. This resource is also free and can be accessed via a smart phone, tablet or laptop.

NSW Education Parent App

This app can be downloaded through Google and Apple app stores and is intended to be used as a tool to disseminate warnings and notifications around impending extreme weather, or around temporary shelter within school buildings during events in progress. A link to the app is provided below: https://education.nsw.gov.au/about-us/technology/nsw-education-parent-app

For Private Schools, the equivalent parent app should be used to disseminate warnings.

City of Parramatta Council Warning Systems

FloodSmart Automatic Warning Service

The City of Parramatta Council offers a free flood warning service the provides early warning messages to residents and businesses within the LGA identifying when flooding may be likely. The service uses the Early Warning Network to coordinate warnings as previously mentioned. It is recommended the Facility Manager and staff register for this service as it is to be used as the primary warning system for the purposes of evacuation.

https://www1.ewn.com.au/parramatta/register.aspx

The warning service is broken up into ten warning areas that cover different communities within the Local Government Area. These ten warning areas are outlined presented in the below Figure 8.

It is recommended that the Chief Flood Warden register to receive warnings provided in the Lower Toongabbie and Wentworthville area (Location 3) and the Westmead and North Parramatta Area (Location 4). These warning areas are the two closest zones to the site and flood warnings issued in these areas are expected to remain appropriate for the subject site.

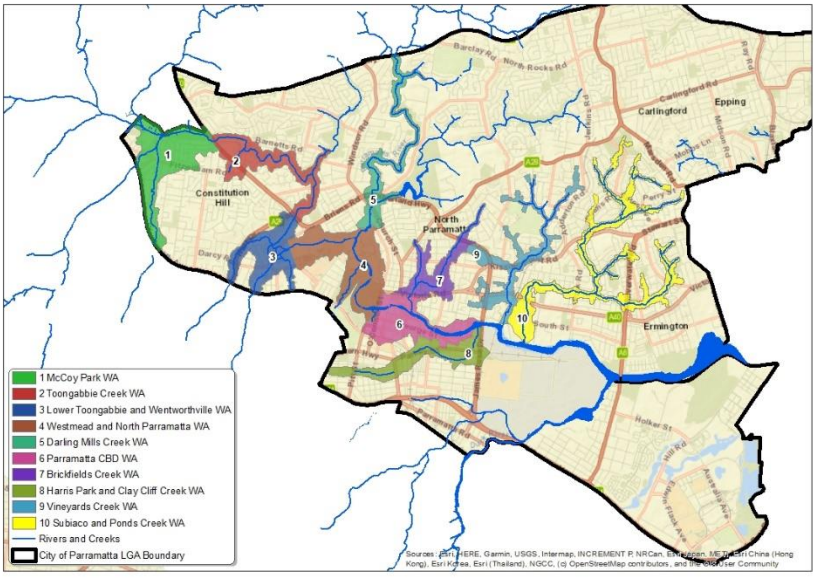

Figure 8 - FloodSmart Parramatta Warning Zones (COPC, 2023)

A summary of the warning types that are expected to be issued by Council's flood warning network is presented in the below Figure 9.

The Parramatta Council FloodSmart Warning Service is linked to the City of Parramatta Council Know Your Flood Risk Categories, as mentioned above. Areas vulnerable to the High Risk Area are expected to flood following receipt of a Minor Flood Warning. Areas that are vulnerable to the High and Medium Risk Areas are expected to flood following receipt of a Moderate Flood Waring while areas vulnerable to Low, Medium and High flood risk are expected to flood following receipt of a Major Flood Warning.

Public information message	**(Parramatta CDB Riverside area only)** Footpaths and footbridges may be flooded - please use alternative travel routes
Minor Flood Warning • High risk areas may experience property flooding.	**Local area conditions** • Risk to life from fast flowing or deep water near the river or creek • Closure of roads most at risk of flooding • Flooding of land near rivers, creeks, low spots and recreational areas • Water levels may be high for many hours
Moderate flood warning • High and Medium risk areas may experience property flooding.	**Local area conditions** • High risk to life from fast-flowing or deep water near the river or creek • Closure of many bridges and roads • Widespread flooding in areas not necessarily near the river • Water levels may be high for many hours
Major flood warning • High, Medium and Low risk areas may experience property flooding	**Local area conditions** • Damage is possible to buildings and infrastructure • Extreme risk to life from fast-lowing deep water even in areas not near the river or creek • Closure of many bridges, roads and transport routes • Widespread deep flooding in many areas not necessarily near the river • Water levels may be high for many hours
No Further Impact	**Local Area Conditions** The local conditions should now be improving: • No further flooding is expected in the next 12 hours • Flood levels will continue to drop However: • There may still be dangerous fast flowing water near the river or creek • Debris and contamination may still cause problems in areas that have been flooded

Figure 9 - Flood Warning Types (COPC, 2023)

City of Parramatta Council Alerts Dashboard

The City of Parramatta Council also provides an Alerts Dashboard which provided real-time updates on current emergencies. In addition to flood emergencies, the Dashboard provides advice with respect to Road conditions and closures, weather warnings, power outages, fires etc. A link to the Dashboard is provided below:

https://alerts.cityofparramatta.nsw.gov.au/

It is recommended that the dashboard be reviewed before evacuating the site to gain advice with respect to current road conditions and closures.

Flood Response Personnel

Summarised in Table 6 below are the facilities nominated emergency personnel, their location and responsibilities in managing flood response.

Table 6 - Flood Response Personnel

	Location	Responsibilities
Chief Flood Warden (Principal)	On-site	• Coordinate flood evacuation drills. • Monitor weather at 4pm daily for upcoming extreme rainfall events. • Receive notifications from the City of Parramatta Council Flood Alert Service. • Decide when Cancellation of activities or Evacuation / Refuge is required. • Communicate Cancellation and Evacuation / Refuge to staff, students and visitors. • Liaison with SES or Emergency Services personnel if they attend site. • Remain calm and direct visitors and staff through the evacuation procedures.
First Aid Officer	On-site	• Prepare and maintain Flood Emergency Kit. • Prepare and coordinate assistance for staff, students and visitors with mobility difficulties.
Deputy Chief Flood Warden	On-Site	• Undertake Chief Flood Warden duties when Chief Flood Warden is unavailable. • Maintain calm and direct staff and visitors through the evacuation process.
Flood Wardens	On-Site	• Assist Chief and Deputy Chief Flood Warden with evacuations.
Staff	On-site	• Maintain calm and direct visitors onsite through evacuation or refuge processes.

It is anticipated the Principal, or a staff member who is in charge of emergencies and evacuation at the site will be nominated the role of Chief Flood Warden.

A staff member who is on-site on a regular basis, with first aid training should be nominated the role as the First Aid Officer. Similarly, staff members who are on-site on a regular basis should be nominated the role of Deputy Chief Flood Warden and general Flood Wardens.

It is recommended that at least one Flood Warden is assigned in each level and section of the facility. A learning support teacher (or similar) should be made available to Flood Wardens during a flood emergency to supervise students and enable the Flood Wardens to move around the upper levels of the facility if required. All remaining staff are to assist the Flood Wardens with Evacuation / Refuge during a flood emergency.

Emergency Assembly Point

The following Figure 10 presents the nominated **Emergency Assembly Point** for flooding as the **Covered Outdoor Space on Level 2.** Once a learning support officer (or similar) has taken control of their class, all Flood Wardens are to proceed to this location to receive instruction from the Chief Flood Warden.

In the event where a learning support officer (or similar) is not available, the Chief Flood Warden is to convey instructions via the handheld walkie talkies that will be available in each Flood Emergency Kit.

All remaining staff, students and visitors on-site following declaration of an emergency should remain in place until instruction is received from the Chief Flood Warden / Flood Wardens.

It is the responsibility of the Chief Flood Warden to activate the evacuation procedure with all staff, students and visitors to evacuate early, prior to rainfall commencing. If rainfall has commenced, refuge within Level 1 and above is to be sought on-site.

Figure 10 - Flood Emergency Assembly Point Level 2 (Alleanza, Sept 2024)

Floor Levels and On-Site Refuge

Floor Levels

The proposed GLA building has six floors (1 ground floor and five upper levels). The level of each floor is presented below in Table 7. The floor levels with respect to the 1% AEP and PMF flood events are also presented in the below Table 7.

Table 7 - Internal Floor Levels

Floor	Level (m AHD)	Relationship to Flood Levels
Ground Floor	20.5	Above 1% AEP
Level 1	24.3	Above 1% AEP and PMF
Level 2	29.0	Above 1% AEP and PMF
Level 3	33.0	Above 1% AEP and PMF
Level 4	38.0	Above 1% AEP and PMF
Level 5	42.0	Above 1% AEP and PMF
Roof	46.0	Above 1% AEP and PMF

On-Site Refuge

In the event where rainfall has commenced or staff, students and visitors become trapped on-site, refuge may be sought on-site as a means of last resort. In the event where refuge onsite is required, all staff and students are to remain within the facility on Level 1 and above.

Staff, students and visitors located within the Ground Floor Level are to proceed into the upper levels of the facility and are to remain in the upper levels of the facility for the duration of the flood emergency. It is recommended a flood warden or staff member be located at each access point into the lower levels of the facility to ensure no one attempts access during a flood emergency.

Lifts should also not be used during a flood emergency. There is the potential for power to be cut to the facility during major and extreme weather events and therefore the potential for people to become trapped. Access to the lifts should be restricted during a flood event.

It is recommend that staff, students and visitors stay within classrooms once rainfall has commenced or if evacuation is impractical. Levels 1 and above are sited is sited at an elevation of 24.3m AHD, approximately 5.33m above the worst case PMF.

Should you become isolated on-site, proceed to **Level 1** or above and do not try to evacuate by foot or vehicle and never enter rising flood water.

Call the SES on 132 500 if emergency supplies are getting low, or 000 if in a life-threatening situation.

Remember if its flooded, forget it.

Emergency Provisions for Essential Services

It is recommended the following contingency measures be implemented and maintained to facilitate on-site refuge:

- Staff with first aid training on-site at all times during operation.
- Supply of medicines, non-perishable food items and bottled water to withstand isolation for 12 hours.
- Provision for backup generator/s in the event of loss of power.
- Back up provisions in the event where water supply and sewage services are temporarily unavailable.

Do not Drive or Walk through Floodwater.

Remember, If It's Flooded, Forget It!

Emergency Contact

For emergency assistance during flood events, please call the **SES** on **132 500.**

If you are in a life-threatening situation please call **Police, Fire or Ambulance** on **000.**

For road blockages, fallen trees and other local asset issues, please call **The City of Parramatta Council's Hotline** on (02) 9806 5050 or 1300 617 058.

Flood Response Preparation

It is the responsibility of the Chief Flood Warden to prepare the facility for a flood event. This will be achieved through; induction training provided by the operator, nomination of flood wardens, education of flood risks and behaviour, and the preparation and maintenance of a *Floodsafe Emergency Kit.*

The information presented above is a summary of the flood behaviour and considered key to understanding the risks associated with flooding. This should be displayed in conjunction with other emergency information (such as fire, etc.) throughout the facility.

Induction training

Induction training is recommended for all new Staff which is to occur on the first day of employment. Induction training should include a site walkover that identifies the expected flood behaviour. The emergency procedures, namely points of assembly and refuge, are also to be relayed to staff during this induction training as well as all additional information contained within this plan.

Records should be kept which detail who has had the training, when they were trained, the name of the trainer as well as reference to the material used in the training course.

Flood Emergency Response Drills

Evacuation drills are designed to increase flood awareness within the centre. These drills are to be undertaken twice per year to familiarise staff and facility users of the procedures when responding to a flood event.

It is also an opportunity to outline expected flood levels and dangers of entering flood water. The following link can be used as a resource for evacuating staff, students and visitors that are mobility impaired: https://www.ses.nsw.gov.au/floodsafe/what-floodsafe-means-for-you/mobility-impaired/.

For new staff it is expected they will be made familiar with the site flooding conditions and made familiar with the emergency procedures and response during the initial site induction.

Floodsafe Emergency Kit

Although the storm event may only last a couple hours, there is the potential for flood water to remain for a longer period following completion of rainfall. As such, enough resources should be contained in the Flood Emergency Kit to ensure anyone trapped on site has enough supplies for up to 24 hours. In the event were resources are getting low, the SES may be contacted to provide a re-supply/evacuation from the facility.

Potential items for a flood emergency kit are outlined at; https://www.ses.nsw.gov.au/floodsafe/prepare-your-home/emergency-kit/. Items outlined on the SES website and some additional items are presented below:

- Drinking water, medicines and non-perishable food items.
- A copy of the facilities emergency management plan.
- Chemical register.
- Air horn and hand-held loudspeaker.
- Portable radios with spare batteries.
- Torches with spare batteries.
- Lanterns with spare batteries.

- Two-way radio with spare batteries.
- A first aid kit.
- Candles and waterproof matches.
- Waterproof bag for valuables.
- A copy of emergency numbers.

When leaving or evacuating add the following items:

- **Register** of Staff, Students and Visitors on-site.
- **Sign in book** for visitors and contractors.
- **Individual Health Care Plans** including asthma puffers, diabetes medication, epi pens, etc.
- **Drinking water** and **non-perishable food items**.

Individual kits should be kept in each classroom in a roll trolley suitable for easy deployment in the event of an evacuation / refuge. The contents of the kit and management during a flood event will be the responsibility of each **Flood Warden / Chief Flood Warden**.

It is essential that the items recommended for the Floodsafe Emergency Kit be maintained to ensure those seeking refuge on-site are as comfortable as possible during a flood event.

TRIGGER FOR REVIEW AND EDUCATION:

- Three monthly checking of the emergency kit to ensure all items are in suitable working order.
- Six monthly evacuation drills and reminder of the flood risks.
- Inductions for new staff, highlighting the flood risk associated with the subject site.

BY WHO: Chief Flood Warden and Flood Wardens

Storage of Sensitive Goods

All sensitive goods which are susceptible to damage from flood waters or, if exposed to floodwaters would have significant ramifications to the surrounding area, must not be stored in the basement carparks or ground floors which are susceptible to flooding. The first floor is above the PMF level and are therefore considered appropriate places to store goods which are sensitive to water.

Monitoring of Weather Situation

It is the responsibility of the Chief Flood Warden to monitor the weather situation and be aware if a warning has been issued. This will be achieved through automatic text messages and emails from Council's Flood Alert Service and checking of the local radio stations and the Bureau website.

TRIGGER FOR MONITORING:

- Continuous, 4pm daily

BY WHO: Chief Flood Warden

Signage

Flood warning signage, such as the Flood Response Actions shown at the beginning of this plan is to be placed throughout the building within common areas (i.e. administration spaces, libraries etc.) in addition to each classroom.

It is also recommended that a copy of this Flood Response Summary be placed within each Flood Emergency Kit. All flood warning signage is to be laminated and must identify that the site is flood prone.

It is the responsibility of the Chief Flood Warden to ensure signage is up to date and displayed as recommended above.

Flood Response Actions

Early Site Closure / Cancellation of Operations

In order to minimise the risk to life, it is recommended the school be closed on any day where a **Moderate or Major Flood Warning is received from Council's FloodSmart Warning Service**. These warning are equivalent to a 1% AEP flood event or PMF design storm event and present potentially hazardous flood behaviour across the site. Closure is to occur prior to the commencement of operation for the day with all students to be notified

Closure of the facility should be communicated as early as possible via the various means of school communication available to the operator. This may be made via email and the Parent App (or equivalent app).

If early closure of site upon receipt Flood Warning is not possible, refuge on site is available. Early closure is preferred as it reduces the strain on emergency services during a flood event

Evacuation

In the event where school has commenced, rainfall has not yet commenced and there is sufficient time to safely coordinate evacuation, the **primary flood Emergency Response Action** for the site **is evacuation.**

In the event where a **Moderate or Major Flood Warning** is received from Council's FloodSmart Warning Service **and sufficient time is available,** the site is to be **closed and evacuated**. All deliveries and visitors expected to attend the site are to be cancelled and staff are to return home if safe to do so.

Once a **Moderate or Major Flood Warning** is received, Flood Wardens are to proceed to the nominated Emergency Assembly Point as soon as possible and following handover of class supervision. It is imperative that the students remain supervised at all times. Where supervision is not possible, walkie talkies remain available in the Floodsafe Emergency Kits and instruction from the Chief Flood Warden can be made through this means.

Once at the Emergency Assembly Point, Flood Wardens are to receive instructions from the Chief Flood Warden.

It is recommended the Chief Flood Warden contract the SES prior to instructing Flood Wardens to notify the SES of the closure and evacuation of the facility. When talking with the SES, it is a good opportunity to seek advice with respect to current flooding and road conditions. Similarly, the Parramatta Council Disaster Dashboard may be used to obtain live information on Road Closures.

The Chief Flood Warden is to coordinate roll call and manage evacuation requirements and with Flood Wardens and staff.

It is the responsibility of the Chief Flood Warden to ensure all staff evacuate the site prior to a flood event. In the event where evacuation is not possible, it is unsafe for staff to return home, staff, students and visitors are to remain on-site and seek refuge within the building.

Early evacuation reduces the strain on emergency services during a flood event. Evacuation should be undertaken in advance of rainfall occurring or as soon as possible after receiving the Moderate Flood Warning

On-Site Refuge

On-site refuge is recommended if a Moderate or Major flood warning is received from the Council's FloodSmart Warning Service and heavy rainfall has already commenced, school has commenced for the day and evacuation is not feasible.

The procedure for on-site refuge should be carried out as per the following:

- Facility Manager Sound alarm on PA system to notify staff and visitors of imminent risk.
- Flood Wardens to proceed to the Emergency Assembly Point (Level 2 Covered Play Space) and receive instruction from the Chief Flood Warden
- Ground Floor Level to be evacuated with staff, students and visitors on the Ground Floor to proceed into the upper levels of the facility.
- All remaining staff, students and visitors to remain within the classrooms on Level 1 or above and wait it out until flood water subsides / given the all clear from emergency services.

It is recommended a back-up generator/s or other forms of emergency power be provided to ensure power remains available within the building, that may otherwise be disrupted during an extreme flood event.

It is strongly recommended that in the event of a flood, the elevators are not used due to the potential for centralised power supply to be cut.

Should you become isolated on-site, move to the **Upper-Level Office Space** and do not try to evacuate by foot or by vehicle and never enter rising flood water.

Call the SES on 132 500 if emergency supplies are getting low, or 000 if in a life-threatening situation. Remember if its flooded, forget it.

Flood Emergency Response Summary

The aim is to eliminate/reduce the risk to life by removing as many staff, students and visitors from the floodplain prior to the commencement of rainfall, provided there is enough time for them to return home or to a safe place of residence.

The Chief Flood Warden is responsible for reviewing the weather forecasts daily and notifying facility users and staff of the decision to close the facility or seek refuge on-site.

When a warning is received, consideration should be given to (if time permits):

- Cancelling services and appointments for the day of the event.
- Blocking floor wastes and toilets on the Ground Floor Level.
- Securing objects that are likely to float and cause damage.
- Turning off mains power, water and gas and other hazardous materials.
- Relocating chemicals above the predicted water level.
- Moving vehicles away from the site where possible.

If time permits the evacuation / refuge procedure should generally as follow:

- **Chief Flood Warden** to **Sound** alarm on PA system / air horn.
- **Chief Flood Warden** to the **Emergency Assembly Point.**
- **Flood Wardens to transfer supervision of classes and proceed to Emergency Assembly Point**
- **Remaining Staff, Students and Visitors to remain in place.**
- **Chief Flood Warden** to contact the **SES to receive instruction / coordinate decision to evacuate / refuge on-site.**

- **Roll call** to ensure everyone is accounted for.
- **Return home** if it is safe to do so and wait out the storm event.
- **If unable to return home:**
    - **Staff, Students and Visitors on Ground Floor Level to proceed into upper levels including Level 1 and above.**
    - **Flood Wardens** clear Ground Floor Level.
    - **Seek refuge on-site until given the all clear by emergency services.**
- **If evacuating the facility, leave signage undercover** and notify **Service/Police/ SES** that evacuation has occurred.

TRIGGERS FOR CLOSURE / EVACUATION / ON-SITE REFUGE:

- Following receipt of a **Moderate or Major flood warning** from **Council's FloodSmart Warning Service.**

RESPONSIBLE FOR THE DECISION: Chief Flood Warden

Emergency Services Attending Site

It is noted self-motivated evacuation, such as that proposed in this plan, reduces strain on emergency services. There is a possibility that emergency services such as Police, Fire, Ambulance or SES may attend site and assume control from the Chief Flood Warden. Once this has occurred, they are in control of the site and any response operations.

TRIGGERS FOR EMERGENCY SERVICES TAKE CONTROL:

- Police, Fire, Ambulance or SES attending site.

RESPONSIBLE FOR THE DECISION; Chief Flood Warden

After a Flood

Once a Final Flood Warning or SES "All Clear" has been received:

- A thorough check of services such as electricity, sewer, water and gas should be undertaken by qualified persons.
- Advice should be sought from a suitably qualified engineer as to the structural integrity of buildings prior to their use.
- Personal protective equipment should be worn during the clean-up and disinfectant used.

TRIGGER FOR RETURN:

- All clear given by SES or emergency services and building inspected by representatives appointed by the department of education.

BY WHO: SES, Emergency services, Flood wardens

Revision of this Flood Evacuation Plan

This plan should be revised prior to Construction to capture updated flood modelling currently being prepared at the site.

Furthermore, this plan should be revised if there are revisions to the Parramatta River Flood Study (Stantec, 2024) to capture changes in the catchment since the last study.

Notwithstanding the above, this plan shall be **revised every three years** or when there is a major operational change or flood event.

Revisions should be undertaken by a suitably qualified flood emergency response consultant.

Conclusion

The subject site is affected by flooding caused by overland flow from the upstream catchment. A review of the proposed development has been undertaken in conjunction with the expected flood behaviour and it was concluded that:

- **Proposed Finished Floor Levels are positioned above the PMF plus 500mm freeboard**. This is based on the flood levels that are presented in Council's Flood Certificate (FL/82/2024).
- **Nominated flood wardens** will provide adequate direction in flood emergencies.
- **Cancellation of operations** is preferable prior to major and extreme events to eliminate community exposure to flood hazards and in the event where school has not yet commenced.
- If school has commenced for the day, **evacuation well in advance of a predicted major or extreme event** is preferable with staff, students and visitors recommended to return home and wait out the flood event.
- If staff and visitors are unable to return home, on-site refuge is available in the upper levels of the facility.
- Through adoption of this plan, the proposed development adequately minimises the flood risks associated with the subject site. The recommendations contained herein assist in managing the risk to life of the staff, facility users and visitors to the subject site.

References

SES	(2024)	*Flood Disaster Website* accessed from: https://www.ses.nsw.gov.au/disaster-tabs-header/flood/ 4 October 2024
SES	(2023)	*Emergency Business Continuity Plan* accessed from: https://www.smallbusiness.nsw.gov.au/sites/default/files/2023-11/16370_SBC%20Prepare%20for%20the%20unexpected%20ACCESSIBLE.pdf October 2024
SES	(2024)	*Flood Planning for the Mobility impaired* accessed from: https://www.ses.nsw.gov.au/floodsafe/what-floodsafe-means-for-you/mobility-impaired/ October 2024
Bureau of Meteorology	(2024)	Service Level Specification for Flood Forecasting and Warning Services for New South Wales – Version 3.15 accessed from: http://www.bom.gov.au/nsw/NSW_SLS_Current.pdf October 2024
Parramatta Council	(2024)	Flood Information Certificate (FL/82/2024) dated the 19th of April 2024
Parramatta Council	(2023)	The City of Parramatta Council Know your Flood Risk accessed from: https://www.cityofparramatta.nsw.gov.au/environment/floodsmart-parramatta/know-your-flood-risk Accessed October 2024
Parramatta Council	(2023)	Flood Warning Service Accessed from: https://www.cityofparramatta.nsw.gov.au/environment/floodsmart-parramatta/flood-warning-service
Stantec	(2024)	Parramatta River Flood Study: https://www.cityofparramatta.nsw.gov.au/flooding/2024-parramatta-river-flood-study/full-report October 2024

Laurence Gitzel

Associate | Group Manager | Senior Flood Engineer

BEng(Env) MProfEng(Env) MIEAust CPEng NER (Civil)

Laurence completed his undergraduate degree at the University of Newcastle in 2015 and has almost ten years engineering experience in the private sector. More recently, Laurence has completed a Master of Professional Engineering at the University of Newcastle in 2022 with a specific focus on Stormwater, Flooding and Disaster Risk Reduction.

Laurence is familiar with numerous engineering software including XP-RAFTS, DRAINS, TUFLOW, XP-STORM and HECRAS for water quantity modelling, MUSIC for water quality modelling, AutoCAD and 12D for Computer Aided Drawing as well as QGIS and ArcGIS for GIS processes.

Laurence has completed a number of flood and drainage studies for the purposes of rezoning, approval and construction. He has a strong interest in everything flooding and strives to produce the best possible outcome for his clients and the community.

Project Experience

Catchments & Flood Studies

- Melrose Park Residential Precinct
- Wentworth Road, Wallsend
- Signature Gardens Retirement Village, Rutherford
- Newcastle Golf Course, Fern Bay
- Canton Beach Boarding House, Canton Beach
- Inner Sydney High School, Surry Hills
- Talavera Road, Macquarie Park
- Macquarie Road Intersection, Cardiff
- Residential Apartments Nerigai Close, Elermore Vale
- Suttons Car Show Rooms, Homebush
- Eleebana Shores Retirement Village, Eleebana
- American Creek Debris Control Structure, Wollongong
- Byarong Creek Debris Control Structure, Wollongong

Flood Emergency Response Plans

- Aberdeen Street Service Station, Scone
- Resource Recovery Centre, Wetherill Park
- Daphne Street Boarding House, Botany
- Campsie Private Hospital
- Lingard Private Hospital
- Moree State Hospital
- Kempsey Youth Club
- Kayuga Fire Station
- Industrial Warehouse, Camellia

Property Development

- Aged Care Facility, Allambie Heights
- Ingleburn High School, Ingleburn
- Ashton Gardens Retirement Village, East Maitland
- Residential Apartments Banks Street, East Maitland
- M1 Twin Service Centres, Cooranbong
- Maitland Private Hospital, East Maitland

Sub-Divisions

- Claymore Urban Renewal Masterplan
- Huntlee, Branxton
- Residential Subdivision – Highland Avenue, Cooranbong
- Kingshill Residential Subdivision, Raymond Terrace
- Speers Point Quarry Residential Subdivision
- Black Hill Industrial Sub-Division
- Mardi Old Farm Residential Sub-division

Rezoning Studies

- Irrawang Highway, Tullimbar
- Nelson Bay Road, Fullerton Cove
- Stoney Creek Road, Beverly Hills

Dam Break Assessments

- Huntlee Main Basin, Huntlee
- Fairfax Road, Warners Bay
- Sydney Science Park, Luddenham
- Speers Point Quary, Speers Point