



Project Specific Environmental Management Plan

**(Construction Environmental Management Plan
for purpose of Development Consent reference)**

Penshurst Public School, Penshurst

PROJECT No. 6380

Grindley Construction Pty Ltd

55 Grandview Street

PYMBLE NSW 2073

Phone: 02 9988 3811

Fax: 02 9988 3575

Document Control

This plan is a key element of the environmental management system of Grindley.

This plan will be reviewed and updated as required and as a minimum at significant stages of the project where applicable such as commencement on site, completion of earthworks, completion of structure, completion of fit out and or at least six (6) monthly to reflect the changes occurring to the project.

Further information on this plan should be addressed to:

Project Manager
Rodney Peachey
02 9988 3811
mail@grindley.com.au

Date of Revision	Details of Changes Made	Revision Number	PM Approved
21/3/19	Project commencement, CC1 Submission	1	RP
12/6/19	Traffic Section Amended	2	RP
1/8/19	Environmental Plans (CEMP Rev. 1 and PSEMP Rev. 2) consolidated	3	RP
2/10/19	Sediment Control Plan Updated	4	RP
10/2/20	Company System and Enquiries and Complaints Management Update	5	RP

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1. INTRODUCTION

1.1 Environmental Policy



Environmental Policy

Grindley Construction was established in 1988 and has built a reputation based on our core value of Commitment. Commitment to being an environmentally and socially responsible organisation while meeting the needs of our clients without hindering future generations.

To achieve this we will:

- Document, implement and maintain an environmental management system
- Maintain and update our environmental management system to incorporate legislative regulative, and any other requirements to which we subscribe that relate to environment to ensure minimum compliance
- Senior management will demonstrate commitment to environmental sustainability
- Set measurable objectives
- Monitor performance
- Provide education and training to facilitate knowledge and experience
- Maintain and improve our environmental management system alongside our integrated management system
- Allocate appropriate resources to implement our objectives
- Strive to achieve greater environmental sustainability where our activities preserve natural resources for future generations

We acknowledge that the organisation operates in an environment where we have a responsibility to all, and are committed to continual improvement of and prevention of pollution.

Our policy documents how we will achieve our commitment to being environmentally and socially responsible. It governs how we manage the environmental impacts of our activities and it will be communicated to all those applicable in our operations. The policy will be reviewed regularly to maintain relevance and appropriateness to our organisation's objectives.

Handwritten signature of Alan Carstens in black ink.

Alan Carstens
Owner

Handwritten signature of Matthew Macauley in black ink.

Matthew Macauley
Chief Executive Officer

Handwritten signature of John Little in black ink.

John Little
Company Secretary

Environmental Policy
Doc.: 812 Version: 2 Date: 18/8/15

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1.2 AS/NZS ISO 14001 Certification



Statement of Certification

Grindley Construction Pty Ltd

Best Practice Certification Pty Ltd has assessed the above company as complying with the following management system standard requirements at the address shown.

Standard:	ISO 14001:2015 Environmental Management System Requirements	
Scope of Certification:	Commercial, Residential and Industrial construction for private and government clients.	
Head Office Address:	55 Grandview Street, Pymble NSW 2073 Australia	
Initial Certification Date:	28/07/2011	
Issue Date:	Expiry Date:	Certificate Number:
20/08/2019	29/09/2022*	42003586687E

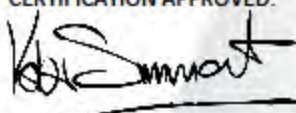
Additional Registered Entities Covered By This Certification: Grindley Interiors Pty Limited



Address: Suite 2, Level 2, Building B
122-126 Old Pittwater Road
Brookvale NSW 2100
Phone: 1300 402 602
Website: <https://bestpracticecertification.com.au>

* Subject to regular surveillance audits

CERTIFICATION APPROVED:



Kobi Simmat
Managing Director
Best Practice Certification Pty Ltd





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1.3 Project Management Plans

The Project Specific Environmental Management Plan is part of Grindley's integrated management system, the plan is to be read in conjunction with the Project's other documentation and Grindley's Management System.

The overall format and content of this plan has been structured to fully meet the requirements of ISO 14001 Environmental Management Systems.

1.4 Objectives

- Increase amount of waste being recycled, reduce waste costs
- Have an environmental officer on each site
- Comply with all legislation requirements and conditions of the development consent
- Reduce the amount of environmental impact our operations have on the environment
- Individual targets are reviewed and set each year based on our significant impacts and are detailed in impact mitigation plans

1.5 Scope of Works

The demolition, excavation, civil and construction works associated with the Penshurst Public School Upgrade to accommodate up to 1,012 primary school age students. An overview of the works is as follows:

- The removal of all existing buildings and structures on the site, including heritage structures and demountable buildings.
- The removal of approximately 25 trees.
- Excavation works to accommodate new buildings and structures.
- Construction of three storey buildings (ground, first and second floor), with a rooftop playground.
- External landscape works including hard, soft landscaping and a new carpark.
- Boundary works including retention walls and fences.
- Works to the curtilage including footpath and roadway amendments.
- The removal of existing and provision of new (and amended) engineering infrastructure (electricity and power substation, gas, water stormwater, sewer, communications, obtaining registration of Section 88b instruments etc) both within the boundary of the site and connection from the boundary of the site to statutory services providers' points of connection off the site.

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1.6 Reference Documents

The following documents will be referenced for use in this Plan:

Contract Specifications and Drawings
Project DA and consultant reports

1.7 General Applicable Regulatory Requirements

The following are legislative requirements that are applicable to Grindley Construction's business:

- Protection of the Environment Operations Act 1997

This Act covers the scope of issuing licences regarding environmentally hazardous activities, issuing offence notices, establishing environmental protection policies, instituting proceedings, investigating breaches and auditing activities.

- Waste Avoidance and Resource Recovery Act 2001

The objectives of the Waste Avoidance and Resource Recovery Act 2001 are to encourage the most efficient use of resources, to reduce environmental harm, and to provide for the continual reduction in waste generation in line with the principles of ecologically sustainable development (ESD). To meet the objectives of the Act, a resource management hierarchy has been established, comprising; avoiding unnecessary resource consumption; recovering resources (including reuse, reprocessing, recycling and energy recovery); and disposal (as a last resort)

- Environmental Planning and Assessment Act 1979

The objects of this Act is to encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment, and to promote ecologically sustainable development

- Environment Protection and Biodiversity Conservation Act 1999

This is the federal Act that protects the environment, particularly matters of National Environmental Significance (Protected matters). It streamlines national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places.

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- Environmental Hazardous Chemicals Act 1985

The Act sets up the Hazardous Chemicals Advisory Committee. Its functions include advising the EPA in relation to the assessment and control of chemicals that are environmentally hazardous. The EPA may assess chemicals under the Act.

The EPA may declare substances to be chemical wastes for the purposes of the Act. Examples of substances that have been so declared include dioxin contaminated waste materials and PCB (polychlorinated biphenyl) wastes.

- Heritage Act 1977

This Act aims to protect land, buildings, movable objects and other locations and items that are deemed to have State Heritage Significance or Local Heritage Significance.

- Soil Conservation Act 1938

An Act to make provision for the conservation of soil resources and farm water resources and for the mitigation of erosion

- Contaminated Land Management Act 1997

This Act enables the EPA to respond to contamination that is causing a significant risk of harm to human health or the environment and sets out criteria for determining whether such a risk exists.

1.8 Project Specific Applicable Regulatory Requirements

- State Significant Development (SSD) 8365 dated 21st February, 2019

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2. PROJECT PLANNING

2.1 Systems and Procedures

The Project Manager is responsible for the implementation of this Project Specific Environmental Management Plan for the project.

The Project Manager and his nominees shall review weekly the effectiveness of the system and will consider project safety and environmental issues.

Preparation of project programs and monitoring of progress shall be carried out from time to time as required. The Project Manager shall address any changes required by the client or by virtue of latent conditions, safety considerations or environmental considerations and update the program accordingly.

When a non-conformance or incident is detected, it shall be addressed according to Procedure 787 Non-Conformance. When it is necessary to seek concession, the Project Manager shall act according to the requirements of this procedure. The corrective action and improvement to prevent the reoccurrence of non-conformance/incident is also covered in the Procedure 787 Non-Conformance.

2.2 Strategy

Construction of Penshurst Public School, Penshurst will be via a GC21 (Edition 2) Contract and the Project Specific Construction Management Plan (PSCMP).

The Project management team will be responsible for:

- Site establishment
- Temporary fencing of compound to ensure security
- Hoarding off to any existing facilities to ensure resident and staff safety.
- Environmental protection apparatus being correctly installed and or maintained ready for use in case of emergency
- Site inductions, environmental & safety meetings
- Production, review and approval of work method statements and Waste Management plans
- Monitoring adherence to Waste Management plans as per Head Contract
- Monitoring inspection and testing methods and records
- Implementing Project Quality, Environmental and Safety plans
- Monthly reporting of progress

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2.3 Project Designers and Consultants

Contact details for project designers and consultants are established and distributed by the superintendent on initiation of the project. Some of these are displayed on the wall of the site office, as well as filed in the appropriate folder.

PROJECT DISCIPLINES	CONSULTANT COMPANY & NAME
Council	Georges River Council
Client	NSW Department of Education, Jane Hagan
Client Superintendent	Root Partnerships, William Blake
Project Architect	Perumal Pedavoli Architects, Katherine Longhurst
Head Contractor	Grindley Construction, Rodney Peachey
Arborist	Glenyss Laws
Quantity Surveyor	WT Partnership, Paul Feng
Landscape Architect	Lorna Harrison, Lorna Harrison
BCA Certifier	Group DLA, Nick Aitchison

2.4 Inspections

The importance that Grindley places on the environmental aspect of its business is shown by the constant inspection program it puts its sites through. Environmental inspections will occur at least once a week on every site.

Weekly and after intense or prolonged inclement weather site inspections are conducted by Site Management using Procore Inspection Environmental Inspection, monthly Project inspections are conducted by the WHSEQ Manager using Procore Inspection WHSEQ Monthly Project Inspection.

2.5 Internal Audit Schedule

Internal audits will be conducted on all project activities as well as company nominated activities to provide a further review process for the effective management of this project and the management systems generally. The following project elements will be audited at the times indicated which is outlined in the audit schedule (form 506):

- Project Safety Plan – (six (6) monthly)
- Project Quality Plan – (six (6) monthly)
- Project Environmental Plan – (six (6) monthly)

Reports of all audits conducted on the project shall be distributed to the following:

- Grindley Construction - Construction Manager
- Grindley Construction - Project Manager

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- Grindley Construction - Site Manager
- Grindley Construction Management Review Meeting

2.6 Neighbour Notification

Managing Neighbour interfaces with the construction process is an important part of the process of environment interaction. The following processes will be undertaken by Grindley to inform neighbours of the work as well as provide a contact point:

- Site Sign will be erected giving contact details of the site manager to be contacted for any concerns/queries regarding the construction works
- Letters will be issued to all immediate neighbours also with Grindley contact details as well as an indicative start and duration of construction activities (If required).

2.7 Construction Hours

Site Operation Hours:

Monday – Friday 07:00 – 18:00

Saturday 08:00 – 13:00

2.8 Enquiries and Complaints Management

All enquiries and complaints are managed by NSW Department of Education.

Any enquiry or complaint received by Grindley will be forwarded onto the NSW Department of Education as soon as practical.

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3. MANAGEMENT RESPONSIBILITIES

3.1 Position Descriptions

Construction Manager – Evan Graves

Responsibilities and Authorities

- Overall control of system compliance
- Review of system administrations

Project Manager – Rodney Peachey (Reports to Construction Director)

Responsibilities and Authorities

- Control of system compliance
- Supervision of head office process control
- Oversee site process control
- Internal monthly reporting
- Sub-contract administration and payment
- Review all incident/non-conformance records, accident & incident reports and audit reports
- Authorise subcontract tendering and subcontract procedures, and establish an administrative system to monitor the subcontracts and the payment of subcontractors in relation to their environmental responsibilities

Contracts Administrator – Mitchell Thorburn (Reports to Project Manager)

Responsibilities and Authorities

- Ensure that all dockets required by EPA guidelines for waste and spoil removal are present before invoices are processed
- Ensure that waste removal contractors provide monthly reports of waste removed from sites.

Site Manager – Steve McInerney (Reports to Project Manager)

Responsibilities and Authorities

- Implement and ensure adherence to Project Plan and all associated sub-plans
- Implement all environmental plans and procedures as required

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- Co-ordination of all on site activities including trade interface
- Organisation of all deliveries and managing materials handling
- Establish and maintain site environmental measures
- Review all Subcontractor Management Plans and waste management plans submitted and obtain approval from Project Manager before allowing work to commence on site
- Implementation of all inspection and testing requirements
- Liaison and co-ordination with testing and inspection authorities
- Preparation of check sheets and supervision of remedial works
- Liaise with Project Manager to co-ordinate the works and resources required

Site Environment Officer – Steve McNerney
(Reports to Site Manager)

Responsibilities and Authorities

- Ensure compliance with environmental plans and regulations
- Isolate and report any environmental spills/events to site manager and Environmental Manager
- Conduct weekly site inspections
- Conduct inspections after intense or prolonged inclement weather
- Ensure all environmental protection equipment is in place
- Advise the Site Manager / Foreman on areas of concern
- Quarantine unsafe work areas, materials, plant and equipment
- Identify and report potential environmental impacts and risks
- Assume the role of company Representative for the Environment on site

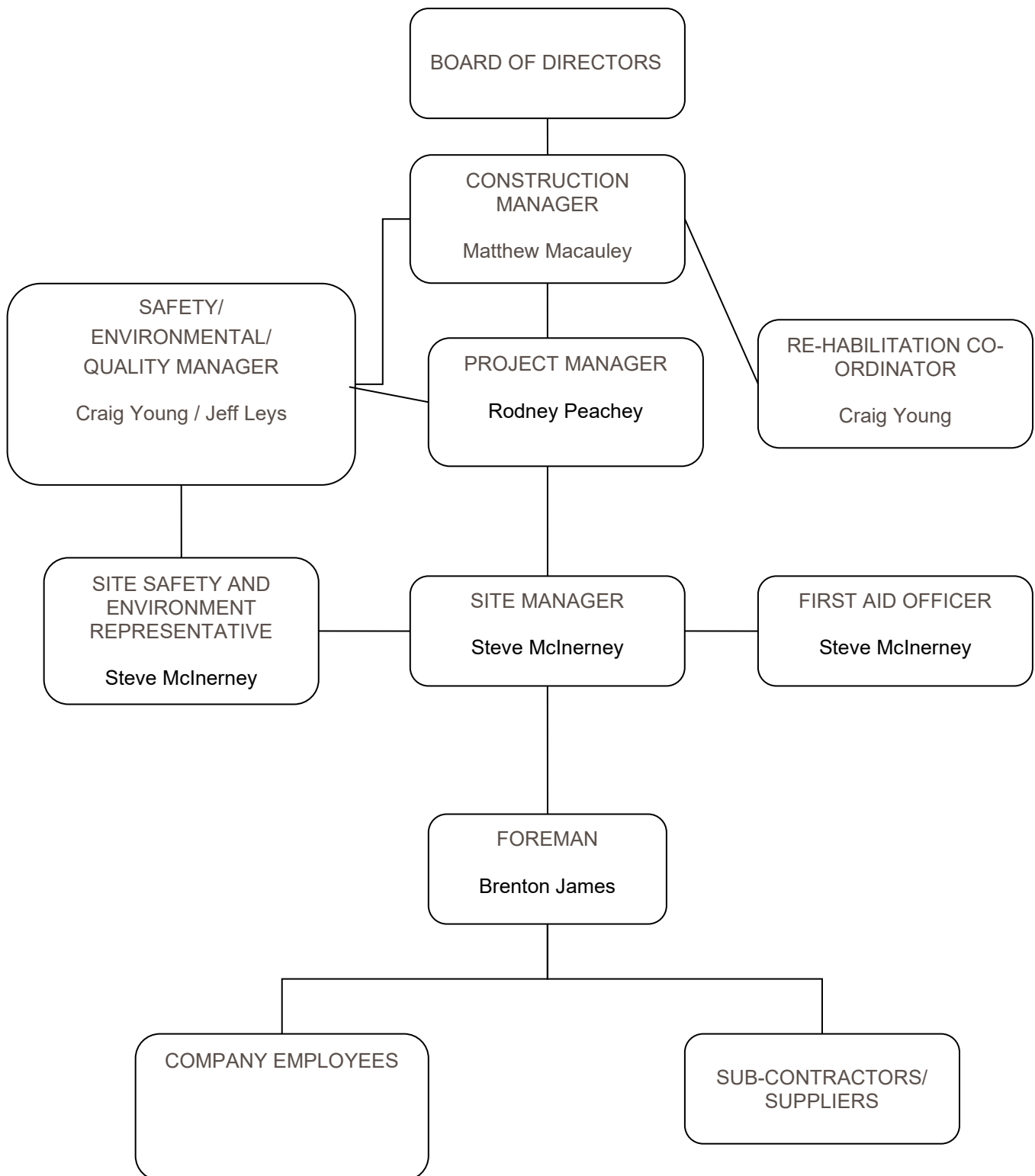
Subcontractors

Responsibilities

- Ensure compliance with environmental plans and regulations
- Ensure all required paperwork is presented on submission of progress claims

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3.2 Project Organisational Chart



4. SITE EMERGENCY RESPONSE PLANS

4.1 Emergency Response Plan

In the event of any emergency the Site Manager must be contacted to ensure the appropriate action is taken.

POTENTIAL EMERGENCY	WHAT TO DO?	RELEVANT AUTHORITIES & PERSONS
Injury caused by: • Fire • Explosion • Machinery accidents • Minor injuries	• For serious injuries call an ambulance. You should also have the contact details of the nearest doctor, Medical Centre and Hospital. • Immediately inform the site First Aid Officer. • Follow the procedures as detailed in the Site Safety plan. • For major injuries contact the Site Manager or Project Manager	• Emergency Services • Nearest Doctor • Medical Centre • Site Manager • Project Manager
Fire • Fire at the diesel tank • Fire at any of the machineries • Fire caused by vandalism	Evacuate all personnel to a safe area immediately. • Call the Fire Brigade (Emergency Services). • If the fire is likely to damage neighboring property inform the adjacent residents. • Follow the procedures as detailed in the Site Safety plan. • For major fire emergencies, contact the Site Manager or Project Manager	• Emergency Services • Site Manager • Project Manager • Adjacent residents
Explosion (e.g. rupture in a gas line)	• Evacuate all personnel to a safe area immediately. • Call the Emergency Services immediately. • Contact the neighbouring residents. • If service related, call the relevant service provider (e.g. AGL) • Follow the procedures as detailed in the Site Safety Plan • Contact the Site Manager or Project Manager	• Emergency Services • AGL • Site Manager • Project Manager • Adjacent residents
Spills • Major spill when filling the diesel tank • Major spill from the diesel tank stored on-site • Spill or release of other hazardous chemicals of material	• For major spills, immediately call the Fire Brigade. • Identify the source of the spill. • Refer to the Material Safety Data Sheet (MSDS) and quickly evaluate the hazards of the material. • If the material is dangerous, evacuate the site immediately and notify the neighbours. • If it is safe, stop the source of the spill immediately. • Contain the spill and control its flow. • Block storm water drains downstream of the spill. • EPA and local council must be notified about any spills that are likely to threaten the environment.	• Emergency Services (fire brigade) • DEC • Council Officer • Site Manager • Project Manager • DNR

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	• If the spill is likely to impact on the catchments, contact Department of Natural Resources (DNR) immediately. • Clean up small spills promptly to prevent run-off into the storm water system. • Contact the Site Manager or Project Manager	
Heavy rainstorm and flood – beyond the capacity of the sediment and erosion controls on-site. Or, failure of the sedimentation control measures.	• Contain/minimise the flow. • Contact Council immediately. • Investigate reasons for failure and prepare an incident report including details of five-day rainfall figures. • Contact the Project Manager	• Council • Site Manager • Project Manager
Discovery of items of conservation value (e.g. flora & fauna, heritage)	• Fence off the area as “no go” zone and contact the Site Manager or Project manager immediately for further action.	• Site Manager • Project Manager
Discovery of contaminated material on-site (e.g. underground fuel storage tanks)	• Fence off the area as “no go” zone and contact the Site Manager or Project manager immediately for further action.	• Site Manager • Project Manager
Rupture of Authority pipelines (water pipes, sewerage pipes)	• Contain/minimise the flow • Ensure all spilled materials are contained on site or if running off site are directed through sediment control measures • Block storm water drains downstream of the spill. • Contact relevant authority as soon as possible • EPA and local council must be notified about any spills that are likely to threaten the environment. • If the spill is likely to impact on the catchments, contact Department of Natural Resources (DNR) immediately.	• Relevant Authority • DEC • Council Officer • Site Manager • Project Manager • DNR
Waste contractor not submitting waste dockets and illegally disposing of waste in an unauthorized facility	• Immediate contact with contractor to establish reasons • Hold all payments to contractor • Request waste dockets for approved facility • Notify local council where waste is being deposited (section 148 POEO Act 1997)	• Site Manager • Project Manager • Environment Manager • Council Officer

4.2 Emergency Contacts

Name	Contact Details
Emergency services including Fire Brigade, Ambulance and Police	000
Nearest Medical Centre	Ashby Medical Centre Business Hours +61 2 9579 6777 After Hours +61 2 8724 6300
Nearest Hospital	St George Hospital +61 2 9113 1111
NSW EPA	Pollution Line Tel: 131 555
Local Council	Georges River Council
Site Manager (24 hour contact)	Steve McInerney +61 416 019 427
Project Manager	Rodney Peachey +61 458 099 494
Construction Manager	Evan Graves +61 2 9988 3811
Ausgrid	13 13 88
Jemena Gas Network (NSW)	13 19 09
Sydney Water	13 20 90
Waste Disposal	TBA

4.3 Incident and Non-conformance procedure

In the case of an environmental incident flowchart 757 – Environmental Emergency Response must be followed and all aspects of the incident addressed and entered to the relevant logs for appropriate review.

4.4 Environmental Impact Issues

4.4.1 Air Quality and Dust Management

Air quality and dust management is the responsibility of the site manager. As per Impact Mitigation Plan 006 (IMP006) dust minimisation techniques are to be employed as needed during construction, including the use of water carts as necessary. Air quality is to be managed through the proper maintenance of all machinery on site as per Plant and Equipment Inspection Checklist (Form 161). Any incidents where poor air quality becomes an issue is to be assessed on a case by case basis and managed according to all relevant legislation.

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4.4.2 Contaminated water and soil

Refer 6.1 Unexpected Contamination Finds Protocol

4.4.3 Cultural Heritage

Refer 6.2 Unexpected Aboriginal and Non-Aboriginal Heritage Finds Protocol

4.4.4 Flora and Fauna

Flora and Fauna on the site will be managed through the recommendations of the Flora and Fauna conditions detailed in the DA approval and any subsequent conditions will be complied with as detailed.

4.4.5 Noise

Noise impacts from construction are an ongoing concern for all construction projects. Construction noise management will be in accordance with the Acoustic Assessment Report (Construction Noise and Vibration Management Sub-Plan for the purpose of Development Consent reference) Sections 9.0, 10.0 and 11.0 (refer Appendix B) and will be the responsibility of the Site Manager to enforce.

4.4.6 Traffic

Traffic management will be in accordance with the Construction Traffic Management Plan (Construction Traffic and Pedestrian Management Sub-Plan for purpose of Development Consent reference) (refer Appendix A) and will be the responsibility of the Site Manager to enforce.

The effectiveness of the TMP control measures will be monitored regularly, in particular the Environmental Inspection conducted weekly will formally prompt the inspection of the effectiveness of the control measures in addition to the informal observations made by Site Management in their day to day operations.

4.4.7 Waste Management

Waste Management will be in accordance with the Waste Management Plan (Construction Waste Management Sub-Plan for purpose of Development Consent reference) (refer Appendix C) and Impact Mitigation Plan 004 (IMP004). A waste management plan will be developed in conjunction with the selected waste contractor for the project and will be audited at random intervals throughout the course of the project.

All waste is to be classified in accordance with the Protection of the Environment Operations Act and all material to remain on site is to be validated in accordance with the Remediation Action Plan.

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Waste Management Plan

Type	Estimated Volume (m³)	Recycled		Landfill	
		Estimated Volume (m³)	Disposal Location	Estimated Volume (m³)	Disposal Location
Green Waste	80	80	Plateau Trees		
Bricks	1500	1500	Concrete Recyclers		
Concrete	1500	1500	Concrete Recyclers		
Timber	250			250	Genesis
Plasterboard	250			250	Genesis
Metals	200	200	One Steel		
Asbestos	30			30	Genesis
Roof Tiles	100	100	Concrete Recyclers		
Carpet	100			100	Genesis
Total	4010	3380		630	

4.4.8 External Lighting

External lighting if any is to comply with AS 4282 Control of the obtrusive effects of outdoor lighting.

5. SEDIMENT AND EROSION CONTROL

This section identifies sediment control systems to be implemented on the project. The sediment control systems are designed to minimise erosion on-site and retain sediment eroded by water and wind.

Sediment and erosion control will be in accordance with the Stormwater Management Report (Construction Soil and Water Management Sub-Plan for purpose of Development Consent reference) and Sediment and Erosion Control Plan and Details Series Number CW2 Revision C (refer Appendix D). These documents have been prepared in accordance with Landcom's guide on Managing Urban Stormwater (the "Blue Book")

The erosion and sediment control measures described will be installed during site preparation works along with the site fences and sheds. These devices will be in place throughout all construction phases, especially excavation.

Weather forecasts will be monitored and where significant inclement weather is identified, Site Management will review the current status of the sediment and erosion control measures and where applicable action any observations.

Review of such control measures will include but are not limited to:

- Bins/areas used for concrete and mortar slurries, paints, acid washing, lightweight waste materials and litter are clean, tidy and reflect a status that will not allow for the weather to dislodge such waste
- Drains, diversion banks, table drains, berm drains, drop-down structures, sediment fences and alike are clean, free from obstructions that would prevent the removal of stormwater and operating as intended
- Material stockpiles are protected and placed in a manner to prevent erosion of materials entering the stormwater system
- Vegetative growth is maintained to ensure water flow is not impeded
- Unsealed roads and other exposed surfaces control measures are adequate
- Sediment detention system is in good working condition
 - o Water is still being diverted towards the system
 - o Degradable products such as straw bales are in acceptable condition
 - o Sediment is at an acceptable level
 - o Water requiring pumping is treated to ensure water entering the stormwater system is acceptable
- Controls measures are adequate to handle the forecasted inclement weather

Following periods of significant inclement weather Site Management will conduct an Environmental Inspection, as described in 2.4 Inspections.

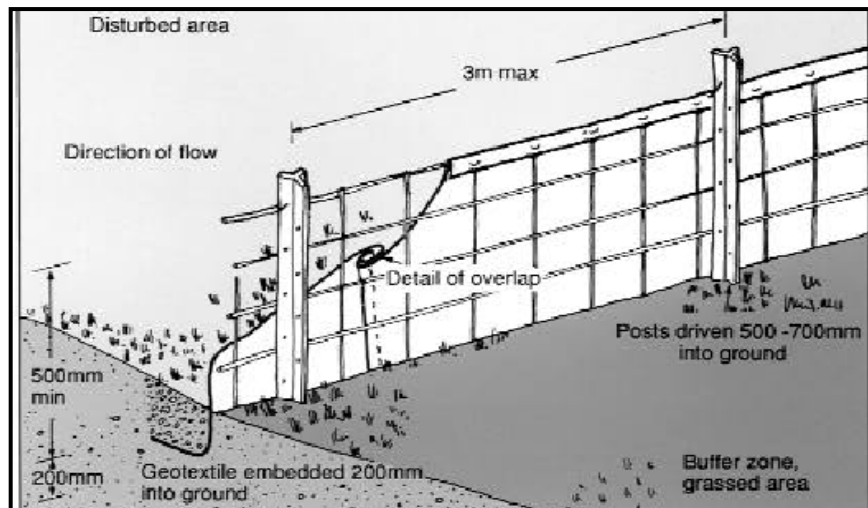
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5.1 Sediment and Erosion Control Devices

Unnecessary disturbance of the site shall not occur and all cuts are to be stabilised as soon as possible after the completion of site earthworks. Extra care will be taken to prevent sediment run off into all neighbouring lots and stormwater. Any collected silt will be disposed of in accordance with all other relevant codes and standards.

5.1.1 Silt Fences

Silt fences are to be installed to all site boundaries. Geotextile fabric will be fixed to the temporary construction fencing to the 'downhill' boundaries of the site. The fabric will be turned down under the existing ground line and secured at regular intervals not exceeding 3m in accordance with the following diagram.



5.1.2 Vehicle Access

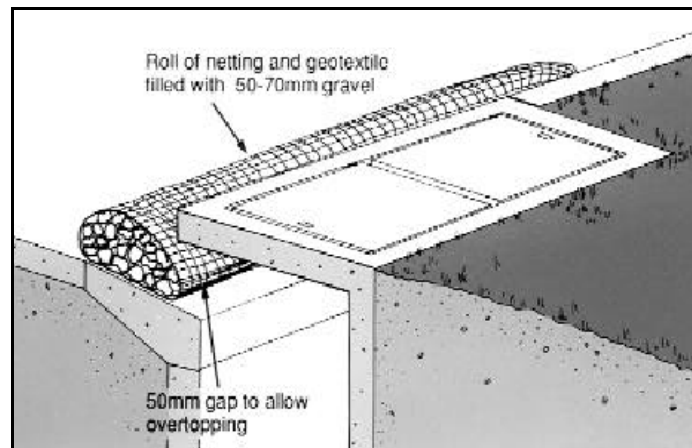
Vehicular access will be controlled to prevent sediment being tracked. This will be done by maintaining an all weather access/driveway composed of an approved course aggregate surface. Also if the need arises a shaker grid will be installed to the main access by Grindley Construction during the construction works. Any sediment that is tracked onto the surrounding roads will be cleaned off in a timely manner.

5.1.3 Stormwater Inlets

All stormwater inlets are to be covered with geotextile fabric in a roll or other format to ensure that no sediment enters into the stormwater system. This will be the responsibility of the Site Manager to enforce. The rolls will not only be placed directly at the inlets as shown below, they will also be placed at regular intervals in the gutters 'upstream' from the inlets creating multiple barriers.

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Project Specific Environmental Management Plan



5.1.4 Stockpiles

If appropriate topsoil is to be stockpiled on site then the following measures will be put in place. If stockpiling is required, stockpiles shall be stored at least 2 meters clear of drainage lines, natural watercourse and established trees.

Stockpiles will have temporary silt fences in place around the stockpiles to create an enclosure and if necessary they will be covered with shade cloth or tarpaulin to retain the materials on the stock pile. The location of stock piles will be determined on site.

5.1.5 Waste Enclosures

Dedicated building waste enclosures will be set up around the site to enclose building waste where required. No waste enclosures will be set up outside of the site boundary.

5.1.6 Dust Control

The shade cloth to the boundary fences will be maintained throughout all stage of construction to assist in dust control. Also if the need arises due to excessive dust being created, the site will be watered down by a water truck where possible, and/or sprinklers and hoses. Also all stockpiled soils will be covered during periods of high wind to reduce the dust created from on site storage.

5.1.7 Monitoring

In order to maintain the various erosion and sediment control devices, regular inspections, repairs and cleaning will be carried out on the silt fences to the boundaries, stockpiles, waste enclosures, and to the stockpile covers.

Inspections of the site erosion and sediment control devices will be carried out in accordance with section 2.4 of this Management Plan.

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6. UNEXPECTED FINDS PROTOCOL

6.1 *Unexpected Contamination Finds Protocol*

In the event of any unexpected contamination being encountered, all work in the immediate area is to cease and the following is to occur:

- Area to be secured to prevent disturbance
- Pending the type of contamination, an appropriately qualified environmental consultant is to be contacted to attend site and assess the extent of remediation if any that may be required
- If remediation is required, upon completion of, appropriate validation is to be confirmed, once received works can recommence

6.2 *Unexpected Aboriginal and Non-Aboriginal Heritage Finds Protocol*

In the event of any unexpected heritage related Aboriginal or Non-Aboriginal items being encountered, all work in the immediate area is to cease and the following is to occur:

- Area to be secured to prevent disturbance
- Pending the type of items being encountered the following is to occur:
 - o Aboriginal Heritage
 - An appropriately qualified archaeologist and the registered Aboriginal representatives is to be contacted to attend site to determine the significance of the objects
 - Consultation with the archaeologist, Aboriginal representatives and the Office of Environmental and Heritage (OEH) to develop and implement management strategies
 - Written approval from OEH is to be received, once received works can recommence
 - o Non-Aboriginal Heritage
 - Contact OEH Heritage division
 - Written approval from OEH is to be received, once received works can recommence

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APPENDIX A – Construction Traffic and Pedestrian Management Sub-Plan

Traffic Assessment
Prepared by TTM
Rev 13
Refer Section 7

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Traffic Assessment

Penshurst Public School

Perumal Pedavoli Architects



About TTM

For 30 years, we've been at the centre of the Australian development and infrastructure industry. Our unique combination of acoustics, data, traffic and waste services is fundamental to the success of any architectural or development project.

We have over 50 staff, with an unrivalled depth of experience. Our industry knowledge, technical expertise and commercial insight allow us to deliver an exceptional and reliable service.

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Revision Record

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1 Introduction

1.1 Background

TTM Consulting was engaged by NSW Department of Education to prepare a traffic assessment report for a proposed school expansion and upgrades at Penshurst Public School to accommodate a student population increase from around 439 students in 2016 to 1,012 in the future.

This report has been prepared to address the Transport and Accessibility issue (Key Issues No.5) of the Secretary's Environmental Assessment Requirements (SEARs), reissued by the Department of Planning and Environment on 29 September 2017.

The proposed upgrade of Penshurst Public School will result in approximately 59 full time equivalent staff and 31 other staff. The site is currently occupied by Penshurst Public School catering for students between kindergarten and year 6.

A survey was conducted of how students and staff currently travel to and from the school in September 2017. The survey asked students and staff to identify their time of arrival and departure and their mode of travel (car passenger, car driver, bus, walked, cycled etc.). Staff who drove were also asked where they parked.

1.2 Scope

This report investigates the transport aspects associated with the proposed development. The scope of the transport aspects investigated includes:

- Parking supply required to cater for development demand.
- Parking layout to provide efficient and safe internal manoeuvring.
- Identification of likely traffic volumes and traffic distribution from the future development.
- Identification of likely traffic impact of development on the public road network.
- Access configuration to provide efficient and safe manoeuvring between the site and the public road network.
- Access to suitable levels of public transport.

To assess the proposed transport arrangements, the development plans have been assessed against the following guidelines and planning documents:

- Hurstville Local Environmental Plan 2012.
- Hurstville Development Control Plan 2016.
- RTA (RMS) Guide to Traffic Generating Developments.

1.3 Site location

The subject site is located at 18 Arcadia Street Penshurst (see Figure 1-1 and Figure 1-2). Currently there are another two schools located near the subject site: St Declan's Catholic Primary School and Georges River College – Penshurst Girls Campus (see Figure 1-1). Each school has frontage to different roads.

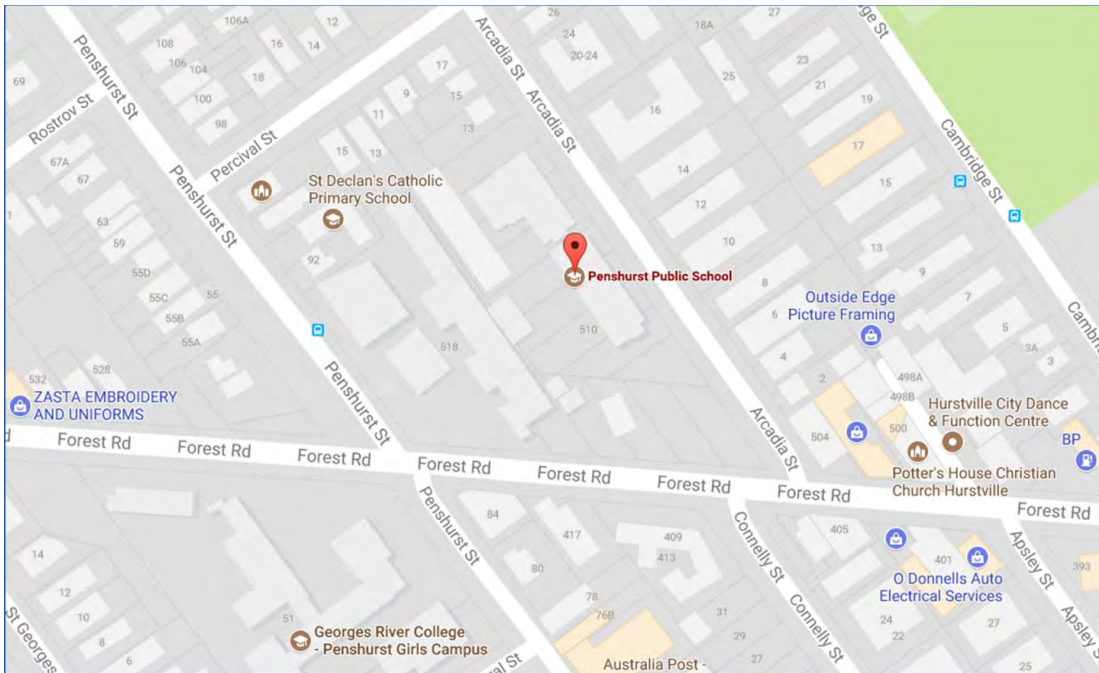


Figure 1-1: Site location



Figure 1-2: Aerial image of the site

1.4 Development profile

Penshurst Public School is currently operating as a primary school. 439 students and 34 full-time equivalent staff were at the school in 2016¹.

The proposed upgrade of Penshurst Public School will result in the following staffing arrangements:

- Full time equivalent staff from 34 to 59.
- Other staff from 18 to 31.

Student numbers will increase to 1,012 which will occur gradually over time.

15 car parking spaces will be provided on site, one of which will be an accessible parking space. This will match existing provision as noted below. Additional staff are expected to park on street or use alternative travel modes to access the school.

1.5 Parking

There are currently 15 parking spaces on site. The proposed development provides for 15 car parking spaces on site including one accessible space. The carpark layout is designed in accordance with AS2890.1 and AS2890.6.

TTM has been advised that provision of additional parking on site is not feasible due to limitations on the site area and the building footprint.

Nevertheless, there are opportunities to extend the Kiss and Ride provisions on Arcadia Street.

The car park layout is presented in Appendix A.

¹ Source: My School (<https://www.myschool.edu.au/SchoolProfile/Index/104412/PenshurstPublicSchool/41045/2016>)

2 Existing transport infrastructure

2.1 Road network

The subject site has frontages to Arcadia Street and Forest Road. These roads and the other roads near the site (except for King Georges Road) are maintained and controlled by Georges River Council.

The road characteristics are shown in Table 2-1.

Table 2-1: Road characteristics

Road	Speed Limit	Lanes	Road Authority
Arcadia Street	50kph	2 (undivided)	Council
Forest Road	60kph	4 (divided)	Council
King Georges Road	60kph	6 (divided)	RMS
Percival Street	50kph	2 (undivided plus parking)	Council
Penshurst Street	50kph	2 (divided plus parking)	Council

Arcadia Street has an 8 metre wide carriageway at the site frontage. The intersection of Arcadia Street and Forest Road is a priority controlled intersection. The intersection of Penshurst Street and Forest Road is traffic light controlled.

2.2 Public transport

The site is located within 700 metres walking distance of the Penshurst Railway Station which is on the T4 Eastern Suburbs and Illawarra Line. Bus stops are located within 400 metres walking distance from the site to Penshurst Street, and Cambridge Street. These routes include:

- Buses stopping on Penshurst Street:
 - Route 940: Hurstville to Bankstown via Riverwood
 - Route 941: Bankstown to Hurstville via Greenacre
 - Route 943: Lugarno to Hurstville
 - Route 944: Bankstown to Hurstville via Peakhurst Heights
 - Route 945: Hurstville to Bankstown via Mortdale
- Buses stopping on Cambridge Street:
 - Route M91: Hurstville to Parramatta via Padstow and Chester Hill

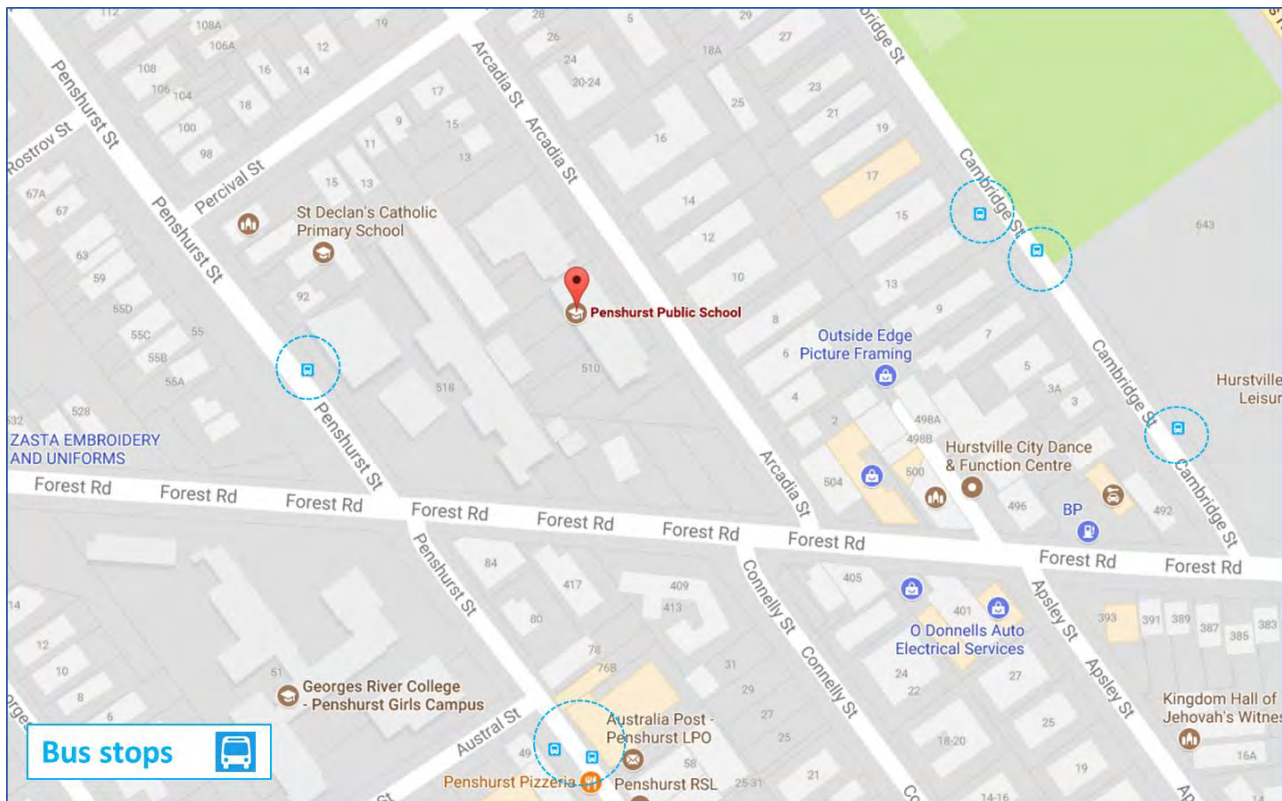


Figure 2-1: Bus stop locations

The M91 Route is a high frequency regional bus route connecting Parramatta to Hurstville via Bankstown Central Shopping Centre, Westfield Hurstville Shopping Centre, Parramatta Railway Station, Bankstown Railway Station and Eventide Village. This service provides buses every 10 minutes in morning and evening peak periods, and every 15 to 30 minutes during the off-peak periods.

The M91 bus route is shown in Figure 2-2.

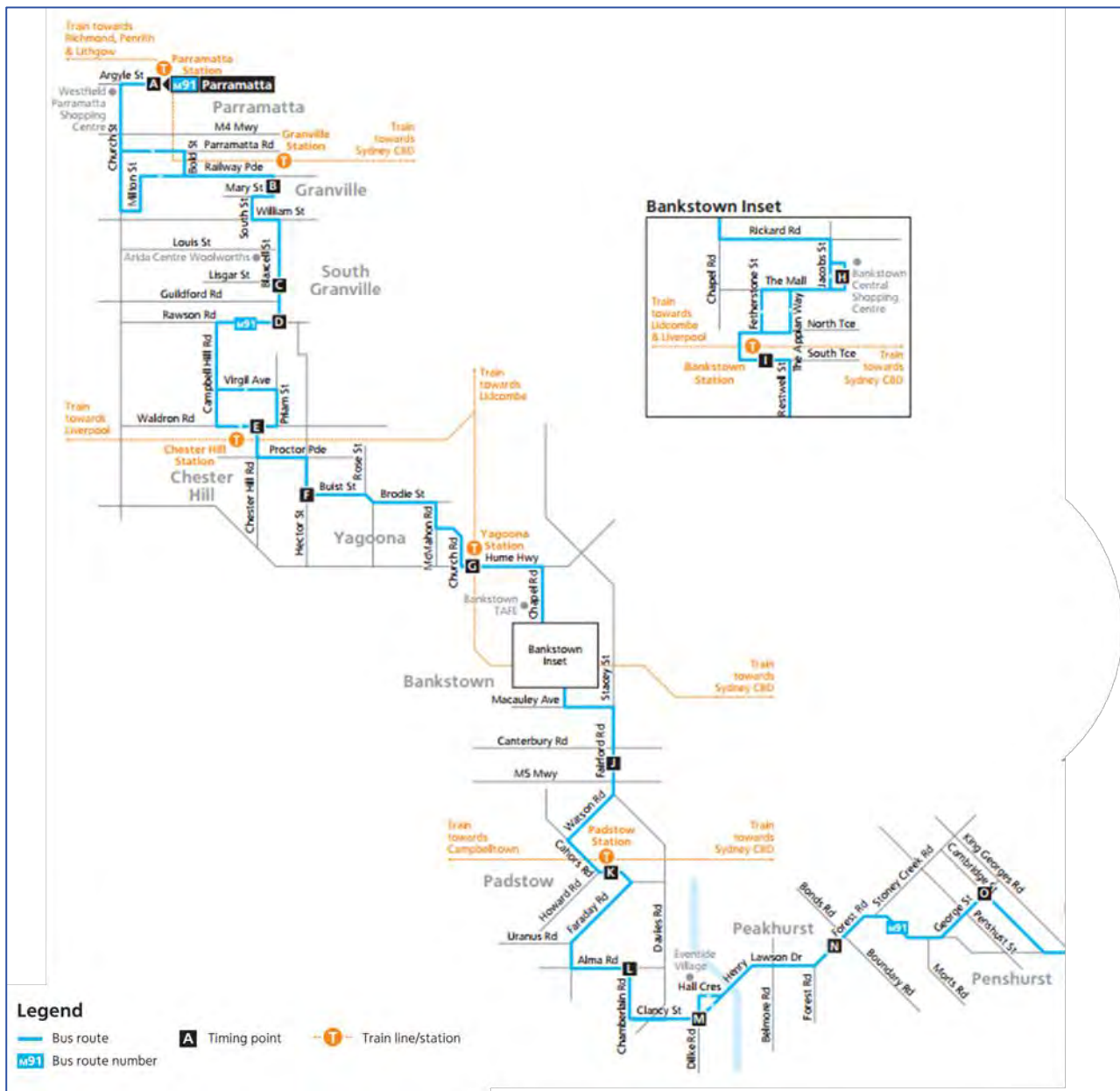


Figure 2-2: M91 Bus route

2.3 Walking and cycling infrastructure

Pedestrian footpaths are located on Arcadia Street, Forest Road, Percival Street and the streets surrounding the site, as shown in Figure 2-3.



Figure 2-3: Existing pedestrian footpath on Arcadia Street

Designated cycle routes are located within the vicinity of the site along Penshurst Street, Woniora Road and Hillcrest Avenue.

Bike network maps from Council and the NSW Roads and Maritime Services (RMS) are shown in Figure 2-4 and Figure 2-5, respectively.

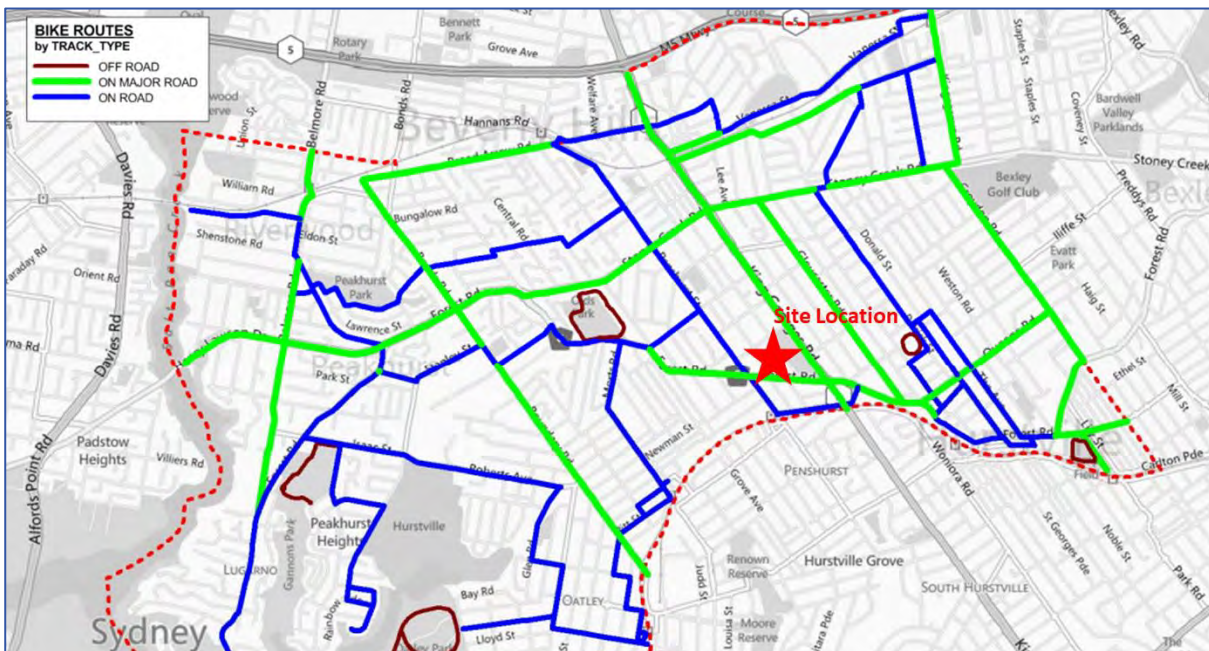


Figure 2-4: Hurstville cycleways map²

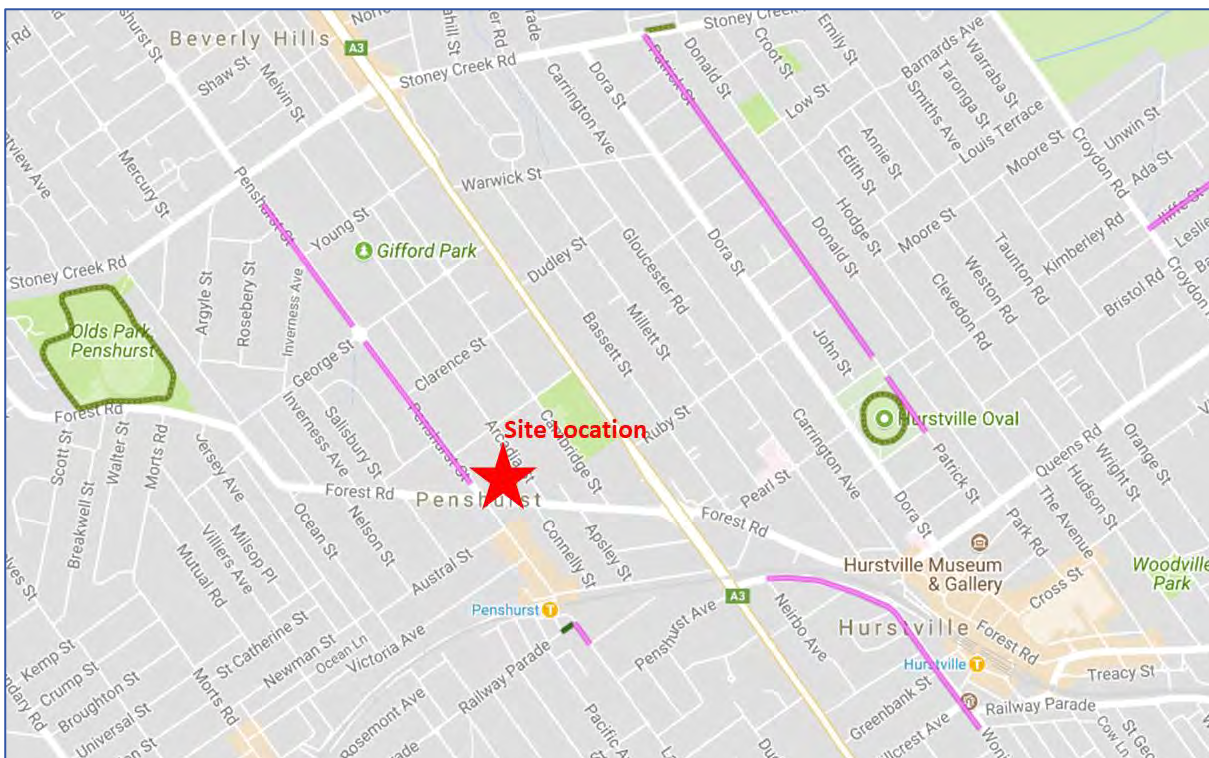


Figure 2-5: NSW RMS cycle network map³

² Source: <http://www.hurstville.nsw.gov.au/Cycleways.html>

³ Source: <http://www.rms.nsw.gov.au/roads/bicycles/cyclewayfinder/index.html>

2.4 On street parking

A review was undertaken of on-street parking around the proposed site. Parking controls are presented in Figure 2-6.



Figure 2-6: Street parking near the site

A traffic light crossing is located at the intersection of Forest Road and Penshurst Street. A Children's crossing is located on Arcadia Street at a raised pedestrian crossing. Flags for the crossing are put out in the morning and afternoon by the school (see Figure 2-7). The crossing is manned before and after school.



Figure 2-7: Children's crossing on Arcadia Street

2.5 Staff parking

Staff parking is currently located on-site in one car parks via Arcadia Street. Up to 15 staff cars can be accommodated on site.

Unrestricted on-street parking spaces are available near the school on Arcadia Street, Percival Street, Penshurst Street and Clarence Street. A site inspection was conducted by TTM staff between 8am and 10am on 31st July 2017. It was observed that on street parking on Arcadia Street between Forest Road and Percival Street was nearly fully occupied in the morning. There were vacant spaces in surrounding streets. It is our view that supply is adequate for the current parking demand.



Figure 2-8: School on-site car park

2.6 Pick-up and Drop-off Facilities

Pick-up and drop-off facilities are provided in the frontage of the site on Arcadia Street (see Figure 2-9). Currently here are about 12 standard car spaces and one accessible space are designed as pick-up and drop-off facilities.



Figure 2-9: Kiss & Ride zone on Arcadia Street

2.7 Surveys of existing student and staff travel

2.7.1 Student Mode of travel to school

Table 2-2 presents a summary of the existing modes used by students to travel to and from school. A separation has been provided for arrivals and departures during school peak hour (8 to 9 am & 2:45 to 3:45 pm) and other times.

The weighted percentages of student related cars arriving and departing as car passengers are presented. This weighted average provides an allowance for car occupancies where some parents drive more than one student to or from school.

Table 2-2: Existing student mode of travel to and from school (2017)

	Travel Mode					
	Bus	Bicycle	Car Passenger	Train	Walked	Total
Morning Peak						
Student Arrivals in School Peak (8.00 to 9.00 am)	0.5%	0.3%	40.4%	0.3%	46.3%	87.7%
Student Arrivals outside School Peak Hour	0.0%	0.0%	7.5%	0.0%	4.9%	12.3%
All Student Arrivals	0.5%	0.3%	47.8%	0.3%	51.2%	100.0%
Weighted Car Passengers (% of students)			36.2%			
Evening Peak						
Student Departures in School Peak (2.45 to 3.45 pm)	0.8%	0.3%	42.4%	0.3%	51.7%	95.9%
Student Departures outside School Peak Hour	0.0%	0.0%	2.8%	0.0%	1.3%	4.1%
All Student Departures	0.8%	0.3%	45.2%	0.3%	53.0%	100.0%
Weighted Car Passengers (% of students)			33.3%			

From Table 2-2 it can be seen that:

- 48% of the students are driven to school in the morning. The remainder generally walk. Bus usage is low. This reflects the small catchment of the school.
- Percentage of car passenger reduces to 45% in the afternoon when students are departing.

The weighted car passenger estimates can be applied in determining increase in future parking demands.

2.7.2 Staff Mode of travel to school

Table 2-3 presents a summary of the existing staff travel patterns as surveyed in September 2017. The number of staff on site at any one time varies from day to day, particularly in relation to part time staff.

Table 2-3: Existing staff travel patterns (2017)

	Tuesday
Staff present	52
Staff who drove	43
Car drivers (%)	83%
Staff who parked on-site	16
Staff Parked on-street	27

The majority of staff drove to school (83%). More than half of the staff who drove parked their car outside the school on the street.

The staff survey shows that 16 cars were parked in the school carpark. 15 spaces are marked. One of the cars is likely to have occupied on a vacant space on the carpark instead of a designated space.

2.8 Traffic surveys

TTM Data conducted traffic surveys at the intersections of Penshurst Street / Forest Road and Arcadia Street / Forest Road / Connelly Street from 6:00 to 10:00 am and 2:00 to 6:00 pm on Tuesday 25th July 2017.

The morning and evening school peak hours were found to be from 8:00 to 9:00 am and 2:45 to 3:45 pm for the Penshurst Street / Forest Road and intersection Arcadia Street / Forest Road / Connelly Street intersections.

The results for the Penshurst Street / Forest Road intersection are presented in Figure 2-10 and Figure 2-11, and the results for the Arcadia Street / Forest Road / Connelly Street intersection are presented in Figure 2-12 and Figure 2-13.



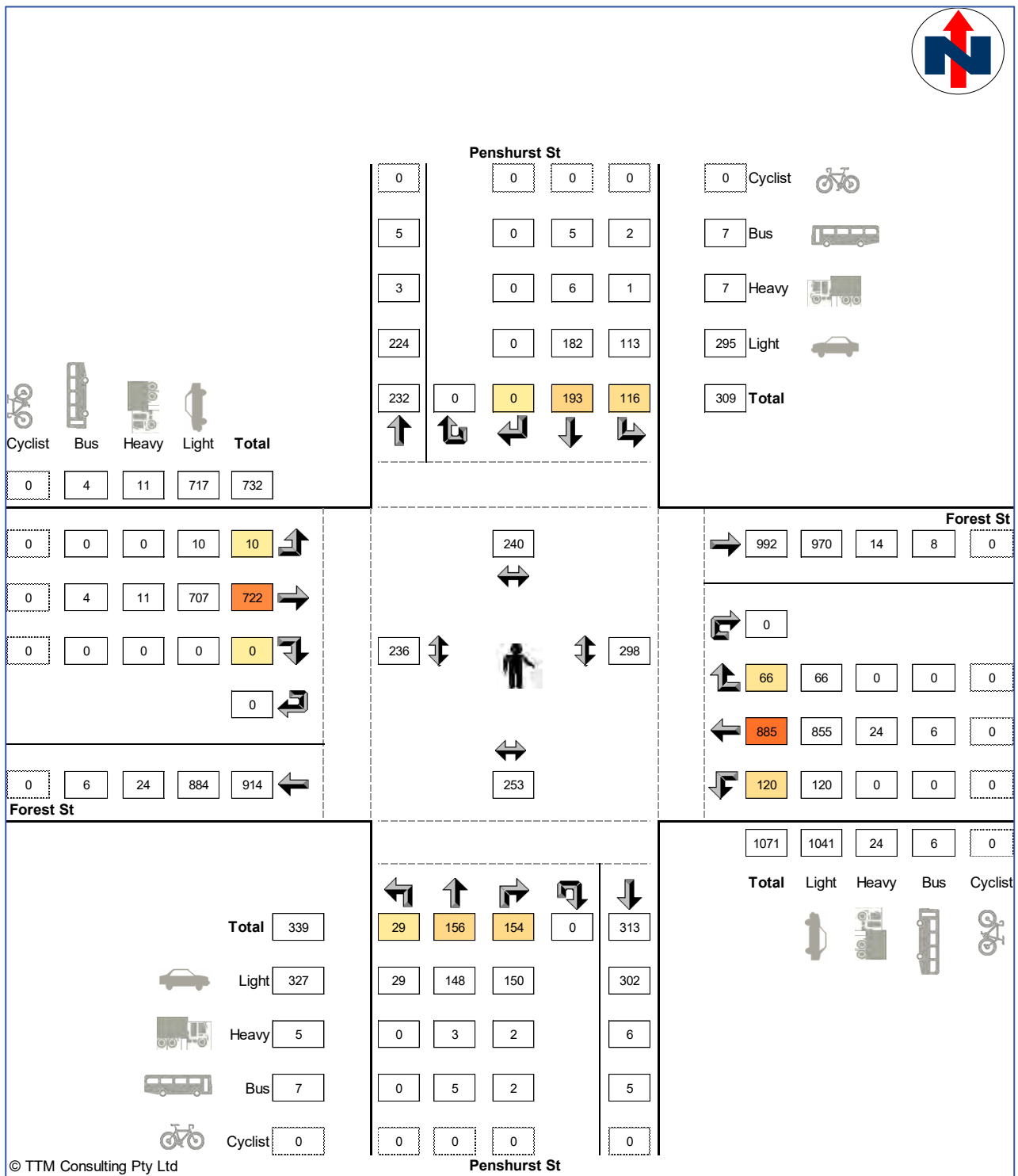


Figure 2-11: Evening School Peak - Penshurst Street and Forest Road intersection (2:45 to 3:45 pm)



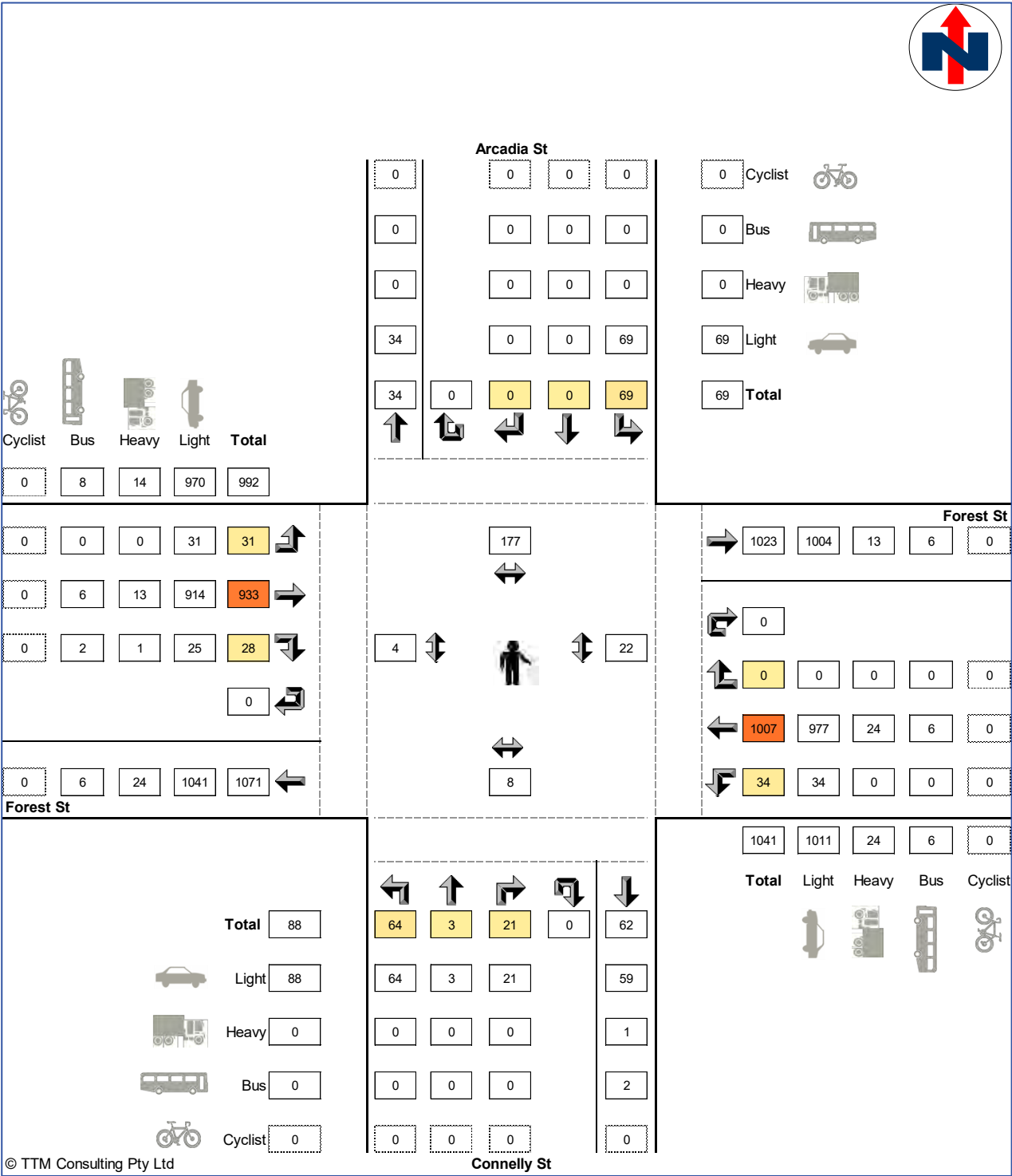


Figure 2-13: Afternoon School Peak – Arcadia Street, Forest Road and Connolly Street intersection (2:45 to 3:45 pm)

2.9 Assessment of existing traffic conditions

TTM has assessed the performance of the intersections using the SIDRA Intersection Analysis Software. Performance criteria for intersections are based on the RTA (RMS) Guide to Traffic Generating Developments. A qualitative rating and its corresponding Level of Service (LoS) are applied to the average delay per vehicle as shown in Table 2-4.

Table 2-4: Level of Service Criteria for Intersections

Level of Service (LoS)	Average Delay per Vehicle (seconds)	Traffic Signals, Roundabouts
A	Less than 15	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; at signals incidents will cause excessive delays

For signals, average delays per vehicle are for the intersection as a whole. If the average delay for the worst movement is greater than the cycle time, a Level of Service F is assigned, regardless of the average delay for the intersection as a whole. For Roundabouts / Give Way / Stop Signs, average delay per vehicle is for the worst movement.

2.9.1 Analysis of Penshurst Street and Forest Road intersection

The existing intersection configuration of Penshurst Street / Forest Road is shown in Figure 2-14.



Figure 2-14: Existing intersection configuration Penshurst Street and Forest Road

Table 2-5 gives a summary of the SIDRA results for the current volumes applied to the existing intersection configuration.

Table 2-5: Summary of SIDRA Outputs for Penshurst Street and Forest Road Intersection – Existing Conditions

Case	Degree of Saturation (%)	Average Delay (sec)	Level of Service (LoS)
Morning (8:00 to 9:00 am)	0.92	45	D
Afternoon (2:45 to 3:45 pm)	0.83	32	C

The current intersection configuration of Penshurst Street and Forest Road is operating near capacity with a Level of Service (LoS) D for the morning school peak period. This intersection is operating at a satisfactory Level of Service (LoS) C for the afternoon school peak period.

The results indicate that the current intersection configuration has ample capacity for future traffic demands from the proposed development.

2.9.2 Analysis of Arcadia Street, Forest Road and Connelly Street Intersection

The existing intersection configuration of Arcadia Street, Forest Road and Connelly Street is shown in Figure 2-15.



Figure 2-15: Existing intersection configuration Arcadia Street, Forest Road and Connelly Street

Table 2-6 gives a summary of the SIDRA results for the current volumes applied to the existing intersection configuration.

Table 2-6: Summary of SIDRA Outputs for Arcadia Street, Forest Road and Connelly Street Intersection – Morning Peak

Direction	Degree of Saturation (%)	Average Delay (sec)	Level of Service (LoS)
South: Connelly Street	4.2	See Note 1 below	F
East: Forest Road	0.2	5.6	A
North: Arcadia Street	0.7	33.9	C
West: Forest Road	0.5	14.9	B

Table 2-7: Summary of SIDRA Outputs for Arcadia Street, Forest Road and Connelly Street Intersection – Afternoon Peak

Direction	Degree of Saturation (%)	Average Delay (sec)	Level of Service (LoS)
South: Connelly Street	3.1	See Note 1 below	F
East: Forest Road	0.3	5.6	A
North: Arcadia Street	0.1	12.2	A
West: Forest Road	0.3	20.2	B

The current intersection configuration of Forest Road and Arcadia Street is operating at a Level of Service (LoS) C or better for both the morning and evening peak periods.

Note 1

SIDRA Outputs for Connelly Street showed a high degree of delay for right-turn vehicle movements. This is not correct. The right-turn traffic flow is small (average 20 vehicles per hour). Video footage from traffic surveys showed that the maximum holding time for the right-turn vehicle on Connelly Street was less than one minute. The proposed development will have no association with the Connelly Street intersection apart from some parents who may choose to use this route to drive their children to School.

The future traffic demands from the proposed development will mainly be vehicles turning left from Forest Road onto Arcadia Street and vehicles turning left from Arcadia Street onto Forest Road. The results indicate that the current intersection configuration will have ample capacity for future traffic demands from the proposed development.

2.10 Cumulative impacts from nearby developments

The traffic survey data and the intersection modelling have taken into account the current traffic flows generated by the nearby developments.

There are another two schools located near the subject site: St Declan's Catholic Primary School and Georges River College – Penshurst Girls Campus (see Figure 1-1). Each school has frontage to different roads. We

understand that there are no proposals at this stage to expand those schools. St Declan's has advised that they are not looking at an expansion until after 2020.

Potential residential development could occur. However, most of the surrounding sites already have residential flat buildings. Increases in traffic flows on Arcadia Street from potential development would be low. Impacts on the school related traffic are not expected to be significant.

3 Car parking arrangement

3.1 Council requirement

Car parking requirements for primary schools are specified in the 'Hurstville Development Control Plan (Amendment No.5) Section 3.1 Vehicle, Access, Parking and Manoeuvring' requires the below:

Table 3-1: Council Car Parking Rates

Development Type	Car Parking Spaces required on-site
Educational establishments	1 car parking space per 2 employees

Table 3-2 presents the parking requirements for compliance with Council's DCP. Note that the calculation is for full time equivalent staff as defined in the DCP. It excludes other staff employed at the school.

Table 3-2: Parking Supply Requirement

	Current	Proposed
Full time equivalent staff	34	59
Car Parking requirements	17	30

15 on-site car parking spaces are provided on the current car park. TTM has been advised that no additional on-site car parking space can be provided in the proposed development due to the limitation of the building footprint and site area. NSW Department of Education guidelines state that "a school is not obliged to provide parking on site to anyone at any time⁴ (copy on following page).

We recommend that the school address this difference by implementing a green travel plan encouraging staff to use the M91 bus service, other bus services, and train services via Penshurst Station which is within 650 metres walking distance.

It was observed by TTM staff that there were vacant spaces in surrounding streets in the morning in typical school day. With the high convenient access to public transport and available on street parking the proposed parking arrangement is workable. Regardless, the increase in on-street parking demands will impact on parking currently available for residents and their visitors.

⁴ <https://education.nsw.gov.au/teaching-and-learning/curriculum/learning-across-the-curriculum/road-safety-education/safety-around-schools/parking-on-school-grounds>

ON SITE PARKING
• Anyone parking a vehicle on school premises does so at their own risk. Principals need to make sure they are aware of this as outlined in Legal Issues Bulletin 8, (intranet) • A school is not obliged to provide parking on site to anyone at any time. • If a school has space available they may offer disabled parking spaces and parking for visitors and staff.
ON SITE PARKING BY STUDENTS
• Principals may give permission for students to park in school grounds if there is adequate space available and that no one is in danger. • Principals wishing to allow students to park in school grounds may request vehicle users and/or owners sign a disclaimer. • Refer to Legal Issues Bulletin 8 (intranet).

Figure 3-1: NSW Education Department guidelines in relation to provision of on-site parking

3.2 Existing on-street parking occupancy

TTM have conducted on-street parking surveys on Arcadia Street, Percival Street, Cambridge Street and Clarence Street from 7:30 am to 10:00 am and from 2:00pm to 4:00pm on 11/04/2018 (Wednesday).

The surrounding on-street parking has been divided into five different areas:

- Area A: Arcadia Street
- Area B: Percival Street
- Area C: Arcadia Street
- Area D: Cambridge Street
- Area E: Clarence Street

Figure 3-2 identifies the areas surveyed.



Figure 3-2: Parking survey areas

The results of the existing on-street parking surveys are summarised in Table 3-3.

Table 3-3: Existing on-street parking occupancy

	Time	Occupied	Vacant	%vacant
AM Peak (total 260 parking spaces)	7:30	151	109	42%
	8:00	147	113	43%
	8:30	160	100	38%
	9:00	187	73	28%
	9:30	153	107	41%
	10:00	153	107	41%
PM Peak (total 260 parking spaces)	14:00	159	101	39%
	14:30	170	90	35%
	15:00	183	77	30%
	15:30	217	43	17%
	16:00	147	113	43%

Figure 3-3 presents the existing on street parking occupancy during morning drop-off hours. Figure 3-4 presents the existing on-street parking occupancy during evening pick-up hours.

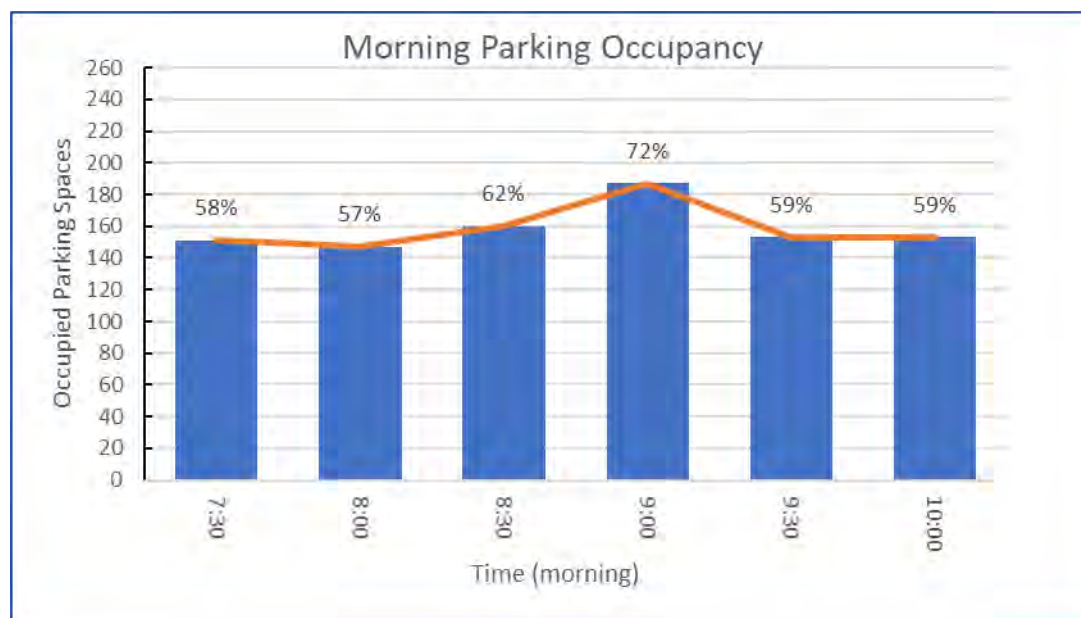


Figure 3-3: Morning peak on-street parking occupancy

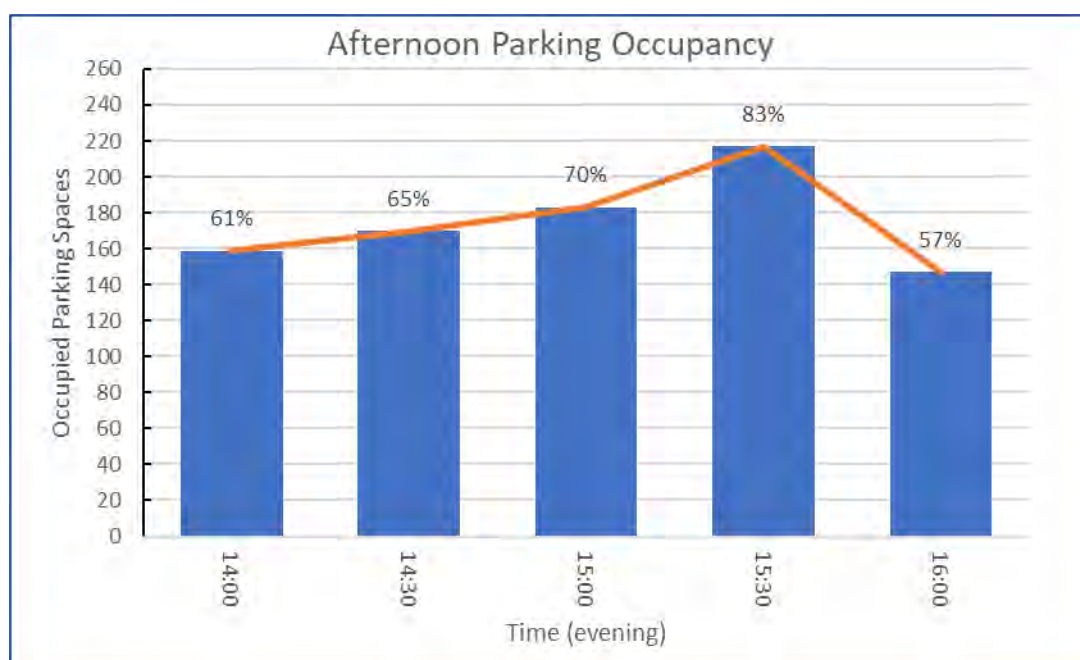


Figure 3-4: Evening peak on-street parking occupancy

The survey results show that the existing on-street parking supply is able to accommodate the existing drop-off and pick-up activities during school zone periods. The parking facilities around the school had a maximum occupancy of 72% in the morning at 9 am. The survey results for the afternoon period showed that parking occupancy reached a maximum of 83% at 3:30 pm.

Table 3-4: Vacant spaces near the site

	Time	Vacant Spaces			
		Arcadia Street (between Percival St. & Clarence St.)	Cambridge Street	Clarence Street	Total
AM Peak	7:30	31	34	14	79
	8:00	30	37	13	80
	8:30	18	37	15	70
	9:00	16	37	14	67
	9:30	24	35	15	74
	10:00	25	35	14	74
PM Peak	14:00	23	32	19	74
	14:30	21	29	18	68
	15:00	18	27	19	64
	15:30	6	24	16	46
	16:00	30	22	19	71

Error! Reference source not found. presents the vacant car parking spaces near the school on Acadia Street (between Percival Street and Clarence Street), Cambridge Street and Clarence Street, which could be utilised

by the school staff. All these parking spaces are located within 500 metres walking distance from the School. There are approximately 70 on-street car parking spaces which could be utilised by additional staff of the new Penshurst Public School.

We have been advised that the upgrading of the school will increase:

- Full time equivalent staff from 34 to 59.
- Other staff from 18 to 31.

The existing on-street parking supply near the school will be able to accommodate the parking demand generated by the additional staff. This will impact on on-street parking currently available for residents and their visitors.

4 Traffic impacts

4.1 Assessment of future traffic conditions

TTM has assessed the performance for Penshurst Street / Forest Road and Arcadia Street / Forest Road / Connelly Street intersections using SIDRA Intersection Analysis Software, for two scenarios applied over the existing road network as follows:

Current traffic scenario

This scenario includes the 2017 traffic volumes modelled over the existing road network. This analysis has been performed for both the morning and evening school peak periods (refer to Section 2.9).

Traffic scenario 1: future (1,012 Students)

This scenario includes the 2017 traffic volumes modelled over the existing road network with the additional traffic generation of the increase in student population. 40% of the additional students are assumed to come and leave by car (based on the survey results of weighted car passengers). This would generate 229 additional vehicle trips during the morning and afternoon school peak hour. This is a conservative upper bound.

It is our advice that the traffic impacts from additional 25 staff are considered insignificant on the surrounding road network. From the Staff travel survey, most staff who drove would arrive before 8am in the morning and leave after 4pm in the afternoon. This is different from the school peak hours.

Assumption of the distributions of additional vehicle trips are presented in Figure 4-1.

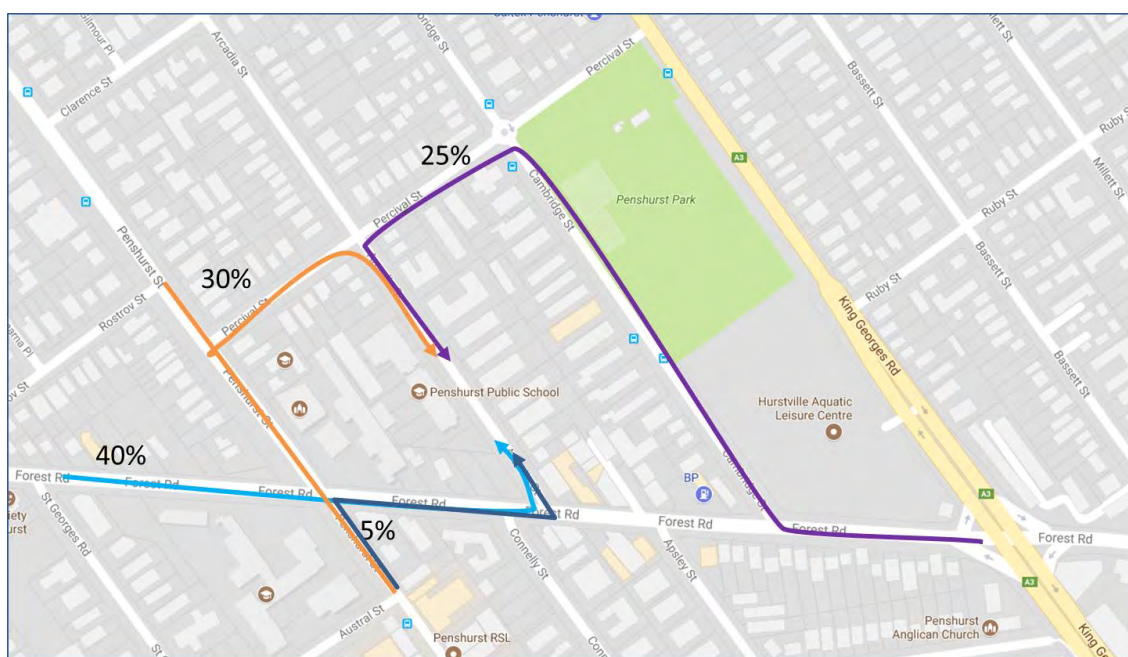


Figure 4-1: Assumption of the distributions of additional vehicle trips

4.2 Traffic impacts

The traffic impacts of the proposed development are compared against existing conditions. Table 4-1 gives a summary of the outputs for the various traffic cases applied to the intersections.

The detailed outputs for this analysis are provided in Appendix B.

Table 4-1: SIDRA Intersection Performance Results

Intersection	Scenarios	Morning Peak Hour		Afternoon Peak Hour	
		Average Delay	Level of Service	Average Delay	Level of Service
Penshurst Street and Forest Road	Base	45	D	32	C
	Future	57	E	33	C
Arcadia Street at Forest Road (Arcadia Street delays reported)	Base	31	C	12	A
	Future	44	D	11	A

Note: The traffic volumes on Arcadia Street (left turn movements) can clear the intersection with minor delays. It is also noted that drivers turn with shorter gaps within the traffic as observed from the site inspection, this has been accommodated into the model.

From Table 4-1 the increase in traffic flows does not have a significant impact on the intersection operations. The additional traffic generated from the proposed development is considered acceptable.

4.3 Kiss and Ride impacts

An extension of the pick-up and drop off facilities is required. Other on-street parking areas can also be utilised by parents who drive the kids to school by car (see Figure 2-6). It is our advice that the unrestricted on-street parking area on the frontage of the site on Arcadia Street can be redesigned as Kiss and Ride Zone, to accommodate the demand from the future development. This could provide up to 17 kiss and ride spaces (including the existing kiss and ride area) and one accessible bay (existing). Indicative locations are shown in Appendix C.

We have been advised that the School provides special needs classes at the site. There are currently 23 special needs students. The special needs education will also form part of the School in the future. We estimate that there will be up to 27 special needs students in the new school.

Some of the special needs students will be picked up and dropped off by taxi. Taxis are currently accommodated in the kiss and ride areas. We have been advised by the school that the special needs students are picked up by taxi or parent cars at 2:45 pm. This was also indicated in the questionnaire surveys conducted in September 2017. The remaining school students collected by parents were picked up at about 3:10 pm.

It is our advice that the increase of four special needs students will have no significant impacts on the kiss and ride facilities.

In addition to the extended kiss and ride facilities we advise that parents should be encouraged to walk their children to and from school (either escorted or unescorted). Implementation of a walking school bus style scheme would also assist (see <http://www.travelsmart.gov.au/schools/schools2.html>). A walking school bus scheme groups children along routes supervised by one to two parents instead of many. This can be achieved due the school catchment being within walking distance of the school itself. The walking school bus scheme will depend on parent participation.

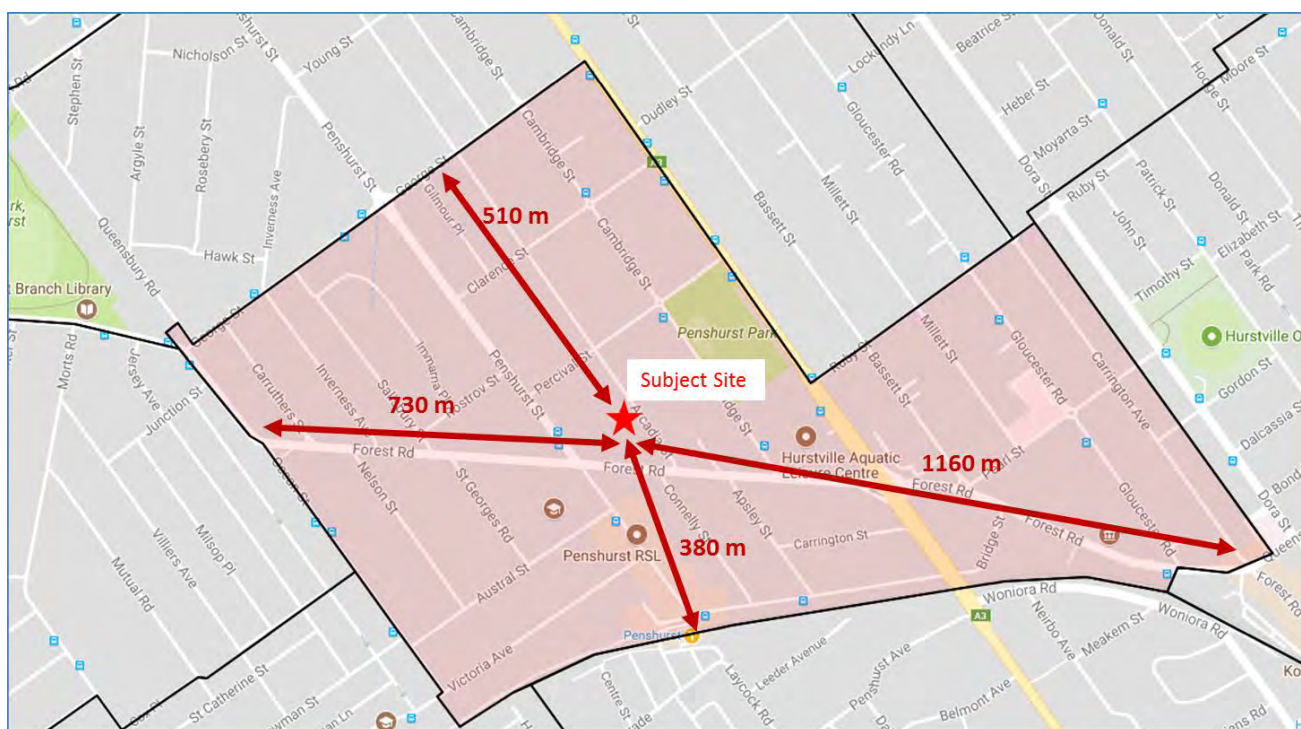


Figure 4-2: Penshurst Public School Catchment⁵

4.4 Impacts from community events after school hours

TTM has been advised that the new school hall may be used to host community events occasionally out of school hours. The estimated maximum capacity of each event will be 350 people, including audiences and performers. Events will occur after 5:30 pm on weekdays in general school terms.

Since the community events would occur after school time and peak hours, there will be insignificant impacts on school related traffic. Community or private events with greater than 100 attendees may have significant traffic and parking impacts on the surrounding streets. We recommend that events with more than 100 attendees (excluding school events) be subject to a separate application to Council.

Parking demands of a typical community event (up to 100 people) will be accommodated on the school car parks and the surrounding streets, consistent with the current situation. We understand that majority of the

⁵ Source: <http://schoolzones.net.au/nsw/schools/penshurst-public-school/>

attendees will be residents from the local community. With the high convenient access to the public transports, it is our advice that on-street parking and the school car park will be able to accommodate the parking demands from a typical community event (up to 100 people).

5 Additional Transport Related Issues

5.1 Service Vehicle Arrangement

No change is proposed for service vehicle access, delivery and loading arrangements. Vehicular access for deliveries and waste vehicles will all be facilitated at the existing car park as per existing arrangements off Arcadia Street. 1 to 2 service vehicles are expected to access the school each day. This includes courier deliveries.

5.2 Emergency Vehicle Access

No change is proposed for emergency vehicle access arrangement. Emergency vehicles will be accommodated at the existing carpark via Arcadia Street.

5.3 Pedestrian Access

Pedestrian access to the site is good with pedestrian facilities along the site frontage, and from local roads surrounding the site.

6 Green travel plan

A Green Travel Plan will be developed by the school to encourage travel behaviour change through raising awareness of other alternatives to using a private vehicle.

The Green Travel Plan is a collection of initiatives and actions to encourage travel behaviour change. The plan will provide students, staff and parents with information on sustainable transport and encourages them to make alternative transport choices than the use of a private vehicle. The implementation of the Green Travel Plan will reduce traffic congestion and parking problems.

This Green Travel Plan has been prepared in the interests of providing guidance to current/future members, staff and visitors of the proposed development to reduce car trips and encourage the use of sustainable transport.

To provide guidance for the preparation of a Green Travel Plan for members, staff and visitors of the development, the following 'generic' Green Travel Plan includes:

Carpooling

Carpooling is considered as an opportunity to significantly reduce cars on the road network. The school would set up a system to manage and display the real-time carpool information from participants. This system can be a cloud, google maps or various smartphone applications.

Carpooling should be a long term initiative which requires consistent promotion of this travel mode and incentives. It is recommended to have the initiative operated through parents on a carpooling forum. The school will manage and encourage parents to be proactive in offering carpooling services. The benefits of carpooling can be promoted in parent teacher meetings, school newsletters and by educating students.

A range of free apps are currently available online to assist with the implementation of carpooling. Examples are presented below. The School would need to consider the Child Protection Policies before promoting the initiative.

Carpool – School Edition

This app is designed specifically for students who carpool to school. Parents can form a carpool group, and add members into the group manually or import from contacts. This app let parents manually create a schedule, or it will automatically generate one based on the driver's preferences. For example, if one person like to drop off in the morning, or prefers pick-up.

This app is free for iOS devices. Parents can also email the carpool schedule to those members who do not have an iOS device. They can view it on their computers and print it.

Cozi

Cozi is a free mobile app for iOS and Android devices. It allows parents to create shared calendars jam-packed with information. Parents can make a calendar of driving assignments, and share the calendar with other parents in the carpool.

Provide Information on Public Transport Services

The proposed development site enjoys a high level of public transport accessibility in the form of bus and train services being within close proximity to the subject site. The Green Travel Plan will provide the following information on the public transport services to include:

Railway Services

Details of conveniently accessible train services to include:

- A copy of the Sydney Railway Network Map showing the extent of the rail service throughout the Sydney Metropolitan Area and the location of Penshurst Train Station
- Details of current train time tables for Penshurst Train Station
- A map showing the shortest and safest pedestrian route from the site to Penshurst Train Station

Bus Services

Details of conveniently accessible bus services to include:

- Route Service Number
- Origin and Destination
- Travel route along streets near the site
- Bus stops located around the site
- A map showing the shortest and safest pedestrian route from the site to various bus stop locations

Provide Information on Active Transport Options

The proposed development site is near cycle facilities located on Penshurst Street, Woniora Road and Hillcrest Avenue. The Green Travel Plan will provide the following information on the cycle network to include:

- **Bicycle Access**

The Travel plans will identify

- The location of designated bicycle parking spaces for occupants for the proposed development
- A map showing cycle ways conveniently accessible from the site and the surrounding facilities

6.1 Implementation

Just prior to the initial expansion of the development, the Green Travel Plan will be finalised with the inclusion of relevant information such as train and bus timetables, illustrations showing the shortest and most convenient routes between the site and various destinations.

Hard copies of the Green Travel Plan will be produced for distribution.

The school website will have a link to the Green Travel Plan. The administration staff will be responsible for updating the Travel Plan on a regular basis.

7 Construction traffic management plan

The purpose of a Construction Traffic Management Plan (CTMP) is to ensure that the impacts of the construction activities on the public domain and road network, in particular with respect to temporary interruptions to vehicular and pedestrian traffic are limited and acceptable.

The demolition of existing buildings and construction of the new school will occur after all existing students and staff have been temporarily relocated to another site.

7.1 Limitations of this CTMP

The CTMP developed by TTM only considers the impact of works on traffic and pedestrians. As the project is in its preliminary stages, the CTMP is based on anticipated information, and advice supplied by Perumal Pedavoli Architects.

7.2 Duration of Works and Construction Schedule

The duration of construction activities will be subject to the contractor once it is appointed for the project. The daily/ weekly schedule of the construction work will be subject to Council's conditions of consent.

7.3 Construction Permits

7.3.1 Works Zone

An application for a works zone fronting the subject site on Arcadia Street will be submitted to Council if required. This would be a separate application to the CTMP.

7.3.2 Other Permits

A Standing Plant permit, temporary road/footpath closure, hoarding and will be applied and submitted to the relevant authorities, when required.

This would be a separate application to the CTMP.

7.4 Construction Vehicles

Various types of trucks will visit the site. The maximum sized design vehicle will be a heavy rigid vehicle. A truck and dog may access the site during demolition and excavation. Both vehicles are legally allowed on the local road system. The length of most other vehicles will be less than the standard heavy rigid 12.5 metre vehicle. Typical lengths are around 8 metres.

All heavy goods such as girders or machinery plants are likely to be delivered outside of peak traffic hours.

7.5 Haulage Routes

During construction vehicle movements for the project will be required to:

- Comply with relevant environment approvals.
- Minimise the number of vehicle movements by balancing earthworks and recycling excavated materials.
- Enter and exit the site in a forward facing direction.
- Promote safe driving principles.
- Evaluate the need for temporary traffic control.
- Plan on-site vehicle movements.
- Avoid or minimise truck reversing and three point turns on site.

The proposed haulage route is shown in Figure 7-1.

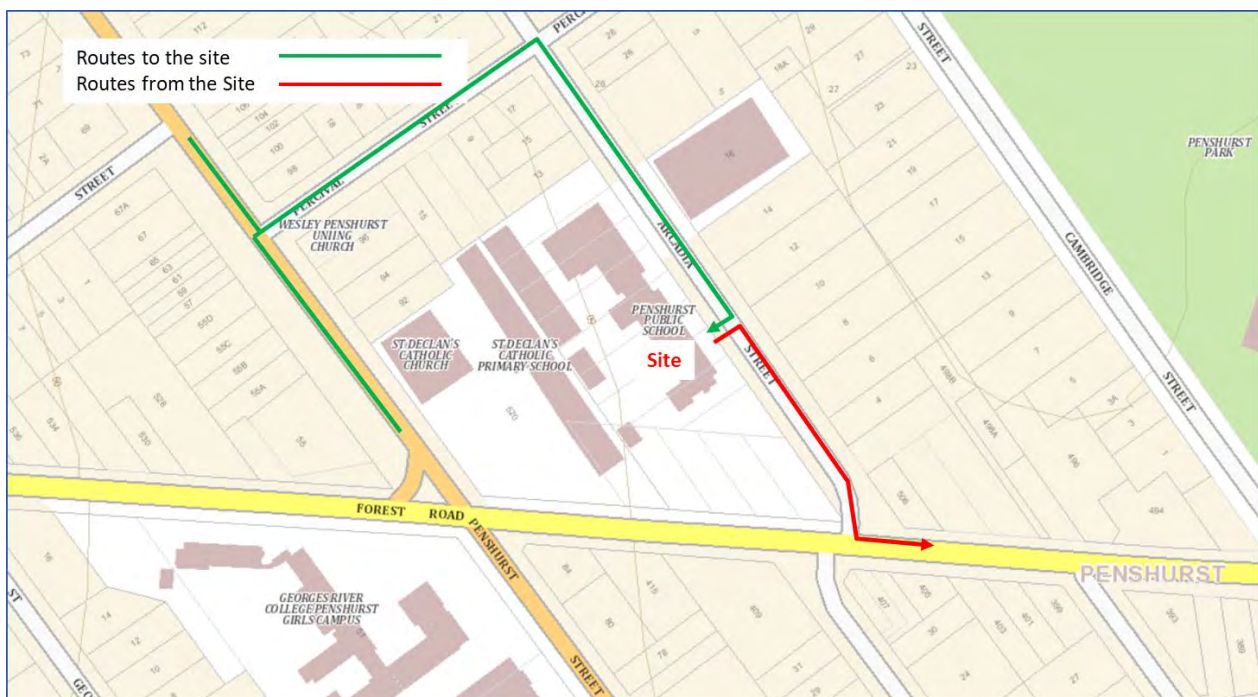


Figure 7-1: Construction vehicle routes

7.8 Employee Parking

Employees, tradespeople and small construction vehicles will park on site and around the surrounding streets of the subject site.

7.9 Driver Code of Conduct

Management of vehicular access to and from the site is essential to maintain the safety of the general public as well as the labour force. The following code is to be implemented as a measure to maintain safety within the site:

- Utilisation of only the designated transport routes.
- Drivers to maintain a sufficient distance from the temporary barriers that will be implemented around trees that form part of the endangered plant community.
- Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities.

8 Summary and conclusions

8.1 Development access

The access arrangements will remain unchanged. TTM considers the proposed access arrangements for this development is acceptable.

8.2 Car parking arrangements

TTM advises the proposed car parking arrangement for this development is acceptable.

8.3 Impact on surrounding road network

Assessment of the proposed development indicates that the development will not have a significant impact on the future road network. No mitigating road works are required.

8.4 Active transport facilities

The current public transport infrastructure is adequate for the development.

8.5 Conclusion

TTM see no traffic engineering reason why the relevant approvals should not be granted.

Appendix A Proposed Site Plan

27/03/2018 11:25:58 AM



AMMENDMENTS			
REV	BY	DATE	DESCRIPTION
1		26-03-18	ISSUE FOR INFORMATION

LEGEND



STRIUC. CIVIL & HYD
WOOLACOTT'S ENGINEERS
T: 02 8341 990
MECH. ELEC. IT, COMMS & SEC.
JHA CONSULTING
T: 02 9437 1000
BCA
GROUP DLA
T: 02 8355 3160
LANDSCAPE
LORNA HARRISON P/L
T: 02 9555 1147

PERUMAL PEDAVOLI ARCHITECTS
T: +0000 0000
WEB: www.ppa.com.au
Nominated Architect
Vince Pedavoli NSW reg No 5045
STATUTORY PLANNER
DON FOX PLANNING P/L
T: 02 9473 4914

PERUMAL
PEDAVOLI
ARCHITECTS

PENSHURST PUBLIC SCHOOL
18 Arcadia Street, Penshurst
DRAWING NAME
SITE PLAN

PROJECT NORTH			
0 2500 5000 7500 10000 12500 25000			
SCALE 1:250 @ A1			
DRAWN	CHECKED	VERIFIED	DATE
Author	Checker	Approver	26-03-18
DRAWING NUMBER	REVISION		
PROJECT CODE	DISCIPLINE	PHASE	SERIES NUMBER
3199-ARC-DA_00_004			

ISSUE FOR INFORMATION

Appendix B Sidra Intersection Analysis

MOVEMENT SUMMARY



Site: 1 [Base Case: Forest Rd - Penshurst St - Morning School Peak]

Base Case

Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Penshurst Street South											
1	L2	25	4.2	0.355	43.6	LOS D	11.4	81.8	0.81	0.69	33.4
2	T1	196	3.2	0.355	38.1	LOS C	11.4	81.8	0.81	0.69	34.1
3	R2	146	4.3	0.758	75.7	LOS F	10.3	75.0	1.00	0.86	16.7
Approach		367	3.7	0.758	53.4	LOS D	11.4	81.8	0.88	0.76	26.4
East: Forest Road East											
4	L2	88	2.4	0.311	21.0	LOS B	11.5	84.0	0.54	0.55	36.8
5	T1	594	6.0	0.311	15.5	LOS B	11.6	85.2	0.54	0.51	42.8
6	R2	71	3.0	0.543	76.4	LOS F	4.9	35.0	1.00	0.76	20.3
Approach		753	5.3	0.543	21.8	LOS B	11.6	85.2	0.59	0.53	38.1
North: Penshurst Street North											
7	L2	176	2.4	0.484	55.4	LOS D	12.3	88.4	0.91	0.81	24.9
8	T1	196	5.4	0.484	55.1	LOS D	12.3	88.4	0.94	0.78	28.6
Approach		372	4.0	0.484	55.2	LOS D	12.3	88.4	0.93	0.79	26.9
West: Forest Road West											
10	L2	16	0.0	0.012	7.6	LOS A	0.2	1.2	0.21	0.59	52.7
11	T1	1637	3.2	0.920	51.6	LOS D	61.7	443.5	1.00	1.03	26.2
Approach		1653	3.2	0.920	51.2	LOS D	61.7	443.5	0.99	1.02	26.4
All Vehicles		3144	3.9	0.920	44.9	LOS D	61.7	443.5	0.87	0.85	28.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	60	25.3	LOS C	0.1	0.1	0.60	0.60	
P2	East Full Crossing	76	58.7	LOS E	0.3	0.3	0.92	0.92	
P3	North Full Crossing	75	25.3	LOS C	0.2	0.2	0.60	0.60	
P4	West Full Crossing	46	55.9	LOS E	0.2	0.2	0.89	0.89	
All Pedestrians		257	40.7	LOS E			0.75	0.75	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY



Site: 1 [Base Case: Forest Rd - Penshurst St - Evening School Peak]

Base Case

Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Penshurst Street South											
1	L2	31	0.0	0.315	43.0	LOS D	9.9	71.6	0.79	0.68	33.6
2	T1	164	5.1	0.315	37.5	LOS C	9.9	71.6	0.79	0.68	34.2
3	R2	162	2.6	0.830	79.2	LOS F	11.9	84.9	1.00	0.91	16.2
Approach		357	3.5	0.830	56.9	LOS E	11.9	84.9	0.89	0.79	25.0
East: Forest Road East											
4	L2	126	0.0	0.501	23.5	LOS B	21.8	156.2	0.63	0.62	35.2
5	T1	932	3.4	0.501	17.5	LOS B	21.8	156.2	0.62	0.58	41.3
6	R2	69	0.0	0.524	76.2	LOS F	4.8	33.5	1.00	0.76	20.3
Approach		1127	2.8	0.524	21.8	LOS B	21.8	156.2	0.64	0.59	38.2
North: Penshurst Street North											
7	L2	122	2.6	0.451	57.3	LOS E	10.4	74.9	0.92	0.79	24.6
8	T1	203	5.7	0.451	54.8	LOS D	10.4	74.9	0.94	0.77	28.6
Approach		325	4.5	0.451	55.7	LOS D	10.4	74.9	0.93	0.78	27.2
West: Forest Road West											
10	L2	11	0.0	0.008	7.3	LOS A	0.1	0.7	0.19	0.58	53.0
11	T1	760	2.1	0.426	25.8	LOS B	17.1	122.1	0.71	0.62	36.5
Approach		771	2.0	0.426	25.5	LOS B	17.1	122.1	0.70	0.62	36.7
All Vehicles		2580	2.9	0.830	32.0	LOS C	21.8	156.2	0.73	0.65	33.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	266	25.5	LOS C	0.6	0.6	0.61	0.61	
P2	East Full Crossing	314	59.3	LOS E	1.2	1.2	0.93	0.93	
P3	North Full Crossing	253	25.5	LOS C	0.6	0.6	0.61	0.61	
P4	West Full Crossing	248	56.4	LOS E	0.9	0.9	0.90	0.90	
All Pedestrians		1081	42.4	LOS E			0.77	0.77	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY



Site: 1 [Base Case: Forest Rd - Arcadia St - Connelly St - Morning School Peak]

Base Case

Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Connelly Street											
1	L2	43	2.4	0.054	10.1	LOS A	0.2	1.4	0.42	0.90	43.0
2	T1	8	0.0	4.211	3221.0	LOS F	20.8	145.7	1.00	1.32	0.8
3	R2	17	0.0	4.211	3213.8	LOS F	20.8	145.7	1.00	1.32	0.7
Approach		68	1.5	4.211	1193.9	LOS F	20.8	145.7	0.63	1.06	1.5
East: Forest Road East											
4	L2	24	4.3	0.195	5.6	LOS A	0.0	0.0	0.00	0.04	56.8
5	T1	709	5.5	0.195	0.0	LOS A	0.0	0.0	0.00	0.02	59.6
Approach		734	5.5	0.195	0.2	NA	0.0	0.0	0.00	0.02	59.5
North: Arcadia Street											
7	L2	160	1.3	0.517	30.7	LOS C	2.9	20.8	0.91	1.13	38.1
Approach		160	1.3	0.517	30.7	LOS C	2.9	20.8	0.91	1.13	38.1
West: Forest Road West											
10	L2	26	0.0	0.537	5.6	LOS A	0.0	0.0	0.00	0.02	57.2
11	T1	1889	3.3	0.537	0.6	LOS A	1.8	13.2	0.08	0.02	58.3
12	R2	43	0.0	0.537	14.9	LOS B	1.8	13.2	0.17	0.03	53.2
Approach		1959	3.2	0.537	1.0	NA	1.8	13.2	0.08	0.02	58.1
All Vehicles		2921	3.6	4.211	30.3	NA	20.8	145.7	0.12	0.11	29.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY



Site: 1 [Base Case: Forest Rd - Arcadia St - Connelly St - Evening School Peak]

Base Case

Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Connelly Street											
1	L2	67	0.0	0.105	11.6	LOS A	0.4	2.6	0.52	0.96	41.8
2	T1	3	0.0	3.062	2176.7	LOS F	18.2	127.1	1.00	1.37	1.2
3	R2	22	0.0	3.062	2228.7	LOS F	18.2	127.1	1.00	1.37	1.0
Approach		93	0.0	3.062	614.5	LOS F	18.2	127.1	0.65	1.07	2.7
East: Forest Road East											
4	L2	36	0.0	0.287	5.6	LOS A	0.0	0.0	0.00	0.04	57.1
5	T1	1060	3.0	0.287	0.0	LOS A	0.0	0.0	0.00	0.02	59.6
Approach		1096	2.9	0.287	0.2	NA	0.0	0.0	0.00	0.02	59.5
North: Arcadia Street											
7	L2	73	0.0	0.088	12.1	LOS A	0.5	3.2	0.66	0.89	48.7
Approach		73	0.0	0.088	12.1	LOS A	0.5	3.2	0.66	0.89	48.7
West: Forest Road West											
10	L2	33	0.0	0.310	5.5	LOS A	0.0	0.0	0.00	0.03	57.1
11	T1	982	2.0	0.310	1.5	LOS A	1.8	13.1	0.12	0.04	56.2
12	R2	29	10.7	0.310	20.2	LOS B	1.8	13.1	0.28	0.05	48.1
Approach		1044	2.2	0.310	2.2	NA	1.8	13.1	0.12	0.04	56.0
All Vehicles		2305	2.4	3.062	26.2	NA	18.2	127.1	0.10	0.10	31.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY



Site: 1 [Scenario 1: Forest Rd - Penshurst St - Morning School Peak]

Scenario 1 (School Expansion)

Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Penshurst Street South											
1	L2	25	4.2	0.373	43.9	LOS D	12.0	86.6	0.81	0.70	33.3
2	T1	207	3.0	0.373	38.3	LOS C	12.0	86.6	0.81	0.70	34.0
3	R2	158	4.0	0.816	78.4	LOS F	11.5	83.1	1.00	0.90	16.3
Approach		391	3.5	0.816	54.9	LOS D	12.0	86.6	0.89	0.78	25.9
East: Forest Road East											
4	L2	88	2.4	0.311	21.0	LOS B	11.5	84.0	0.54	0.55	36.8
5	T1	594	6.0	0.311	15.5	LOS B	11.6	85.2	0.54	0.51	42.8
6	R2	71	3.0	0.543	76.4	LOS F	4.9	35.0	1.00	0.76	20.3
Approach		753	5.3	0.543	21.8	LOS B	11.6	85.2	0.59	0.53	38.1
North: Penshurst Street North											
7	L2	176	2.4	0.484	55.4	LOS D	12.3	88.4	0.91	0.81	24.9
8	T1	196	5.4	0.484	55.1	LOS D	12.3	88.4	0.94	0.78	28.6
Approach		372	4.0	0.484	55.2	LOS D	12.3	88.4	0.93	0.79	26.9
West: Forest Road West											
10	L2	16	0.0	0.012	7.6	LOS A	0.2	1.2	0.21	0.59	52.7
11	T1	1733	3.0	0.973	73.2	LOS F	77.5	556.6	1.00	1.15	21.2
Approach		1749	3.0	0.973	72.6	LOS F	77.5	556.6	0.99	1.15	21.4
All Vehicles		3264	3.7	0.973	56.8	LOS E	77.5	556.6	0.88	0.92	25.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	60	25.3	LOS C	0.1	0.1	0.60	0.60	
P2	East Full Crossing	76	58.7	LOS E	0.3	0.3	0.92	0.92	
P3	North Full Crossing	75	25.3	LOS C	0.2	0.2	0.60	0.60	
P4	West Full Crossing	46	55.9	LOS E	0.2	0.2	0.89	0.89	
All Pedestrians		257	40.7	LOS E			0.75	0.75	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY



Site: 1 [Scenario 1: Forest Rd - Penshurst St - Evening School Peak]

Scenario 1 (School Expansion)

Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Penshurst Street South											
1	L2	31	0.0	0.333	43.3	LOS D	10.5	76.2	0.80	0.69	33.5
2	T1	176	4.8	0.333	37.7	LOS C	10.5	76.2	0.80	0.69	34.1
3	R2	174	2.4	0.890	84.9	LOS F	13.4	95.7	1.00	0.96	15.4
Approach		380	3.3	0.890	59.8	LOS E	13.4	95.7	0.89	0.81	24.3
East: Forest Road East											
4	L2	126	0.0	0.501	23.5	LOS B	21.8	156.2	0.63	0.62	35.2
5	T1	932	3.4	0.501	17.5	LOS B	21.8	156.2	0.62	0.58	41.3
6	R2	69	0.0	0.524	76.2	LOS F	4.8	33.5	1.00	0.76	20.3
Approach		1127	2.8	0.524	21.8	LOS B	21.8	156.2	0.64	0.59	38.2
North: Penshurst Street North											
7	L2	122	2.6	0.451	57.3	LOS E	10.4	74.9	0.92	0.79	24.6
8	T1	203	5.7	0.451	54.8	LOS D	10.4	74.9	0.94	0.77	28.6
Approach		325	4.5	0.451	55.7	LOS D	10.4	74.9	0.93	0.78	27.2
West: Forest Road West											
10	L2	11	0.0	0.008	7.3	LOS A	0.1	0.7	0.19	0.58	53.0
11	T1	841	1.9	0.470	26.5	LOS B	19.5	138.4	0.73	0.64	36.1
Approach		851	1.9	0.470	26.2	LOS B	19.5	138.4	0.72	0.64	36.3
All Vehicles		2684	2.8	0.890	32.7	LOS C	21.8	156.2	0.74	0.66	33.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	266	25.5	LOS C	0.6	0.6	0.61	0.61	
P2	East Full Crossing	314	59.3	LOS E	1.2	1.2	0.93	0.93	
P3	North Full Crossing	253	25.5	LOS C	0.6	0.6	0.61	0.61	
P4	West Full Crossing	248	56.4	LOS E	0.9	0.9	0.90	0.90	
All Pedestrians		1081	42.4	LOS E			0.77	0.77	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY



Site: 1 [Scenario 1: Forest Rd - Arcadia St - Connelly St - Morning School Peak]

Scenario 1 (School Expansion)
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Connelly Street											
1	L2	43	2.4	0.054	10.1	LOS A	0.2	1.4	0.42	0.90	43.0
2	T1	8	0.0	4.211	3209.2	LOS F	20.6	144.4	1.00	1.33	0.8
3	R2	17	0.0	4.211	3202.4	LOS F	20.6	144.4	1.00	1.33	0.7
Approach		68	1.5	4.211	1189.7	LOS F	20.6	144.4	0.63	1.06	1.5
East: Forest Road East											
4	L2	24	4.3	0.195	5.6	LOS A	0.0	0.0	0.00	0.04	56.8
5	T1	709	5.5	0.195	0.0	LOS A	0.0	0.0	0.00	0.02	59.6
Approach		734	5.5	0.195	0.2	NA	0.0	0.0	0.00	0.02	59.5
North: Arcadia Street											
7	L2	293	0.7	0.808	43.8	LOS D	7.9	55.8	0.95	1.47	33.0
Approach		293	0.7	0.808	43.8	LOS D	7.9	55.8	0.95	1.47	33.0
West: Forest Road West											
10	L2	135	0.0	0.566	5.6	LOS A	0.0	0.0	0.00	0.07	56.4
11	T1	1889	3.3	0.566	0.6	LOS A	2.0	14.1	0.08	0.05	57.7
12	R2	43	0.0	0.566	15.5	LOS B	2.0	14.1	0.17	0.03	53.2
Approach		2068	3.1	0.566	1.2	NA	2.0	14.1	0.08	0.05	57.5
All Vehicles		3162	3.4	4.211	30.7	NA	20.6	144.4	0.15	0.20	30.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY



Site: 1 [Scenario 1: Forest Rd - Arcadia St - Connelly St - Evening School Peak]

Scenario 1 (School Expansion)

Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Connelly Street											
1	L2	67	0.0	0.105	11.6	LOS A	0.4	2.6	0.52	0.96	41.8
2	T1	3	0.0	4.026	3083.1	LOS F	21.4	149.6	1.00	1.32	0.8
3	R2	22	0.0	4.026	3122.9	LOS F	21.4	149.6	1.00	1.32	0.7
Approach		93	0.0	4.026	858.8	LOS F	21.4	149.6	0.65	1.06	1.9
East: Forest Road East											
4	L2	36	0.0	0.287	5.6	LOS A	0.0	0.0	0.00	0.04	57.1
5	T1	1060	3.0	0.287	0.0	LOS A	0.0	0.0	0.00	0.02	59.6
Approach		1096	2.9	0.287	0.2	NA	0.0	0.0	0.00	0.02	59.5
North: Arcadia Street											
7	L2	205	0.0	0.227	11.8	LOS A	1.3	8.9	0.67	0.91	48.9
Approach		205	0.0	0.227	11.8	LOS A	1.3	8.9	0.67	0.91	48.9
West: Forest Road West											
10	L2	141	0.0	0.339	5.5	LOS A	0.0	0.0	0.00	0.13	55.8
11	T1	982	2.0	0.339	1.6	LOS A	2.0	14.0	0.13	0.09	55.3
12	R2	29	10.7	0.339	20.9	LOS B	2.0	14.0	0.26	0.04	48.4
Approach		1153	2.0	0.339	2.6	NA	2.0	14.0	0.12	0.09	55.2
All Vehicles		2547	2.1	4.026	33.5	NA	21.4	149.6	0.13	0.16	28.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

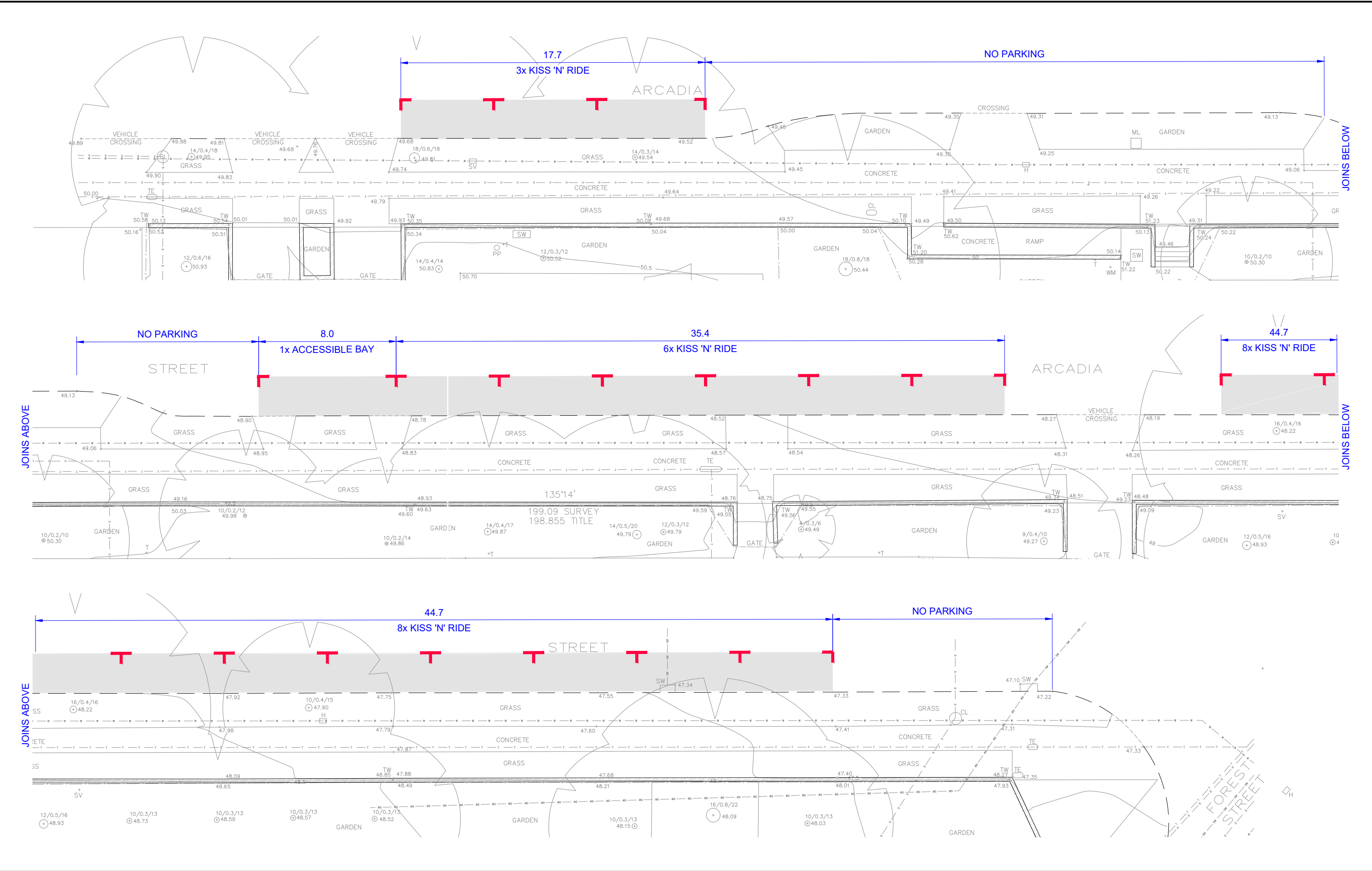
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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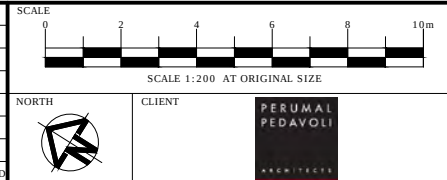
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Appendix C Potential Kiss and Ride Spaces



REV.	DATE	AMENDMENT DESCRIPTION	DRAWN	CHECKED	APPROVED
A	20-09-17	ORIGINAL ISSUE	HT	PC	





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PROJECT	PENSHURST PUBLIC SCHOOL - TRAFFIC ASSESSMENT	
DRAWING TITLE	KERBSIDE PARKING ALLOCATION ARCADIA STREET FRONTAGE	

PROJECT NUMBER	17SYT0030	ORIGINAL SIZE	A3
DRAWING NUMBER	17SYT0030-01	REVISION	A
DATE	20 SEPT 2017	SHEET	1 OF 1

APPENDIX B – Construction Noise and Vibration Management Sub-Plan

Acoustic Assessment Report
Prepared by Day Design
Report No. 6320-1.1R Rev C
Refer Sections 9.0, 10.0 and 11.0

Grindley	GRINDLEY CONSTRUCTION PTY LTD 55 Grandview Street Pymble NSW 2073 Ph 02 9988 3811 Fax 02 9988 3575	Version 06	Date 21/7/2014
Location	C:\Users\mthorburn\Dropbox (Grindley)\Projects - Construction\6380 Penshurst PS\whseq\plans\6380 PPS - Project Specific Environmental Management Plan - Rev5.docx	Page 27 of 29	



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Acoustic Assessment Report

**Penshurst Public School
Arcadia Street, Penshurst**

**REPORT No
6320-1.1R Rev C**

**DATE ISSUED
3 April 2018**

Prepared For:
Perumal Pedavoli Pty Ltd
PO Box 636
Glebe NSW 2037

Attention: Ms Carmit Harnik



Revision History

Report	Date	Prepared	Checked	Comment
Final	8/2/2018	William Wang	Stephen Gauld	
Rev A	28/03/2018	William Wang	Stephen Gauld	Updated Drawings, Layout
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Document R16320-1.1R REV C, 51 pages plus attachments

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9.0 CONSTRUCTION NOISE AND VIBRATION CRITERIA

9.1 Australian Standard AS2436

The Australian Standard AS2436:2010 *"Guide to noise and vibration control on construction, demolition and maintenance sites"* provides guidance on noise control in respect to construction, demolition and maintenance sites. The Standard also provides guidance for the preparation of noise and vibration management plans.

Section 1.5 'Regulatory Requirements' of the Standard states:

"Legislation associated with the control of noise and vibration on and from construction, demolition and maintenance sites in Australia is generally the responsibility of the relevant State or Territory government, local council or a designated statutory authority."

Consequently the Standard does not provide specific noise criterion rather sets out practical methods for determining the potential for noise and vibration impact on the community from construction, demolition and maintenance sites.

A qualitative method is described in Section 3.3 of the standard, which is designed to avoid the need for complex noise predictions by following a series of questions relating to, for example, whether the noise is likely to be loud, have annoying characteristics or affect sleep.

In the event that any of these outcomes are likely, a more detailed and quantitative approach should be adopted.

In relation to carrying out detailed noise impact assessments, Section 4 'General' of the standard states:

"Regulatory authorities may have relevant policies and/or guidelines for the control of noise and vibration on construction sites. These should also be referred to when developing noise and vibration management plans for such projects."

In NSW this is the NSW Environment Protection Authority's *Interim Construction Noise Guideline 2009* as outlined in Section 9.2 below.

The Standard further states, in Section 4.6.1, that if noisy processes cannot be avoided, then the amount of noise reaching the receiver should be minimised and goes on to provide advice and recommendations to reduce noise and vibration impacts as far as reasonably practicable.



9.2 EPA Construction Noise Guideline

The NSW Environment Protection Authority published the *Interim Construction Noise Guideline* in July 2009. While some noise from construction sites is inevitable, the aim of the Guideline is to protect the majority of residences and other sensitive land uses from noise pollution most of the time.

The Guideline presents two ways of assessing construction noise impacts; the quantitative method and the qualitative method.

The quantitative method is generally suited to longer term construction projects and involves predicting noise levels from the construction phase and comparing them with noise management levels given in the guideline.

The qualitative method for assessing construction noise is a simplified way to identify the cause of potential noise impacts and may be used for short-term works, such as repair and maintenance projects of short duration.

In this instance, the quantitative method is the most appropriate and has been used in this assessment. Details of the quantitative method are given in Section 4 of the Guideline.

Normal construction hours are defined by the EPA as follows:

- 7.00 am to 6.00 pm Monday to Friday;
- 8.00 am to 1.00 pm Saturday; and
- No work on Sunday or Public Holiday.

Correspondance with Georges River Council indicates their standard conditions of consent for construction hours are 7 am to 5 pm Monday to Saturday. This is a slight variance of the standard EPA construction hours.

In certain cases, the community may prefer extended construction hours to achieve a shorter overall construction period. In this situation, we have been informed the preference for construction hours are 7 am to 6 pm Monday to Friday, and 7 am to 5 pm Saturdays. These proposed construction hours are still within the daytime period and are valid for the counstruction noise assessment.

Table 2 in Section 4 of the Guideline sets out noise management levels at affected residences and how they are to be applied during normal construction hours. The noise management level is derived from the rating background level (RBL) plus 10 dB in accordance with the Guideline. This level is considered to be the 'noise affected level' which represents the point above which there may be some community reaction to noise.

The 'highly noise affected' level of 75 dBA represents the point above which there may be strong community reaction to noise. This level is provided in the Guideline and is not based on the RBL. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected' noise management level.



Based on the RBL of 55 dBA (towards Forest Road) and 44 dBA (towards 13 Arcadia Street) in the daytime, the recommended noise management level during all aspects of the construction program are summarised in Table 19.

Table 19 L_{eq} Noise Management Levels from Construction Activities

Receptor Location	Noise Management Level	How to Apply
All Residential Receptors	65 dBA (55 + 10) or 54 dBA (44 + 10)	The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured L_{Aeq} (15 min) noise level is greater than 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 75 dBA	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 (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: - times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences); - if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

* Section 6, 'work practices' of The *Interim Construction Noise Guideline*, states: "there are no prescribed noise controls for construction works. Instead, all feasible and reasonable work practices should be implemented to minimise noise impacts.

This approach gives construction site managers and construction workers the greatest flexibility to manage noise".

Definitions of the terms feasible and reasonable are given in Section 1.4 of the Guideline.



The Interim Construction Noise Guideline recommends the following noise levels for land uses other than residential, as shown in Table 20. The external noise levels should be assessed at the most affected occupied point on the premises. A conservative estimate of 10 dB is generally applied as the difference between the external and internal level for noise sensitive uses that require internal noise measurement.

Table 20 Other Sensitive Land Uses

Land Use	Noise Management Level, $L_{Aeq,(15\text{ minute})}$ Applies when properties are being used.
Classrooms at schools and other educational institutions	45 dBA – Internal Noise Level
Active Recreation Areas, (areas that generate their own noise and less sensitive to external noise intrusion)	65 dBA – External Noise Level



9.3 EPA Vibration Guideline

The NSW EPA published the *Assessing Vibration: a technical guideline* in February 2006. This guideline is based on the British Standard BS6472:1992 "Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz)."

The guideline presents preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. The guideline considers vibration from construction activities as Intermittent Vibration. Table 2.4 of the guideline sets out limits for Vibration Dose Values to assess intermittent vibration and is replicated in Table 21 for residential receptor locations.

Table 21 Vibration Dose Values (VDV) from Construction Activities

Receptor Location	Daytime	
	Preferred value ($\text{m/s}^{1.75}$)	Maximum value ($\text{m/s}^{1.75}$)
All Residences	0.20	0.40

The British Standard BS7385-2:1993 "Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration" provides guide values for transient vibration relating to cosmetic damage, replicated in Table 22 for residential buildings.

Table 22 Transient Vibration Guide Values for Cosmetic Damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Residential	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

In our opinion, an overall peak particle velocity of **15 mm/s** at the boundaries is an acceptable criterion for intermittent vibration to prevent cosmetic damage to the adjacent residential buildings.



10.0 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

The main sources of noise on the site during the construction of the school buildings will be from heavy machinery such as excavators, dump trucks and hand held pneumatic and electric power tools, etc. Activities that may cause particular annoyance, due to tonality, spectral content or impulsiveness include generator motors, hand tools such as grinders, jackhammering and other activities involving impacts. These activities will require particular attention with regard to mitigation.

10.1 Stage 1 – Site Preparation

Site establishment works are likely to be completed within 2 months. Works will involve the use of excavators and regular truck movements transporting waste materials from the site. The equipment likely to be used and their corresponding sound power levels are presented in Table 23.

Table 23 Typical Site Preparation Equipment - Sound Power Levels

Description	Qty	Sound Power Level, dBA [^]
Excavators (up to 38 ton)	Up to 2	107 to 110
Trucks (up to 40 ton)	Up to 2	107 to 110
Bulldozer (21 ton)	1	108
Generator	2	Up to 89
Pneumatic and Electric Hand Tools	Up to 5 simultaneously	Up to 110

[^]All sound power levels are based on AS2436:2010 of various plant noise measurements.

As a conservative approach, it is assumed that all items of plant will be operating simultaneously.



Levels are based on the closest potential distance and furthest potential distance at which each item of plant may operate from each respective residential location. The calculated noise levels at nearby residential receptors are presented in Table 24.

Table 24 Calculated Receptor Sound Pressure Levels from Site Preparation

Receptor Location	Calculated Sound Pressure Levels (dBA)	Noise Management Level (dBA)	Compliance
R1 – 13 Arcadia Street (Ground Floor)	61 - 90	54	No
R2 – 12 Arcadia Street (Third Floor)	64 - 78	54	No
R3 – St Declan's Primary School (Second Floor)	65 - 90	55	No
R4 – 409 Forest Road (Third Floor)	59 - 70	65	No

10.2 Stage 2 – Earthworks

The Stage 2 Works will be completed within 5 months. The equipment likely to be used and their corresponding sound power levels are presented in Table 25.

Table 25 Typical Earthworks Equipment - Sound Power Levels

Description	Qty	Sound Power Level, dBA [^]
Excavators (up to 38 ton)	Up to 2	107 to 110
Trucks (up to 40 ton)	Up to 2	107 to 110
Compactor Rollers	Up to 2	110
Bulldozer (25 ton)	2	108
Front End Loader (25 ton)	1	110 to 115
Silenced Diesel Generator	Up to 2	Up to 89
Elevated Work Platforms	2	Up to 95
Pneumatic and Electric Hand Tools	Up to 5 simultaneous	Up to 110
Pile Driver	Up to 2	Up to 120
Screw Piling	Up to 2	Up to 105
Hydraulic Rock Breaker	Up to 2	Up to 118

[^]All sound power levels are based on AS2436:2010 and DEFRA database of various plant noise measurements.

As a conservative approach, it is assumed that all items of plant will be operating simultaneously. Levels are based on the closest potential distance and furthest potential distance at which each item of plant may operate from each respective residential location.



Given the intensity of work involved with pile driving and rock breaking, it is unlikely that these two activities will take place at the same time as any other activity. Therefore we have assessed the noise impact of these two activities individually.

The calculated noise levels at nearby residential receptors are presented in Table 26.

Table 26 Calculated Receptor Sound Pressure Levels from Earthworks

Receptor Location	Calculated Sound Pressure Levels (dBA)	Noise Management Level (dBA)	Compliance
R1 – 13 Arcadia Street (Ground Floor)	61 - 90	54	No
R2 – 12 Arcadia Street (Third Floor)	64 - 78	54	No
R3 – St Declan’s Primary School (Second Floor)	65 - 90	55	No
R4 – 409 Forest Road (Third Floor)	59 - 70	65	No
Rock breaking or pile driving (If required)			
R1 – 13 Arcadia Street (Ground Floor)	71 - 100	54	No
R2 – 12 Arcadia Street (Third Floor)	74 - 88	54	No
R3 – St Declan’s Primary School (Second Floor)	75 - 100	55	No
R4 – 409 Forest Road (Third Floor)	70 - 80	65	No



10.3 Vibration Impacts

Past measurements of ground borne vibration show that vibration levels can vary significantly at different distances and receptor locations. Recommended safe working distances for various items of vibration generating plant are given in Section 6.3 of Transport for NSW Construction Noise Strategy 2012. This information is shown below in Table 27.

Table 27 Recommended Safe Working Distances for Vibration Generating Plant

Plant Item	Rating/Description	Safe Working Distance	
		Cosmetic Damage (BS7385)	Human Response (OH&E Assessing Vibration – A Technical Guideline)
Small Hydraulic Hammer	300 kg – 5 to 12T Excavator	2 m	7 m
Medium Hydraulic Hammer	900 kg – 12 to 18T Excavator	7 m	23 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤800 mm	2 m (nominal)	N/A
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

We recommend that compliance monitoring of ground borne vibration is carried out at the nearest residence, when vibratory machinery such as pile drivers, jackhammers and the like are used on site. Refer to Section 11.10 for the mitigation measures to be engaged to reduce the impact of adverse vibration.



10.4 Stage 3 – Construction

The construction of the School is estimated to take 60 weeks and will involve the use of power tools and portable mechanical plant such as generators and cement mixers. The equipment likely to be used and their corresponding sound power levels are presented in Table 28.

Table 28 Typical Construction Equipment - Sound Power Levels

Description	Qty	Sound Power Level, dBA [^]
Silenced Diesel Generator	Up to 2	Up to 89
Telehandler (3 ton)	1	Up to 99
Elevated Work Platforms	2	Up to 95
Pneumatic and Electric Hand Tools	Up to 5 simultaneous	Up to 110

[^]All sound power levels are based on AS2436:2010 and DEFRA database of various plant noise measurements.

During the construction phase, work will be more dispersed across the site as the scale of work, compared to the previous two phases, is less intensive. Calculations consider distance attenuation only and the range of levels are based on the closest potential distance and furthest potential distance at which each item of plant may operate from each respective residential location.

The calculated noise levels at nearby residential receptors are presented in Table 29.

Table 29 Calculated Receptor Sound Pressure Levels from Construction

Receptor Location	Calculated Sound Pressure Levels (dBA)	Noise Management Level (dBA)	Compliance
R1 – 13 Arcadia Street (Ground Floor)	60 - 89	54	No
R2 – 12 Arcadia Street (Third Floor)	63 - 77	54	No
R3 – St Declan's Primary School (Second Floor)	64 - 89	55	No
R4 – 409 Forest Road (Third Floor)	58 - 69	65	No

Note that once the school buildings begin to be erected, the buildings will act as a noise barrier to the adjoining receptor locations, reducing the level of construction noise as construction progresses.



11.0 CONSTRUCTION NOISE AND VIBRATION MITIGATION RECOMMENDATIONS

The predicted level of noise (Section 10.1, 10.2, and 10.4) and vibration (Section 10.3) emission from the construction of the School show that noise levels will likely exceed the Noise Management Levels established in Section 9.2 of this report. The highly affected noise level of 75 dBA will also likely be approached for the majority of the construction carried out close to the nearby affected locations.

The following work practices are recommended to be implemented where necessary and practicable, to reduce noise emission as far as reasonably practicable:

- Works to be staged to minimise noise impact,
- Methodology of demolition will be carried out so that noisy activities do not occur concurrently where possible,
- Impact noise will be limited
- Substitution of equipment will be considered to minimise noise (Section 11.3)
- Impulsive and tonal noise to be restricted to the hours of 9.00 am to 4.00 pm Mon-Fri, and continuous blocks will not exceed three hours each with a minimum respite from those activities and works of not less than one hour between each block (Section 11.4)
- Management plan to ensure construction vehicles arrive and depart during construction hours only
- Reversing alarms to be of “quacker” broadband alarm style

11.1 Noise Measurement Equipment

All acoustic instrumentation employed throughout the monitoring programme will comply with the requirements of AS IEC 61672.1:2004 *Electroacoustics – Sound level Meters-Specifications*. All sound level meters must have a current calibration certificate from a NATA accredited laboratory in accordance with NATA guidelines. Instrument calibration shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ± 0.5 dB.



11.2 Attended Residential Noise Monitoring Procedure

Any attended noise measurements to be carried out as a result of a noise complaint should be conducted in accordance with the procedures outlined in Australian Standard AS1055 *Acoustics – Description and measurement of environmental noise* and in accordance with methods outlined in the NSW Industrial Noise Policy (INP). The following points should be followed when conducting noise monitoring:

- A field calibration should be conducted before and after measurements;
- The sound level meters must be set to A-weighting and Fast response;
- The sound level meters sample period should be set to 15 minutes;
- The following descriptors should be measured as a minimum: L_{A1} , L_{Aeq} and L_{A90} ; and
- Measurements should be conducted a minimum of 3 metres from the nearest façade and/or solid fence/wall. If it is not possible to do this corrections for façade reflection should be applied to the measurement results.

11.3 Noise Monitoring of Equipment

In addition to the residential noise monitoring procedures described above, the following equipment measurements can be undertaken if a noise complaint arises:

- Noise emission levels of all critical items of mobile plant and equipment will be checked by the site environmental officer for compliance with noise limits appropriate to those items prior to the equipment going into regular service;
- For equipment and mobile plant used for construction works, L_{Aeq} measurements will be taken at an appropriate distance, normally 7 metres and converted to a Sound Power Level;
- An *Equipment Noise Certificate*, presenting relevant sound levels of the equipment tested, will be issued by the Construction Contractor's site environmental officer within the first week of the equipment commencing at the construction site.

The equipment sound power levels will be compared to the levels contained in Table 23, 25 and 28. If noise checks on any equipment result in a prediction of non-compliance, quieter equipment or alternate construction methods should be substituted. For example, screw piling instead of impact piling can result in a 15 dB noise reduction.



11.4 Periods of Respite

All activities associated with the construction shall take place within the proposed hours, as shown below:

- 7:00 am to 6:00 pm, Monday to Friday inclusive; and
- 7:00 am to 5:00 pm Saturdays;
- At no time on Sundays or public holidays.

Works that result in impulsive or tonal noise emissions shall only be undertaken:

- 8:00 am and 5:00 pm Monday to Friday inclusive;
- In continuous blocks, not exceeding 3 hours each, with a minimum respite from those activities and works of not less than one hour between each block.

11.5 Reducing Noise from Plant and Equipment

- Use alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electriccontrolled units where feasible and reasonable. Where there is no electricity supply, use an electrical generator located away from residences.
- 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 supersilenced compressors, silenced jackhammers and damped bits where possible.
- Place as much distance as possible between the plant or equipment and residences and other sensitive land uses.

11.6 Work Practices

Workers and contractors shall be trained in work practices to minimise noise emission such as the following:

- Avoid dropping materials from a height.
- Avoid shouting and talking loudly outdoors.
- Avoid the use of radios outdoors that can be heard at the boundary of residences.
- Turn off equipment when not being used.
- Carry out work only within the approved hours of operation.
- Construction vehicles to arrive and depart during construction hours only.



11.7 Heavy Vehicles and Staff Vehicles

- Truck drivers shall be informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (for example, minimising the use of engine brakes, and no extended periods of engine idling).
- Site vehicle entrances shall be located away from residences where practicable.
- The number of vehicle trips shall be configured to reduce the number of trips to and from the site – movements shall be organised to amalgamate loads rather than using a number of vehicles with smaller loads.
- Parking and queuing of construction staff vehicles and other construction vehicles shall be avoided as far as is practicable on streets outside of the site.
- There shall be no access for construction vehicles to the site or park within residential areas prior to 7 am on any occasion, in order to avoid sleep disturbance.
- Vehicles shall be fitted with broadband reversing alarms or alternative, non-tonal proximity warning systems.
- For the duration of construction, use of compression braking shall not be permitted on the site or nearby the site, such as on access roads within close proximity to residential premises.



11.8 Community Relations

- A Community Liaison Officer shall to be appointed by the contractor prior to the commencement of any works;
- The officer will approach all potentially affected residents prior to the commencement of any works as an initial introduction and provide their contact details;
- The officer will explain the project, duration of works, potentially noisy periods as well as determine any particularly sensitive receivers or sensitive time periods and schedule works accordingly, as far as reasonably practical;
- A community information telephone number may be established to provide access and information about the project.
- Community notifications and newsletters shall be prepared and distributed, at least 7 days prior to commencement of any works, to the community in areas that are potentially affected by the project. The contents of the notifications shall include information on the nature of the works, location of works being carried out, possible impacts to amenity, traffic flow or services, and the contact details as listed above.
- Community drop-in sessions shall be organised to engage with the community and to provide a conduit for direct consultation between those affected, or with an interest in the project, and the project team. To encourage the widest attendance and accessibility to the community, drop-in sessions shall be arranged outside of business hours such as weeknights or on Saturday.
- Information cards with the above contact details shall be prepared and distributed to the project management team and other staff on site. These cards shall be given to members of the community or other interested parties should they approach staff on site for information.

Once works commence, communication with the community shall be maintained by the Community Liaison Officer. Communication shall be maintained via the aforementioned methods.

Consultation and cooperation between the contractor and the neighbours and the removal of uncertainty and rumour can help to reduce adverse reaction to noise.



11.9 Managing a Noise Complaint

The Liaison Officer shall receive and manage noise complaints and implement a Construction Complaints Management System.

All complaints shall be treated promptly and with courtesy.

In the event that a noise complaint is received, noise monitoring will be carried out at the affected receptor location and appropriate measures be taken to reduce the noise emission as far as reasonably practicable.

Where it is not practicable to stop the noise, or reduce the noise, a full explanation of the event taking place, the reason for the noise and times when it will stop shall be given to the complainant.

The following guidelines are recommended in Section 6 of the *Interim Construction Noise Guideline* to manage a noise complaint:

- Provide a readily accessible contact point, for example, through a 24 hour toll-free information and complaints line.
- Give complaints a fair hearing.
- Have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow.
- Call back as soon as possible to keep people informed of action to be taken to address noise problems. Call back at night-time only if requested by the complainant to avoid further disturbance.
- Provide a quick response to complaints, with complaint handling staff having both a good knowledge of the project and ready access to information.
- Implement all feasible and reasonable measures to address the source of complaint, which may include standing equipment down.
- Keep a register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, work area, time of verbal response and timeframe for written response where appropriate.



11.10 Noise Monitoring

In the event of a noise complaint, monitoring shall be carried out at the complainant's residence to determine which activities are generating excessive noise. If practicable, noise mitigation measures, such as those outlined above, shall be implemented and further monitoring shall then be employed to determine the efficacy of noise mitigation.

11.11 Vibration Monitoring

If high impact activities, such as rock hammering or piling are to be conducted at any time during each stage, vibration measurements may be carried out at a residence within each of the nearest receptor locations at the commencement of high impact activities to determine the maximum levels of vibration during these peak vibration generating events.

In the event of an exceedance of the Peak Particle Velocity (PPV) vibration criteria as defined in Table 22, unattended vibration monitor or monitors shall be installed at each residential location where an exceedance was measured.

Unattended vibration monitors shall have the capability to trigger an alert to make the site manager and/or plant operator aware immediately when the vibration limit is exceeded. The vibration monitor should be set to trigger the alert when the overall PPV exceeds the criteria within each frequency range, as stipulated in Table 22, at the nearest residential building.

In the event that levels of ground-borne vibration exceed the recommended acceptable levels for cosmetic damage vibration causing works should cease immediately and alternative methods shall be considered.



APPENDIX C – Construction Waste Management Sub-Plan

Waste Management Plan
Prepared by Root Partnerships
Rev 3
Refer Section 4

Grindley	GRINDLEY CONSTRUCTION PTY LTD 55 Grandview Street Pymble NSW 2073 Ph 02 9988 3811 Fax 02 9988 3575	Version 06	Date 21/7/2014
Location	C:\Users\mthorburn\Dropbox (Grindley)\Projects - Construction\6380 Penshurst PS\whseq\plans\6380 PPS - Project Specific Environmental Management Plan - Rev5.docx	Page 28 of 29	



Waste Management Plan

Penshurst Public School Upgrade

NSW Department of Education

Revision 3
2 February 2018

**ROOT
PARTNERSHIPS**

Advisory+
Project Management

Date	Revision	Prepared	Approved
12/01/2018	1	AJ	-
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4 Construction and Demolition

4.1 General

This section provides an overarching guideline for managing waste during the demolition and construction phases. The principal contractor will be required under the contract to prepare a Construction Management Plan including a section on waste management. This will describe how the contractor will manage waste produced by themselves and their subcontractors throughout the construction process. This includes waste produced during any demolition and site preparation activity, as well as during the construction process itself. All waste management procedures will comply with Georges River Council waste management requirements as outlined in Appendix 1 of the DCP.

The demolition and construction works for this development are required to consider the project Green Star objectives, particularly in regards to the use of recycled building materials and recycling construction waste (>60% required, >80% target).

Waste will be managed so as to maximise diversion from landfill. This may be done either through on-site segregation of recyclable components, or through off-site sorting by special waste contractors.

Furniture considered in good condition may be re-used or distributed to other schools to retain furniture that would be otherwise disposed of.

Waste generated during construction and demolition will be reused and recycled as a priority and only disposed to landfill when unavoidable.

During the onsite works adequate space and access will be provided for:

- Separated storage of building materials
- Separated storage of construction and demolition waste
- Separated sorting of construction and demolition waste
- Removal of construction and demolition for recycling, reuse or landfill

Refer to Appendix 1 for the Section 1 form required by the Georges River Council DCP, to be completed by the Principal Contractor upon contract award.

4.2 Hazardous Materials

Asbestos containing materials (ACM's) that are present on site are detailed in the Asbestos Register in Appendix 3.

In addition, ACM may be present in areas that were inaccessible during the survey including but not limited to wall cavities, sub-floor voids and sub-surface concrete and soil layers of the site.

In its current state, all ACM and assumed ACM located at the sites would meet the definition of “non-friable” asbestos as defined in the *NSW Work Health and Safety Regulation 2011* and in the *Working with Asbestos Guide – 2008* produced by SafeWork NSW.

All ACM located on the site will be removed by a Class A or Class B licensed asbestos removal contractor under controlled asbestos conditions in accordance with all relevant regulations and requirements noted in section 3.1 of this report.

An Asbestos Removal Control Plan is to be developed by a licensed asbestos removalist to address the requirements as part of the contract of the Principal Contractor upon contract award.

APPENDIX D – Construction Soil and Water Management Sub-Plan

Stormwater Management Report
Prepared by Woolacotts
Rev C
Refer Section 6

Erosion and Sediment Control Plan
Prepared by Woolacotts
Series Number CIV-01-008 Rev.2

Grindley	GRINDLEY CONSTRUCTION PTY LTD 55 Grandview Street Pymble NSW 2073 Ph 02 9988 3811 Fax 02 9988 3575	Version 06	Date 21/7/2014
Location	C:\Users\mthorburn\Dropbox (Grindley)\Projects - Construction\6380 Penshurst PS\whseq\plans\6380 PPS - Project Specific Environmental Management Plan - Rev5.docx	Page 29 of 29	

Penshurst Public School Stormwater Management Report

28 March 2018 | 16-242

Document control

Rev No	Date	Revision details	Approved	Verified	Prepared
A	13.11.17	Approved Issue	SETB	CMW	CMW
B	5.2.18	Drawings amended	SETB	CMW	CMW
C	28-3-2018	SSDA issue	SETB	CMW	CMW

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6. Stormwater Management

On-site stormwater detention (OSD)

On-site stormwater detention (OSD) is required to restrict the peak flow from the developed site in a 1% (100year ARI) storm event back to the peak flow from existing site in a 20% (5 year ARI) storm event.

The peak flow from the existing site was calculated using the computer model RAFTS, with the existing impervious area being 74% of the site. The analysis determined that the peak flow from the site in the 5year ARI storm event is 433 L/s. Consequently, this flow was adopted as the permitted site discharge (PSD).

To reduce the flow from a 100year ARI storm back to the PSD, a detention volume of 240m³ is required. It is not possible to provide this volume in an above ground basin with a depth of less than 300mm. Therefore it is proposed to provide the volume in a tank, located beneath a classroom block, with access into the tank available from outside the building. Locating the tank in this position minimises excavation, as the ground slope in the area can be used as part of the space.

The tank is located in a position where it is able to capture runoff from the majority of the impervious area of the site. However, it is not able to capture runoff from the playing fields. Consequently, the outflow from the tank has been reduced, to allow for the areas bypassing the detention tank. Calculation detailing the areas, flow and detention volume are presented in Appendix B.

Pipe network

A piped drainage system will be provided for the site. The majority of the site will drain to the detention tank, and the pipe network draining to the tank will be sized for a 100year ARI storm event, the same recurrence interval as required by Council for the design of the detention system. This will ensure that all stormwater from the design storm reaches the tank, to allow the tank to restrict flows as designs.. Pipes not draining to the detention tank will be sized for the 20year ARI storm event, in accordance with Council's policy.

Currently the site has a number of connections to the street drainage system. It is proposed that the existing connections to the kerb and gutter are removed and a new connection provided to the Council pit in Arcadia Street, located approximately 30m from the corner of Forest Road. The majority of the site will drain to this pit. The existing connection to the pit immediately adjacent to the corner will be maintained and will drain the south-east corner of the site, which is unable to drain to the main system. Details of the location of both pits and the overall proposed site drainage system are shown on Drawing SW1 in Appendix A.

Rainwater tank

A rainwater tank will be located adjacent to the OSD tank, with an internal wall separating the rainwater stormwater portion from the detention portion. The pipe system for the main part of the site will drain to the rainwater tank. When water reaches the top of the wall it will overflow into the OSD part. A gross pollutant trap will be provided upstream of the tank, to remove rubbish and leaf litter.

Water stored in the tank will be used for non-potable uses on site, such as watering garden areas and flushing of toilets.

Erosion and sediment control

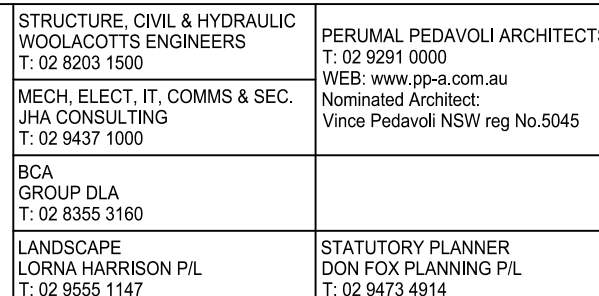
During construction, erosion and sediment control measures will be provided in accordance with the “Blue Book” – Managing Urban Stormwater – Soils and Construction. Measures will include a silt fence on the low side of the site, a construction exit, silt traps on the Council pits in Arcadia Street and a silt basin in the south-east corner of the site. Refer to Drawing SW2 in Appendix A for further details.

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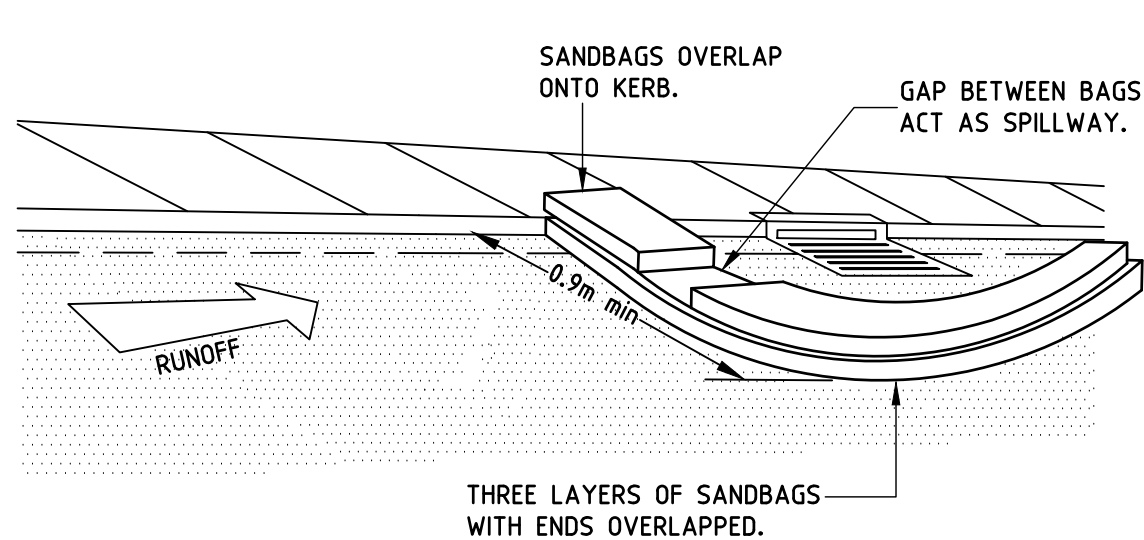
Job Number	Approved	Verified	Prepared
16-242	SETB 10.05.19	AP 10.05.19	JK 10.05.19



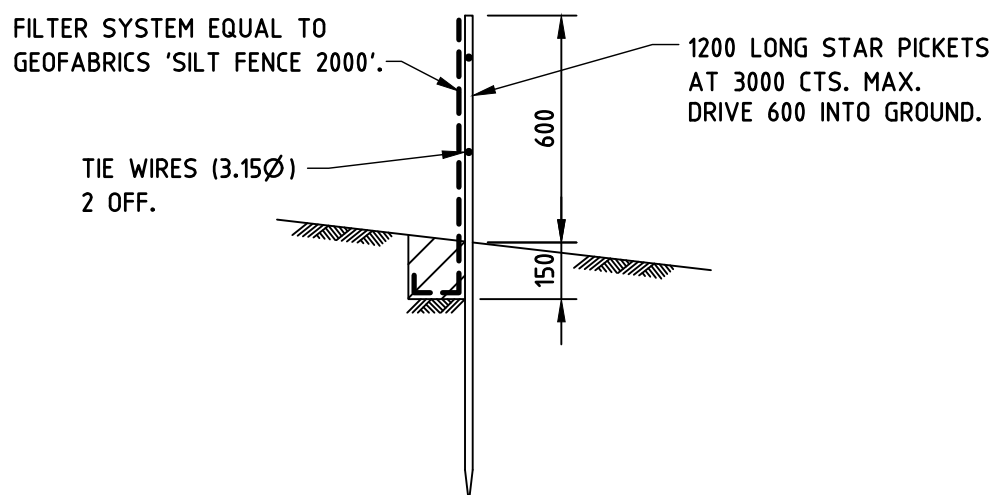
PENSHURST PUBLIC SCHOOL
18 Arcadia Street, Penshurst

Drawing Name
**SEDIMENT & EROSION CONTROL
PLAN & DETAILS**

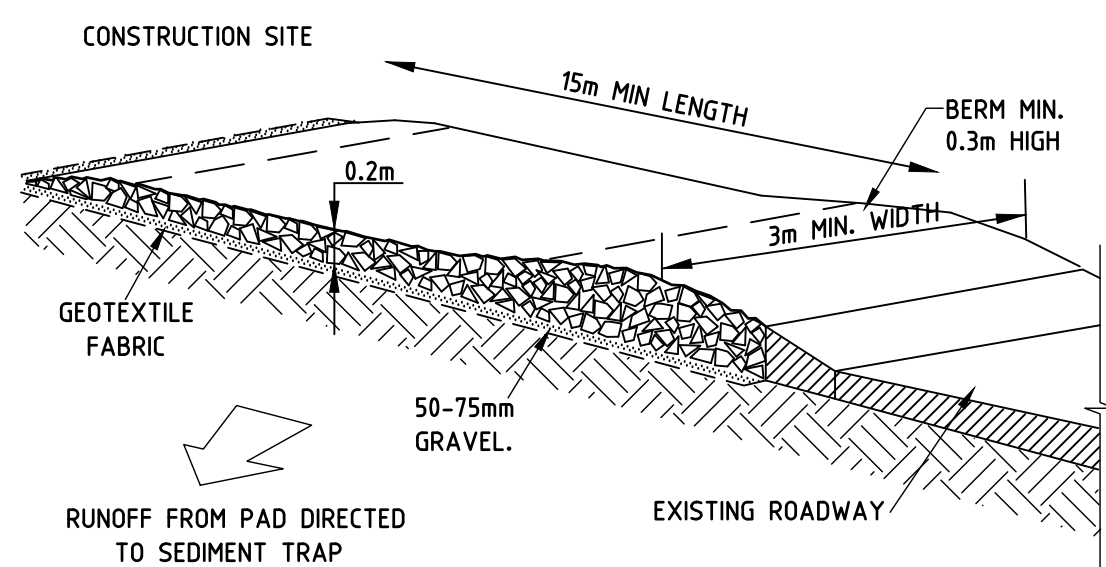
CONTRACT NUMBER SINSW-18-1257		SCALE 1:250 @ A1	
DRAWN	CHECKED	VERIFIED	Date
PROJECT NORTH		10 MAY 2019	
Drawing Number		Revision	
PROJECT CODE	DISCIPLINE	PHASE	SERIES NUMBER
3199 - CIV- CD- 01_008			02



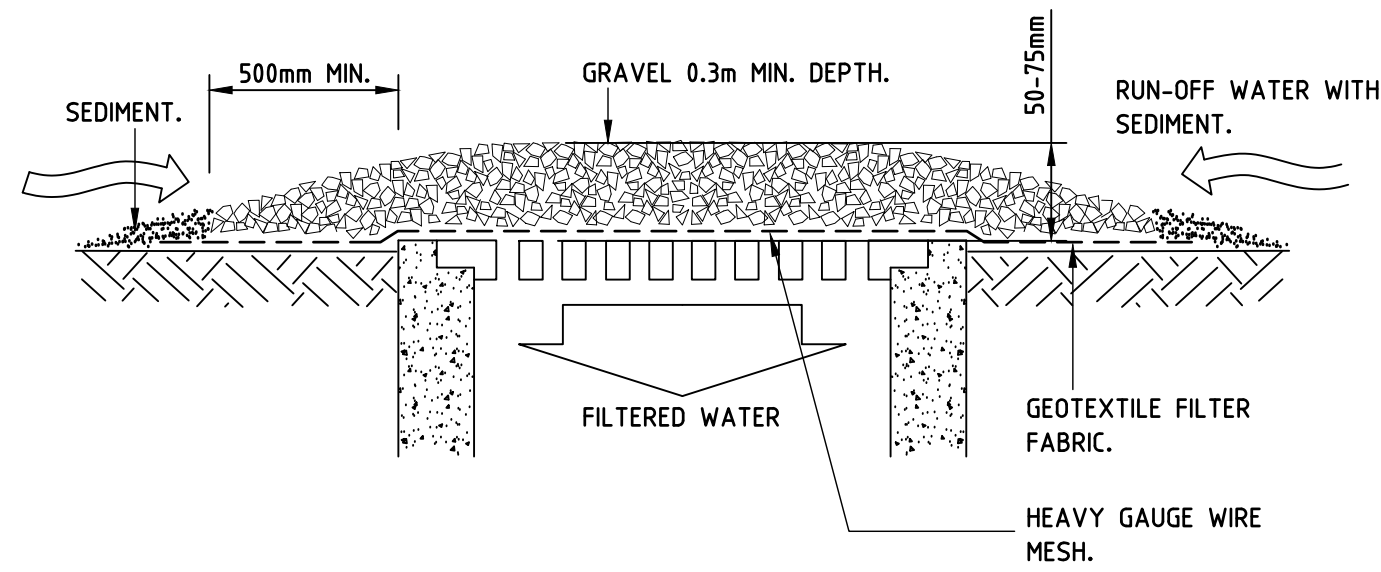
TYPICAL SANDBAG KERB INLET SEDIMENT TRAP



SILT FENCE DETAIL
TO BE PLACED AROUND LOW SIDE OF WORKS AND AS REQUIRED TO PREVENT SOIL WASHING OFF SITE.



TEMPORARY CONSTRUCTION EXIT
TO BE PROVIDED WHERE CONSTRUCTION VEHICLES LEAVE SITE.



WIRE MESH AND GRAVEL DROP INLET SEDIMENT TRAP.
TO BE PROVIDED AT ALL NEW AND EXISTING GRATED PITS WITHIN IMPERVIOUS AREAS.

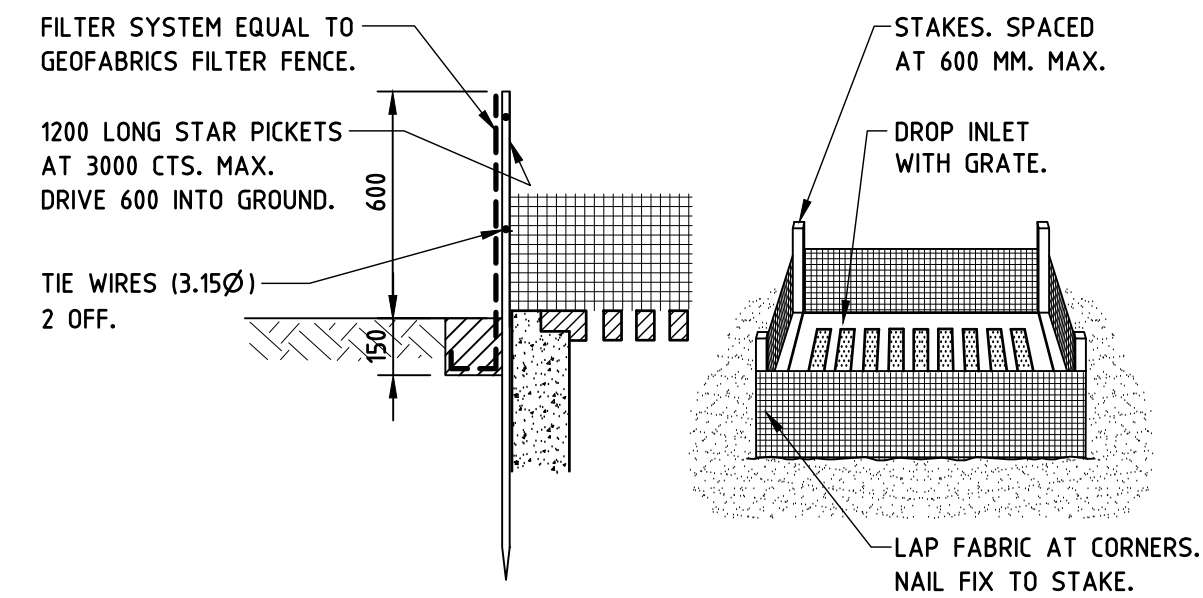
LEGEND

- TEMPORARY SITE EXIT
- DETENTION TANK
- RAINWATER TANK
- EXISTING STORMWATER PIPE
- SILT FENCE
- SILT TRAP
- SWALE

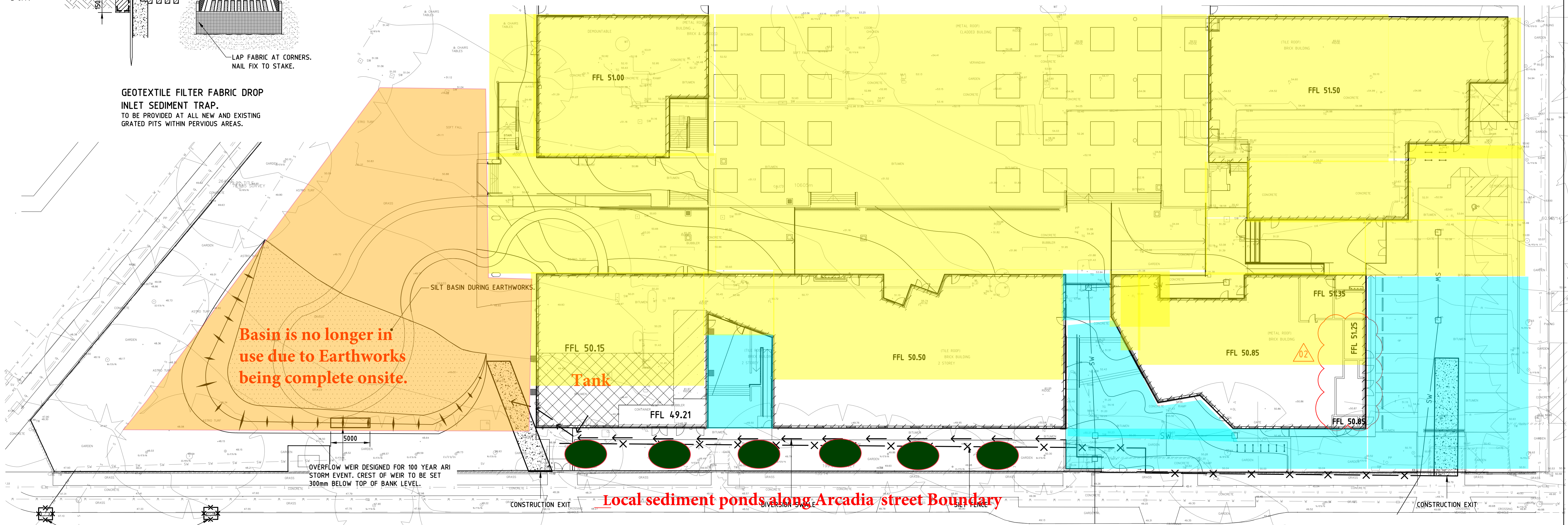
NOTE:
• PROVIDE SILT TRAP AROUND ALL EXISTING GRATED INLET PITS UNTIL THEY ARE REMOVED/DEMOLISHED.
• PROVIDE SILT TRAPS AROUND ALL NEW PITS DURING CONSTRUCTION.

EROSION AND SEDIMENT CONTROL DETAILS

PROVIDE AS REQUIRED TO PREVENT SILT FROM LEAVING THE SITE.



GEOTEXTILE FILTER FABRIC DROP INLET SEDIMENT TRAP.
TO BE PROVIDED AT ALL NEW AND EXISTING GRATED PITS WITHIN PERVIOUS AREAS.



Basin is no longer in use due to Earthworks being complete onsite.

Tank

Local sediment ponds along Arcadia street Boundary

SEDIMENT BASIN SUMMARY

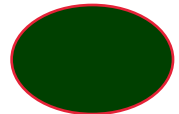
SEDIMENT BASIN

VOLUME CALCULATED IN ACCORDANCE WITH "MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION VOLUME 1, 4TH EDITION 2004".

TYPE D AND F SOILS
DESIGN RAINFALL DEPTH (DAYS) = 5 DAYS
DESIGN RAINFALL DEPTH (%) = 85%
SDAY 85% RAINFALL EVENT (GRAFTON NSW) = 31.5mm
RAINFALL INTENSITY 2YEAR, 6MIN STORM = 9.82mm
RAINFALL EROSIVITY (R-FACTOR) = 3557
VOLUMETRIC RUNOFF COEFFICIENT = 0.64

BASIN VOLUMES

CATCHMENT AREA (ha) = 1.05ha
SETTLING ZONE VOLUME (m³) = 212m³
SEDIMENT STORAGE VOLUME (m³) = 106m³
TOTAL BASIN VOLUME (m³) = 318m³



Sediment Pond



Drains to perimeter sediment fence and tree protection zone

SEDIMENT DETAIL TO BE CONSTRUCTED IN ACCORDANCE WITH DETAIL SD6-4 OF "MANAGING URBAN STORMWATER-SOILS AND CONSTRUCTION, VOLUME 1, 4TH EDITION 2004"

REV	BY	DATE	DESCRIPTION
A	SETB	31.08.18	ISSUE FOR TENDER
B	SETB	26.03.19	SEDIMENT BASIN VOLUME ADDED
C	SETB	05.04.19	DRAFT IFC
D	AP	18.04.19	GATEWAY 4 REVIEW
01	A.P	10.05.19	ISSUE FOR CONSTRUCTION
02	A.P	05.12.19	BACKGROUND UPDATED, REISSUED FOR CONSTRUCTION

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Job Number: 16-242
Approved: 10.05.19
Verified: 10.05.19
Prepared: 10.05.19

NSW GOVERNMENT
Education

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LANDSCAPE
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STATUTORY PLANNER
DON FOX PLANNING P/L
T: 02 9473 4914

PERUMAL PEDAVOLI
ARCHITECTS

PENSHURST PUBLIC SCHOOL
18 Arcadia Street, Penshurst
Drawing Name:
SEDIMENT & EROSION CONTROL PLAN & DETAILS

CONTRACT NUMBER: SINSW-18-1257
SCALE: 1:250 @ A1

DRAWN	CHECKED	VERIFIED	Date	10 MAY 2019
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Drawing Number: 3199 - CIV- CD- 01_008
Revision: 02

PROJECT CODE: DISCIPLINE: PHASE: SERIES NUMBER