Transport for NSW

Marine Drive, Lang Park – Wollongong Bus Layover Relocation

Minor works review of environmental factors

June 2025

NSW GOVERNMENT

transport.nsw.gov.au

Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which the Marine Drive, Lang Park – Wollongong Bus Layover Relocation is proposed.

We pay our respects to their Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.

Report review tracking.

Draft No.	Date	Drafted by	Comments
1	12/12/2024	Lachlan Jones	Initial Concept Draft
2	19/02/2025	Lachlan Jones	Combined Environmental Review
3	16/04/2025	Lachlan Jones	Detailed Design & Noise Assessment Review
4	05/06/2025	Lachlan Jones	Operational Noise Assessment Update
5	20/06/2025	Lachlan Jones	Finalisation & Determination

Approval and authorisation

Approved by	Lachlan Jones Project Engineer Project Services South
Signed	
Date	20/06/2025

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1. Introduction

The purpose of the minor works review of environmental factors (REF) is to describe the proposal, to document the likely impacts of the proposal on the environment, to detail mitigation measures to be implemented and to determine whether or not the proposal can proceed. For the purposes of this work Transport for NSW (Transport) is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The description of the proposed works and assessment of associated environmental impacts has been undertaken in the context of section 171 of the Environmental Planning and Assessment Regulation 2021, Guidelines for Division 5.1 Assessments (DPE, 2022), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act) and the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (EPBC Act).

In doing so the REF helps to fulfil the requirements of section 5.5 of the EP&A Act including that Transport examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act.

The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.

The potential for the proposal to significantly impact a matter of national environmental significance, including nationally listed threatened biodiversity matters, or the environment of Commonwealth land. Where a significant impact is considered likely on nationally listed biodiversity matters, either the proposal must be reconsidered, or a project REF must be prepared.

2. The proposal

2.1 Description

2.1.1 Proposal location

Table 2-1: Proposal location details

Location details	
Title	Marine Drive, Lang Park – Wollongong Bus Layover Relocation
File number	A67958125
Road name and number	N/A
Closest crossroad(s)	North: Burelli Street East: Atchison Street South: Ellen Street West: Auburn Street
Chainage of works	Start: (-34.427139, 150.889603), End: (-34.427290, 150.890555)
Local government area	Wollongong City Council
Transport for NSW region	South

2.1.2 Proposal description

The Wollongong bus layover is currently located on Marine Drive, Lang Park on Wollongong's foreshore. This layover has been the base location for Illawarra bus operations within the Wollongong region for over 25 years.

A request from Wollongong City Council (WCC) notified Transport for NSW (TfNSW) of the need for a permanent relocation of the Wollongong bus layover to support WCC's future vision for Lang Park. This was initiated during the preparation for the 2022 UCI World Cycling Championships which required the temporary relocation of the bus layover for the event. In January 2024, Wollongong City Council informed Transport for NSW the existing layover would be re-utilised to support the 2025 World Triathlon Championships in October 2025.

The bus layover in Wollongong is required to provide bus drivers with a safe place to break between services and is therefore a necessity for the safe operation of bus services in the Illawarra. The local Bus Operators and the Transport Workers' Union (TWU) have previously informed TfNSW that they will not entertain a temporary relocation of the bus layover facility following a number of WHS safety issues that occurred during the previous temporary relocation of the layover in 2022.

In FY23 and FY24, TfNSW led a detailed options assessment to identify a future location for the layover. More than 20 locations were considered in collaboration with WCC, the Illawarra Bus Operators and the TWU. As a result, three sites were identified as best meeting the requirements for the current and future bus services in the region (Appendix C).

The preferred options included:

- Atchison Street car park in Wollongong
- Wollongong Train Station car park
- Oak Flats Train Station car park

The Atchison Street car park site can provide sufficient spaces for buses to layover in lieu of the existing Marine Drive site and has been identified as the optimum location for the relocation of the bus layover within the Wollongong CBD.

TfNSW is proposing to relocate the bus layover currently existing along Marine Drive, Lang Park to the car park along Atchison St to minimise the impact to current bus services, customers, and the wider community, while providing a safe location for Bus Operators to break during services.

Key features of the proposal include:

- Provide a designated, long-term, layover location for Illawarra Bus Operators within the Wollongong CBD.
- Provide at minimum, 11 layover spaces to reflect the capacity of the existing layover location.
- Provide suitable toilet and lunchroom facilities with the provisions of power, water, and sewerage connections to service the use of the layover.
- Provide a designated pedestrian link between Atchison St & Auburn St.

The proposal is anticipated to involve the following work methodology:

Preliminary Works:

- Pre-clearance checks to ensure no unexpected hazards are identified.
- Accurately locate utility service lines to determine any services that may be impacted by the completion of the works.
- Establish traffic control measures including temporary lane closures, exclusion zones, reduced speed limits and/or detours where necessary through/around the works location.
- Establish a compound site within the shoulder of Atchison St, Auburn St and/or within the confines of the Atchison St car park.
- Establish site protection measures such as erosion and sediment controls, security fencing, concrete barriers etc. as necessary to ensure the safety of the project site.
- Remove existing assets including parking meters, boom gates, bollards and other car park assets likely to be impacted during the construction of the layover.

Pavement Rehabilitation:

- Identify extent of works and establish works zone.
- Implement erosion and sediment controls, including the provisions for protecting existing drainage lines and adjacent infrastructure.
- Excavate existing pavement and substructure and remove unsuitable materials to the depth specified within the project detailed pavement design.
- Build subgrade and basecourse with stabilised sand cement or similar to the thicknesses specified within the project detailed pavement design. Compact subgrade and basecourse as per correlating Australian Standards and Transport for NSW specifications.
- Install asphalt overlay and wearing course and compact with roller to achieve required relative compaction and strength as per the project detailed pavement design.
- Complete QA assessments, inspection tests and repairs to ensure all implemented treatments adhere to the requirements of the project detailed design.
- Conduct sweep of asphalt to remove and collect loose aggregate/other debris from the works location.

Installing Toilet/Lunchroom Facilities.

- Identify extent of works and establish works zone.

- Excavate toilet/lunchroom facility area including connection lines for water, power, and sewerage.
- Install connection lines for water, power, and sewerage.
- Install concrete slab and foundations.
- Install modular toilet/lunchroom facility.
- Complete QA assessments, inspection tests and repairs to ensure the provided facilities adhere to the requirements of the project detailed design.

Installing Additional Layover Features:

- Excavate designated lighting pole footings and conduit trenches.
- Install conduits and power connection to supply box.
- Install lighting footings, posts, and lights as per the commissioned Level 3 ASP Detailed Lighting Design.
- Excavate designated signage post footings.
- Install sign posts and changes to on-street signage arrangements on Station St, Dean St, Auburn St and Atchison St as per the approved detailed project design.
- Excavate median footpaths, designated pedestrian link, driveways, and impacted kerb.
- Install concrete median footpaths, designated pedestrian link, driveways, and new kerb as per the project detailed design.
- Install fencing around facility as per the requirements of the detailed design including along the pathway link to separate the pedestrian pathway from the layover facility.
- Install bollards around power supply box, and adjacent to fencing and facility as per the requirements of the detailed project design.
- Mark-out, using standard surveying techniques, line marking configuration within the layover location.
- Install line marking as per the project detailed design and survey mark-out.
- Complete QA assessments, inspection tests and repairs to ensure the provided infrastructure adheres to the requirements of the project detailed design and relevant standards.

Site Demobilisation:

- Complete QA assessments, inspection tests and repairs to ensure all implemented scope items adhere to the requirements of the project detailed design.
- Remove and stabilise the works area including cleaning of loose aggregate, general waste, debris etc.
- Remove and stabilise the compound site area and stockpile sites.
- Remove erosion and sediment controls including clearing around existing drainage lines.
- Remove traffic control measures and demobilise from site.

The following facilities are a proposed as a part of the works (refer to Appendix B):

- Temporary compound site within the road shoulder of Atchison St or Auburn St.
- Temporary stockpiling/staging area to be included in the project area or at the respective TfNSW/Contractor depot.
- Light vehicle parking, (most likely four-wheel drives) within the designated works area or in adjacent side streets.

- Plant parking/laydown areas within the designated compound site or within adjacent side streets.

The onsite commencement date is yet to be confirmed however, it is expected works will commence in July 2025; with the construction works required to be completed prior to 31 August 2025. The proposed works activities would be conducted under standard working hours due to the minimal impact on traffic and pedestrians within the confined works space. The following working hours would be used for the proposed works:

- Monday to Friday – 7am to 6pm
- Saturday – 8am to 1pm
- Public Holidays – No works.

There is the potential requirement for night works to be completion to allow access to utility services within the existing Atchison St & Auburn St road corridor for the installation and connection of the toilet/lunchroom facilities and street lighting. Night works would only be required for 1-2 shifts to reduce the impact to motorists and residents. Night works would be undertaken between:

- Sunday to Thursday – 7pm to 6am.

2.1.3 Proposal objectives

The objectives of the works are to:

- Provide a designated location for the layover and break of Bus Operators between services within the Wollongong CBD.
- Provide a layover facility that results in minimal impacts to customers and existing bus services.
- Provide toilet/lunchroom facilities that adhere to Australian & Transport for NSW Standards.
- Provide a designated safe connection for pedestrian movements between Atchison St & Auburn St.

2.1.4 Ancillary facilities

Table 2-2: Ancillary facilities

Ancillary facilities		
Will the proposal require the use or installation of a compound site? A temporary compound site would be installed on either the road shoulder of Atchison St or Auburn St adjacent to the project site and/or within the designated works area. This area would include the parking/laydown of plant/equipment, the inclusion of a site shed, toilet facilities and a storage shed. All sheds would be located on existing hardstand pavement and would be enclosed by security fencing to omit entry from the Public. Parking of personal/works vehicles and construction plant would be completed on existing hardstand areas within adjacent streets or within the works area itself.  Figure 2-1 - Works Impact Area  Figure 2-2 - Example Compound Site	Yes ☒	No ☐
Will the proposal require the use or installation of a stockpile site? The stockpiling of materials would occur at the respective TfNSW or Contractor depots or within the works location for immediate use. Deliveries to the site would allow the temporary storage of materials within the works area prior to use during construction. All	Yes ☒	No ☐

erodible materials would be stockpiled away from drainage lines to minimise the potential release of debris.		
Are any other ancillary facilities required (e.g. temporary plants, parking areas, access tracks)? The parking of construction plant, equipment and personal vehicles would occur within the established works area and/or in adjacent streets on the existing hardstand pavement. Rehabilitation of all disturbed areas including but not limited to the replacement of damaged ground would be undertaken at the completion of the proposed. No excavation works would be required in adjacent streets for the propose of installing any ancillary facilities.	Yes ☒	No ☐

2.1.5 Proposed date of commencement

The on-site commencement date is yet to be confirmed however, it is expected that the works will commence as early as July 2025 with a required construction completion date prior to 31 August 2025.

2.1.6 Estimated length of construction period

The construction phase of this project is expected take approximately 8 weeks to complete. All project objectives and handover of site is required to be completed prior to 31 August 2025.

2.2 Need and options.

2.2.1 Options considered

The options considered for the proposal included:

Option 1 – Do Nothing

The 'Do Nothing' option would entail providing no additional bus layover facilities to the Bus Operators with all services returning to the respective company's depot. The 'Do Nothing' option would remove all short-term development, and construction impacts such as noise, traffic interruption, potential contamination to the surrounding environment and socio-economic impacts to permit/public parking. The 'Do Nothing' option would also result in no disturbance to existing assets, drainage systems, sensitive receivers, car park users, residents, and businesses. There would be no pollution to soil or the atmosphere in the short-term and there would be no impact on the functionality of the car park and adjacent roadways. This option would result in no loss of parking as a result of the occupation of the area (in the short-term), would result in no operational noise impacts on businesses and residents and would not result in any associated socio-economic issues. The 'Do Nothing' option would result in a significant loss of bus serviceability, increased impacts to bus service customers, and it would significantly increase the requirement of additional bus services and drivers. Furthermore, this option would not address the requirements of a suitable layover location, toilet and lunchroom facilities for the Bus Operators, nor would it reasonably maintain existing bus services within the Wollongong and Illawarra region. This option would not achieve the proposed project objectives and therefore, this option is not recommended.

Option 2 – Install a Bus Layover Site at Wollongong Train Station and Oak Flats Train Station

This option would entail installing a layover and facilities at the car parks at Wollongong Train Station and/or Oak Flats Train Station to service bus movements within the Wollongong and Illawarra region. This option would reduce short-term development, and construction impacts such as noise, traffic interruption, potential contamination to the surrounding environment and socio-economic impacts to commuter/public parking. This option would have an increased impact on the aforementioned categories when compared to Option 1 however, would not have as large of an impact as Option 3. This option would result in some disturbance to existing assets, drainage systems, sensitive receivers, commuter car park users and businesses. There would be an increased potential in the pollution of soil and the atmosphere in the short-term and there would be a significant impact on the functionality of the car parks and adjacent roadways. This option would result in the loss of commuter car parks at both Wollongong and/or Oak Flats Train Station, it would result in some operational impacts on residents and businesses and would introduce minor socio-economic impacts. This option would result in some loss in bus

serviceability at Wollongong Train Station with a significant loss if Oak Flats Train Station was used. Neither site would provide a suitable capacity when compared to the existing configuration at Lang Park, and for Oak Flats Train Station, the layover distance from the Wollongong CBD is too great to provide appropriate access and serviceability levels. This option would not achieve the project objectives required by the works and for that reason is not recommended.

Option 3 – Install a Bus Layover Site at Atchison St Car Park.

This option would entail installing a layover site at the car park encompassed between Auburn St & Atchison St to service bus movements within the Wollongong and Illawarra region. This option would increase short-term development, and construction impacts such as noise, traffic interruption, potential contamination to the surrounding environment and socio-economic impacts on permit holder/public parking. This option would have an increased impact on the aforementioned categories when compared to Option 1 and Option 2. This option would result in some disturbance to existing assets, drainage systems, sensitive receivers, and the permit holder/public car park. There would be an increased potential in the pollution of soil and the atmosphere in the short-term and there would be a significant impact on the functionality of the car park and adjacent roadways. This option would result in a loss of both permit holder and limited duration public parking with minor operational noise and traffic impacts on residents. This option would result in a minor loss in bus serviceability for the Wollongong region, however, would have the lowest impact on existing services. This option would provide a replicated capacity when compared to the existing configuration at Lang Park and is within a close proximity to the Wollongong CBD allowing TfNSW to provide suitable access and serviceability levels for public bus services. This option would achieve the objectives required by the works and for that reason is recommended.

The preferred option is:

Option 3 – Install a Permanent Layover at Atchison St car park.

2.2.2 Justification for the proposal

Transport for NSW is responsible for managing road related infrastructure and proving safe and efficient public transport services to the road network. Wollongong and Illawarra bus services are a key link in the public transport network and must remain at safe operation serviceability levels to provide continual benefits to its users and Bus Operators in the Wollongong locality.

Bus layover sites and facilities are an essential service to ensure Bus Operators are provided a designated safe location to complete allocated breaks between services. The existing configuration, facilities and location of the Wollongong Bus Layover are longer able to service bus operations within the Wollongong locality and as such TfNSW is responsible for ensuring the safety and efficiency of Bus Operator services is maintained.

The proposed layover location and facilities are designed to ensure Bus Operators are provided with suitable facilities and appropriate measures which will allow them to continue to provide excellent public transport services. The scope of works outlined in Section 2.1.2 of this MWREF provides a sustainable, cost-for-benefit approach to ensuring the provided facilities, safety measures and the protection of Bus Operators are increased while simultaneously accounting for the safety of pedestrians, and the efficiency of the bus transport system in the region. The proposal provides a long-term solution to the lack of facilities that are available for Bus Operators in Wollongong while minimising the impacts experienced on the functionality of bus transport services in the Illawarra region.

2.3 Statutory and planning framework

2.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

The State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the state. This includes roads and roads infrastructure facilities, and port, wharf or boating facilities,

Section 2.109 of the SEPP (Transport and Infrastructure) permits development of any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. As the proposal is appropriately categorised as development for the purpose of a road or road infrastructure facilities

and is to be carried out on behalf of Transport, it can be assessed under Division 5.1 of the EP&A Act. Development consent from Council is not required.

The proposal is not located on land reserved under the National Parks and Wildlife Act 1974 and does not require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021
- State Environmental Planning Policy (Precincts – Central River City) 2021
- State Environmental Planning Policy (Precincts – Western Parklands City) 2021
- State Environmental Planning Policy (Precincts – Regional) 2021
- State Environmental Planning Policy (Planning Systems) 2021

2.3.2 Other relevant legislation and environmental planning instruments

The proposal is not within mapped Coastal Wetlands to which clause 10 of the CM SEPP apply, therefore, Clause 94 of the TISEPP permits the proposal to be addressed under Division 5.1 of the EPA Act. Hence, development consent from Council is not required.

Under Section 9.2 of the Crown Land Management Act 2016, persons are not permitted to reside or erect a structure or graze or drive stock on Crown Land, or clear, dig up or cultivate or enclose Crown Land without appropriate authorisation. As the works are not located on Crown Lands, authorisation from DPE (Crown Lands) is not required for the proposed works.

The proposal is not located in or adjacent to any watercourse. Therefore, authorisation from DPI (Fisheries) with regard to considerations under the Fisheries Management Act 1994 is not required. Mitigation measures and required environmental controls will be implemented as a part of the EMP/EWMS.

There would be no impact to entities listed under the Commonwealth Environmental Protection and Biodiversity Conversation Act 1999 or the NSW Biodiversity Conservation Act 2016. A detailed assessment is provided in Section 3 of this MWREF, with all entities considered listed in the habitat evaluation table.

2.4 Community engagement and agency consultation

2.4.1 SEPP (Transport and Infrastructure) consultation

Part 2.2 of the SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. This is detailed below:

Table 2-3: Consultation required with Council.

Is consultation with Council required under sections 2.10 - 2.12 and 2.14 of the SEPP (Transport and Infrastructure)?		
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	Yes ☐	No ☒
Are the works likely to generate traffic to an extent that will strain the capacity of the existing road system in a local government area?	Yes ☐	No ☒
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system? The installation of toilet/lunchroom facilities within the Atchison St car park will require connection to a Council owned sewerage system. Due to the limited facility size, and	Yes ☐	No ☒

minor scope of works, there is unlikely to be a substantial impact on the capacity of any associated sewerage systems.		
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water? The installation of toilet/lunchroom facilities within the Atchison St car park will require connection to a Council owned water supply system. Due to the limited facility size and the minor scope of works, there is unlikely to be a substantial increase in the volume of water used from this system. Drainage from the pavement will be directed into the local stormwater drains, however given there is no increase in the size of the paved surface area, the proposal would not increase the volume of stormwater runoff which may result in the existing drainage systems exceeding their capacity.	Yes ☐	No ☒
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow? A detailed options assessment conducted in FY23 and FY24 saw a multifaceted assessment completed for 20+ potential layover locations within the Wollongong CBD and greater region. The stakeholders involved in the site selection process included TfNSW, WCC, the local Bus Operators and the TWU. Atchison St was selected as the preferred location due to its proximity to the CBD, its ability to match the existing capacity requirements and the minimal impact it would have on existing bus service schedules (Appendix C). The Atchison St car park is an asset currently owned and operated by Wollongong City Council. The car park consists of 30 paid, limited duration parking spaces and 51 permit holder spaces. Furthermore, this car park provides an unofficial pedestrian link between Wollongong Train Station and residential properties on Atchison St and streets further east. The proposed works would result in the enclosure of the entire car park area and the exclusion of all public during construction and operation. No public parking would be permitted within the layover area, with a designated pedestrian pathway link between Auburn St & Atchison St being included in the scope of works. The proposed works would disrupt the current public use of the car park, however, would result in only a minor or negligible impact to pedestrian movements. TfNSW is proposing to enter into a long-term lease with WCC for the site for an initial 5-year period, with options to extend to 10 and 15-years to service bus operations in the Wollongong and Illawarra region and to provide a safe location for Bus Operators to break between services.	Yes ☒	No ☐
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance? The installation of the layover and layover assets would result in the excavation of adjacent pedestrian footpaths and median owned and operated by Wollongong City Council. As per the project detailed design, all disturbed areas, including pedestrian paths and medians would be rehabilitated during the construction phase of the works.	Yes ☐	No ☒
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	Yes ☐	No ☒
Is the proposal within the coastal vulnerability area and inconsistent with a certified coastal management program applying to that land? Note: See interactive map at Coastal management - (nsw.gov.au). Note the coastal vulnerability area has not yet been mapped.	Yes ☐	No ☒

Note: a certified coastal zone management plan is taken to be a certified coastal management program.		
Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent? Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the Floodplain Development Manual: the management of flood liable land (nsw.gov.au). The NSW ePlanning Spatial Viewer and Wollongong LEP 2009 Mapping do not identify the Atchison St car park as being flood liable land.	Yes ☐	No ☒

Table 2-4: Consultation with other public authorities

Is consultation with a public authority (other than Council) required under sections 2.13, 2.15 and 2.16 of the SEPP (Transport and Infrastructure)?		
Are the works located on flood liable land? (to any extent) If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the Floodplain Development Manual: the management of flood liable land (nsw.gov.au). The NSW ePlanning Spatial Viewer and Wollongong LEP 2009 Mapping do not identify the Atchison St car park as being flood liable land.	Yes ☐	No ☒
Are the works adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	Yes ☐	No ☒
Are the works on land in Zone C1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	Yes ☐	No ☒
Do the works include a fixed or floating structure in or over navigable waters?	Yes ☐	No ☒
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	Yes ☐	No ☒
Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	Yes ☐	No ☒
Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	Yes ☐	No ☒
Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	Yes ☐	No ☒
Are the works on, or reasonably likely to have an impact on, a part of the Willandra Lakes Region Work Heritage Property?	Yes ☐	No ☒
Are the works within a Western City operational area specified in Schedule 2 of the *Western Parkland City Authority Act 2018* with a capital value of $30 million or more?	Yes ☐	No ☒

Table 2-5: Notification of council and occupiers of adjoining land

Do Council and occupiers of adjoining land need to be notified under section 2.111 of the SEPP (Transport and Infrastructure)?		
Does the proposal include a car park intended for the use by commuters using regular bus services?	Yes ☐	No ☒
Does the proposal include a bus depot? The scope of works incorporates the construction of a bus layover and related facilities within the Atchison St car park. A request from Wollongong City Council (WCC) notified Transport for NSW (TfNSW) of the need for a permanent relocation of the Wollongong bus layover to support WCC's future vision for Lang Park. This was initiated during the preparation for the 2022 UCI World Cycling Championships which required the temporary relocation of the bus layover for the event. In January 2024, Wollongong City Council informed Transport for NSW the existing layover would be re-utilised to support the 2025 World Triathlon Championships in October 2025. The proposed works would see the installation of parking spaces and toilet/lunchroom facilities for Bus Operators, in addition to public infrastructure such as pedestrian pathways and changes to on-street signage.	Yes ☒	No ☐
Does the proposal include a permanent road maintenance depot or associated infrastructure, such as garages, sheds, tool houses, storage yards, training facilities and workers amenities?	Yes ☐	No ☒

2.4.2 Other agency and community engagement

Agency and/or Group	Recommended Consultation Action
Transport for NSW (TfNSW)	Internal communication between identified divisions (Transport Planning, Community & Place, Safety, Environment & Regulation, Project Services, Asset, Design Southern, Aboriginal Engagement, M&D South, Transport Technical Solutions etc.) to be conducted through method of liaison with the Project Engineer and Team Representatives. All critical documentation is to be uploaded to Objective throughout the project lifecycle to ensure all Transport personnel have access to current versions of project documentation. Project team meetings and individual discussions would be established to provide a collaborative timeframe to identify and resolve project constraints and risks.
Wollongong City Council (WCC)	Wollongong City Council and its allocated representatives are to be updated regularly throughout the project lifecycle. Direct consultation, specifically focusing on matters of property, changes to on-street arrangements, external community consultation and engagement pieces is to be completed to ensure all project objectives align and information provided to the Public is consistent. Furthermore, direct consultation is to be completed on matters regarding the lease and occupation of the Atchison St car park. TfNSW is to maintain regular communication with WCC regarding the project progress and is to assist in matters regarding permit and public car park user notification.
Transport Workers' Union (TWU) & Local Bus Operators	The TWU & Bus Operators are to be consulted directly regarding the functionality of the facility, site requirements and operational impacts associated with the work. Advice is to be incorporated into the planning, design, and construction of the facility where applicable. Scheduling assessments including a determination of Customer impacts, changes to bus service functionality and additional bus service requirements are to be undertaken to accompany the works.

	TfNSW is to maintain regular communication with the TWU and Bus Operators regarding the project progress to ensure milestones are monitored and the project objectives are achieved.
Noise Impact Residents	Notification of the proposed works is to be provided at least seven (7) days prior to the commencement of works. Relevant construction noise mitigation measures are to be implemented as per the 'Transport Noise Estimator Tool'. Liaison with the TfNSW Community Engagement team would be completed to determine consultation plans and expected collateral for the construction works. Operational impacts are to be assessed, and Bus Operators advised of the potential impacts and proposed mitigation measures. Direct consultation with WCC for matters relating to the engagement and consultation of impacted residents is to occur throughout the project lifecycle.
Motorists/Local Road Users	Traffic management is to be implemented on site under an approved TGS including the installation of signs on approach to and egressing the works length. Security fencing around the designated compound site, works area and stockpiling areas should be implemented to deter unauthorised access to the works area. Signage is to clearly detail the upcoming road restrictions, lane closures, vehicle movements, detours etc. alongside the works location. Further notification may be provided in the form of a live traffic pin and Variable Message Signs (VMS), to provide additional information to motorists within a close proximity to the works location.
Permit Car Park Holders	Permit Holders are to be contacted directly regarding the associated impacts of the proposed works and the loss of parking spaces. Notification of changes to parking, dates and project schedule are to be provided in collaboration with WCC to provide clarity around the resulting impacts of the works.
Bus Service Customers	TfNSW, WCC and Bus Operators are to align with communicating impacts to bus services as a result of the move to Atchison St to Customers. Scheduling assessments and determined impacts are to be identified during the project's development with direct and open engagement to be provided to notify Customers of the resulting impacts.

TfNSW completed consultation regarding the proposed layover sites in November 2023. During this period, the Public were able to comment on the proposed layover locations and were encouraged to provide feedback on the proposal. The resulting feedback summary was published on the project website in December 2023 identifying support for the plan to relocate the existing layover at Marine Drive to three new sites in the Atchison St carpark, Wollongong Train Station car park and Oak Flats Station car park.

A project release identifying the commencement of investigation work at the Atchison St carpark site was completed in September 2024. This release detailed that the Atchison St car park site would be progressing with detailed design and assessments to determined potential impacts to utilities, boundary lines and the suitability of the existing pavement structure.

Furthermore, a project update was completed in April 2025 identifying that TfNSW would be progressing with the relocation of the existing layover to the proposed Atchison St car park site. This update included the key features and a visual of the proposed project design, detailed an estimated construction commencement of July 2025 and identified the next steps in the finalisation of the development and construction of the proposed.

3. Environmental assessment

This chapter provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in s171 of the Environmental Planning and Assessment Regulation 2021.

The matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) are also considered in Appendix A. Site-specific safeguards are provided to ameliorate the identified potential impacts.

3.1 Soil

Table 3-1: Soil

Description of existing environmental and potential impacts		
Are there any known occurrences of salinity or acid sulfate soils in the area?	Yes ☐	No ☒
Does the proposal involve the disturbance of large areas (e.g., >2ha) for earthworks? The proposed works would result in an estimated earthwork disturbance of 2600m^2. This would include the excavation and construction of new pavement, pedestrian footpaths, driveways, and facilities. All works would be confined to the existing disturbed area with only minor impacts expected to result from soil disturbance.	Yes ☐	No ☒
Does the site have constraints for erosion and sedimentation controls such as steep gradients or narrow corridors?	Yes ☐	No ☒
Are there any sensitive receiving environments that are located in or nearby the likely proposal area or that would likely receive stormwater discharge from the proposal? Sensitive receiving environments include (but are not limited to) wetlands, state forests, national parks, nature reserves, rainforests, drinking water catchments).	Yes ☐	No ☒
Is there any evidence within or nearby the likely footprint of potential contamination?	Yes ☐	No ☒
Is the likely proposal footprint in or nearby highly sloping landform?	Yes ☐	No ☒
Is the proposal likely to result in more than 2.5ha (area) of exposed soil?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

Soil Safeguards
1. An Erosion and Sediment Control Plan (ESCP) outlining the erosion and sediment control measures must be developed, approved by the LEO, implemented prior to construction and maintained during the works in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soil and Construction Guidelines (the Blue Book) to: • Divert clean water around the site. • Reduce and control erosion on site. • Reduce water velocity and capture and control sediment and debris on site. • Minimise the amount of material transported from the site. • Protect existing drainage lines and watercourses from potential contamination.
2. Erosion and sediment controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request. Erosion and sediment controls are not to be removed until the works are completed, areas are stabilised, and the works area is removed.

3. The management of established stockpile sites will be in accordance with the Transport Stockpile Site Management Guideline (EMS-TG-10) (2015).

3.2 Waterways and water quality

Table 3-2: Waterways and water quality

Description of existing environmental and potential impacts		
Is the proposal located within, adjacent to or near a waterway?	Yes ☐	No ☒
Is the location known to flood or be prone to water logging?	Yes ☐	No ☒
Is the proposal located within a regulated catchments covered by chapter 6 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP (Biodiversity and Conservation))? Note: See maps here	Yes ☐	No ☒
Would the proposal be undertaken on a bridge or ferry?	Yes ☐	No ☒
Is the proposal likely to require the extraction of water from a local water course (not mains)?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

Waterways and Water Quality Safeguards
4. No dirty water will be released into drainage lines and/or waterways. Water quality control measures are to be used to prevent any materials (e.g., concrete grout, sediment etc.) entering drain inlets or waterways.

3.3 Noise and vibration

Table 3-3: Noise and vibration

Description of existing environmental and potential impacts		
Are there any residential properties or other noise sensitive areas near the location of the proposal that may be affected by the work (i.e., church, school, hospital)? The area surrounding the Atchison St car park comprises of a combination of residential and commercial properties. Construction works would be completed during standard working hours to minimise noise and vibration impacts on surrounding properties with the potential of 1-2 shifts under night works to be required. The 'Transport Noise Estimator Tool' was used to determine a noise-affected radius of 105m for the works location using both the 'Distance Base (Noisiest Plant)' and 'Distance Based (Scenario)' analysis methods. Asphalting works and/or an asphalt profiler was identified as the highest noise generating plant and impact activity to properties within the identified impact region. Due to the limited scope of works, there is expected to be a negligible impact to any properties within the identified noise -affected region. The use of asphalting plant would not be required for the full duration of works providing respite to residential and commercial properties within the locality. Notification to all noise impacted residents, hospitals and recreational facilities within 105m, and schools and places of worship within 240m of the works area would be completed at least seven (7) days prior to works commencing. Table 3-3-1 provides more information on the recommended mitigation measures, see Appendix E for more details on the abbreviated mitigation measures. As works are being completed during the day, asphalting works are not expected to cause more than a minor noise impact on the identified residents. Due to construction taking approximately 8 weeks to complete, a duration respite must be considered.	Yes ☒	No ☐
Is the proposal going to be undertaken only during standard working hours?	Yes ☐	No ☒

Table 3-3-1 - Recommended Noise Impact Mitigation Measures

	Within Mitigations Distance (m)	Mitigation Level (db(A))	Recommended Mitigation Measures
Noticeable/Clearly Audible	105	N/A	N/A
Moderately Intrusive	35	75	N, PC, RO
Highly Intrusive	35	75	N, PC, RO
Highly Affected	35	75	N, PC, RO

Figure 3-1 - Noise Affected Radius (105m)

The majority of construction works would be undertaken using standard working hours, these being: • Monday to Friday - 7:00am to 6.00pm • Saturday - 8.00am to 1.00pm • Public Holidays - No work There is the potential requirement for night works to allow access to utility services within the existing Atchison St & Auburn St road corridor for the installation and connection of the toilet/lunchroom facilities and street lighting. Night works would only be required for 1-2 shifts to reduce the impacts on motorists and residents. Night works would be undertaken between: • Sunday to Thursday – 7pm to 6am. Any night works would be subject to the noise mitigation measures as a part of the 'TfNSW Noise Estimator Tool'. As night works would result in limited noise and would only occur for 1-2 shifts there is unlikely to be any impact to residents and business within the area.		
Is any explosive blasting required for the proposal?	Yes ☐	No ☒
Would construction noise or vibration from the proposal affect sensitive receivers? As above, the use of asphalting plant would likely result in some noise and vibration being experienced by properties within the affected region. Any impacts would be minimised through the implementation of safeguards detailed in Section 3 of the MWREF. The 'Transport Noise Estimator Tool' has been utilised to determine the expected impacts and recommended management requirements. The results of this assessment are provided in Appendix E of this MWREF. Due to the extended duration of works, respite periods would be implemented to minimise the potential impacts of noise affected properties.	Yes ☒	No ☐
Would operation of the proposal alter the noise environment for sensitive receivers? This might include, but not be limited to, altering the line or level of an existing carriageway, changing traffic flow, adding extra lanes, increasing traffic volume, increasing the number of heavy vehicles, removing obstacles that provide shielding including changing the angle of view of the traffic, changing the type of pavement, increasing traffic speeds by more than 10 kilometres per hour or installing audio-tactile line markings. If yes, provide details. Refer to Transport's *Road Noise Criteria Guideline* (EMF-NV-GD-0024) and *Road Noise Mitigation Guideline* (EMF-NV-GD-0024) The proposed works involve the installation of a bus layover facility at the existing car park along Atchison St, Wollongong. An Operational Noise Assessment was undertaken with background monitoring of the existing environment conducted at 19 Atchison St for a 2-week period commencing in November 2024. Preliminary reading assessments were also completed at the existing Marine Drive, Lang Park layover facility for activities likely to generate increased noise impacts. The readings were then modelled to determine the associated impacts at both commercial and residential properties directly adjacent to the Atchison St carpark. The completed Operational Noise Assessment Report provided in Appendix F of this MWREF, outlines the assessment, information gathering and modelling process in addition to providing the results obtained and analysis of mitigation measures. Mitigation measures assessed by TfNSW, and its associated Professionals comprised of both physical and operational features including a determination of the feasibility and reasonability of any potential controls. A worst-case scenario assessment was completed which included contingencies in the occupation and movement of buses in the layover to facilitate potential increases in services, special events or future expansion of the bus transport network. The worst-case scenario assessed the entry, exit and occupation of all available parking spaces and included sound power impacts such as idling, air releases and bus start-ups. TfNSW noted that the worst-case scenario was not indicative of the day-to-day function of the facility, however, presents a situation that although unlikely, has the potential to occur. E.g. During the night period (>10:00pm), the worst -case scenario assessed up to 5 vehicles, whereas the existing schedules identify only up to 2 vehicles would be active at the facility within a 15-minute period.	Yes ☒	No ☐

The noise assessment results identified that for properties R4, R7 & R8, the predicted project noise levels exceeded project noise targets by up to 8db(A) during the morning and evening periods, and up to 10db(A) in the night period under standard conditions with no mitigation measures implemented. Similar impacts were identified during noise enhancing wind conditions and temperature inversions. Furthermore, an assessment of the potential road traffic noise impacts was assessed due to the increase in heavy vehicle presence along Atchison St & Auburn St. Results obtained identified that no more than a 2db(A) increase in traffic noise is predicted across all noise periods excluding the daytime Atchison St period (3db(A) increase). In conjunction with the TWU & Bus Operators, TfNSW was able to determine the necessity of the required bus schedules, operating hours, idling of vehicles, access/egress requirements and movements within the facility to ensure that the appropriate systems and the safety and ride comfort of Drivers and Customers could be maintained. Under the Noise Policy for Industry (2017) (NPfI), feasible and reasonable mitigation measures are required where impacts are determined, to ensure the impacts associated with operational noise are minimised. An assessment of physical and operational measures was completed to determine potential controls that would alleviate the impacts of operational noise. Key operational mitigation measures that would assist in minimising potential impacts identified by the Noise Policy for Industry (2017) (NPfI) include: • Day Period – Limiting the number of buses entering and exiting the facility to no more than ten (10) buses every 15 minutes. • Evening Period – Limiting the number of buses entering and exiting the facility to no more than eight (8) buses every 15 minutes. • Night Period – Limiting the number of buses entering and exiting the facility to no more than three (3) buses every 15 minutes. It is noted that on occasions there may be higher bus movements and capacity requirements under the public bus schedules (service delays, congestion, special events etc.) however, these are not expected to be common occurrences. The details of the completed assessment including the breakdown of the mitigation measures considered and the full results are provided in Appendix F of this MWREF.		
Would the proposal result in vibration being experienced by any surrounding properties or infrastructure during operation? The proposed works would see an increase in the number of heavy vehicles (buses) travelling along Atchison St and Auburn St with an estimated 160 vehicles using the layover facility each week day. Traffic counts undertaken in November 2022 identified an average 24hr traffic volume on Atchison St and Auburn St of approximately 2300 and 3600 vehicles respectively. With the additional bus movements resulting from the proposed layover, an overall estimated traffic increase of <7% along Atchison St and <9% along Auburn St (due to buses egressing and returning to Burelli St via Auburn St) would be experienced as a result of the proposed move. Therefore, there is unlikely to be more than a negligible impact to the vibration experienced by properties due to increases in traffic. In liaison with Bus Operators and the TWU, TfNSW has determined that the idling of buses in the facility is required for a number of reasons, these being: • Ensuring air pressure is obtained prior to layover egress. • Connection to driver tracking and OPAL systems prior to commencing route. • Air conditioning to provide ride comfort to Customers and Drivers. • Short-term layover where the vehicle is not being left unattended. The idling of vehicles is likely to result in a negligible vibration impact to adjacent properties as the open layover space and distance to adjacent infrastructure will allow for the effects of vibration to readily disperse through the ground.	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

Noise and Vibration Safeguards
5. Notification will be given to affected community members prior to the works taking place. The notification is to include: • Details of the proposal, • Duration of the works and working hours, • Changes to traffic or access requirements, • How to lodge a complaint or obtain more information, • Contact details. Notification should be provided a minimum of seven (7) calendar days prior to the start of works.
6. All complaints will be recorded on a complaints register and attended to promptly.
7. Where possible, existing access for nearby residents and adjoining properties is to be maintained. Where this cannot occur, notification to the resident/business is to be provided to ensure works are not impacted throughout the duration of access impedance.
8. Noise impacts will be minimised, and mitigation measures will be carried out in accordance with Transport Construction and Maintenance Noise Estimator (EMF-NV-TT-0067) and Transport Construction Noise and Vibration Guidelines 2022 (EMF-NV-GD_0056).
9. Bus Operators are advised, where possible, to adhere to the following operational noise mitigation measures: • Day Period – Limiting the number of buses entering and exiting the facility to no more than ten (10) buses every 15 minutes. • Evening Period – Limiting the number of buses entering and exiting the facility to no more than eight (8) buses every 15 minutes. • Night Period – Limiting the number of buses entering and exiting the facility to no more than three (3) buses every 15 minutes. Under the Noise Policy for Industry (2017) (NPfI), feasible and reasonable mitigation measures have been considered and are required where impacts have been identified.

3.4 Air quality

Table 3-4: Air quality

Description of existing environmental and potential impacts		
Is the proposal likely to result in large areas (>2ha) of exposed soils?	Yes ☐	No ☒
Are there any dust-sensitive receivers located within the vicinity of the proposal during the construction period? The proposed works area is located in the Wollongong CBD. Exposed ground surfaces have the potential for dust to be generated by the works, specifically the excavation of the area for the proposed pavement works, concrete works and pavement installation. Any impacts would be reduced by the implementation of safeguards outlined within this MWREF. Due to the limited scope of works and confined impact area there is unlikely to be issues associated with dust pollution.	Yes ☒	No ☐
Is there likely to be an emission to air during construction? There is the potential for some small emissions to occur through plant and equipment consumables, however any emissions would be negligible. Emissions generated through the completion of asphalting, excavation, concrete works and line marking installation would not cause more than a minor inconvenience to the surrounding sensitive receivers.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

Air Quality Safeguards
10. During construction, measures (including the watering and covering of exposed areas) are to be used to minimise or prevent air pollution or dust.
11. Works (including the mixing of concrete, spraying of paint and other materials) are not to be carried out during strong winds and in weather conditions where high levels of dust or airborne particulates are likely to occur.
12. Stockpiles or areas that may generate dust will be managed to suppress dust emissions in accordance with the Transport Stockpile Management Guidelines (EMS-TG-10).

3.5 Aboriginal cultural heritage

Table 3-5: Aboriginal cultural heritage

Description of existing environmental and potential impacts		
Would the proposal involve disturbance in any area that has not been subject to previous ground disturbances? All proposed construction activities would be conducted within existing disturbed land and on assets previously impacted by construction works. This is an urban environment which has been heavily disturbed by the formation of road corridors, a car park, residential and commercial properties, and the establishment of public infrastructure.	Yes ☐	No ☒
Has an online Aboriginal Heritage Information Management System (AHIMS) search been completed? An online AHIMS Basic Search was carried out on 16/12/2024 and returned a result indicating no Aboriginal sites and no Aboriginal places recorded within or near the proposed works area. In addition to the AHIMS Basic Search, a search of the Native Title Register was conducted with the search returning one (1) result and no active cases within the Wollongong City Council region. A secondary search of the Native Title Applications, Registration Decisions and Determinations was completed with 17 results being returned. Of the results returned, none where applicable to the proposed works area.	Yes ☒	No ☐
Is there potential for the proposal to impact on any items of Aboriginal cultural heritage?	Yes ☐	No ☒
Would the proposal involve the removal of mature native trees?	Yes ☐	No ☒
Is the proposal consistent with the requirements of Transport's *Procedure for Aboriginal cultural heritage consultation and investigation* (PACHCI)? A Stage 1 PACHCI Assessment was completed for the proposed and was assessed as being unlikely to have an impact on Aboriginal cultural heritage. All search results have been provided in Appendix G of this MWREF.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

Aboriginal Cultural Heritage Safeguards
13. If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Transport Aboriginal Cultural Heritage Officer and Senior Manager Environment and Sustainability contacted immediately. Refer to steps in the Transport Unexpected heritage items procedure (EMF-HE-PR-0076) which must be followed.

3.6 Non-Aboriginal heritage

Table 3-6: Non-Aboriginal heritage

Description of existing environmental and potential impacts		
Have online heritage database searches been completed? Online heritage database searches were carried out on 18/12/2024 for results within 500m of the proposed project location with the following results obtained: • Transport for NSW Section 107 Register (Roads) – no results within 500m of the proposed works area. • Local Environmental Plans – returned (30) results within 500m of the works areas, the closest being Wollongong Railway Station Group located approximately 150m west of the works area. • NSW State Heritage Database – returned three (3) results within 500m of the works areas, the closest being Wollongong Railway Station Group located approximately 150m west of the works area. • Australian Heritage Places Inventory - returned seven (7) results within 500m of the works area, the closest being Wollongong Memorial Arch located approximately 200m east of the works area. Due to the limited scope of works and no heritage items being identified within the proposed works area there is unlikely to be an impact to any known Local, State or Nationally listed heritage items. The location of the works is confined to the existing car park, footpaths, and road which have been subject to previous disturbance. Due to the limited scope of works there is unlikely to be any impact on known heritage items, and limited potential for uncovering items of heritage significance. Works are not being conducted on any heritage items either Local, Stage or Nationally listed, therefore no impact is expected to result from the completion of the proposed. All heritage results obtained have been provided in Appendix H of this MWREF.	Yes ☒	No ☐
Are there any items of non-Aboriginal heritage or heritage conservation areas listed on relevant heritage databases/registers that are located within the vicinity of the proposal?	Yes ☐	No ☒
Is the proposal likely to impact trees that form part of a heritage listing or have other heritage value?	Yes ☐	No ☒
Is the proposal likely to occur in or near features that indicate potential archaeological remains? The location of the works is confined to the existing car park, footpaths, and road which have been subject to previous disturbance. Due to the limited scope of works there is unlikely to be any impact on known heritage items, and limited potential for uncovering items of heritage significance.	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

Non-Aboriginal Heritage Safeguards
14. If unexpected heritage items are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Transport Unexpected heritage items procedure (EMF-HE-PR-0076) must be followed.

3.7 Biodiversity

Table 3-7: Biodiversity

Description of existing environmental and potential impacts		
Have relevant database searches been carried out? The following database searches were carried out on 17/12/2024. • BioNet NSW Wildlife Atlas Search (recorded within 10km of location collected), results for notable species located within a close proximity of the works (<1km) were noted and have been outlined in Appendix I. • Species Profile and Threats Database search (Cth) for EPBC Act listed species within 10km of the works length.	Yes ☒	No ☐
Did the database searches identify any endangered ecological communities, threatened flora and/or threatened or protected fauna, or migratory species in or within the vicinity of the proposed works? Both Commonwealth and State listed The threatened species and ecological communities classified under the BC Act and EPBC Act BioNet Wildlife Atlas Search (47 species) and Species Profile and Treats Database Search (97 species) were assessed in relation to the potential impact that may occur to each entity due to the proposed scope of works. Only species and ecological communities classified as threatened or endangered were assessed and results within 1km were noted as most likely to be impacted. The assessment of the potential impact was qualitative based on the nature of the proposed works, scope of works, distance between works and the identified species, and the likelihood of the proposed activities causing a significant impact to the environment and potential habitat locations.	Yes ☒	No ☐

Scientific and Common Name	Current Status and Listing Type	Sightings	Potential Impacts
Grey-headed Flying-fox (Pteropus poliocephalus)	V (NSW) V (Comm)	100m (closest sighting) Number of Sightings: 55	Low – small scope of works and limited impact unlikely to cause harm to species.
Swift Parrot (Lathamus discolor)	E (NSW) CE (Comm)	200m (closest sighting) Number of Sightings: 1	Low – small scope of works and limited impact unlikely to cause harm to species.
Koala (Phascolarctos cinereus)	E (NSW) E (Comm)	200m (closest sighting) Number of Sightings: 2	Low – small scope of works and limited impact unlikely to cause harm to species.
Superb Fruit-Dove (Ptilinopus superbus)	V (NSW)	200m (closest sighting) Number of Sightings: 1	Low – small scope of works and limited impact unlikely to cause harm to species.

Squirrel Glider (Petaurus norfolcensis)	V (NSW)	200m (closest sighting) Number of Sightings: 1	Low – small scope of works and limited impact unlikely to cause harm to species.
Large Bent-winged Bat (Miniopterus orianae oceanensis)	V (NSW)	200m (closest sighting) Number of Sightings: 1	Low – small scope of works and limited impact unlikely to cause harm to species.
Coastal Sawmp Oak (Casuarina glauca)	EEC (EPBC Act)	Community likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Coastal Swamp (Sclerophyll)	EEC (EPBC Act)	Community may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Illawarra and south coast lowland forest and woodland	CEEC (EPBC Act)	Community likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Illawarra-Shoalhaven Subtropical Rainforest	CEEC (EPBC Act)	Community may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
River-flat eucalypt forest	CEEC (EPBC Act)	Community likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Regent Honeyeater (Anthochaera phygia)	CE (EPBC Act)	Species habitat known to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Australasian Bittern (Botaurus poiciloptilus)	E (EPBC Act)	Species or habitat known to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Curlew Sandpiper (Calidris ferruginea)	CE (EPBC Act)	Species or habitat known to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Gang-Gang Cockatoo (Callecephalon fimbriatum)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Eastern Bristlebird (Dasyornis brachypterus)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.

Northern Royal Albatross (Diomedea sanfordi)	E (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Bar-tailed Godwit (Limosa lapponica baueri)	E (EPBC Act)	Species or habitat know to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Southern Giant Petrel (Macronectes giganteus)	E (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Orange-bellied Parrot (Neophema chrysogaster)	CE (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Eastern Curlew (Numenius madagascariensis)	CE (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Gould's Petrel (Pterodroma leucoptera leucoptera)	E (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Australina Painted Snipe (Rostratula australis)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Shy Albatross (Thalassarche cauta)	E (EPBC Act)	Foraging, feeding or related behaviours likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Chatham Albatross (Thalassarche eremita)	E (EPBC Act)	Foraging, feeding or related behaviours may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Common Greenshank (Tringa nebularia)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Pied Bat (Chalinolobus dwyeri)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.

Spot-tailed Quoll (Dasyurus maculatus maculatus)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Southern Brown Bandicoot (Isoodon obesulus obesulus)	E (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Greater Glider (Petauroides Volans)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
White-flowered Wax Plant (Cynanchum elegans)	E (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Illawarra Socketwood (Daphnandra johnsonii)	E (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Midge Orchid (Genoplesium baueri)	E (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Spiked rice-flower (Pimalea spicta)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Leek-orchid (Prasophyllum affine)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Illawarra Greenhood (Pterostylis gibbose)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Eastern Underground Orchid (Rhizanthella slateri)	E (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Scrub Turpentine (Rhodamnia rubescens)	CE (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.
Native Guava	CE (EPBC Act)	Species or habitat may occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.

Broad-headed snake (Hoplocephalus bungariodes)	E (EPBC Act)	Species or habitat likely to occur within area.	Low – small scope of works and limited impact unlikely to cause harm to species.		

Although some of the listed flora and fauna have the potential to be in the impact area, the scope of works and area of impact do not exhibit characteristics that may be considered suitable habitat. There are no EECs, CE or E flora/fauna would be impacted as a result of the proposed works. A full list of the returned results has been provided in Appendix I of this MWREF.

Does the proposal involve pruning, trimming or removal of any tree/s?	Yes ☐	No ☒
Is the proposal likely to impact nationally listed threatened species, ecological communities, or migratory species? The works have the potential to impact some of the identified species during the construction process as a result of noise and air emissions. However, the impacts are expected to be negligible with the implementation of the safeguards outlined within Section 3 of this MWREF.	Yes ☐	No ☒
Would the proposal require the removal of any other vegetation? Vegetation such as grasses, shrubs and juvenille trees are required to be removed from the exising roadside gardens on Auburn St & Atchison St to permit the excavation of footpaths, driveways and the pavement area. There is no exotic vegetation required to be removed as a part of the proposed works.	Yes ☒	No ☐
Would the proposal require the removal of any tree hollows?	Yes ☐	No ☒
Are there any known areas of outstanding biodiversity value or areas mapped as 'littoral rainforest' or 'coastal wetland' under chapter 2 of SEPP (Resilience and Hazards) in or within the vicinity of the proposed work?	Yes ☐	No ☒
Would the proposal provide any additional barriers to the movement of wildlife?	Yes ☐	No ☒
Would the proposal disturb any natural waterways or aquatic habitat?	Yes ☐	No ☒
Would the proposal impact (directly or indirectly) any potential microbat roosting or breeding habitat such as on bridges and culverts?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

Biodiversity Safeguards
15. If threatened fauna or flora species are discovered unexpectedly, stop works immediately and follow the Transport Unexpected Threatened Species Find Procedure contained in the Transport Biodiversity Guidelines-Guide 1 (Pre-clearing process (EMF-BD-GD-0032)).
16. Works will not create an ongoing barrier to the movement of wildlife.

3.8 Traffic and transport

Table 3-8: Traffic and transport

Description of existing environmental and potential impacts		
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during construction? During construction, the works would require the implementation of lane closures for the excavation and installation of the footpaths, driveways etc. and for the delivery of plant/equipment and materials. All other works would be conducted under exclusion zones and/or the closure of the car park. Pedestrian footpaths would be closed, and detours implemented around the works site. A reduced speed limit would be enforced for the length of works to maximise driver reaction time and increase the safety of workers, motorists and vehicles accessing/egressing the area. Furthermore, the removal of public and permit holder car parks would see public vehicles permanently excluded from the area. During construction, the car park would be closed with no access from the public permitted at any time. During operation, additional signage would be installed to identify that no admittance to the public would be permitted at any time.	Yes ☒	No ☐
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation? The proposed works involves the occupation of an existing Wollongong City Council owned car park for the installation of a bus layover facility. This facility would result in the loss of an estimated 30 limited duration paid public parking spaces and 51 permit holder parking spaces. Atchison St and Auburn St, adjacent to the works site, currently permits a combination of limited duration, paid and unpaid parking on-street. Therefore, the impacts to parking within the area would be reduced with existing availability on adjacent streets. The proposed works would also see an alteration to on-street parking arrangements with the loss of 2 x limited duration unpaid 1/4hr parking spaces on Auburn St, the introduction of 1 x limited duration unpaid 2hr parking space on Dean St, the loss of 1 x taxi space on Station St and the replacement of up to 3 x light vehicle parking spaces with mobility accessible parking spaces on Atchison St.	Yes ☒	No ☐
Is the proposal likely to affect any other transport nodes or transport infrastructure (e.g., bus stops, bus routes) in the surrounding area? Or result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation? Due to the proposed lift and shift of all bus movements from Marine Drive, Lang Park, a revision of the existing bus schedules has been completed to identify the alteration in service levels, additional bus services required and changes to the timing and functionality of existing routes. Transport Planning and the Illawarra Bus Operators have been liaising to redevelop and output a 'like-for-like' replacement of existing bus services to minimise the impacts experienced by Customers. The new schedules would be communicated to Customers and the wider community by the TfNSW Community & Customer Engagement Team in conjunction with Wollongong City Council and the Bus Operators.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

Traffic and Transport Safeguards
17. A Traffic Guidance Scheme will be prepared in accordance with the Traffic Control at Work Sites Manual (TfNSW 2022 Issues 6.1) and Australian Standard 1742.3 Manual of Uniform Control Devices.
18. Where possible, current traffic movement and property accesses are to be maintained during the works, any disturbance is to be minimised and to prevent unnecessary traffic delays.

3.9 Socio-economic

Table 3-9: Socio-economic

Description of existing environmental and potential impacts		
Is the proposal likely to impact on local business? Minor impacts would result to businesses due to undertaking the proposal. The loss of an estimated 82 parking spaces (30 limited duration, paid parking, 51 permit holder parking and 1 x on-street parking space) would occur from the implementation of the proposed works. Short-term impacts due to traffic management and noise impacts would occur to businesses that would operate during the proposed working hours. TfNSW initially completed consultation with the community and residents in November 2023 and subsequent project updates in September 2024, and April 2025 regarding the proposed occupation of the Atchison St car park and changes to the operating environment. Comments received focused on the loss of parking and alteration to the existing noise environment with the project design incorporating the comments provided where possible. The consultation conducted allowed TfNSW to highlight the need for reduced on-street parking impacts and appropriately incorporate as such into the project design. The final impacts have been determined as a part of the 100% detailed project design provided in Appendix J.	Yes ☒	No ☐
Is the proposal likely to require any property acquisition? The proposed works would result in the permanent occupation of the Atchison St car park (18 Atchison St, Wollongong NSW – Lot 101 DP 814507). WCC are the current Landowners with TfNSW seeking to undertake a long-term lease for the construction and operation of the car park. The works would result in the long-term occupation of 2498m^2 of land from WCC. WCC & TfNSW Property Teams have been liaising on the matter with the agreed long-term lease to commence from the date of construction.	Yes ☒	No ☐
Is the proposal likely to alter any access for properties (either temporarily or permanently)? The proposed works would result in the permanent alteration of access/egress to the Atchison St car park. No public access would be permitted during the construction and operation of the facility with signage implemented to identify such exclusion. Access/egress to the car park facility would be permanently altered, no other residential or commercial accesses would be impacted as a result of the proposed works.	Yes ☒	No ☐
Is the proposal likely to alter any on-street parking arrangements (either temporarily or permanently)? The proposed works would result in the loss of an estimated 30 limited duration, paid parking spaces and a further 51 permit holder spaces. On-street parking arrangements would be altered to accommodate the installation of a bus overflow spaces on Auburn St & Station St. This would result in the removal of 2 x limited duration, unpaid parking spaces on Auburn St and the loss of an estimated 1 x taxi space. An additional light vehicle parking space would be introduced on Dean St to minimise the impacts associated with on-street parking loses.	Yes ☒	No ☐
Is the proposal likely to change pedestrian movements or pedestrian access (either temporarily or permanently)? During the construction of the proposed, the closure of the pedestrian footpath on Atchison St and Auburn St would be required to permit the installation of the layover infrastructure. Temporary detours would be implemented to direct pedestrians safely around the construction zone and away from workers and plant. The proposed works would result in the permanent alteration of pedestrian movements that utilise the car park as an informal link between Atchison St and Auburn St. The proposed works would include the construction of a designated pedestrian link between Auburn St and Atchison St to mitigate the potential access to the layover facility from pedestrians. Signage would be utilised to identify the restrictions on pedestrian movements and to direct them towards the designated footpath.	Yes ☒	No ☐

Is the proposal likely to impact on any items or places of social value to the community (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to reduce or change visibility of any businesses, farms, tourist attractions or the like (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to impact trees planted by a community group, Landcare group or by council or a tree that is a memorial or part of a memorial group e.g., has a plaque? The works will require the removal of small vegetation such as grasses, shrubs and juvenile trees planted by WCC along the roadside of Auburn St & Atchison St. There is no exotic vegetation being removed as a part of the proposed works.	Yes ☐	No ☒
Is the proposal likely to impact trees that form part of a streetscape, an avenue or roadside planting?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

Socio-Economic Safeguards
19. The parking of vehicles and storage of plant/equipment will only occur on existing paved areas. Where this is not possible, vehicles and plant/equipment will be kept away from environmentally sensitive areas and outside the dripline of trees.
20. A Pedestrian Management Plan is to be implemented for the works which clearly outlines the exclusion of pedestrians from the works zone and identifies the designated detour.
21. Permit Parking Holders are to be contacted directly regarding the loss of individual parking spaces and provided information regarding the changes at the location. The Community are to be informed of the loss of parking including the installation of VMS boards on approach to the site prior to the works commencing. VMS boards are to provide details of the impacts to the area.

3.10 Landscape character and visual amenity

Table 3-10: Landscape character and visual amenity

Description of existing environmental and potential impacts		
Is the proposed work over or near an important physical or cultural element or landscape? (For example, heritage items and areas, distinctive or historic built form, National Parks, conservation areas, scenic highways etc.)	Yes ☐	No ☒
Would the proposal obstruct or intrude upon the character or views of a valued landscape or urban area? (For example, locally significant topography, a rural landscape or a park, a river, lake or the ocean or a historic or distinctive townscape or landmark)	Yes ☐	No ☒
Would the proposal require the removal of mature trees or stands of vegetation, either native or introduced?	Yes ☐	No ☒
Would the proposal result in large areas of shotcrete visible from the road or adjacent properties?	Yes ☐	No ☒
Would the proposal involve new noise walls or visible changes to existing noise walls?	Yes ☐	No ☒
Would the proposal involve the removal or reuse of large areas of road corridor, landscape, either verges or medians?	Yes ☐	No ☒

Would the proposal involve substantial changes to the appearance of a bridge (including piers, girders, abutments and parapets) that are visible from the road or residential areas?	Yes ☐	No ☒
If involving lighting, would the proposal create unwanted light spillage on residential properties at night (in construction or operation)? The proposed scope of works includes the installation of overhead lighting to increase the safety of Pedestrians and Drivers using the pathway link and facility respectively. A Level 3 ASP Lighting Design has been developed for the proposal in accordance with AS/NZS1158.3 and Endeavour Energy Standards to ensure minimal impact to adjacent properties occurs. There is unlikely to be light spillage on adjacent residential properties as a result of the operation of the proposed layover facility. The existing environment already comprises of street lighting with any light alterations being required to conform with AS/NZS1158.3. Lighting would be designed, positioned and directed in a manner to minimise spillage on residential properties.	Yes ☐	No ☒
Would any new structures or features to be constructed, result in over shadowing to adjoining properties or areas?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

Landscape Character and Visual Amenity Safeguards
22. Lighting is to be designed responsibly and directed away from windows, residential properties, and oncoming traffic. The installation of lighting must conform with the Level 3 ASP Design and AS/NZS1158. The installation of lighting must be undertaken by a Level 1 ASP Construction company.

3.11 Waste

Table 3-11: Waste

Description of existing environmental and potential impacts		
Is the proposal likely to generate >200 tonnes of waste material (contaminated and /or non-contaminated material)? The removal of the existing pavement and substructure to allow for the installation of a suitable foundation and pavement would result in more than 200 tonnes of non-contaminated waste being generated. The waste expected for the project would be a maximum of: • Pavement Waste: 2498m^2 x 0.6m = 1499m^3 (approximately 3600 tonnes) • Concrete Waste: 200m^2 x 0.15 = 30m^3 (approx. 70 tonnes) • Plant and equipment consumables. • General waste from works personnel. Waste from plant and equipment consumables would be negligible. All waste would be collected and recycled or disposed of lawfully at a licensed waste facility. A Waste Management Plan would be developed to ensure the disposal and management of waste generated by the works is appropriately managed.	Yes ☒	No ☐
Is the proposal likely to require a licence from EPA?	Yes ☐	No ☒
Is the proposal likely to require the removal of asbestos?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

Waste Safeguards
23. Resource management hierarchy principles are to be followed (in accordance with the Waste Avoidance & Resource Recovery Act 2001): • Avoid unnecessary resource consumption as a priority. • Avoidance is followed up by resource recovery (including the reuse of materials, reprocessing, recycling, and energy recover). • Disposal is to be undertaken only as a last resort.
24. A Waste Management Plan must be prepared in accordance with the Transport Waste management guideline (EMF-WM-GD-0055).

3.12 Climate change and greenhouse gas emissions

Table 3-12: Climate change and greenhouse gas emissions

Description of existing environmental and potential impacts		
Is the proposal located in an area likely to be permanently or tidally inundated in the future or subject to increased duration and intensity of flooding?	Yes ☐	No ☒
Have opportunities for reduced energy consumption during construction and operation been considered. If yes, summarise actions taken e.g., material selection, local suppliers, and construction staff, etc. Reduced energy consumption has been accounted for in the design selection process by minimising the capacity of plant and materials required to ensure the works objectives is achieved. The proposed works are considered a sustainable method of maintaining bus services within the Illawarra region while providing suitable layover facilities of the Bus Operators.	Yes ☒	No ☐
Greenhouse gas emissions sources during construction are likely to be largest from: • Transporting materials to site. • Operation of plant and equipment. During operation sources would include: • Maintenance of the proposal which includes infrastructure and pavement repairs, and fuel use for the operation of the plant and equipment to perform the maintenance activities • Increased use of the facility during bus operations and future expansion of the bus public transport system. • Electricity usage for street furniture including lighting, electronic signage, and variable message signs.		

Safeguards

Safeguards to be implemented are:

Nil.

3.13 Cumulative impact

Table 3-13: Cumulative impact

Description of existing environmental and potential impacts		
Are there other projects and developments in the study area which could add to potential impacts in both construction and operation? This area of Wollongong is both residential and commercial in nature. There are several high-rise construction projects ongoing in the area. Due to the limited scope of this project and the various requirements for both of the works, there is unlikely to be a cumulative impact in aspects of resource management, materials, and personnel labour. There is likely to be some cumulative impacts such as noise, traffic and socio-economic however, these impacts would be negligible and would only be short-term impacts.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

Nil.

4. Summary of safeguards and environmental management measures

4.1 Safeguards and environmental management measures

This section provides a summary of the site-specific environmental safeguards and management measures identified in described in chapter 3 of this minor works REF. These safeguards will be implemented to reduce potential environmental impacts throughout construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant Transport QA specifications. Any potential licence and/or approval requirements required prior to construction are also listed.

Table 4-1: Summary of site-specific safeguards for proposed work

Factor	Safeguards
Soil	1. An Erosion and Sediment Control Plan (ESCP) outlining the erosion and sediment control measures must be developed, approved by the LEO, implemented prior to construction and maintained during the works in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soil and Construction Guidelines (the Blue Book) to: • Divert clean water around the site. • Reduce and control erosion on site. • Reduce water velocity and capture and control sediment and debris on site. • Minimise the amount of material transported from the site. • Protect existing drainage lines and watercourses from potential contamination. 2. Erosion and sediment controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request. Erosion and sediment controls are not to be removed until the works are completed, areas are stabilised, and the works area is removed. 3. The management of established stockpile sites will be in accordance with the Transport Stockpile Site Management Guideline (EMS-TG-10) (2015).
Waterways and water quality	4. No dirty water will be released into drainage lines and/or waterways. Water quality control measures are to be used to prevent any materials (e.g., concrete grout, sediment etc.) entering drain inlets or waterways.
Noise and vibration	5. Notification will be given to affected community members prior to the works taking place. The notification is to include: • Details of the proposal, • Duration of the works and working hours, • Changes to traffic or access requirements, • How to lodge a complaint or obtain more information, • Contact details. Notification should be provided a minimum of seven (7) calendar days prior to the start of works. 6. All complaints will be recorded on a complaints register and attended to promptly. 7. Where possible, existing access for nearby residents and adjoining properties is to be maintained. Where this cannot occur, notification to the resident/business is to be provided to ensure works are not impacted throughout the duration of access impedance.

	8. Noise impacts will be minimised, and mitigation measures will be carried out in accordance with Transport Construction and Maintenance Noise Estimator (EMF-NV-TT-0067) and Transport Construction Noise and Vibration Guidelines 2022 (EMF-NV-GD_0056). 9. Bus Operators are advised, where possible, to adhere to the following operational noise mitigation measures: • Day Period – Limiting the number of buses entering and exiting the facility to no more than ten (10) buses every 15 minutes. • Evening Period – Limiting the number of buses entering and exiting the facility to no more than eight (8) buses every 15 minutes. • Night Period – Limiting the number of buses entering and exiting the facility to no more than three (3) buses every 15 minutes. Under the Noise Policy for Industry (2017) (NPfI), feasible and reasonable mitigation measures have been considered and are required where impacts have been identified.
Air quality	10. During construction, measures (including the watering and covering of exposed areas) are to be used to minimise or prevent air pollution or dust. 11. Works (including the mixing of concrete, spraying of paint and other materials) are not to be carried out during strong winds and in weather conditions where high levels of dust or airborne particulates are likely to occur. 12. Stockpiles or areas that may generate dust will be managed to suppress dust emissions in accordance with the Transport Stockpile Management Guidelines (EMS-TG-10).
Non-Aboriginal heritage	13. If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Transport Aboriginal Cultural Heritage Officer and Senior Manager Environment and Sustainability contacted immediately. Refer to steps in the Transport Unexpected heritage items procedure (EMF-HE-PR-0076) which must be followed.
Aboriginal cultural heritage	14. If unexpected heritage items are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Transport Unexpected heritage items procedure (EMF-HE-PR-0076) must be followed.
Biodiversity	15. If threatened fauna or flora species are discovered unexpectedly, stop works immediately and follow the Transport Unexpected Threatened Species Find Procedure contained in the Transport Biodiversity Guidelines-Guide 1 (Pre-clearing process (EMF-BD-GD-0032)). 16. Works will not create an ongoing barrier to the movement of wildlife.
Traffic and transport	17. A Traffic Guidance Scheme will be prepared in accordance with the Traffic Control at Work Sites Manual (TfNSW 2022 Issues 6.1) and Australian Standard 1742.3 Manual of Uniform Control Devices. 18. Where possible, current traffic movement and property accesses are to be maintained during the works, any disturbance is to be minimised and to prevent unnecessary traffic delays.
Socio-economic	19. The parking of vehicles and storage of plant/equipment will only occur on existing paved areas. Where this is not possible, vehicles and plant/equipment will be kept away from environmentally sensitive areas and outside the dripline of trees.

	20. A Pedestrian Management Plan is to be implemented for the works which clearly outlines the exclusion of pedestrians from the works zone and identifies the designated detour. 21. Permit Parking Holders are to be contacted directly regarding the loss of individual parking spaces and provided information regarding the changes at the location. The Community are to be informed of the loss of parking including the installation of VMS boards on approach to the site prior to the works commencing. VMS boards are to provide details of the impacts to the area.
Landscape character and visual amenity	22. Lighting is to be designed responsibly and directed away from windows, residential properties, and oncoming traffic. The installation of lighting must conform with the Level 3 ASP Design and AS/NZS1158. The installation of lighting must be undertaken by a Level 1 ASP Construction company.
Waste	23. Resource management hierarchy principles are to be followed (in accordance with the Waste Avoidance & Resource Recovery Act 2001): • Avoid unnecessary resource consumption as a priority. • Avoidance is followed up by resource recovery (including the reuse of materials, reprocessing, recycling, and energy recover). • Disposal is to be undertaken only as a last resort. 24. A Waste Management Plan must be prepared in accordance with the Transport Waste management guideline (EMF-WM-GD-0055).
Climate change and greenhouse gas emissions	Nil.
Cumulative impacts	Nil.

4.2 Licensing and approvals

Table 4-2: Summary of licensing and approvals required

Nil.

4.3 Other requirements

Table 4-3: Other requirements

Requirement		
Environmental management plan sent to SMES or their delegate (ESL) for review.	Yes ☒	No ☐

5. Certification, review and determination

5.1 Certification

This minor works REF provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses, to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the proposal.

Prepared by:

Signature 

Name: Lachlan Jones
Position: Project Engineer
Company name: Transport for NSW
Date: 23/06/2025

Minor works REF reviewed by:

Signature 

Name: Sharon Barbaro
Position: Senior Environment & Sustainability Officer
Company name: Transport for NSW
Date: 23/6/2025

5.2 Environment and sustainability staff review

The minor works REF has been reviewed and considered against the requirements of sections 5.5 and 5.7 of the EP&A Act.

In considering the proposal this assessment has examined and considered to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity as addressed in the minor works REF and associated information. This assessment is considered to be in accordance with the factors required to be considered under section 171 of the Environmental Planning and Assessment Regulation 2021.

The proposal described in this minor works REF will have some environmental impacts which can be ameliorated satisfactorily. Having regard to the safeguards and management measures proposed, this assessment has considered that these impacts are unlikely to be significant and therefore an approval for the proposal does not need to be sought under Division 5.2 of the EP&A Act.

The assessment has considered the potential impacts of the activity on areas of outstanding value and on threatened species, ecological communities or their habitats for both terrestrial and aquatic species as defined by the *Biodiversity Conservation Act 2016* and the *Fisheries Management Act 1994*.

The proposal described in the minor works REF will not affect areas of outstanding value. The activity described in the minor works REF will not significantly affect threatened species ecological communities or their habitats. Therefore, a species impact statement is not required.

The assessment has also addressed the potential impacts of the activity on matters of national environmental significance and any impacts on the environment of Commonwealth land and concluded that there will be no significant impacts. Therefore, there is no need for a referral to be made to the Australian Government Department of Climate Change, Energy, the Environment and Water for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the *Environment Protection and Biodiversity Conservation Act 1999*.

The minor works REF is considered to meet all relevant requirements.

5.3 Environment and Sustainability staff recommendation

It is recommended that the proposal to install a bus layover facility at 18 Atchison St Wollongong, NSW 2500 as described in this minor works REF proceed subject to the implementation of all safeguards identified in the minor works REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

The minor works REF has examined and taken into account to the fullest extent possible all matters likely to affect the environment by reason of the activity in accordance with the EP&A Act, EP&A Regulation and the Guidelines approved under clause 170 of the EP&A Regulation. The minor works REF has established that the activity is not likely to significantly affect the environment or threatened species, ecological communities or their habitats.

The minor works REF has concluded that there will be no significant impacts on matters of national environmental significance or any impacts on the environment of Commonwealth land.

If the proposal has not commenced within two years of the determination date the SMES must be consulted to identify any new or updated assessment or approval requirements.

Recommended by:		**Noted by:**	
Signature		Signature	
Name:	Charlie Payne	Name:	Lachlan Jones
Position:	A/Environment & Sustainability Manager	Position:	Project Engineer
Date:	23/06/2025	Date:	23/06/2025

5.4 Decision statement

In accordance with the above recommendation, I certify that I have reviewed and endorsed the contents of this minor works REF, and to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading.

I determine that Transport for NSW may proceed with the activity:

Signature 

Name: Stephen Onions

Position: Senior Manager Project Services South

Date: 27/06/2025

5.5 EP&A Regulation publication requirement

Table 5-1: EP&A Regulation publication requirement

Requirement		
Does this minor works REF need to be published under section 171(4) of the EP&A Regulation?	Yes ☒	No ☐

6. Definitions

Table 6-1: Definitions

Term	Definition
TfNSW	Transport for NSW
WCC	Wollongong City Council
TWU	Transport Workers' Union
ESCP	Erosion and Sediment Control Plan

Appendix A: Consideration of State and Commonwealth environmental factors

Environmental Planning and Assessment Regulation 2021 section 171(2) factors

The following factors, listed in section 171(2) of the Environmental Planning and Assessment Regulation 2021, have been considered to assess the likely impacts of the proposal on the natural and built environment. This consideration is required to comply with sections 5.5 and 5.7 of the EP&A Act.

Table A1: Consideration of section 171 of the EP&A Regulation factors

Factor	Description of impact	Duration and extent
a) Environmental impact on the community.	The proposed works may cause minor-short term environmental impacts on the community such as delays in traffic flow via implemented lane closures, reduced speed limits, noise impacts on residents and businesses however, the potential impacts would be minimised by the implementation of safeguards outlined within this MWREF. The proposed works may have minor long-term environmental impacts on the community due to operational noise impacts on residents and businesses, delayed traffic movements and the loss of parking. Any long-term impacts would be minimised by the implementation of safeguards outlined within this MWREF.	Short-Term – Minor Negative. Long Term – Minor Negative.
b) The transformation of the locality.	The proposed works has to potential to change the locality of the area with the removal of a public car park and installation of the bus layover facility. As the works are being conducted on existing disturbed land and would not raise infrastructure that is likely to overshadow businesses or infrastructure there is expected to be no impact.	No Impact.
c) Any environmental impact on the ecosystems of the locality.	The proposal would have minor environmental impacts on the ecosystems in the locality in the short-term as a result of air emissions, noise and potential contamination from works materials however, any impacts would be minimised due to the small scope of works. The proposed would have minor environmental impacts on the ecosystems in the locality in the long-term as a result of air emissions and noise from bus idling and increased traffic movements. Any impacts on entities identified in Section 3.7 of this MWREF would be minimised through the implementation of safeguards outlined within Section 3 of this MWREF.	Short-Term – Minor Negative. Long-Term – Minor Negative.
d) Any reduction of the aesthetic, recreational, scientific, or other environmental quality or value of a locality.	The proposal would have minor visual and noise impacts during the construction of the proposed however, any impacts would be short-term and minimised through the implementation of the safeguards outlined within this MWREF. Due to the works being confined to existing infrastructure and previously disturbed area, the proposal is unlikely to degrade the aesthetics of the area. The proposal has the potential to increase the aesthetics of the area in the long-term with the installation of upgraded facilities and the introduction of new infrastructure.	Short-Term – Minor Negative. Long-Term – Minor Positive.
e) Any effect on any locality, place or building having	The proposal would have no impact on the locality, place or building of significance or other special value for present and future generations.	No Impact.

Factor	Description of impact	Duration and extent
aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.		
f) Any impact on the habitat of protected fauna (within the meaning of the Biodiversity and Conservation Act 2016).	The proposal may have a minor impact in the short-term on any unknown habitats near the proposed works through possible contamination of water systems and surrounding vegetation with dust/debris, noise, and air emissions. However, any impacts would be limited due to the implementation of safeguards outlined in Section 3 of this MWREF and the application of erosion and sediment controls around the works area. There may be a minor impact on the environment in the long-term due to the increased presence of buses and increased movement of vehicles within the proposed area.	Short-Term – Minor Negative. Long-Term – Minor Negative.
g) Any endangering of a species of animal, plant, or other form of life, whether living on land, in water or in the air.	The proposed works has the potential to cause harm to any endangered flora/fauna identified within the works area during the short-term due to contamination from plant/equipment consumables, construction materials noise and air emissions. However, any impacts would be minimised through the implementation of safeguards outlined within Section 3 of the MWREF. The proposed has the potential to cause harm to any endangered flora/fauna identified within the works proximity during the long-term due to impacts such as noise and air emission from idling buses and increased traffic movements however, any impacts would be minimised with the implementation of safeguards outlined within this MWREF.	Short-Term – Minor Negative. Long-Term – Minor Negative.
h) Any long-term effects on the environment	The proposed works may have a minor negative long-term impact on the environment due to the potential increase in vehicle volumes, therefore increasing noise and air emissions at the location. However, the proposed would reduce the requirement for future maintenance which would otherwise result in a cumulative effect with plant and materials impacts within the area.	Long-Term – Minor Negative.
i) Any degradation of the quality of the environment.	The proposal would likely degrade the quality of the environment in the short-term due to the potential contamination from construction materials and plant/equipment consumables. However, any potential impacts would be minimised with the implementation of safeguards outlined within this MWREF. In the long-term, the proposed works would have a negative impact on the environment from additional air and noise emissions being generated by the presence of buses.	Short-Term – Minor Negative. Long-Term – Minor Negative.
j) Any risk to the safety of the environment.	The proposal has to potential to result in minor soil and water contamination risk during the construction works due to the excavation and use of materials in the presence of drainage systems. There would also be a minor risk to the safety of any unknown habitats within the designated construction length. However, the risk would be minimised through the implementation of the safeguards outlined within the MWREF. Long-term, the	Short-Term – Minor Negative. Long-Term – No Impact.

Factor	Description of impact	Duration and extent
	environment would have no safety risk as a result of completing the works.	
k) Any reduction in the range of beneficial uses of the environment.	The proposed works would have a major reduction in the beneficial use of the car park for the community and residents as a result of implementing lane closures, occupation of the land and the removal of the car park. The closure of the car park and installation of the layover facility would permanently alter the use of the car park while the layover is operational with all public vehicles being excluded from the area.	Short-Term – Negative. Long-Term – Negative.
l) Any pollution of the environment.	The proposal has the potential to cause minor pollution to the surrounding environment through the release of construction waste/debris into adjacent drainage systems. Furthermore, undertaking excavation works has the potential to release contaminants into the surrounding ecosystems. However, due to the limited scope of works, any impacts would be minimal. The potential impacts would be further reduced by the implementation of erosion and sediment controls and the safeguards outlined within this MWREF. Long-term there would be minor pollution to the environment from the operation of the facility with increased noise and air emissions.	Short-Term – Minor Negative. Long-Term – Minor Negative.
m) Any environmental problems associated with the disposal of waste	The waste generated by the works would be uncontaminated soil and construction waste which would be collected, removed, and transported to an approved landfill facility or recycling facility in accordance with the safeguards outlined within this MWREF. No environmental problems are anticipated to occur as a result of the disposal of any project waste.	No Impact.
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply.	The proposed works would require only minor materials quantities for completion. Due to the limited scope of works, the proposed would not significantly increase the demands on resources, which are, or are likely to become in short supply. There is some minor cumulative impact on material demands that could potentially result from the completion of the proposed.	Long-Term – Minor Negative.
o) The cumulative environmental effect with other existing or likely future activities.	The proposed activities are unlikely to have a cumulative impact on the environment with other existing or likely future activities. The effects would be minimised due to the limited scope of works and the safeguards outlined within this MWREF.	No Impact.
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions.	The proposed would not have any impact on any identified coastal processes or hazards. The works site is located approximately 1km away from the NSW coastline with all works being confined to existing infrastructure and within area previously disturbed by prior construction works.	No Impact.
q) Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1	The proposed works would not have any impact on any applicable local planning statements, regional strategic plans or district plans made under the Act, Division 3.1.	No Impact.

Factor	Description of impact	Duration and extent
r) Other relevant environmental factors	The proposed works could have the potential to impact any unknown environmental factors that have not been assessed within the MWREF. However, any effects would be minimal due to the limited scope of works and the implementation safeguards outlined within this MWREF.	Potential Minor Negative or Positive both Short-Term and Long-Term.

Matters of National Environmental Significance

Table A2: Matters of national environmental significance

Environmental factor	Impact
a) Any impact on a World Heritage property?	Nil
b) Any impact on a National Heritage place?	Nil
c) Any impact on a wetland of international importance (often called 'Ramsar' wetlands)?	Nil
d) Any impact on nationally threatened species, ecological communities or migratory species?	Nil
e) Any impact on a Commonwealth marine area?	Nil
f) Does the proposal involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

Appendix B: Works Location & Site Layout

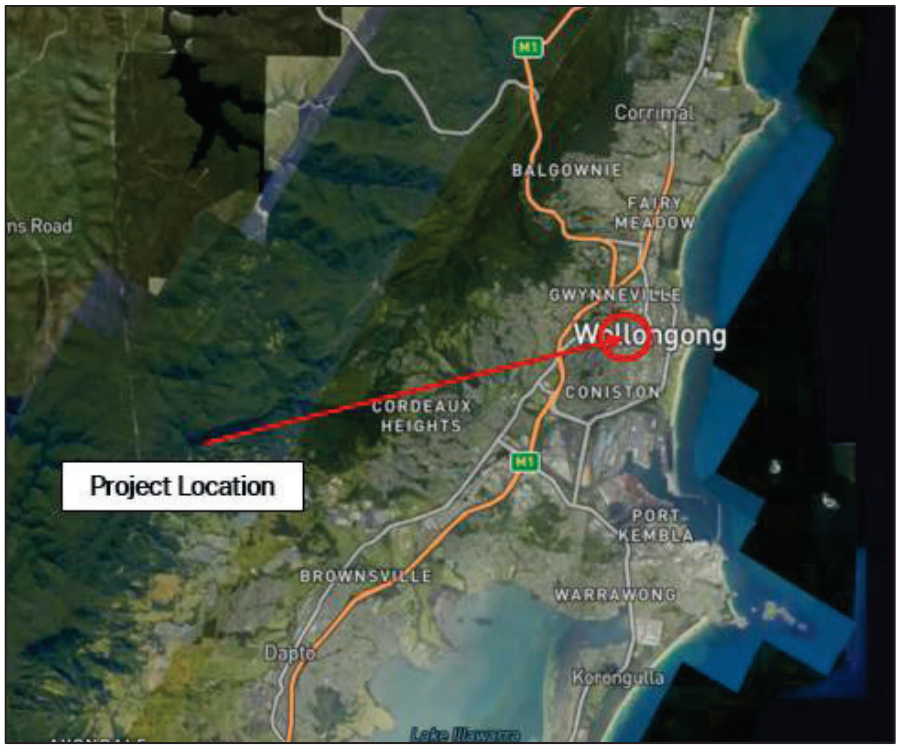

Figure B-1 – Project Location

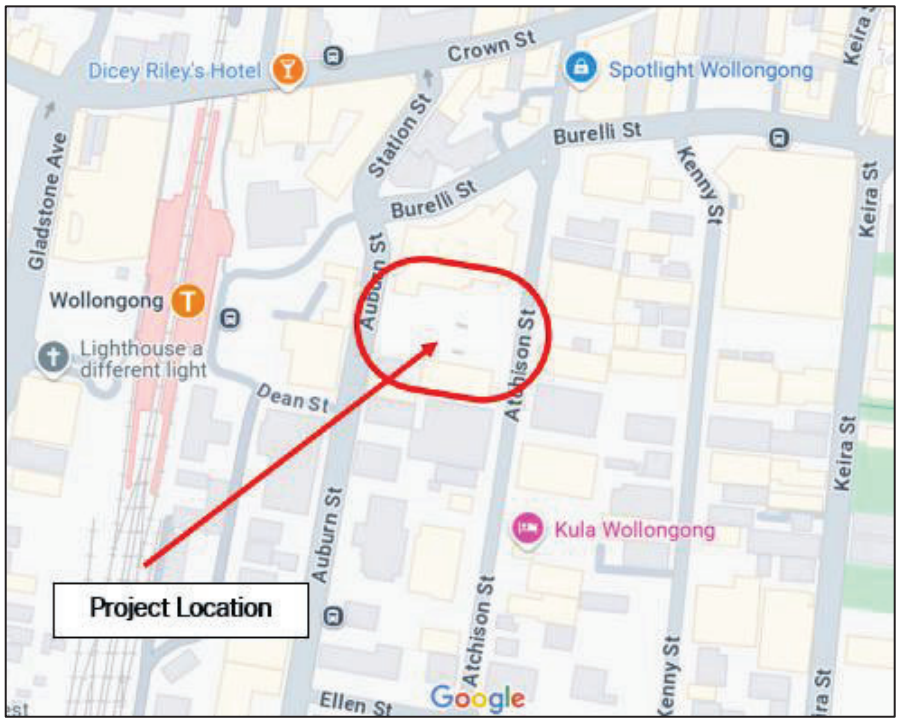

Figure B-2 – Works Area

Figure B-3 - Works Impact Area

Figure B-4 - Example Compound Site

Appendix C: Wollongong Bus Layover Preferred Layover Selection Report

Wollongong Bus Layover Permanent Relocation Study

Preferred Layover Selection Report

19 January 2024

Quality Assurance

Project details			
Project number:	SCT_00420		
Client:	Transport for NSW	ABN:	18 804 239 602
Prepared by:	SCT Consulting Pty. Ltd.	ABN:	53 612 624 058

Document details		
Document name:	Wollongong Bus Layover Relocation Study Preferred Layover Selection Report	
Prepared by:	Matthew Cen	
Reviewed by:	Ravi Kaberwal	
Authorised by:	Ravi Kaberwal	

Version	Date	Description
1.0	8 December 2023	Draft for comment
2.0	19 January 2024	Final addressing client comments

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1.0

Introduction and context

1.1 Project background

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The existing bus layover facility is located at Lang Park on Marine Drive in Wollongong (Figure 1-1). The facility is located on land owned by Wollongong City Council (Council) and leased to Transport for NSW (TfNSW) for use.

The Council is interested in redeveloping the land occupied by the layover because it is located adjacent to recreational land uses. As a result, an alternative layover location is required to ensure continued bus operations within Wollongong and the Illawarra region.

The current layover provides 11 spaces for 12.5m long standard buses in the following configuration:

- Seven 45-degree spaces, all allowing independent operations. These spaces require reversing manoeuvres to exit.
- Four nose-to-tail spaces with minimal gaps apparent between spaces. Hence, buses may be restricted from independent entry and/or exit.

During peak periods, buses will wait at the entrance to the layover facility for a space to free up, meaning the effective capacity of the current facility is 12 spaces.

The layover operates as a one-way loop and is accessed via the roundabout at the intersection of Marine Drive and Crown Street. This location is near the terminating and starting stops outside the WIN Sports and Entertainment Centres (WEC). As a result, the dead-running time is minimised with high travel time reliability which translates to reliable service start times.

Toilet facilities, for use exclusively by bus operators, are provided nearby within Lang Park. These facilities are secured by lock and key and provide convenient amenities for drivers on short-duration layovers.

Figure 1-1 Existing layover at Lang Park

1.2 Purpose and structure

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Purpose and report scope

This report outlines and documents the process undertaken to identify the preferred layover configuration if the existing facility from Lang Park is to be relocated. This report does not comment on whether the existing facility should be retained or relocated, and it is envisaged the outcomes of this report would be an input to a strategic business case to inform the decision-making process.

Report structure

- Section 1.0 introduces this report, its context and purpose.
- Section 2.0 presents the long list of potential layover locations identified and the SWOT analysis conducted on the long list to extract the short list of options.
- Section 3.0 provides concept designs for each short-listed layover location.
- Section 4.0 introduces layover configurations, their purpose and assessment methodology.
- Section 8.0 identifies the preferred option and outlines the next steps for the project and the work to be completed.

1.3 Project development

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To identify the preferred layover configuration for the relocation of existing facilities, a staged approach was undertaken to short-list options. During each stage progressively more detailed analysis was undertaken to support the decision-making process.

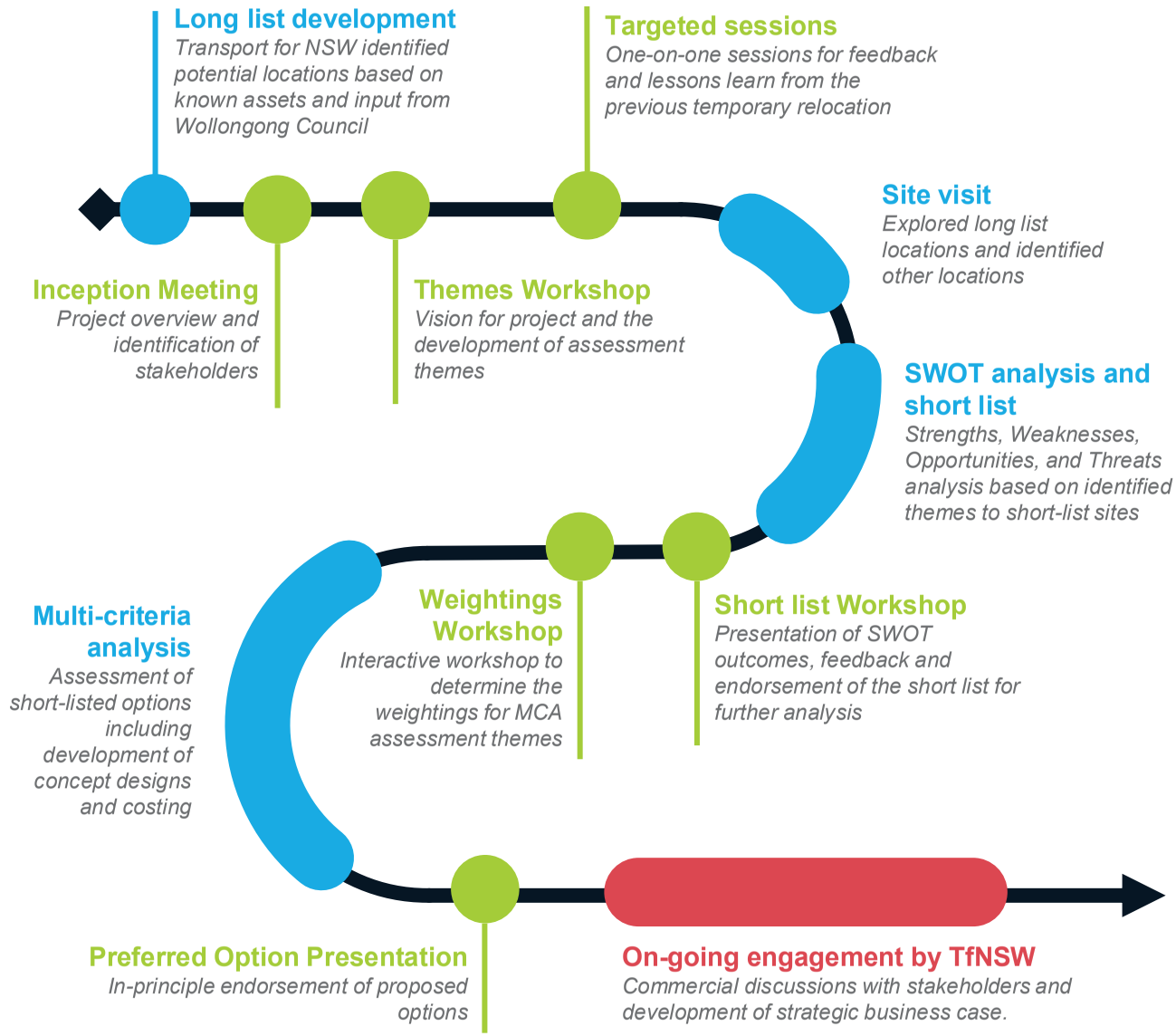
This process was supported by feedback from key stakeholders through a combination of interactive workshops and one-on-one sessions to ensure unfiltered feedback was incorporated into the decision-making process.

Stakeholders engaged through the process included:

- Transport for NSW including representatives from the Transport Planning, Public Transport Services Planning, Community & Place and Commercial teams.
- Wollongong City Council.
- Premier Illawarra (Bus Operator).
- Dion's Bus Service (Bus Operator).
- Transport Workers Union (TWU) NSW.

An overview of the project stages including key steps and engagement with stakeholders is summarised in Figure 1-2.

Figure 1-2 Overview of project stages



2.0

Options long list and SWOT analysis

2.1 Long-list of layover locations

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A long list of potential bus layover locations was provided by Transport for NSW, Council, Premier Illawarra and Dion's Bus Service. Additional layover locations were also identified to produce the long list of options below.

1. Stuart Park Car Park
2. Lighthouse Upper
3. Lighthouse Lower
4. Stewart Street Car Park
5. 8 Bank Street
6. George Street Car Park
7. Church Street
8. MacCabe Park Car Park
9. Atchison Street Car Park
10. Wollongong Train Station Car Park
11. Heliport
12. Water Recycling Plant
13. Oak Flats Train Station Car Park
14. Stockland Shellharbour Car Park
15. JJ Kelly Park Car Park
16. Vikings Rugby Union Club Car Park
17. Bluescope Steel Warehouse
18. 110 Gipps Street
19. 104 Gipps Street
20. University of Wollongong Innovation Campus
21. Department of Education Sports Fields
22. Memorial Drive
23. University of Wollongong Bushland East
24. University of Wollongong Bushland West.

Some additional locations were identified in the initial long list provided by stakeholders; however, these were ruled out by Transport for NSW based on first-principle considerations (such as size and location) before this study commenced.

Figure 2-1 Locations of potential layover locations

2.2 SWOT assessment themes

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To assess and prioritise layover options, eight key themes have been developed to encapsulate the various factors of a successful layover location. These themes have been developed alongside key stakeholders including TfNSW, Council and bus operators to best capture their thoughts and experiences. An overview of the themes and associated factors used during the SWOT assessment are presented below. These themes were distilled further in the subsequent multi-criteria assessment of the short list.

Table 2-1 SWOT assessment themes and factors

Theme	Description	Factors in SWOT assessment
Customer focused	Layover support efficient and reliable bus services now and in the future.	• Travel time to and from layover (dead-running) • Connections to future Tier 1 bus routes
Successful places	Sensitive land uses are not impacted as a result of relocating bus layover space and considers opportunities to upcycle existing land-uses.	• Adjacent land uses • Parking impacts
A strong economy	The project represents good value for money and a financially sustainable proposal.	• Capital costs (land acquisition, constructability) • Operational costs (additional running, fleet, drivers)
Safety	Safety is prioritised in the planning, management and operation of the layover site.	• Ability to ensure driver safety
Performance	Location, layout and the access strategy to/from site do not impact fleet and network efficiency.	• Potential yield of layover spaces • Access constraints
Accessibility	Layover can be accessed by staff regardless of physical ability, socio-economic status, gender, etc.	• On-site navigation by foot (gradient or terrain)
Sustainability	Consideration of impact on the environment.	• Impact to trees and natural environment • Additional fleet emissions
Operator amenity	Provision of driver facilities such as access to food outlets and amenities.	• Proximity to food outlets • Ability to provide dedicated driver amenities

For the SWOT analysis, a qualitative lantern system was used to assess each option in each theme to derive a short list of options from the long list. This lantern system is outlined below. A quantitative assessment with weighted metrics will be conducted on the short list to determine the preferred layover scheme.

Table 2-2 SWOT scoring legend

Scoring legend		
No issues or better than existing layover.	Minor issues which may impact performance.	Significant issues which may render the option prohibitive.

2.3 Stuart Park Car Park

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Overview:

Stuart Park Car Park is located immediately adjacent to Stuart Park and Wollongong North Beach, approximately 1.8km from the existing bus layover facility. The site serves the adjacent recreational spaces and was observed to be heavily utilised.

Land zoning: RE1 Public Recreation

Preliminary yield (indicative): 20 spaces

Strengths:

- The site is located on existing bus routes and near arterial roads.
- There are cafes nearby for drivers to purchase food.

Weaknesses:

- Residential apartments are located to the south of the site which may be impacted by noise and light pollution.
- The site is accessed via a High Pedestrian Activity Area on George Hanley Drive and is adjacent to an existing shared path cycleway.
- High levels of pedestrian activity may impact the travel time reliability of buses moving through the surrounding area.
- Cliff Road becomes a 10km/h zone further south of the site.
- The displacement of parking would impact surrounding recreational and tourism land uses.
- Tree removal would be required as part of the capital works.

Figure 2-2 Existing Stuart Park Car Park

Figure 2-3 Stuart Park Car Park location

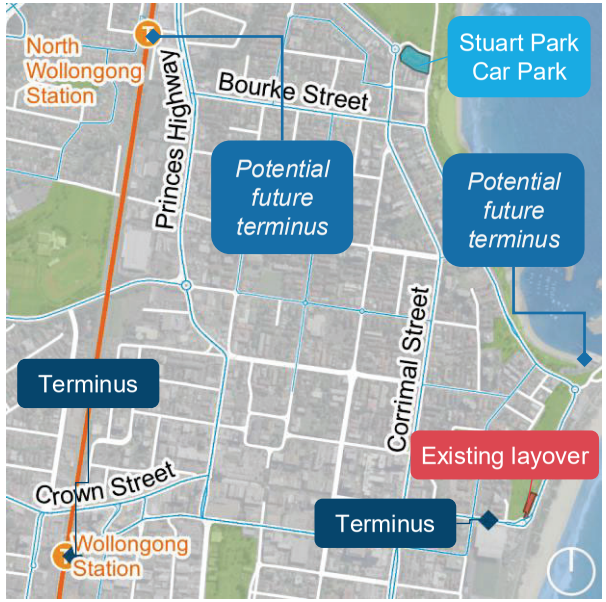

Table 2-3 Qualitative scoring against assessment themes for Stuart Park Car Park

Theme	Commentary	Performance
Customer focused	May have travel time and reliability challenges.	
Successful places	Displaces parking and adjacent to local recreation and tourism.	
A strong economy	Car Park is operated by Council on Crown Land.	
Safety	Located in a high activity area with passive surveillance.	
Performance	Site size is conducive to a large efficient layover layout.	
Accessibility	No accessibility issues.	
Sustainability	Tree removal required as part of capital works.	
Operator amenity	Within walking distance to cafes.	

2.4 Lighthouse Upper

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Overview:

The Lighthouse Upper site would involve replacing existing kerbside parking along Endeavour Drive on Flagstaff Hill and is located approximately 0.8km from the existing bus layover facility. The site serves the adjacent recreational spaces and was observed to be heavily utilised.

Land zoning: RE1 Public Recreation

Preliminary yield (indicative): Flexible depending on configuration (and operational preference)

Strengths:

- Located near existing bus routes and arterial roads.
- Within walking distance to nearby cafes.
- Could serve as an eastern terminus for future Tier 1 routes or some existing routes.

Weaknesses:

- The site is in a High Pedestrian Activity Area on Endeavour Drive which also serves as an on-street cycleway. Pedestrian activity may impact travel time reliability.
- Buses will have to complete the loop either on entry or exit which will incur additional travel time.
- The displacement of parking would impact surrounding recreational and tourism land uses.
- The bus layover will have a negative visual and noise impact on the cliffside pedestrian route.
- Few opportunities to construct and provide dedicated driver amenities.
- Signposted as “No Parking” between 10pm to 5am.
- Proximity to seawater may have impacts on the bus fleet, resulting in additional maintenance costs.
- The area is closed off during bike races and special events.

Figure 2-4 Existing Lighthouse Upper parking lane

Figure 2-5 Lighthouse Upper location

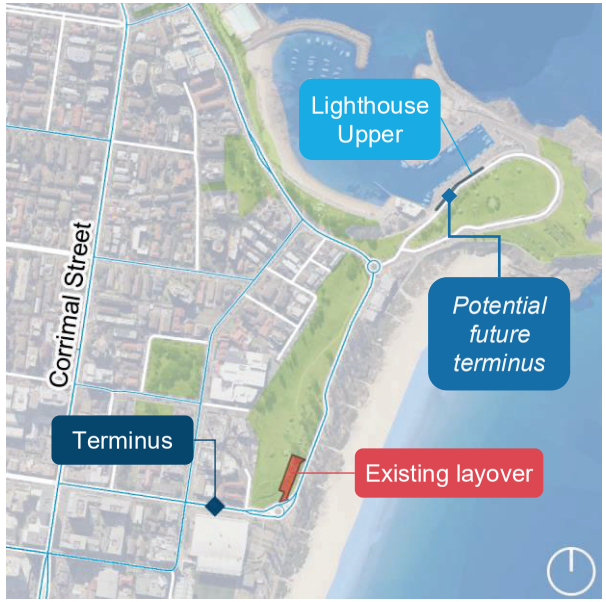

Table 2-4 Qualitative scoring against assessment themes for Lighthouse Upper

Theme	Commentary	Performance
Customer focused	Could serve future Tier 1 routes but may be impacted by events.	
Successful places	Displaces parking and adjacent to local recreation and tourism.	
A strong economy	Capital work required is minimal.	
Safety	Located in a high activity area with passive surveillance.	
Performance	Number of spaces is flexible however will have a long footprint.	
Accessibility	No accessibility issues.	
Sustainability	Minimal impacts on the environment or additional emissions.	
Operator amenity	Within walking distance to food but with driver facility challenges.	

2.5 Lighthouse Lower

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Overview:

The Lighthouse Lower site would involve replacing existing kerbside parking along the docks under Flagship Hill and is located approximately 0.8km from the existing bus layover facility. The site serves the adjacent recreational spaces and docks and was observed to be heavily utilised.

Land zoning: W4 Working Waterfront

Preliminary yield (indicative): 9 spaces

Strengths:

- Located near existing bus routes and arterial roads.
- Within walking distance to nearby cafes.
- Could serve as an eastern terminus for future Tier 1 routes or some existing routes.

Weaknesses:

- The site is in a Shared Zone and accessed via a High Pedestrian Activity Area on Endeavour Drive which also serves as an on-street cycleway.
- Pedestrian activity may impact travel time reliability.
- Buses must travel through a car park and across a shared path to exit on the road network.
- The displacement of parking would impact surrounding recreational and tourism land uses.
- The bus layover will have a negative visual and noise impact on the cliffside pedestrian route.
- Few opportunities to construct and provide dedicated driver amenities.
- Signposted as “No Parking” between 10pm to 5am.
- Adjacency to seawater may have impacts on additional fleet maintenance costs and life.
- The area is closed off during bike races and special events.

Figure 2-6 Existing Lighthouse Lower parking lane

Figure 2-7 Lighthouse Lower location

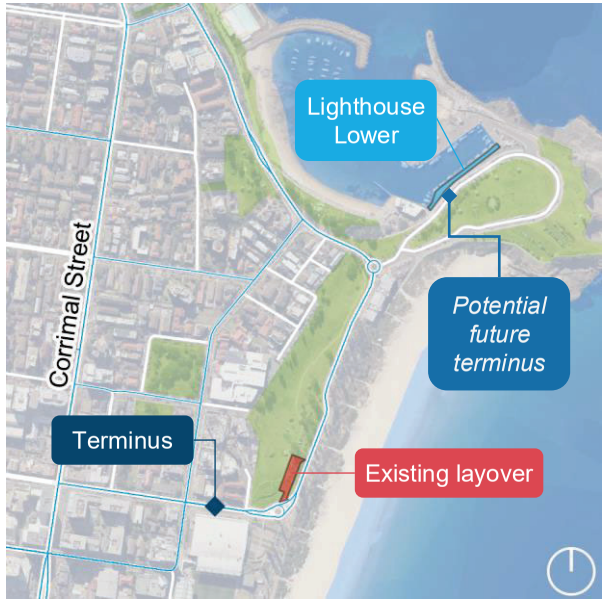

Table 2-5 Qualitative scoring against assessment themes for Lighthouse Lower

Theme	Commentary	Performance
Customer focused	Could serve future Tier 1 routes but may be impacted by events.	
Successful places	Displaces parking and adjacent to local recreation and tourism.	
A strong economy	Located on Crown Land.	
Safety	Located in a high activity area with passive surveillance.	
Performance	Buses must exit through a private car park.	
Accessibility	No accessibility issues.	
Sustainability	Minimal impacts on the environment or additional emissions.	
Operator amenity	Within walking distance to food but with driver facility challenges.	

2.6 Stewart Street Car Park

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Overview:

The Stewart Street Car Park is located approximately 0.9km from the existing bus layover facility and provides ticketed parking on weekdays and free parking on weekends and public holidays. The site is bordered by a mixture of residential and commercial land uses, including a hotel. There is an additional access via Bank Street which is currently fenced off.

Land zoning: MU1 Mixed Use

Preliminary yield (indicative): 21 spaces

Strengths:

- Located close to existing route terminus and arterial roads.
- Within the town centre and near food outlets.
- Dual access enables demand-based staging. The site could be partially converted in the short term until bus requirements increase to warrant the entire site.
- Site is set back from street frontage.

Weaknesses:

- Residential properties are located on the north, west and south edges which would experience noise and light pollution impacts.
- The displacement of parking would impact surrounding businesses and result in lost revenue.
- Disabled parking spaces would need to be replaced.
- Bank Street access is via a laneway shared with adjacent apartments.
- Identified as a potential future multistorey car park location in the 2013 City Centre Access and Movement Strategy.
- Opportunity costs as it is located in a prime location for development.

Figure 2-8 Existing Stewart Street Car Park

Figure 2-9 Stewart Street Car Park location

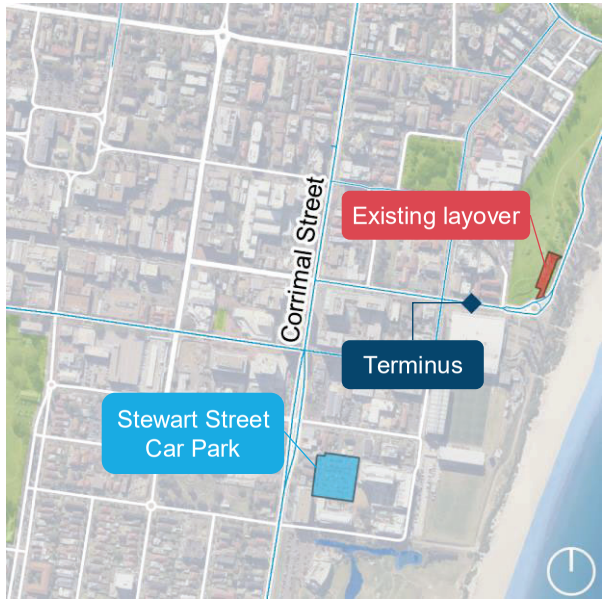

Table 2-6 Qualitative scoring against assessment themes for Stewart Street Car Park

Theme		Commentary	Performance
	Customer focused	Within close proximity to route start and end points.	
	Successful places	Displaces parking and opportunity costs for future development.	
	A strong economy	Potential cost implications as a prime development location.	
	Safety	Setback from street reduces public interaction.	
	Performance	Site size enables an efficient layout with staging flexibility.	
	Accessibility	No accessibility issues.	
	Sustainability	Minimal impacts on the environment and minimal dead running.	
	Operator amenity	Within walking distance to food outlets.	

2.7 8 Bank Street

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Overview:

8 Bank Street is an undeveloped lot located approximately 0.9km from the existing bus layover facility. The site entrance has warnings for trade waste discharges.

Land zoning: MU1 Mixed Use

Preliminary yield (indicative): 9 spaces

Strengths:

- Located close to existing route terminus and arterial roads.
- Within the town centre and near food outlets.
- Site is set back from street frontage.

Weaknesses:

- Residential properties located to the south-west and south-east would experience noise and light pollution impacts. The hotel to the north of the site may have less of an impact due to setbacks and commercial insulation.
- The lot is privately owned by Sydney Water Corp and would require acquisition.
- Egress (and travel time reliability) would be significantly impacted by events at nearby Stadium.
- Bank Street at Corrimal Street is left-in left-out only which may have impacts on travel time.
- The site may be contaminated with trade waste discharge.

Figure 2-10 Existing 8 Bank Street lot

Figure 2-11 8 Bank Street location

Table 2-7 Qualitative scoring against assessment themes for 8 Bank Street

Theme		Commentary	Performance
	Customer focused	Close to start/end points, but main egress point near stadium.	
	Successful places	Minor impact to nearby apartments and hotel.	
	A strong economy	Land acquisition and remediation will be required.	
	Safety	Setback from street reduces public interaction.	
	Performance	Number of layover spaces is limited by site size.	
	Accessibility	No accessibility issues.	
	Sustainability	Emissions from dead running but good use of contaminated site.	
	Operator amenity	Within walking distance to food outlets.	

2.8 George Street Car Park

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Overview:

George Street Car Park is located approximately 1.3km from the existing bus layover facility. The car park is split into a ticketed portion and a gated pre-paid section. The ticketed portion is heavily occupied.

Land zoning: MU1 Mixed Use

Preliminary yield (indicative): 12 spaces

Strengths:

- Located near existing bus routes and arterial roads.
- Within the town centre and walking distance to cafes.
- The ticketed portion of the car park could be converted initially with future expansion based on demand.

Weaknesses:

- The early learning centre to the west and the residential properties located around the southern half of the site would experience noise and light pollution impacts.
- The displacement of parking would impact surrounding businesses and result in lost revenue.
- Disabled parking spaces would need to be replaced.
- Identified as a potential future multistorey car park location in the 2013 City Centre Access and Movement Strategy.
- Opportunity costs as it is located in a prime location for development.

Figure 2-12 Existing George Street Car Park

Figure 2-13 George Street Car Park location

Table 2-8 Qualitative scoring against assessment themes for George Street Car Park

Theme		Commentary	Performance
	Customer focused	Within close proximity to bus routes and arterials.	
	Successful places	May have impacts to residential and early learning centre.	
	A strong economy	Potential cost implications as a prime development location.	
	Safety	Can be fenced to minimise interaction with public.	
	Performance	Site layout enables staging flexibility.	
	Accessibility	No accessibility issues.	
	Sustainability	Additional emissions due to extended running distance.	
	Operator amenity	Within walking distance to food outlets.	

2.9 Church Street

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Overview:

Church Street includes median parking and off-street parking within the adjacent MacCabe Park. The site is located approximately 1.2km from the existing bus layover facility. Median parking can be converted into two lanes of parallel layover bays.

Land zoning: MU1 Mixed Use and RE1 Public Recreation

Preliminary yield (indicative): 24 spaces

Strengths:

- Located near existing bus routes and arterial roads.
- Within the town centre and walking distance to cafes.
- Layover spaces in the median can be arranged to minimise impacts to adjacent residential dwellings.
- Layover can be staged based on demand.

Weaknesses:

- A cycleway passes through the existing car park.
- Visual and noise impacts on the adjacent recreational green space.
- Civil works may be required to realign the median.
- The displacement of parking would result in lost revenue.
- Trees may need to be removed to improve the efficiency of layover layout.

Figure 2-14 Existing Church Street environment

Figure 2-15 Church Street location

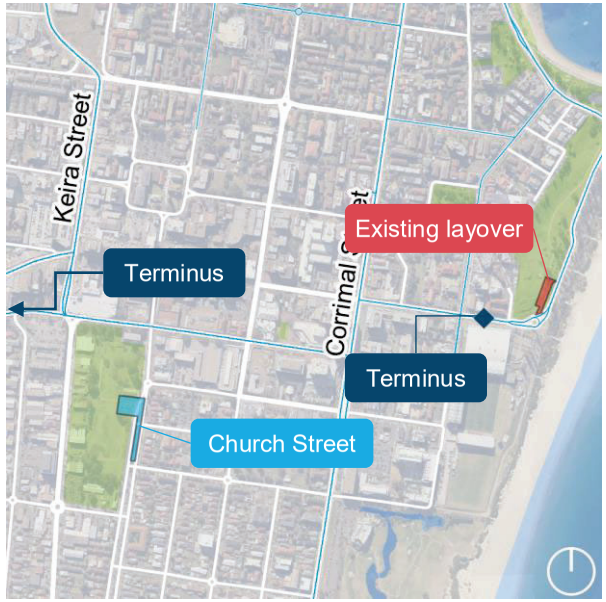

Table 2-9 Qualitative scoring against assessment themes for Church Street

Theme		Commentary	Performance
	Customer focused	Within close proximity to bus routes and arterials.	
	Successful places	May have impacts to residential and adjacent park.	
	A strong economy	Civil works may be required to realign road and median.	
	Safety	Layover in the median cannot be separated from public.	
	Performance	Site layout enables staging flexibility.	
	Accessibility	No accessibility issues.	
	Sustainability	Trees may be removed and emissions from dead running.	
	Operator amenity	Within walking distance to food outlets.	

2.10 MacCabe Park Car Park

Overview:

MacCabe Park Car Park is a gated pre-paid car park located on Keira Street, approximately 1.5km from the existing layover. The car park was observed to be approximately half occupied and was located immediately adjacent to an early learning centre.

Land zoning: RE1 Public Recreation

Preliminary yield (indicative): 10 spaces

Strengths:

- Within the town centre and walking distance to cafes.
- Opportunity to create an entrance on Ellen Street.

Weaknesses:

- Adjacent to recreational green space and early learning centre.
- The displacement of parking would result in lost revenue.
- Not located near existing bus routes or major road connections.
- May impact the future MacCabe Park masterplan currently under development.

Figure 2-16 Existing MacCabe Park Car Park

Figure 2-17 MacCabe Park Car Park location

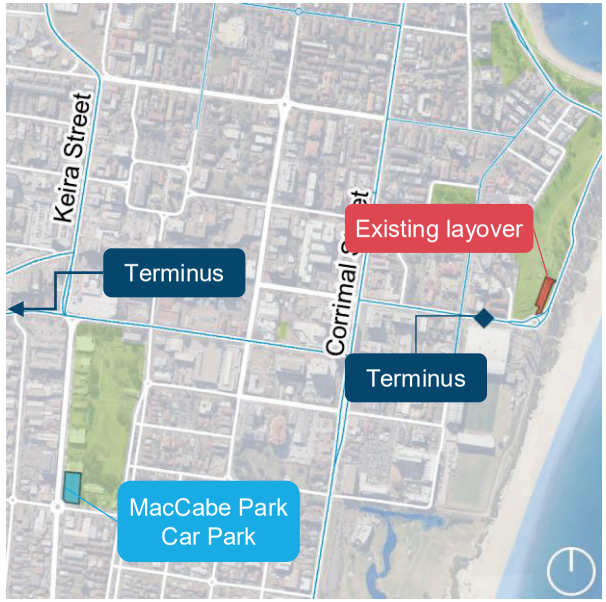

Table 2-10 Qualitative scoring against assessment themes for MacCabe Park Car Park

Theme		Commentary	Performance
	Customer focused	May have travel time and reliability challenges.	
	Successful places	May have impacts adjacent park and early learning centre.	
	A strong economy	Capital work required is minimal.	
	Safety	Can be fenced to minimise interaction with public.	
	Performance	Layout can be maximised through ingress and egress strategies.	
	Accessibility	No accessibility issues.	
	Sustainability	Additional emissions from dead running.	
	Operator amenity	Within town centre and walking distance to food outlets.	

2.11 Atchison Street Car Park

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Overview:

Atchison Street Car Park is a gated prepaid car park located on Keira Street, approximately 1.5km from the existing layover. The car park is split into a ticketed portion accessed via Atchison Street and a gated pre-paid section accessed via Auburn Street. The ticketed portion is heavily occupied, whilst the prepaid was observed to be approximately half occupied.

Land zoning: E2 Commercial Core

Preliminary yield (indicative): 19 spaces

Strengths:

- Located near Wollongong Train Station.
- Within the town centre and near food outlets.
- Dual access enables demand-based staging.
- No sensitive land uses nearby.

Weaknesses:

- The displacement of parking would result in lost revenue and have impacts on surrounding businesses.
- Ingress from Auburn Road would need to be checked through swept path analysis.

Figure 2-18 Existing Atchison Street Park Car Park

Figure 2-19 Atchison Street Park Car Park location

Table 2-11 Qualitative scoring against assessment themes for Atchison Street Park Car Park

Theme		Commentary	Performance
	Customer focused	Located near Wollongong Train Station.	
	Successful places	Displaces parking that serves surrounding commercial.	
	A strong economy	Capital work required is minimal.	
	Safety	Can be fenced to minimise interaction with public.	
	Performance	Site size enables an efficient layout with staging flexibility.	
	Accessibility	No accessibility issues.	
	Sustainability	Minimal impacts on the environment.	
	Operator amenity	Within town centre and walking distance to food outlets.	

2.12 Wollongong Train Station Car Park

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Overview:

Wollongong Train Station Car Park is an unpaid parking lot that is heavily utilised and located adjacent to the bus stops outside the station. It is located approximately 1.6km from the existing layover facility. The car park also provides laneway access to several businesses to the east which should be maintained. Bicycle lockers are also provided next to the lot.

Land zoning: SP2 Infrastructure

Preliminary yield (indicative): 8 spaces

Strengths:

- Located near Wollongong Train Station.
- Within the town centre and near food outlets.
- No sensitive land uses nearby.

Weaknesses:

- The displacement of parking may have impacts on surrounding businesses or commuters.
- Laneway access for adjacent businesses must be preserved.
- Some fencing would be required to minimise pedestrian activity through the site.
- 2020 Wollongong City Centre Urban City Design Framework identifies a direct connection between Wollongong Train Station to MacCabe Park through the site.

Figure 2-20 Existing Wollongong Train Station Car Park

Figure 2-21 Wollongong Train Station Car Park location

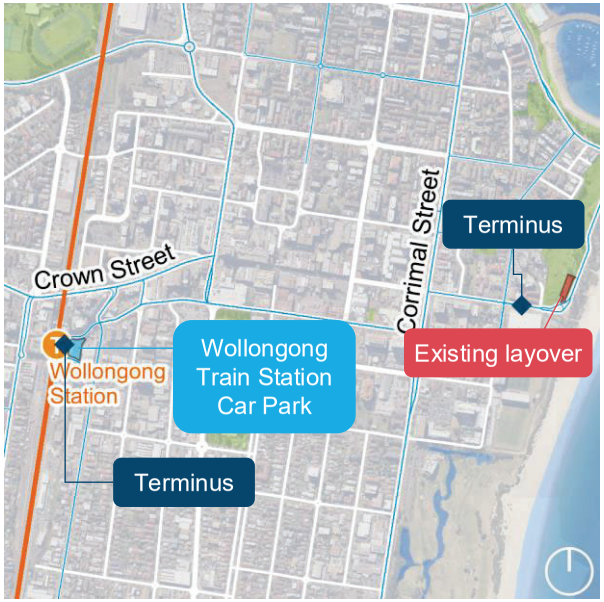

Table 2-12 Qualitative scoring against assessment themes for Wollongong Train Station Car Park

Theme		Commentary	Performance
	Customer focused	Located near Wollongong Train Station.	
	Successful places	Displaces parking that serves surrounding commercial.	
	A strong economy	Capital work required is minimal.	
	Safety	Can be fenced to minimise interaction with public.	
	Performance	Maintaining laneway access constrains site layout.	
	Accessibility	No accessibility issues.	
	Sustainability	Minimal impacts on the environment.	
	Operator amenity	Within town centre and walking distance to food outlets.	

2.13 Heliport

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Overview:

The Heliport is an undeveloped lot owned by the Council located approximately 2.2km from the existing layover facility just south of the heliport.

Land zoning: SP2 Infrastructure

Preliminary yield (indicative): 20 spaces

Strengths:

- Located near arterial road.
- No sensitive land uses nearby.
- Council-owned land.

Weaknesses:

- Far from the town centre and food outlets.
- There is a noticeable unpleasant odour on site from the adjacent water recycling plant and estuarine area.
- Far from existing terminuses and services.

Figure 2-22 Existing Heliport lot

Figure 2-23 Heliport location

Table 2-13 Qualitative scoring against assessment themes for Heliport

Theme	Commentary	Performance
Customer focused	May have travel time challenges.	
Successful places	No sensitive land uses nearby.	
A strong economy	Capital work required to develop lot.	
Safety	Can be fenced to minimise interaction with public.	
Performance	High operational costs due to dead running.	
Accessibility	No accessibility issues.	
Sustainability	Additional emissions from increased dead running.	
Operator amenity	Far from town centre and food outlets.	

2.14 Water Recycling Plant

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Overview:

The site is an undeveloped lot within the Water Recycling Plant located approximately 2.2km from the existing layover facility.

Land zoning: SP2 Infrastructure

Preliminary yield (indicative): 12 spaces

Strengths:

- Located near arterial road.
- No sensitive land uses nearby.

Weaknesses:

- Far from the town centre and food outlets.
- There is a noticeable unpleasant odour on site from the adjacent water recycling plant and estuarine area.
- Land acquisition would be required.
- Far from existing terminuses and services.

Figure 2-24 Existing Water Recycling Plant

Figure 2-25 Water Recycling Plant location

Table 2-14 Qualitative scoring against assessment themes for Water Recycling Plant

Theme		Commentary	Performance
	Customer focused	May have travel time challenges.	
	Successful places	No sensitive land uses nearby.	
	A strong economy	Land acquisition would be required.	
	Safety	Can be fenced to minimise interaction with public.	
	Performance	High operational costs due to dead running.	
	Accessibility	No accessibility issues.	
	Sustainability	Additional emissions from dead running.	
	Operator amenity	Far from town centre and food outlets.	

2.15 Oak Flats Train Station Car Park

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Overview:

The site is the commuter car park of Oak Flats Train Station and was observed to be half occupied during the weekday. Whilst the site is located far from the existing layover facility, it would serve as a layover facility for southern routes alleviating pressure on layover facilities within Wollongong CBD. The full extent of the car park is outlined in Figure 2-27, however, only a small portion of this car park will be converted into a bus layover facility.

Land zoning: E1 Local Centre

Preliminary yield (indicative): Flexible

Strengths:

- Located adjacent to Oak Flats Train Station and aligns with its future potential as a transport hub for Shellharbour.
- No sensitive land uses nearby.
- Located near police station.
- Existing access to train station amenities.
- Could serve as the southern terminus for future Tier 1 routes.

Weaknesses:

- No nearby food outlets.
- Use would be limited to southern routes and would form part of a multiple layover strategy.

Figure 2-26 Existing Oak Flats Train Station Car Park

Figure 2-27 Oak Flats Train Station Car Park location

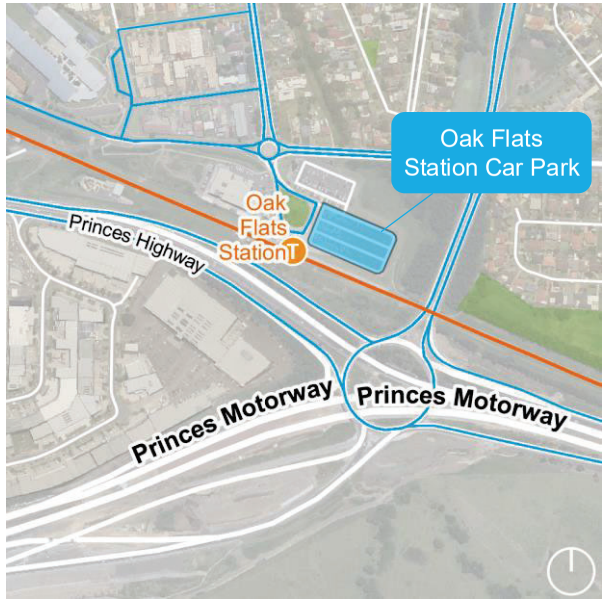

Table 2-15 Qualitative scoring against assessment themes for Oak Flats Train Station Car Park

Theme	Commentary	Performance
Customer focused	Would only serve southern routes and future Tier 1 routes.	
Successful places	No sensitive land uses nearby.	
A strong economy	Capital work required is minimal.	
Safety	Near police station.	
Performance	Site size is conducive to a large efficient layover layout.	
Accessibility	No accessibility issues.	
Sustainability	Minimal impacts on the environment.	
Operator amenity	Far from food outlets.	

2.16 Stockland Shellharbour Car Park

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Overview:

The site is one of the car parks of Stockland Shellharbour and was observed to be mostly unoccupied. Whilst the site is located far from the existing layover facility, it would serve as a layover facility for southern routes alleviating pressure on layover facilities within Wollongong CBD.

Land zoning: E2 Commercial Centre

Preliminary yield (indicative): Flexible

Strengths:

- Within walking distance to food outlets.
- Minimal capital works required to develop the site.
- Could serve as the southern terminus for future Tier 1 routes.
- Existing lighting increases visibility and safety.

Weaknesses:

- Opposite shop-top housing.
- Land acquisition required.
- Use would be limited to southern routes and would form part of a multiple layover strategy.

Figure 2-28 Existing Stockland Shellharbour Car Park

Figure 2-29 Stockland Shellharbour Car Park location

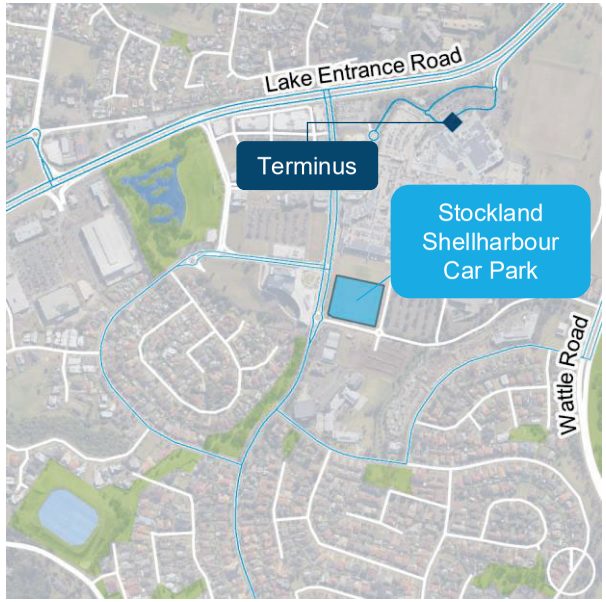

Table 2-16 Qualitative scoring against assessment themes for Stockland Shellharbour Car Park

Theme	Commentary	Performance
Customer focused	Would only serve southern routes and future Tier 1 routes.	
Successful places	May impact residential dwellings across the road.	
A strong economy	Land acquisition required.	
Safety	Can be fenced to minimise interaction with public.	
Performance	Site size is conducive to a large efficient layover layout.	
Accessibility	No accessibility issues.	
Sustainability	Minimal impacts on the environment.	
Operator amenity	Within walking distance to food outlets.	

2.17 JJ Kelly Park Car Park

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Overview:

JJ Kelly Park Car Park is a mostly unoccupied car park (on non-event day) serving the adjacent sports grounds. The site is located approximately 2.3km from the existing layover and can only be accessed from Springhill Road from the northbound travel direction.

Land zoning: RE1 Public Recreation

Preliminary yield (indicative): 22 spaces

Strengths:

- Large site available to accommodate a large number of layover spaces.
- Located on an arterial road.

Weaknesses:

- Far from the town centre and food outlets.
- The displacement of parking would impact surrounding recreational land uses.
- Tree removal would be required as part of capital works.
- Springhill Road is posted as 80km/h. An acceleration lane may be required to allow buses to come to speed when merging onto Springhill Road.
- Far from existing terminuses and services.

Figure 2-30 Existing JJ Kelly Park Car Park

Figure 2-31 JJ Kelly Park Car Park location

Table 2-17 Qualitative scoring against assessment themes for JJ Kelly Park Car Park

Theme		Commentary	Performance
	Customer focused	May have travel time challenges.	
	Successful places	Displaced parking may impact adjacent recreational spaces.	
	A strong economy	Minimal capital works required.	
	Safety	Minimal pedestrian activity but little passive surveillance.	
	Performance	High operational costs due to dead running.	
	Accessibility	No accessibility issues.	
	Sustainability	Tree removal may be required and emissions from dead running.	
	Operator amenity	Far from town centre and food outlets.	

2.18 Vikings Rugby Union Club Car Park

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Overview:

Vikings Rugby Union Club Car Park is a car park serving the adjacent sports grounds and commercial gym located within the club building. The site is located approximately 1.6km from the existing layover.

Land zoning: RE1 Public Recreation

Preliminary yield (indicative): 20 spaces

Strengths:

- Large site available to accommodate a large number of layover spaces.
- Located on an arterial road.

Weaknesses:

- Far from the town centre and food outlets.
- The displacement of parking would impact surrounding recreational land uses.
- Some on-street parking on Swan Street may need to be removed to allow access for buses.
- Far from existing terminuses and services.

Figure 2-32 Existing Vikings Rugby Union Club Car Park

Figure 2-33 Vikings Rugby Union Club Car Park location

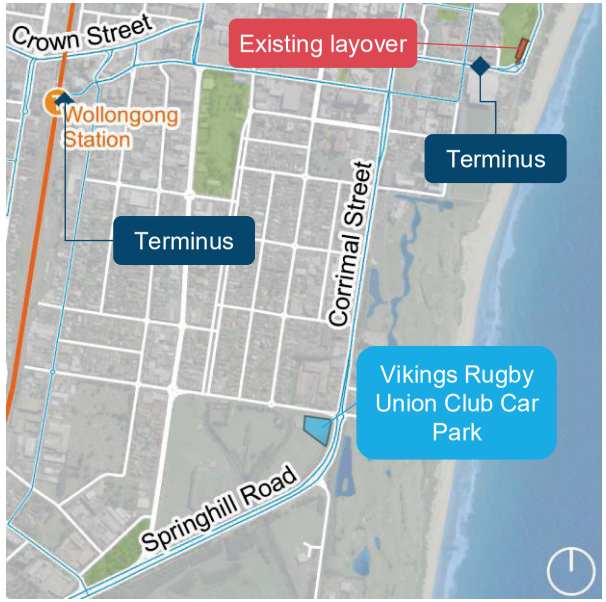

Table 2-18 Qualitative scoring against assessment themes for Vikings Rugby Union Club Car Park

Theme	Commentary	Performance
Customer focused	May have travel time challenges.	
Successful places	Displaced parking may impact adjacent recreational spaces.	
A strong economy	Capital work required is minimal.	
Safety	Can be fenced to minimise interaction with public.	
Performance	High operational costs due to dead running.	
Accessibility	No accessibility issues.	
Sustainability	Additional emissions from dead running.	
Operator amenity	Far from town centre and food outlets.	

2.19 Bluescope Steel Warehouses

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Overview:

The site would be a portion of the Bluescope Steel Warehouses located south of Cringila Station. The site is far from the existing layover facility and may only be suitable for southern routes.

Land zoning: IN3 Heavy Industrial

Preliminary yield (indicative): Flexible

Strengths:

- Large site available to accommodate a large number of layover spaces.

Weaknesses:

- No direct access from arterial roads.
- No adjacent to existing bus routes.
- Land acquisition required.
- Far from the town centre and food outlets.
- May impact the future master plan for the area currently under development.

Figure 2-34 Existing Bluescope Steel Warehouses

Figure 2-35 Bluescope Steel Warehouses location

Table 2-19 Qualitative scoring against assessment themes for Bluescope Steel Warehouses

Theme		Commentary	Performance
	Customer focused	May have travel time challenges.	
	Successful places	No adjacent sensitive land uses.	
	A strong economy	Land acquisition may be required.	
	Safety	Away from public access.	
	Performance	High operational costs due to dead running.	
	Accessibility	No accessibility issues.	
	Sustainability	Additional emissions from dead running.	
	Operator amenity	Far from town centre and food outlets.	

2.20 110 Gipps Street

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Overview:

110 Gipps Street is located south of North Wollongong Train Station and approximately 2.3km from the existing layover facility. The site is currently a commercial office space and is located within an industrial area.

Land use: E3 Enterprise Corridor

Preliminary yield (indicative): 13 spaces

Strengths:

- Located near an arterial road and existing bus routes.
- No adjacent sensitive land uses.
- Could be utilised as a layover for northern routes serving a potential future terminus at North Wollongong Train Station.

Weaknesses:

- Land acquisition and demolition works required.
- Far from food outlets.

Figure 2-36 Existing 110 Gipps Street lot

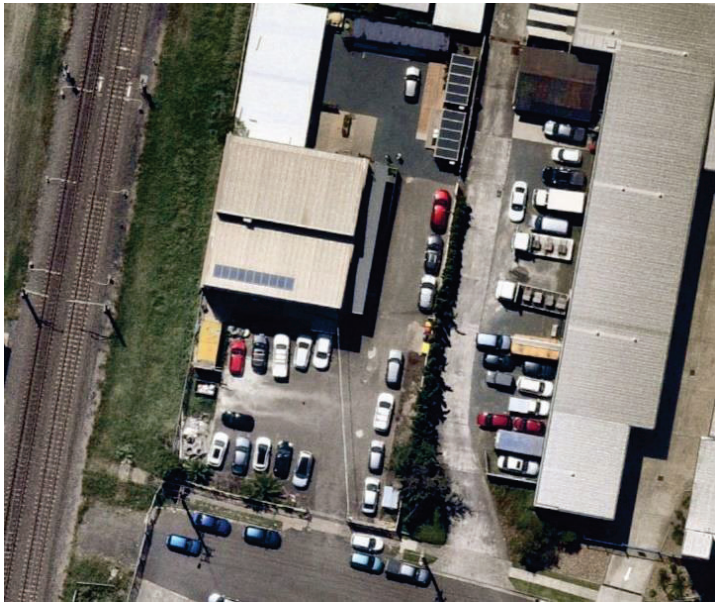

Figure 2-37 110 Gipps Street location

Table 2-20 Qualitative scoring against assessment themes for 110 Gipps Street

Theme	Commentary	Performance
Customer focused	Could serve a potential future terminus.	
Successful places	No adjacent sensitive land uses.	
A strong economy	Land acquisition and demolition required.	
Safety	Can be fenced to minimise interaction with public.	
Performance	Site size is similar to existing layover facility.	
Accessibility	No accessibility issues.	
Sustainability	Minor emissions from dead running.	
Operator amenity	Far from food outlets.	

2.21 104 Gipps Street

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Overview:

104 Gipps Street is located south of North Wollongong Train Station and approximately 2.3km from the existing layover facility. The site is set back from the street with its current unknown. Vehicle access is likely from Gipps Street.

Land use: E3 Enterprise Corridor

Preliminary yield (indicative): 38 spaces

Strengths:

- Located near an arterial road and existing bus routes.
- No adjacent sensitive land uses.
- Could be utilised as a layover for northern routes serving a potential future terminus at North Wollongong Train Station.

Weaknesses:

- Land acquisition required.
- Far from food outlets.
- Tree removal required.

Figure 2-38 Existing 104 Gipps Street lot

Figure 2-39 104 Gipps Street location

Table 2-21 Qualitative scoring against assessment themes for 104 Gipps Street

Theme	Commentary	Performance
Customer focused	Could serve a potential future terminus.	
Successful places	No adjacent sensitive land uses.	
A strong economy	Land acquisition and demolition required.	
Safety	Setback from street reduces public interaction.	
Performance	Site size is conducive to a large efficient layover layout.	
Accessibility	No accessibility issues.	
Sustainability	Tree removal required and minor emissions from dead running.	
Operator amenity	Far from food outlets.	

2.22 University of Wollongong Innovation Campus

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Overview:

The site is located in the southern portion of the University of Wollongong Innovation Campus and approximately 2.9km from the existing layover facility. The site is currently undeveloped but is planned to be developed in the University's masterplan. A portion of the site can be developed and expanded depending on demand.

Land use: SP1 Special Activities and RE1 Public Recreation

Preliminary yield (indicative): Flexible

Strengths:

- Located near an arterial road and existing bus routes.
- No adjacent sensitive land uses.

Weaknesses:

- Land acquisition may be required.
- Far from the town centre and food outlets.
- Tree removal required.

Figure 2-40 Existing UoW Innovation Campus lot

Figure 2-41 UoW Innovation Campus location

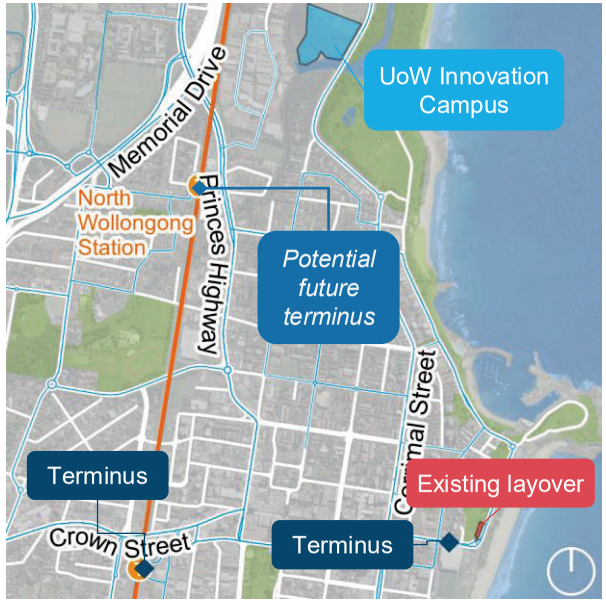

Table 2-22 Qualitative scoring against assessment themes for UoW Innovation Campus

Theme	Commentary	Performance
Customer focused	May have travel time challenges.	
Successful places	No adjacent sensitive land uses.	
A strong economy	Land acquisition may be required.	
Safety	Minimal pedestrian activity but little passive surveillance.	
Performance	Site size is conducive to a large efficient layover layout.	
Accessibility	No accessibility issues.	
Sustainability	Tree removal required and emissions from dead running.	
Operator amenity	Far from town centre and food outlets.	

2.23 Department of Education Sports Fields

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Overview:

The site is located in the sports fields south-east of TAFE NSW Wollongong and approximately 3.1km from the existing layover facility. A portion of the site can be developed and expanded depending on demand.

Land use: SP2 Infrastructure

Preliminary yield (indicative): Flexible

Strengths:

- Located near motorway.
- No adjacent sensitive land uses.

Weaknesses:

- Land acquisition may be required.
- Far from the town centre and food outlets.
- Tree removal required.
- Potential flooding issues.
- May impacted during O-Week for TAFE NSW Wollongong and University of Wollongong where traffic management is implemented due to increased traffic volumes.

Figure 2-42 Existing Department of Education Sports Fields

Figure 2-43 Sports Fields location

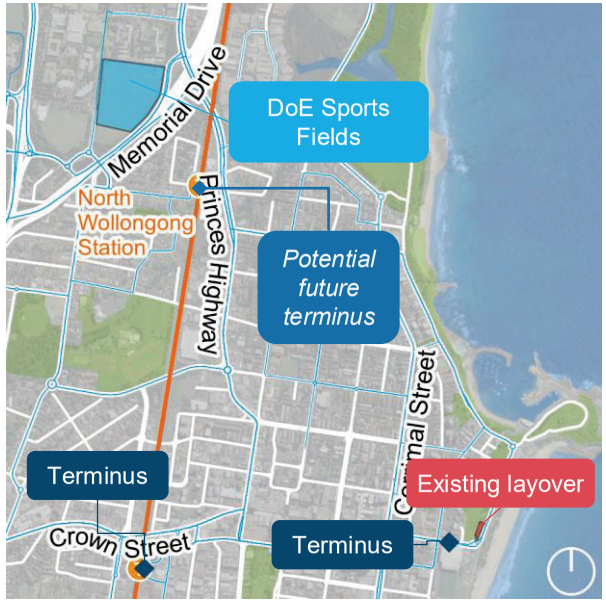

Table 2-23 Qualitative scoring against assessment themes for Department of Education Sports Fields

Theme		Commentary	Performance
	Customer focused	May have travel time challenges.	
	Successful places	No adjacent sensitive land uses.	
	A strong economy	Land acquisition may be required.	
	Safety	Minimal pedestrian activity but little passive surveillance.	
	Performance	Site size is conducive to a large efficient layover layout.	
	Accessibility	No accessibility issues.	
	Sustainability	Tree removal required and emissions from dead running.	
	Operator amenity	Far from town centre and food outlets.	

2.24 Memorial Drive

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Overview:

The site is located off the shoulder of Memorial Drive and approximately 3.1km from the existing layover facility. Access to the site is unknown.

Land use: SP2 Infrastructure

Preliminary yield (indicative): 22 spaces

Strengths:

- No adjacent sensitive land uses.

Weaknesses:

- Located adjacent to the motorway. Access and egress would be limited to one direction.
- Safety implications related to the speed differential of buses (compared to the main motorway speed) as they access and egress the site. Limited space for acceleration and deceleration lanes.
- Site size limits layover yield.
- Land acquisition may be required.
- Far from the town centre and food outlets.
- Tree removal may be required.

Figure 2-44 Existing Memorial Drive lot

Figure 2-45 Memorial Drive lot location

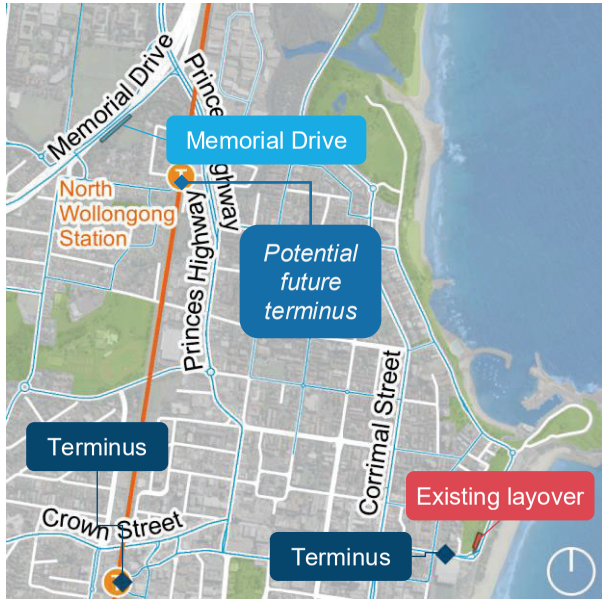

Table 2-24 Qualitative scoring against assessment themes for Memorial Drive

Theme		Commentary	Performance
	Customer focused	May have travel time challenges.	
	Successful places	No adjacent sensitive land uses.	
	A strong economy	Land acquisition may be required.	
	Safety	Minimal passive surveillance and interaction with motorway.	
	Performance	Number of layover spaces is limited by site size and access.	
	Accessibility	No accessibility issues.	
	Sustainability	Tree removal required and emissions from dead running.	
	Operator amenity	Far from town centre and food outlets.	

2.25 University of Wollongong Bushland East

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Overview:

The site is located off the shoulder of Princes Motorway and approximately 5.6km from the existing layover facility. There is currently no access to site and will likely be provided by future Princes Motorway interchange.

Land use: SP2 Infrastructure

Preliminary yield (indicative): 14 spaces

Strengths:

- No adjacent sensitive land uses.
- Close to bus terminus at University of Wollongong.

Weaknesses:

- Access and delivery of site is linked to the provision of an uncommitted interchange.
- Land acquisition may be required.
- Far from town centre and food outlets.
- Tree removal required.

Figure 2-46 Existing UoW Bushland East site

Figure 2-47 UoW Bushland East location

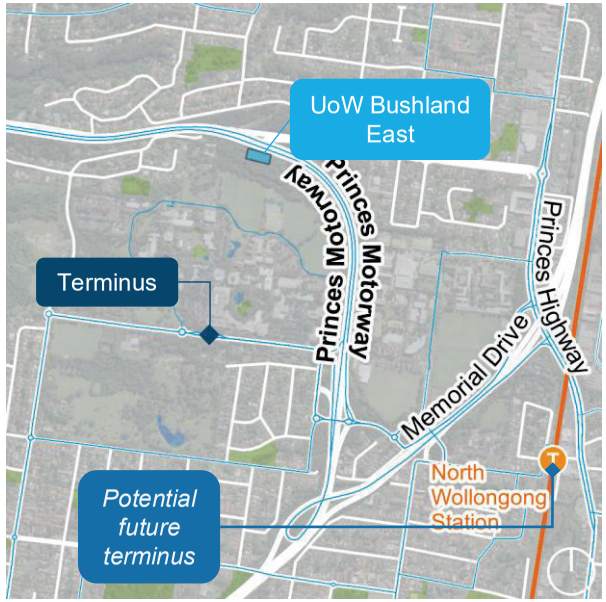

Table 2-25 Qualitative scoring against assessment themes for UoW Bushland East

Theme	Commentary	Performance
Customer focused	May have travel time challenges.	
Successful places	No adjacent sensitive land uses.	
A strong economy	Land acquisition may be required.	
Safety	Minimal pedestrian activity but little passive surveillance.	
Performance	Access is linked to the provision of an uncommitted interchange.	
Accessibility	No accessibility issues.	
Sustainability	Tree removal required and emissions from dead running.	
Operator amenity	Far from town centre and food outlets.	

2.26 University of Wollongong Bushland West

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Overview:

The site is west of the University of Wollongong campus and approximately 5.4km from the existing layover facility. The site is currently undeveloped.

Land use: SP2 Infrastructure

Preliminary yield (indicative): Flexible

Strengths:

- No adjacent sensitive land uses.
- Close to the bus terminus at the University of Wollongong. A small on-street layover could be investigated on adjacent streets.

Weaknesses:

- Located far from existing bus layover facility.
- Land acquisition may be required.
- Far from the town centre and food outlets.
- Tree removal required.

Figure 2-48 Existing UoW Bushland West site

Figure 2-49 UoW Bushland West location

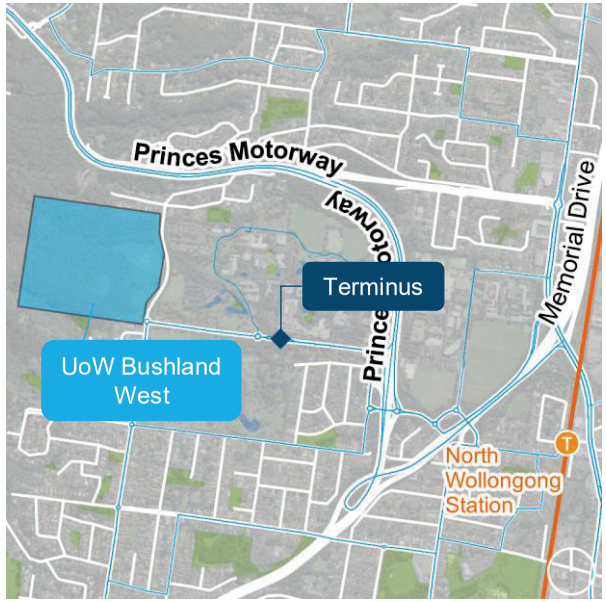

Table 2-26 Qualitative scoring against assessment themes for UoW Bushland west

Theme		Commentary	Performance
	Customer focused	May have travel time challenges.	
	Successful places	No adjacent sensitive land uses.	
	A strong economy	Land acquisition may be required.	
	Safety	Minimal pedestrian activity but little passive surveillance.	
	Performance	Site size is conducive to a large efficient layover layout.	
	Accessibility	No accessibility issues.	
	Sustainability	Tree removal required and emissions from dead running.	
	Operator amenity	Far from town centre and food outlets.	

2.27 SWOT analysis summary

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A summary of option performance against each theme is presented below.

Table 2-27 Summarised SWOT qualitative scores

#	Site
1	Stuart Park Car Park
2	Lighthouse Upper
3	Lighthouse Lower
4	Stewart Street Car Park
5	8 Bank Street
6	George Street Car Park
7	Church Street
8	MacCabe Park Car Park
9	Atchison Street Car Park
10	Wollongong Train Station Car Park
11	Heliport
12	Water Recycling Plant

#	Site
13	Oak Flats Train Station Car Park
14	Stockland Shellharbour Car Park
15	JJ Kelly Park Car Park
16	Vikings Rugby Union Club Car Park
17	Bluescope Steel Warehouse
18	110 Gipps Street
19	104 Gipps Street
20	University of Wollongong Innovation Campus
21	Department of Education Sports Fields
22	Memorial Drive
23	University of Wollongong Bushland East
24	University of Wollongong Bushland West

2.28 Short-listed layover locations

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Based on the SWOT analysis of the long list of options, the following short list of layover locations was identified to be assessed further in a detailed multi-criteria analysis:

- 110 Gipps Street (serving North Wollongong)
- Lighthouse Upper (serving East Wollongong)
- Atchison Street (serving Wollongong CBD)
- Wollongong Train Station (serving Wollongong CBD)
- Oak Flats Station (serving Shellharbour)
- University of Wollongong On-street (serving University of Wollongong).

Figure 2-50 Locations of short-listed layover locations

3.0

Concept designs for short-listed locations

3.1 Layover concept designs

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Concept designs were developed for each of the identified layover designs to serve as a basis for high-level capital and operational cost estimation. During consultation with the bus operators, the following key design criteria were established:

- Buses must not be required to perform any reverse manoeuvres to enter or exit a layover space.
- Amenities for drivers must be provided at each location.

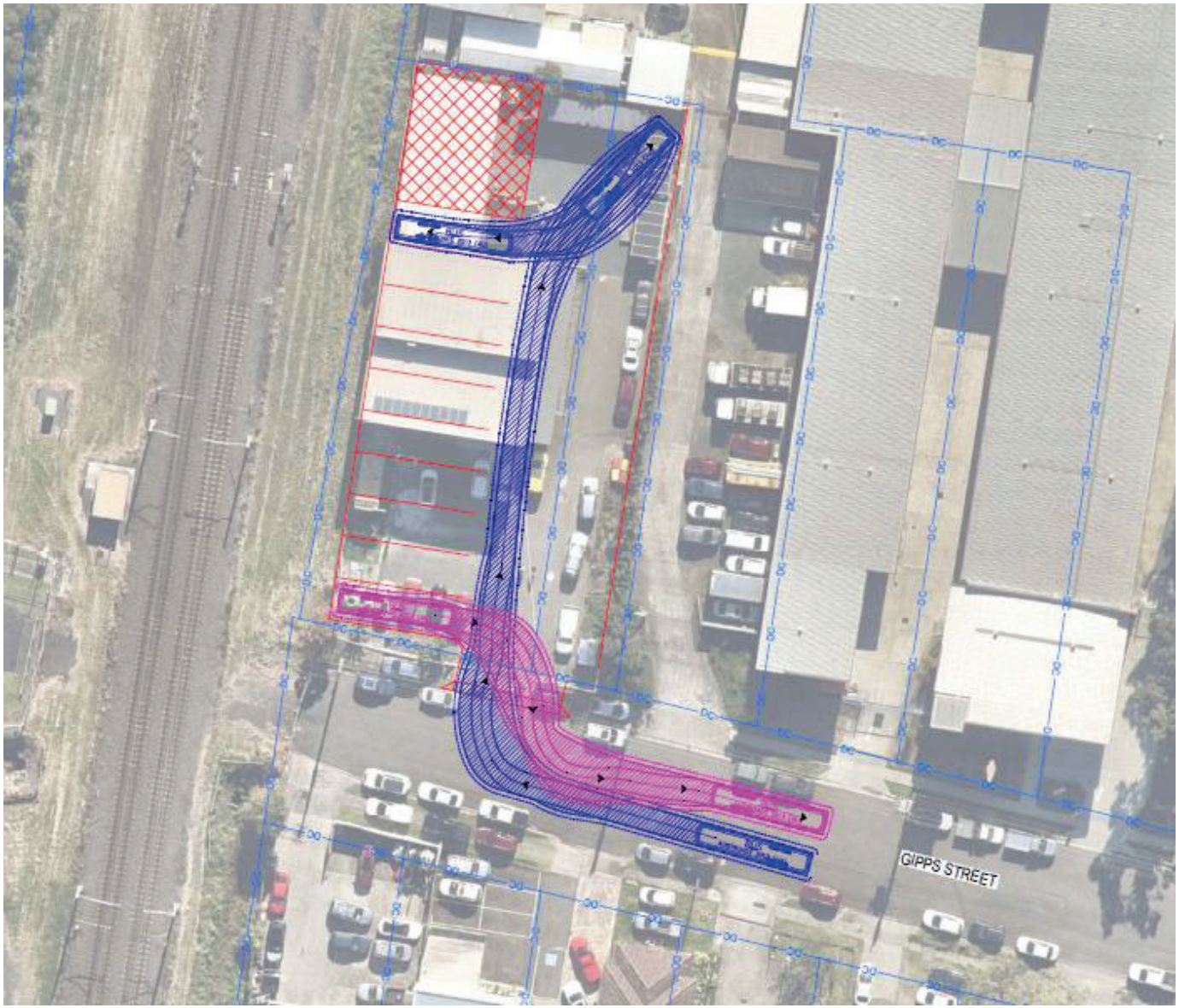
During this design process, it was identified that the layover at 110 Gipps Street would require buses to reverse in the layover. Swept paths shown in Figure 3-1 illustrate the need for this movement due to the narrow footprint of the site. As a result. This location was removed from further consideration.

Furthermore, the layover location identified at the University of Wollongong will continue to use the existing facilities with no changes proposed. As a result, this location was also removed from further assessment as it would not impact the comparative analysis of the MCA.

The concept designs of the following locations are outlined in the remainder of this chapter (and included in Appendix A):

- Stewart Street Car Park
- Atchison Street Car Park
- Wollongong Train Station
- Oak Flats Train Station
- Lighthouse Upper.

Figure 3-1 Bus manoeuvres at 110 Gipps Street



3.2 Stewart Street Car Park concept design

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Overview:

The Stewart Street Car Park is located approximately 0.9km from the existing bus layover facility and provides ticketed parking on weekdays and free parking on weekends and public holidays. The site is bordered by a mixture of residential and commercial land uses, including a hotel. There is an additional access via Bank Street which is currently fenced off.

Land zoning: MU1 Mixed Use.

Yield:

- 16 bus layover spaces
- 220m^2 provision for recreation and toilet facilities.

Capital work required:

- Construction of recreation and toilet facilities
- Widening of existing Stewart Street driveway access
- Installation of gates, fencing and bollards
- Relocation of existing light poles
- Mill and re-sheet of existing surface and line marking.

Implications:

- Loss of all parking spaces (196 spaces including 4 disabled spaces).

Figure 3-2 Stewart Street Car Park layover concept design

3.3 Atchison Street Car Park concept design

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Overview:

Atchison Street Car Park is a gated prepaid car park located on Keira Street, approximately 1.5km from the existing layover. The car park is split into a ticketed portion accessed via Atchison Street and a gated pre-paid section accessed via Auburn Street. The ticketed portion is heavily occupied, whilst the prepaid was observed to be approximately half occupied.

Land zoning: E2 Commercial Core.

Yield:

- 11 bus layover spaces
- 66m^2 provision for recreation and toilet facilities.

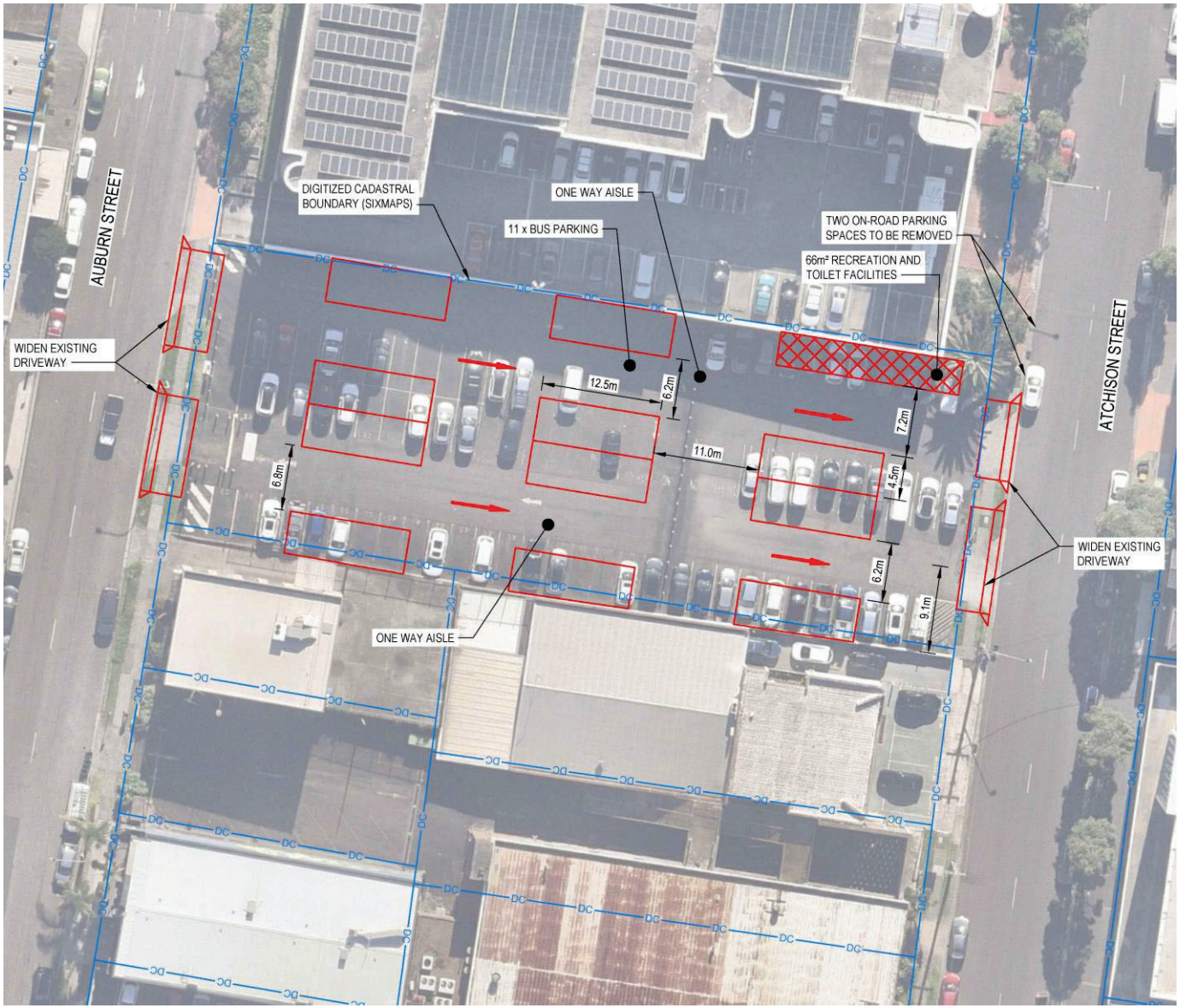
Capital work required:

- Construction of recreation and toilet facilities
- Widening of existing driveways on Auburn Street and Atchison Street
- Installation of gates and fencing
- Removal of existing bollards
- Mill and re-sheet of existing surface and line marking.

Implications:

- Loss of all parking spaces (84 spaces including 2 disabled spaces).

Figure 3-3 Atchison Street Car Park layover concept design



3.4 Wollongong Train Station Car Park concept design

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Overview:

Wollongong Train Station Car Park is an unpaid parking lot that is heavily utilised located adjacent to the bus stops outside the station. It is located approximately 1.6km from the existing layover facility. The car park also provides laneway access to several businesses to the east which should be maintained. Bicycle lockers are also provided next to the lot.

Land zoning: SP2 Infrastructure.

Yield:

- 6 bus layover spaces.

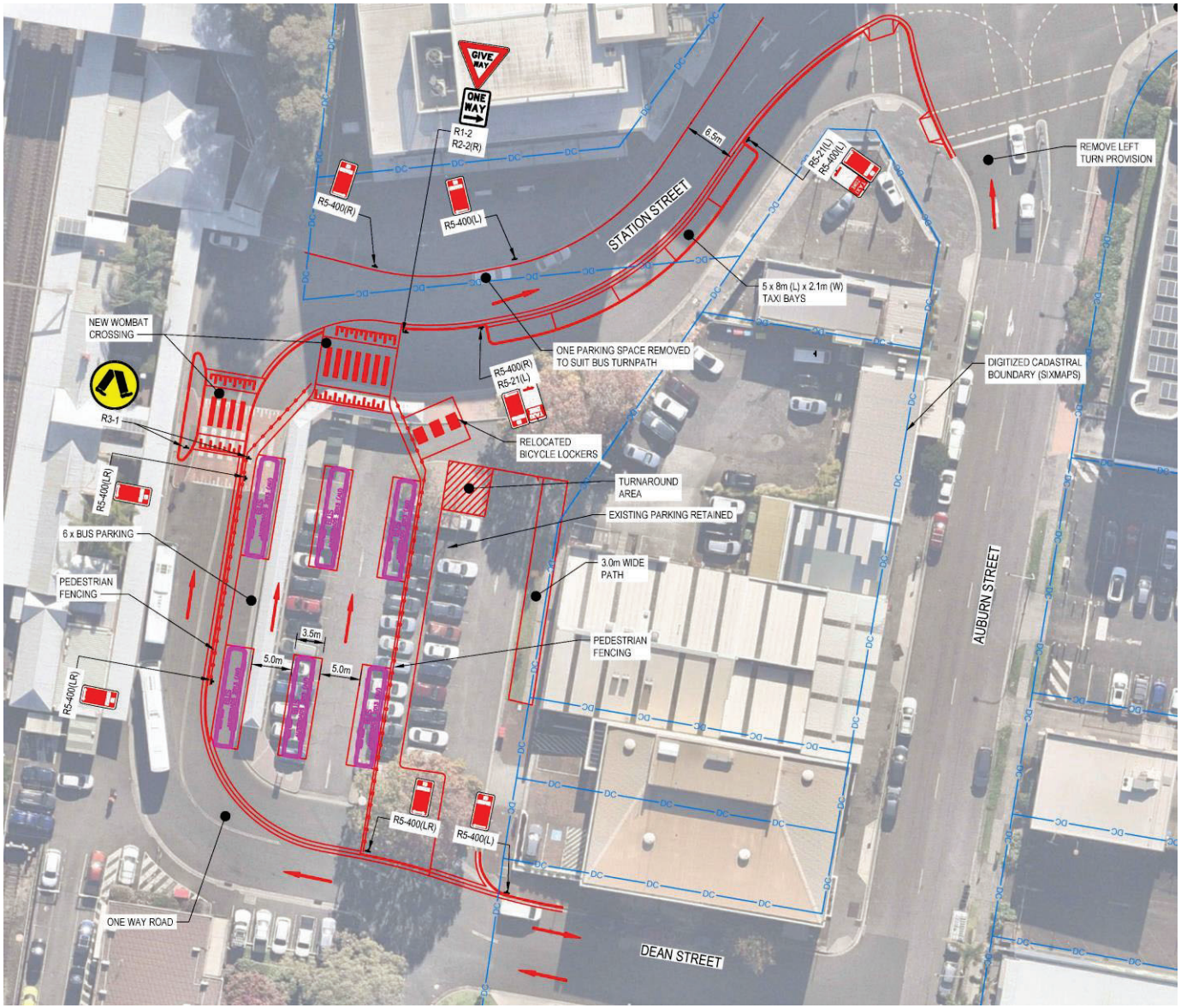
Capital work required:

- Conversion of Station Street / Dean Street into a one-way loop
- Relocation of bike lockers and taxi ranks
- Demolition and construction of wombat crossings and hardstand area
- Installation of gates and fencing
- Mill and re-sheet of existing surface and line marking.

Implications:

- Loss of parking spaces (25 spaces including 2 disabled spaces).

Figure 3-4 Wollongong Train Station layover concept design



3.5 Oak Flats Train Station Car Park concept design

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Overview:

The site is the commuter car park of Oak Flats Train Station and was observed to be half-occupied on a typical weekday. Whilst the site is located far from the existing layover facility, it would serve as a layover facility for southern routes alleviating pressure on layover facilities within Wollongong CBD.

Land zoning: E1 Local Centre.

Yield:

- 4 bus layover spaces.

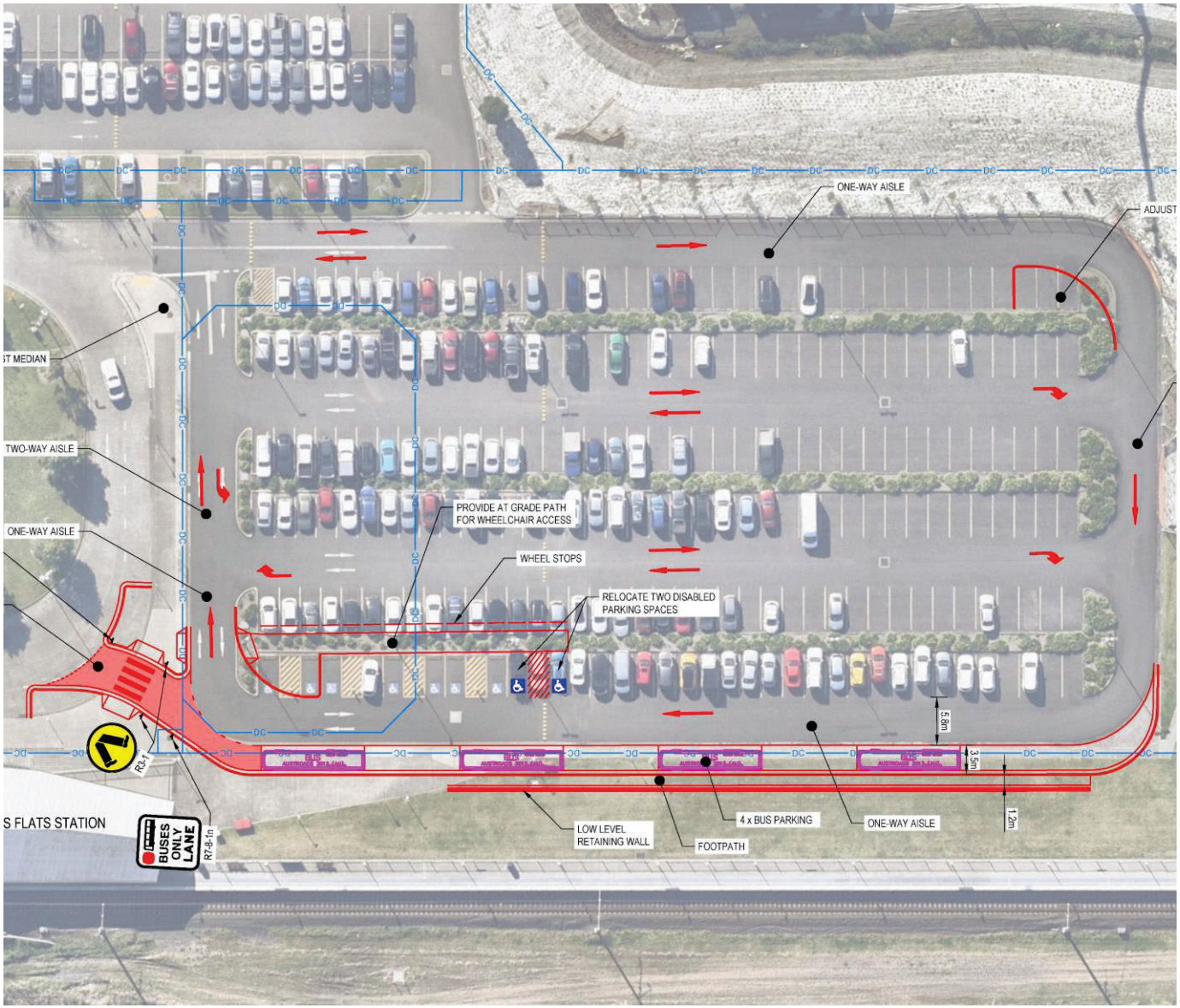
Capital work required:

- Modification of medians
- Potential construction of retaining wall
- Relocation of 2 disabled parking spaces
- Modification of existing wayfinding and line marking.

Implications:

- Loss of 3 parking spaces (2 disabled spaces relocated).

Figure 3-5 Oak Flats Train Station layover concept design



3.6 Lighthouse Upper concept design

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Overview:

The Lighthouse Upper site would involve replacing existing kerbside parking along Endeavour Drive on Flagstaff Hill and is located approximately 0.8km from the existing bus layover facility. The site serves the adjacent recreational spaces and was observed to be heavily utilised.

Land zoning: RE1 Public Recreation.

Yield:

- 4 bus layover spaces including 1 space for route terminus and 1 space for route start.

Capital work required:

- Construction of new toilet facilities
- Demolition and reconstruction of kerb and gutter
- Construction of retaining wall
- Removal of vegetation.

Implications:

- Loss of 17 parking spaces.

Figure 3-6 Lighthouse Upper layover concept design

4.0

Potential layover configurations

4.1 Layover configurations

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The current layover facility has a capacity of 11 spaces. From discussions with bus operators, it was established that there is a current demand for 12 layover spaces.

After the development of concept designs for the short-listed layover locations, it was apparent that certain locations would not have sufficient layover capacity to serve the existing and future layover requirements by themselves. To cater for this, some locations were packaged together into “Configurations”. These configurations are summarized below and illustrated in Figure 4-1.

Configuration 1: Single layover: Stewart Street Car Park

Configuration 2: Multi-layover:

- Atchison Street (serving Wollongong CBD)
- Wollongong Train Station (serving Wollongong CBD)
- Oak Flats Station (serving Shellharbour).

Configuration 3: Multi-layover:

- Lighthouse Upper (serving East Wollongong)
- Atchison Street (serving Wollongong CBD)
- Wollongong Train Station (serving Wollongong CBD)
- Oak Flats Train Station (serving Shellharbour).

Layover locations from either multi-layover configuration may be considered in isolation and/or part of other configurations. It is intended that these will be staged in response to service planning and operational needs.

Figure 4-1 Layover configuration options

4.1 Layover configurations – continued

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Configuration 1:

Configuration 1 consists of a single layover location at Stewart Street Car Park. The large footprint of the site provides room for 16 independently operating layover spaces which is sufficient capacity to meet existing and future layover requirements. This was the only short-listed site large enough to operate as a standalone layover location due to the design and operational requirements outlined by the bus operators.

Buses would travel to and from the existing layover on Crown Street, accessing the layover from Stewart Street.

Configuration 2:

Configuration 2 is a multi-layover configuration that provides a combined layover capacity of 21 spaces, 17 of which are located within Wollongong CBD. This configuration includes:

- Atchison Street Car Park
- Wollongong Train Station Car Park
- Oak Flats Train Station Car Park.

Atchison Street Car Park will serve as the primary layover location with a total capacity of 11 layover spaces. Due to the arrangement of the layover spaces, buses will enter the site via Auburn Street and exit onto Atchison Street. As a result, this is better suited for buses travelling to and from the WEC.

Wollongong Train Station Car Park supplements Atchison Street Car Park by providing an additional six layover spaces. It is better located to serve buses terminating at Wollongong Train Station due to its proximity and decentralising the demand from Atchison Street Car Park.

The inclusion of Oak Flats Train Station Car Park provides four spaces near the existing bus terminus in Shellharbour. Doing so provides additional flexibility for future service planning and relieves demand for layovers within Wollongong CBD. It also serves as a potential anchor point for future Tier 1 routes originating in the southern Illawarra.

Configuration 3:

Configuration 3 extends Configuration 2 with the inclusion of Lighthouse Upper at Flagstaff Point. This location provides an additional four layover spaces in Wollongong's East. Two of these spaces would also serve as a route terminus and a route start.

The location could be a potential destination terminus for future Tier 1 routes as Flagstaff Point is a major recreational destination in Wollongong. However. the operational capability of Lighthouse Upper would be impacted by road closures throughout the calendar year for events.

It is estimated that the location would not be operational for approximately 20 weekends per year. The combination of the reduced availability and the limited layover capacity results in this location being suited only for routes that are extended to Wollongong East.

4.2 Multi-layover contributions

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As Configurations 2 and 3 are comprised of multiple locations, the MCA score for each configuration is a weighted aggregate of the individual locations that make the respective configuration.

A weighted aggregate has been used as scoring and comparing each component location individually to Configuration 1 would not be a reasonable like-for-like comparison, nor would it capture the overall efficacy of a multi-layover configuration. Instead, the scores of each location would be weighted (and then combined) based on their respective contribution (or proportional use) to the overall configuration.

The contribution of each layover location in Configurations 2 and 3 was determined by re-assigning existing layover demand to the appropriate layover locations. This was done to realistically load each location with layover demand such that the available capacity is utilised appropriately.

For Configurations 2 and 3:

- Atchison Street Car Park served as the primary layover location.
- Wollongong Train Station Car Park provides supplementary layover spaces.
- Oak Flats Train Station Car Park provided for routes travelling to and from Shellharbour to alleviate demand within the CBD.

For Configuration 3 specifically, Lighthouse Upper provided additional supplementary supply to support Atchison Street Car Park. However, its capacity is limited and therefore only a few bus layovers were assigned to this location.

The contributions of each location to each configuration are summarised in Table 4-1. These contributions were calculated as a proxy in the absence of schedules for each new configuration. Layover demand and duration may evolve over time as schedules are revised and optimised. As such, these contributions were only intended to be used for a relative comparison for the purposes of the MCA.

Table 4-1 Contributions of layover location to each configuration score

Location	Configuration 1	Configuration 2	Configuration 3
Stewart Street Car Park	100%		
Atchison Street Car Park		55%	45%
Wollongong Train Station Car Park		35%	35%
Oak Flats Train Station Car Park		10%	10%
Lighthouse Upper			10%
Total	**100%**	**100%**	**100%**

8.0

Outcomes and next steps

8.1 Preferred option

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The multi-criteria assessment demonstrated that all configurations scored similarly, and hence are viable options for the potential relocation of the existing facility. Configuration 1 scored the highest by a small margin.

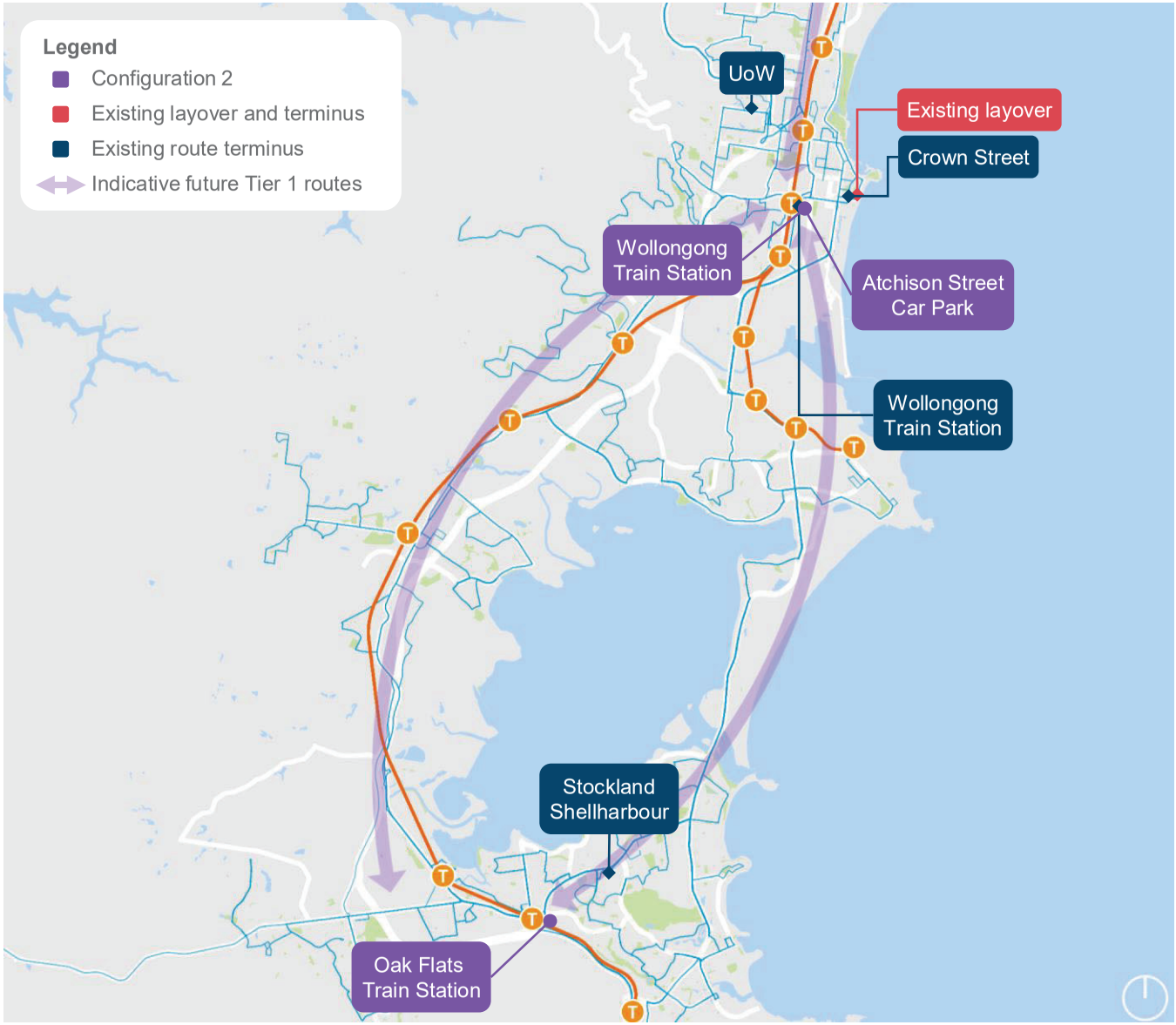
Following conversations between TfNSW and the landowner (Council) for a number of the potential locations, Configuration 2 was ultimately selected to be progressed as the preferred option. This configuration balanced competing requirements for land whilst providing operational flexibility for layover operations (including staging).

The layover locations of Configuration 2 are illustrated in Figure 8-1 and listed below.

Configuration 2:

- Atchison Street (serving Wollongong CBD)
- Wollongong Train Station (serving Wollongong CBD)
- Oak Flats Train Station (serving Shellharbour).

Figure 8-1 Preferred layover configuration



8.2 Next steps

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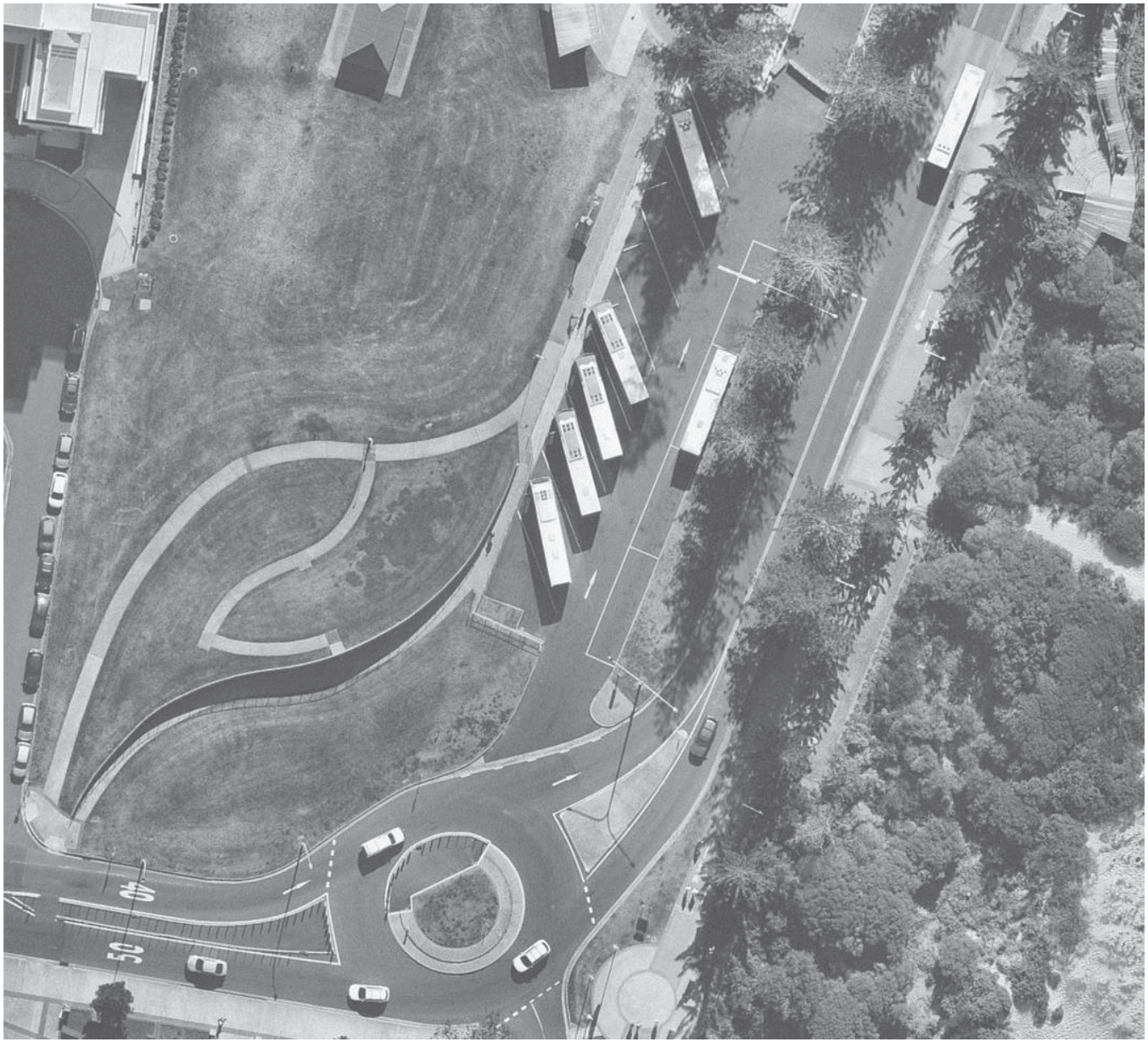
Following the selection of Configuration 2 as the preferred option, a decision can be made on the merit of relocating the existing facility. It is envisaged this decision would be informed by a strategic business case.

To inform the strategic business case further work is required to understand how the bus network will continue to operate with the new layover locations and the resulting transport impact.

The next steps for the project include:

- Development of an Indicative Operational Plan outlining:
  - Operations within each layover location
  - Vehicle access
  - Travel path between route termini and each layover location
  - Traffic impacts on the existing road network.
- Identification of on-street layover options, both temporary and ongoing to service short-duration layovers due to the increased travel time between termini and layovers.
- Public consultation to communicate the changes to the bus network to the wider community and what this means for them.

Following the outcomes of the strategic business case, if the relocation is the preferred outcome, determine the funding mechanisms required to deliver the proposed changes (including capital and operational costs) and collaborate with stakeholders (including bus operators) to develop an implementation strategy.




SCT
Consulting

Wollongong Bus Layover Permanent Relocation Study

Service and Operational Plan

8 February 2024

Quality Assurance

Project details			
Project number:	SCT_00420		
Client:	Transport for NSW	ABN:	18 804 239 602
Prepared by:	SCT Consulting Pty. Ltd.	ABN:	53 612 624 058

Document details		
Document name:	Wollongong Bus Layover Relocation Study Service and Operational Plan	
Prepared by:	Matthew Cen	
Reviewed by:	Ravi Kaberwal	
Authorised by:	Ravi Kaberwal	

Version	Date	Description
1.0	8 December 2023	Draft for comment
2.0	19 January 2024	Update addressing client comments
3.0	8 February 2024	Update to add additional appendix

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1.0

Introduction and context

1.1 Project background

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The existing bus layover facility is located at Lang Park on Marine Drive in Wollongong, depicted in Figure 1-1.

The layover currently provides 11 spaces for 12.5m long standard buses in the following configuration:

- Seven 45-degree spaces, all allowing independent operations. These spaces require reversing manoeuvres to exit.
- Four nose-to-tail spaces with minimal gaps apparent between spaces. Hence, buses may be restricted from independent entry and/or exit.

The layover operates as a one-way loop and is accessed via the roundabout at the intersection of Marine Drive and Crown Street. This location is near the terminating and starting stops outside the WIN Sports and Entertainment Centres (WEC). As a result, the dead-running time is minimised with high travel time reliability which translates to reliable service start times.

Wollongong City Council (Council) is interested in redeveloping the land occupied by the layover because it is located adjacent to recreational land uses. As a result, an alternative layover location is required to ensure continued bus operations within Wollongong and the Illawarra region.

Figure 1-1 Existing layover at Lang Park

1.2 Preferred layover locations

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To identify the preferred alternative layover location(s), a staged selection process was undertaken.

This process, documented in the *Preferred Layover Selection Report*, involved 19 assessment criteria categorised into the following themes:

- Customer focused
- Sustainability
- Performance
- Public safety
- Driver safety and amenity
- Successful places
- A strong economy.

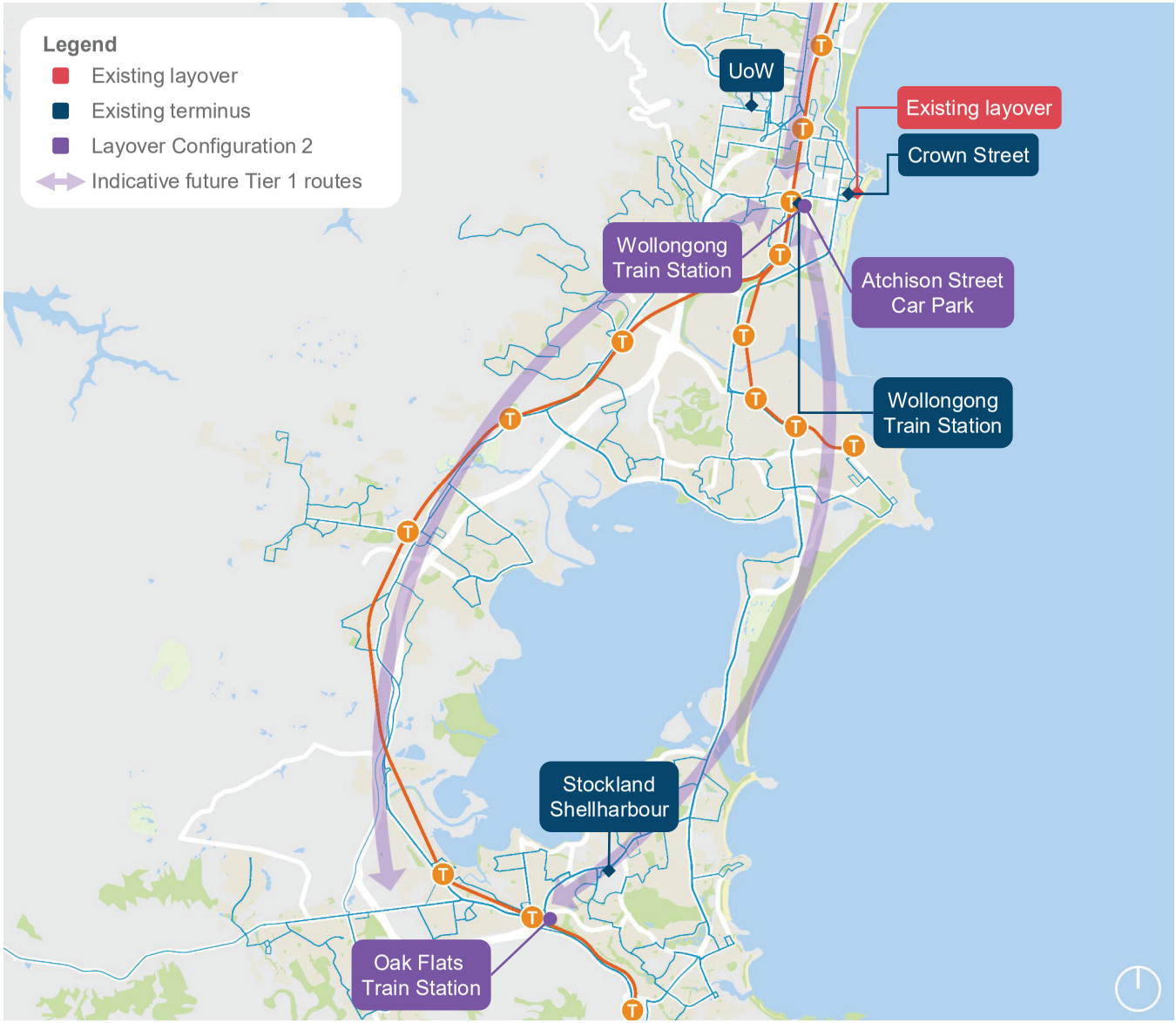
The preferred combination of layover locations, Configuration 2, consists of the three layover locations illustrated in Figure 1-2 and listed below:

- Atchison Street Car Park
- Wollongong Train Station Car Park
- Oak Flats Train Station Car Park.

The selection process was supported by feedback from key stakeholders including:

- Transport for NSW
- Wollongong City Council
- Premier Illawarra (Bus Operator)
- Dion's Bus Service (Bus Operator)
- Transport Workers Union (TWU) NSW.

Figure 1-2 Preferred layover configuration



1.3 Purpose, report scope and structure

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Purpose and report scope

This report describes the service and operational requirements for each of the layover locations from the preferred configuration (Configuration 2). This report does not comment on whether the existing facility should be retained or relocated, and it is envisaged the outcomes of this report would be an input to a strategic business case to inform the decision-making process.

The outcomes of this study include the:

- Identification of changes to the public realm required to facilitate the preferred configuration.
- High-level impact of shifting the layover from Lang Park to these locations.
- Potential next steps to enable the shift in layover.

Report structure

- Section 1.0 introduces this report, its context and purpose.
- Section 2.0 presents the service and operational requirements of Atchison Street Car Park.
- Section 3.0 presents the service and operational requirements of Wollongong Train Station Car Park.
- Section 4.0 presents the service and operational requirements of Oak Flats Train Station Car Park.

2.0

Atchison Street Car Park

2.1 Atchison Street Car Park overview

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Overview

The Atchison Street Car Park layover arrangement is envisaged to operate as two one-way through lanes accessed from Auburn Street and exiting onto Atchison Street. This enables 11 independently operating layover spaces and the inclusion of dedicated driver facilities.

The existing driveways on Auburn Street and Atchison Street will also need to be widened to accommodate the buses.

The proposed arrangement is likely to impact:

Mode						P
Impact	●	●				●

Walking and cycling

The site currently serves as an informal east-west active transport link between Auburn Street and Atchison Street, as pedestrians and cyclists can pass between the bollards. This connectivity will be lost in the future as the layover facility will be enclosed (with a fence and gates) to minimise the risk of collision (between a bus and member(s) of the public) and improve driver security.

To serve this desire line, a protected thoroughfare was investigated during the concept design however could not be accommodated due to the constrained width of the site and bus requirements.

Parking

All current parking spaces, including 84 paid (mix of pre-reserved and casual) standard spaces and two disabled parking spaces, will need to be removed. Two on-street parking spaces on Atchison Street will also need to be removed to widen the northern exit driveway and allow buses to safely turn left out of Atchison Street.

Figure 2-1 Atchison Street Car Park layover concept design

2.2 Path to Atchison Street Car Park

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Figure 2-2 illustrates the travel path from the existing route terminus at the WEC to the layover facility at Atchison Street Car Park. Buses will continue to U-turn at the Marine Drive / Crown Street roundabout before heading towards the relocated layover.

This path traverses through the following eight signalised intersections, most of which are located along Burelli Street:

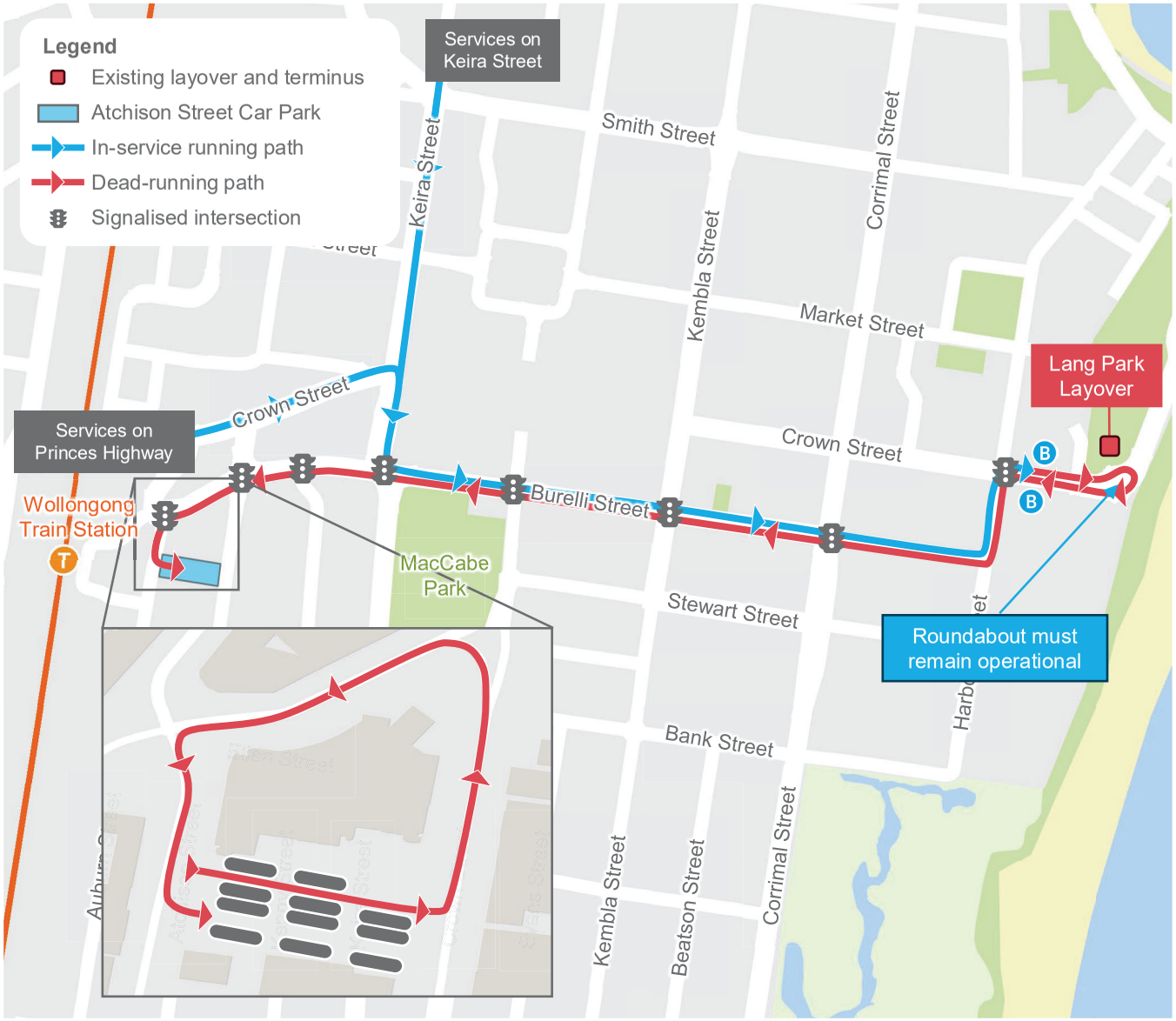
- Crown Street / Harbour Street
- Burelli Street / Corrimal Street
- Burelli Street / Kembla Street
- Burelli Street / Crown Street
- Burelli Street / Keira Street
- Burelli Street / Kenny Street / Findlay Place
- Burelli Street / Atchison Street
- Burelli Street / Auburn Street / Station Street.

Swept paths for this route are included in Appendix A.

A limitation of the arrangement is the lack of visibility of available spaces in each aisle upon approach. If buses enter a full aisle, they must loop around to access the adjacent aisle, as shown in the map inset. This may increase dead running time by up to three minutes (depending on traffic signals) and potentially consume some of the scheduled layover time.

As Atchison Street Car Park will be operating alongside the two other locations, layover demand at this location should only exceed five spaces (capacity of the northern aisle) twice per day based on the current layover schedule. Hence the likelihood of buses needing to loop back is minimal. To further reduce this limitation, mitigations such as available space indicators near the entry driveways can be investigated.

Figure 2-2 Bus path from the WEC to Atchison Street Car Park



2.2 Path to Atchison Street Car Park

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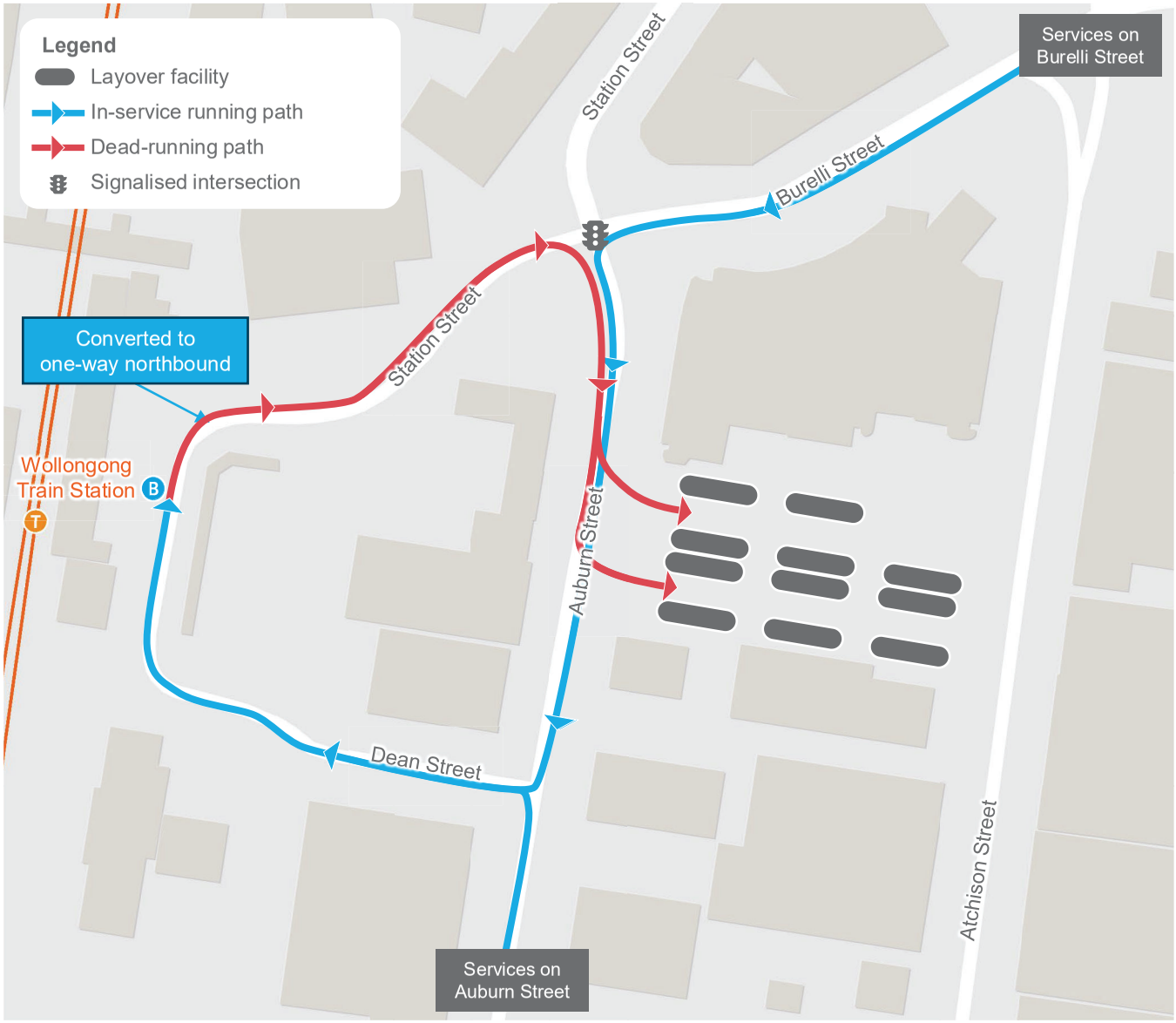
Due to the proximity of Atchison Street Car Park to Wollongong Train Station, services terminating at Wollongong Station may also use the layover facilities at Atchison Street Car Park.

Figure 2-3 illustrates the travel path from Wollongong Train Station to the layover facility. This path traverses through only one signalised intersection at Burelli Street / Auburn Street / Station Street.

Swept paths for key manoeuvres on this route are included in Appendix A.

Figure 2-3 Path from Wollongong Train Station to Atchison Street Car Park



2.3 Path from Atchison Street Car Park

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The travel path from Atchison Street Car Park to the WEC is illustrated in Figure 2-4. Swept paths for this route are included in Appendix A.

Currently, all traffic (including buses) can only turn left at the intersection of Atchison Street / Burelli Street. To potentially reduce dead-running time (and length), the provision of the right turn at this location was investigated during the concept design.

Due to the existing arrangement of the intersection, the resultant scheme to accommodate the right turn would require significant capital work and result in a potentially non-compliant solution (refer to Appendix B).

Therefore, this operational plan does not assume the inclusion of this right turn, and an alternative path was developed in conjunction with feedback from local bus operators.

The plan does not preclude the future implementation of this right turn, which would reduce the dead-running kilometres undertaken by buses, hence improving outcomes.

The egress path developed with bus operators instead travels south on Atchison Street to Ellen Street, before travelling north on Crown Street to rejoin Burelli Street. Buses are still required to perform a U-turn at the Marine Drive / Crown Street roundabout before commencing their routes outside the WEC.

This route passes through fewer signalised intersections, though requires a right turn movement at the intersection of Burelli Street / Crown Street which is more prone to delays and variability (compared to a through movement).

Figure 2-4 Bus path from Atchison Street Car Park to the WEC

2.3 Path from Atchison Street Car Park

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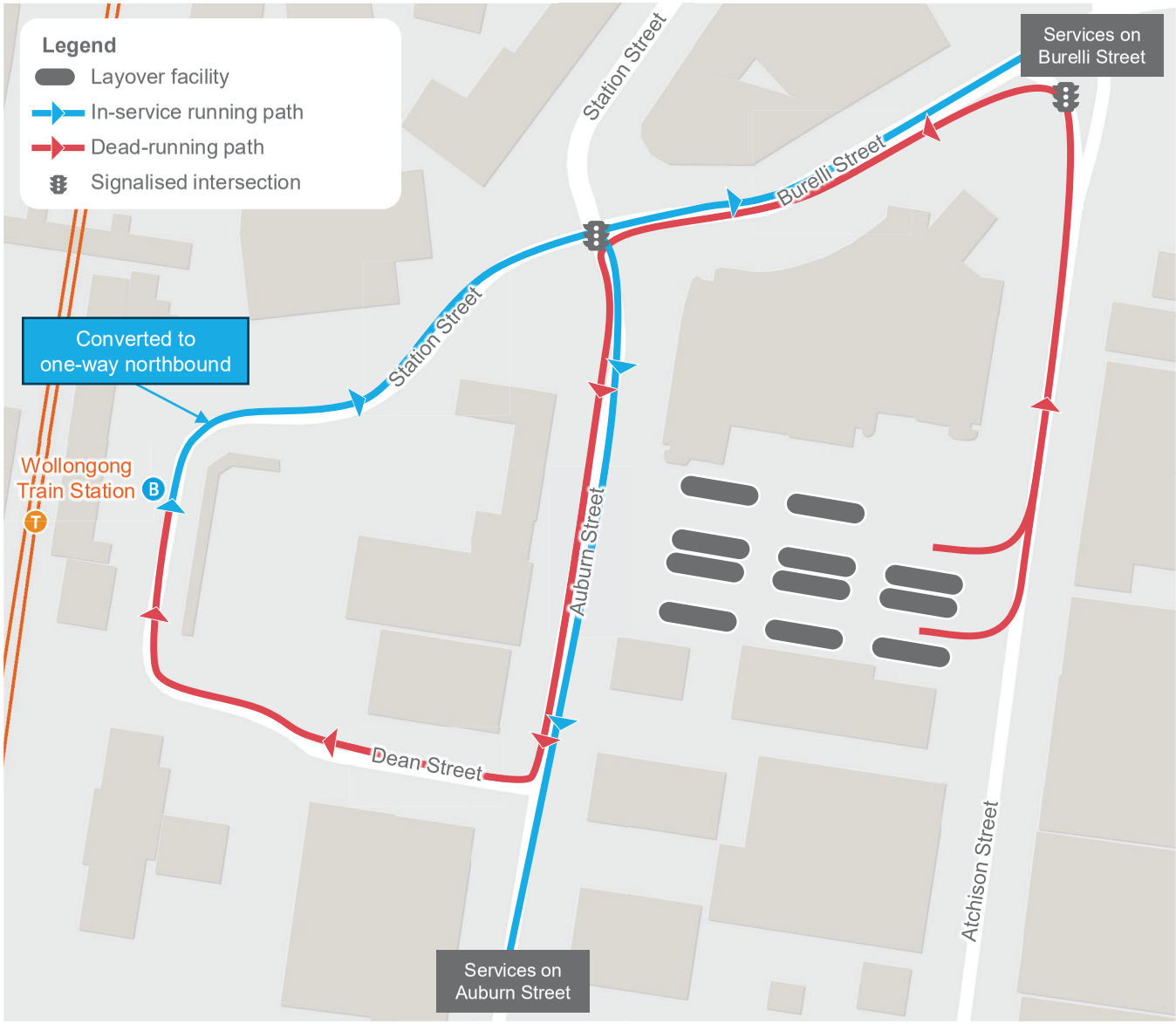
For bus services commencing at Wollongong Train Station, the path from Atchison Street Car Park is along Burelli Street and Auburn Street as shown in Figure 2-5. This path travels through the following signalised intersections:

- Burelli Street / Atchison Street
- Burelli Street / Auburn Street / Station Street.

Swept paths for key manoeuvres on this route are included in Appendix A.

Figure 2-5 Path from Atchison Street Car Park to Wollongong Train Station



3.0

Wollongong Train Station Car Park

3.1 Wollongong Train Station Car Park overview

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Overview

The Wollongong Train Station Car Park layover facility occupies over half of the existing car park and yields six layover spaces. The concept design shown in Figure 3-1 illustrates the extent of changes required to accommodate the layover.

The proposed arrangement is likely to impact:

Mode						
Impact	●	●	●		●	●

Walking and cycling

The existing car park is currently freely traversable by pedestrians travelling to and from Wollongong Train Station. In the future, the bus layover will be gated for pedestrian safety and therefore pedestrians will be forced to walk around the layover. New pedestrian crossings have been included to accommodate this.

The existing bicycle lockers will be relocated slightly to the east.

Buses

Station Street will be converted into a one-way northbound roadway. This will remove the bus stop on the eastern side of Station Street, next to the existing car park. Only Route 65 departs from this bus stop. This route can be accommodated on the western side of Station Street without major changes to the route.

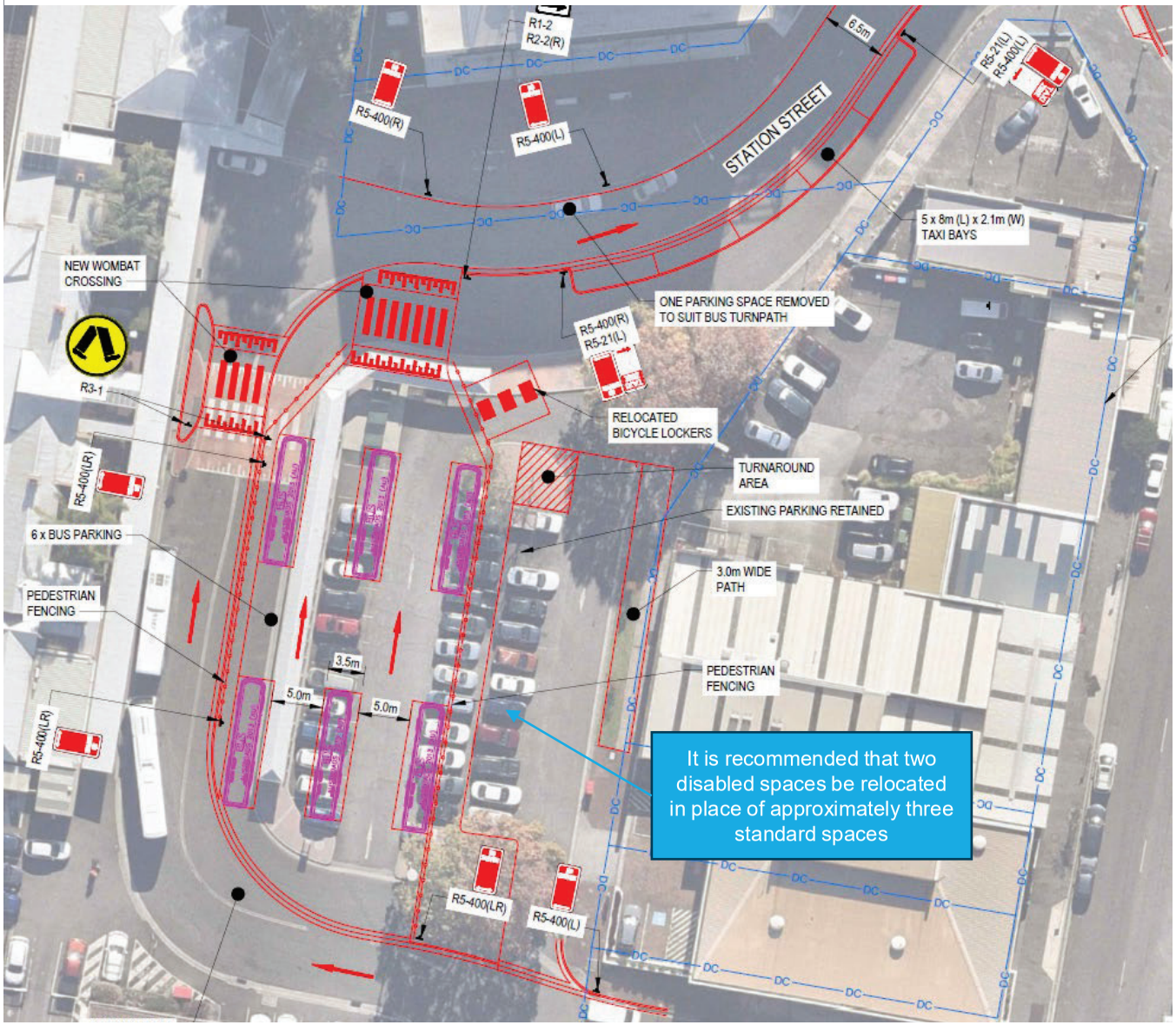
Taxi

The existing taxi rank will be relocated slightly to the east.

Parking

25 general parking spaces and two disabled spaces will be lost. It is recommended that the two disabled spaces be replaced, which will result in a loss of 27 general parking spaces.

Figure 3-1 Wollongong Train Station Car Park layover concept design



3.2 Path to Wollongong Train Station Car Park

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Figure 3-2 illustrates the travel path from the existing route terminus at the WEC to the layover facility at Wollongong Train Station. This path is similar to the path taken to Atchison Street Car Park, except buses will turn right into Dean Street from Auburn Street.

As with the path to Atchison Street Car Park, this path traverses through the following eight signalised intersections, most of which are located along Burelli Street:

- Crown Street / Harbour Street
- Burelli Street / Corrimal Street
- Burelli Street / Kembla Street
- Burelli Street / Crown Street
- Burelli Street / Keira Street
- Burelli Street / Kenny Street / Findlay Place
- Burelli Street / Atchison Street
- Burelli Street / Auburn Street / Station Street.

Swept paths for key manoeuvres on this route are included in Appendix A.

Figure 3-2 Bus path from the WEC to Wollongong Train Station Car Park

3.2 Path to Wollongong Train Station Car Park

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In the current bus schedule, Routes 37 and 57 are indicated to terminate and start from the WEC, and then pass through Wollongong Station as part of their loop service. Between scheduled services, Routes 37 and 57 currently layover at Lang Park. However, in future, these loop services could instead "terminate" and "commence" from Wollongong Station with minimal customer-facing changes. Hence, use the proposed Wollongong Station Car Park Layover.

Additionally, Route 51 terminates and commences at Wollongong Train Station, and may currently layover at either the designated on-street spaces near Wollongong Train Station or at the southern terminus (i.e. Oak Flats Station or Stockland Shellharbour).

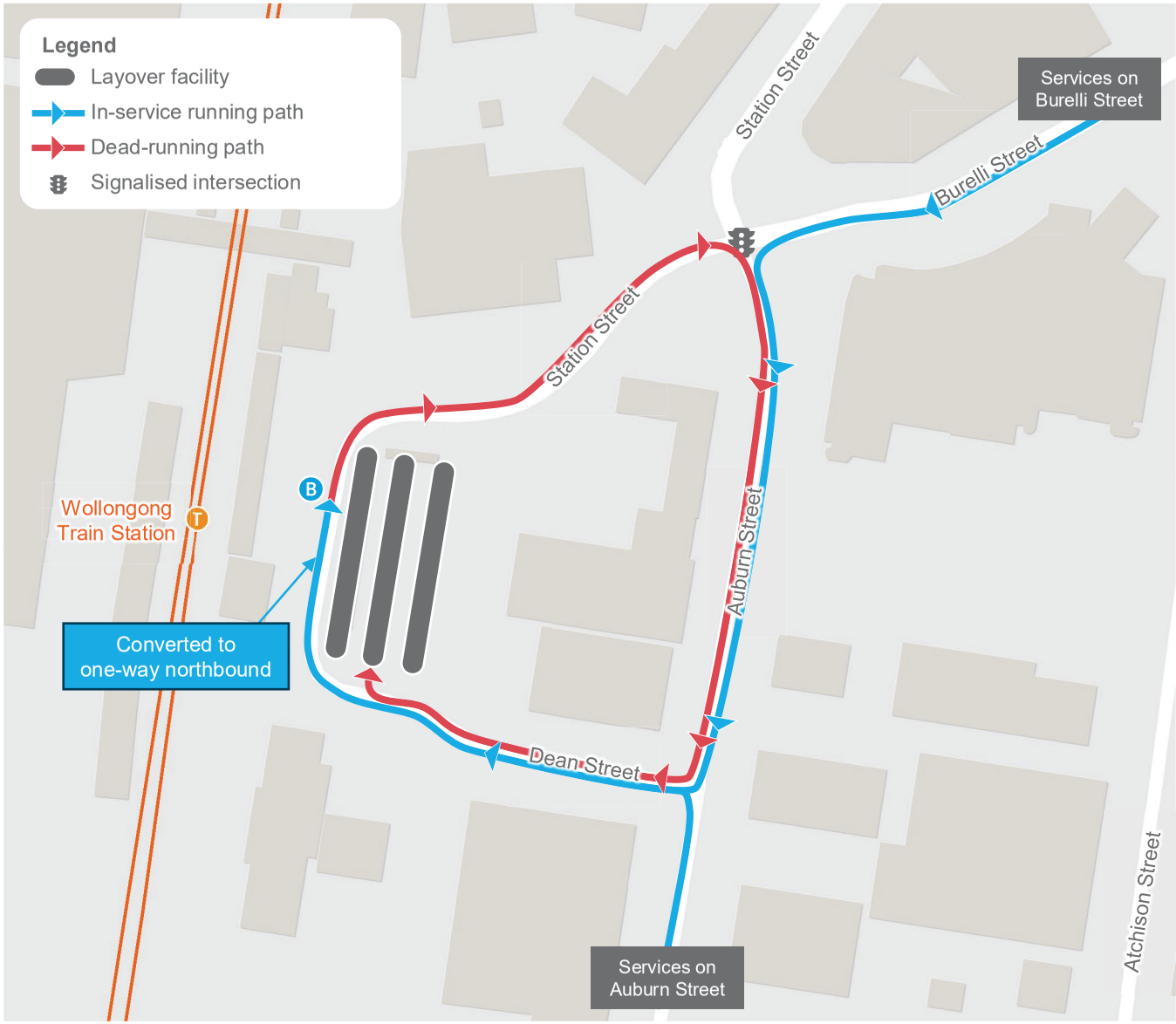
In future, these routes and any future growth services (that terminate or commence from the station) may opt to use the proposed Wollongong Train Station Car Park layover.

Figure 3-3 illustrates the path buses would take from Wollongong Train Station to the layover facility. They will need to drive around the block, making a right turn at the Burelli Street / Station Street / Auburn Street signalised intersection.

Route 51 does not currently use Lang Park for layover, hence it was not included in the calculation of the original layover requirements to inform the spatial provisions. However, with the increased layover provision across Atchison Street and Wollongong Train Station, this route (plus other future routes) could be accommodated if required.

Alternatively, these (and future routes) could also be accommodated at the proposed layover at Oak Flats Station if there is an operational benefit to commence and terminate the loop service at the southern extent of the route.

Figure 3-3 Path from Wollongong Train Station to Wollongong Train Station Car Park



3.3 Path from Wollongong Train Station Car Park

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To travel back to the WEC from Wollongong Train Station, as illustrated in Figure 3-4 buses will travel along Burelli Street until they reach Harbour Street before turning right onto Crown Street to U-turn at the Marine Drive / Crown Street roundabout.

This path will traverse through the same signalised intersections as the path to Wollongong Train Station Car Park:

- Crown Street / Harbour Street
- Burelli Street / Corrimal Street
- Burelli Street / Kembla Street
- Burelli Street / Crown Street
- Burelli Street / Keira Street
- Burelli Street / Kenny Street / Findlay Place
- Burelli Street / Atchison Street
- Burelli Street / Auburn Street / Station Street.

Swept paths for key manoeuvres on this route are included in Appendix A.

Figure 3-4 Bus path from Wollongong Train Station Car Park to the WEC

3.3 Path from Wollongong Train Station Car Park

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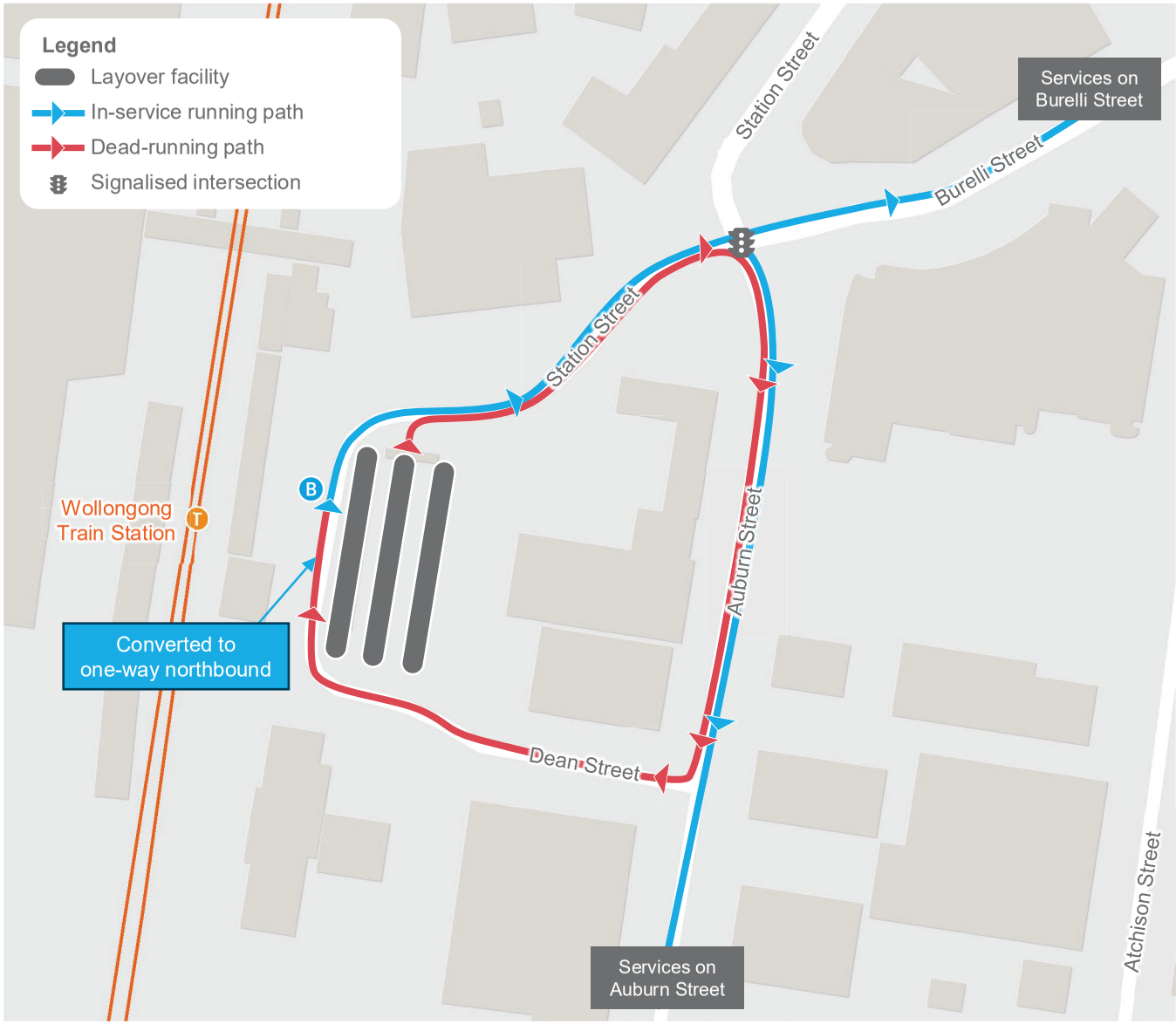
Due to proposed the one-way operation of the bus access through Wollongong Train Station, buses will follow the same path through the Burelli Street / Station Street / Auburn Street signalised intersection to re-enter the station precinct before commencing in-service running from the bus stop adjacent to the station (Figure 3-5).

Swept paths for key manoeuvres on this route are included in Appendix A.

Figure 3-5 Path from Wollongong Train Station to Wollongong Train Station Car Park



4.0

Oak Flats Train Station Car Park

4.1 Oak Flats Train Station Car Park overview

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Overview

The Oak Flats Train Station Car Park layover facility will be housed in a new verge on the southern edge of the commuter car park. The concept design shown in Figure 4-1 illustrates the car park layout changes required to accommodate these spaces. In particular, a bus lane will be added connecting the layover to the existing bus stop.

The proposed arrangement is likely to impact:

Mode						P
Impact	●					●

Walking

The bus layovers cannot be fenced off. To minimise interaction with pedestrians, a pedestrian crossing will be provided across the bus lane to encourage pedestrians to cross away from the parked buses.

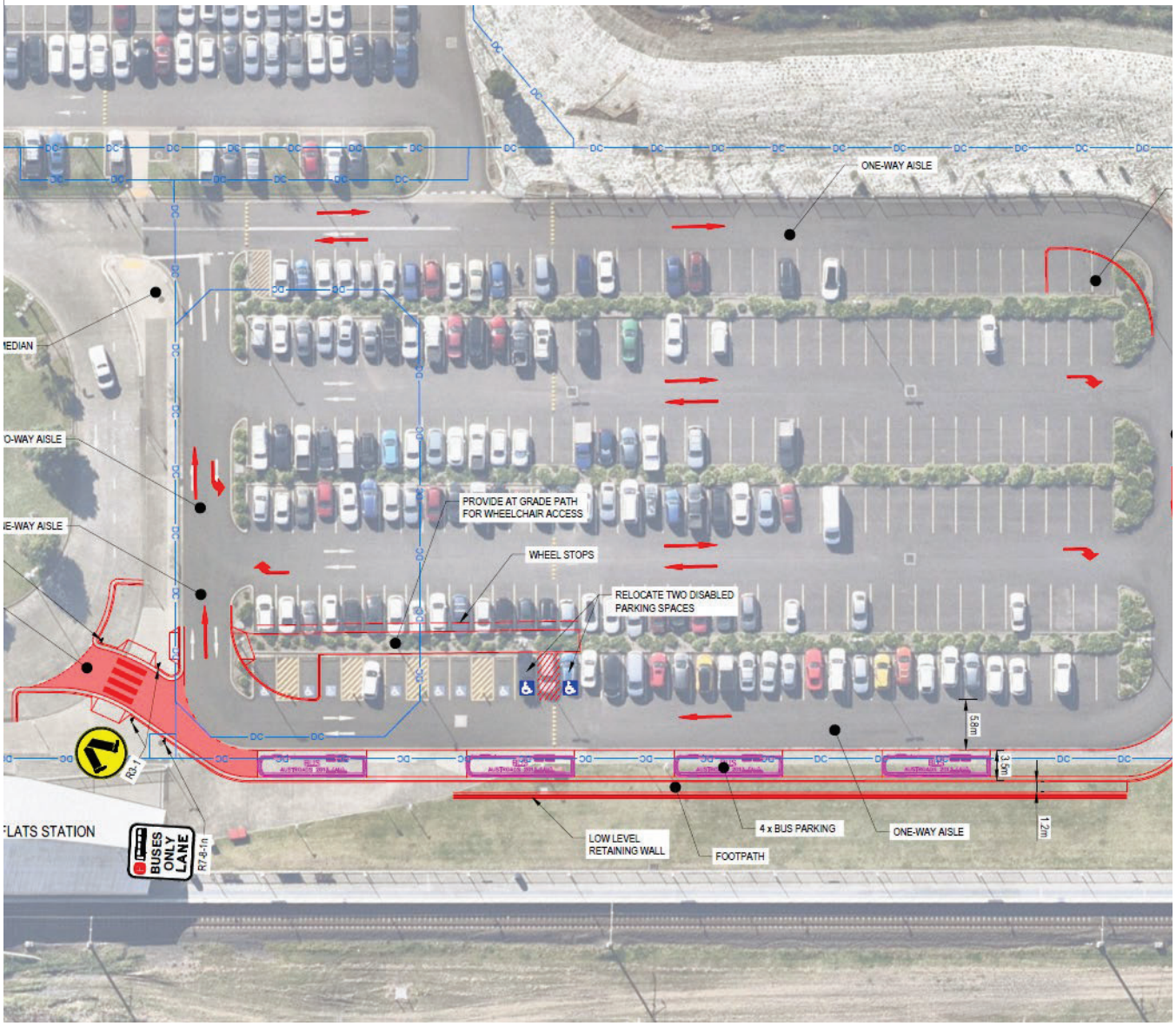
Parking

To accommodate the wider turning circle of buses, some medians will need to be realigned, namely in the north-east and south-west corners of the car park. Some car parking spaces will be lost as a result.

Geotechnical

There is an existing batter between the existing car park and the railway corridor. Since the bus layover encroaches into this batter, a retaining wall may be required. This is subject to further detailed investigation.

Figure 4-1 Oak Flats Train Station Car Park layover concept design



4.2 Path to Oak Flats Train Station Car Park

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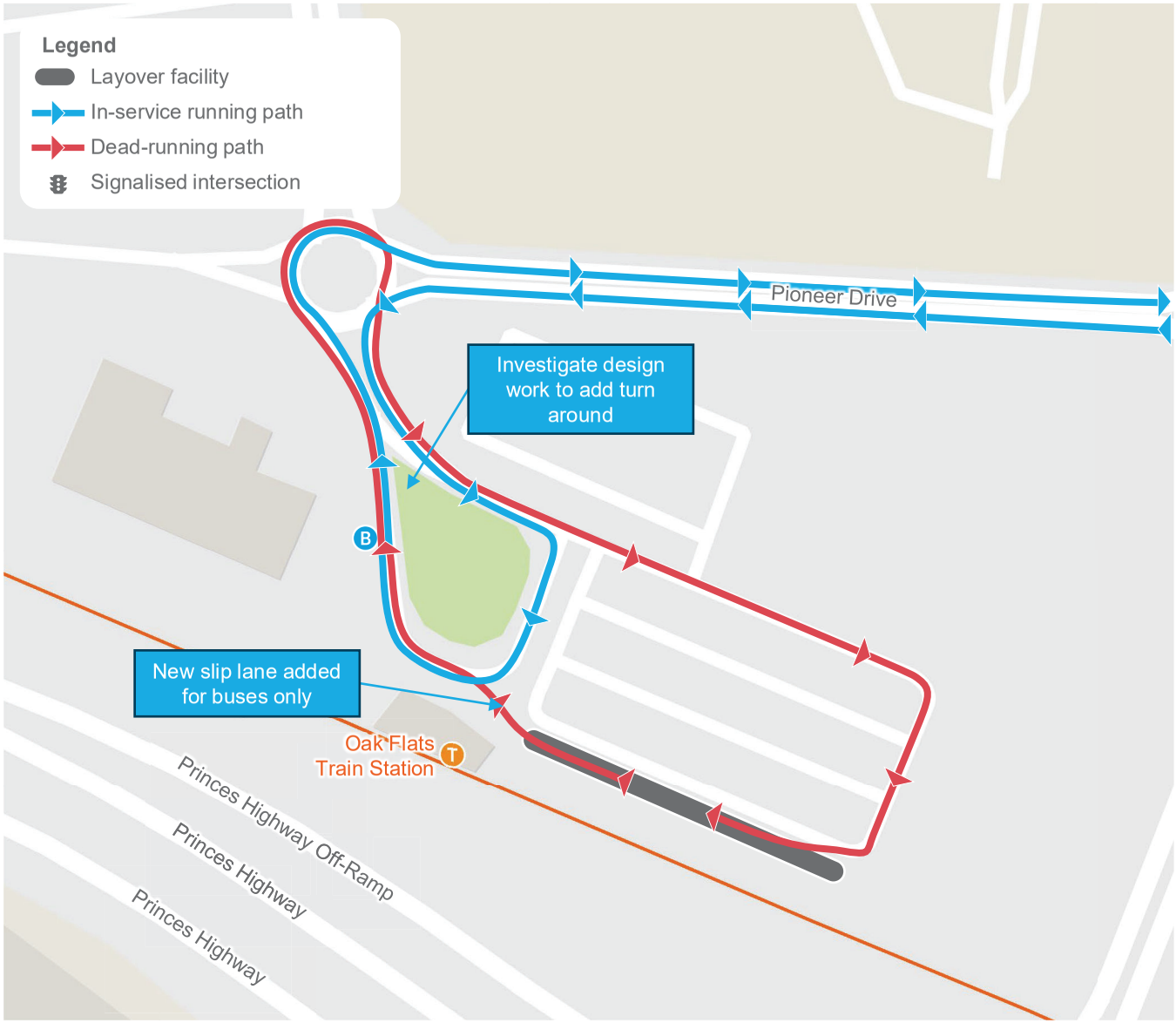
It is envisioned that the layover facility at Oak Flats Train Station could be used by existing routes, such as the 37,51, and 57, and other future routes connecting Wollongong and Shellharbour, to relieve layover requirements in Wollongong CBD. To achieve this outcome some alterations to existing services will be required.

As illustrated in Figure 4-2, buses terminating at Oak Flats Train Station will need to conduct a U-turn using the Pioneer Drive / Central Avenue / Stanford Drive roundabout before entering the car park.

In the future, investigations can be conducted to evaluate the feasibility and benefits of providing a turnaround facility within Stanford Drive. This would enable buses to enter the car park from the bus stop without the need to egress the interchange and U-turn at the roundabout.

Buses currently traverse this road corridor, and hence swept paths were not undertaken for the existing roads and roundabouts. For the layover itself and slip lane, the facilities are designed to accommodate buses. Refer to the preferred Layover Selection Report for the layover designs and swept paths internal to the layover.

Figure 4-2 Path to Oak Flats Train Station Car Park from existing bus stop



4.2 Path to Oak Flats Train Station Car Park

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Oak Flats Train Station Car Park can also serve as a supporting layover option by providing additional layover supply in the region.

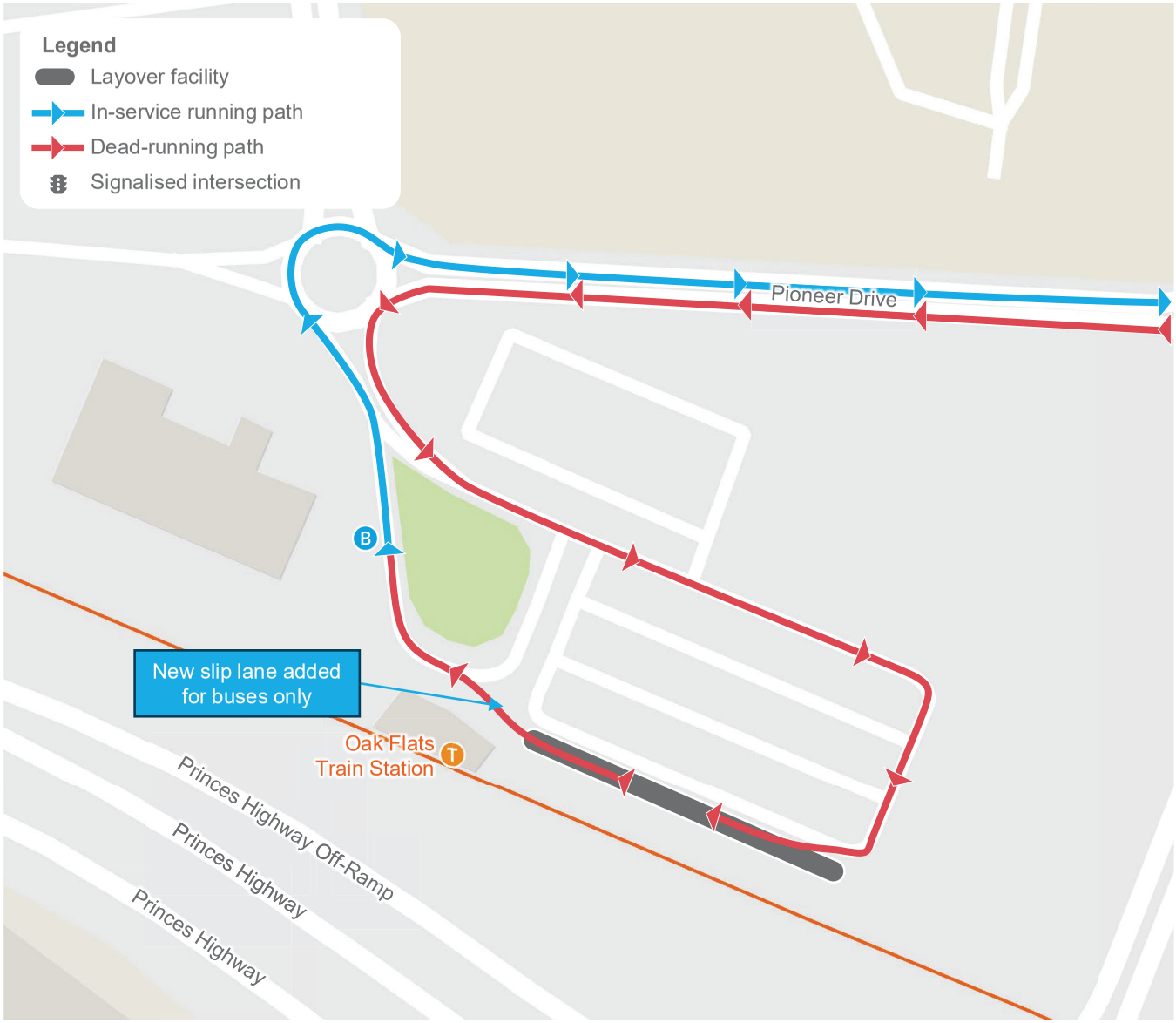
For services that currently layover at Stockland Shellharbour and commence or terminate their route nearer to Oak Flats Station (such as Route 51), it may be beneficial to shift shorter layovers to Oak Flats Train Station.

Operators may continue to schedule longer layovers (such as meal breaks) at Stockland Shellharbour to provide their drivers access to the nearby food and beverage facilities.

This may also free up space at Stockland Shellharbour for services commencing in and around that area. Hence a combination of both layovers should be adopted to balance operational benefits and driver convenience.

For these services, access to the facility would be from Pioneer Drive via the car park (as illustrated in Figure 4-3). The new bus lane allows buses to efficiently exit the layover and travel either to the existing bus stop at Oak Flats Train Station or back to Stockland Shellharbour.

Figure 4-3 Path to Oak Flats Train Station Car Park




SCT
Consulting

Appendix D: Pavement Design Report

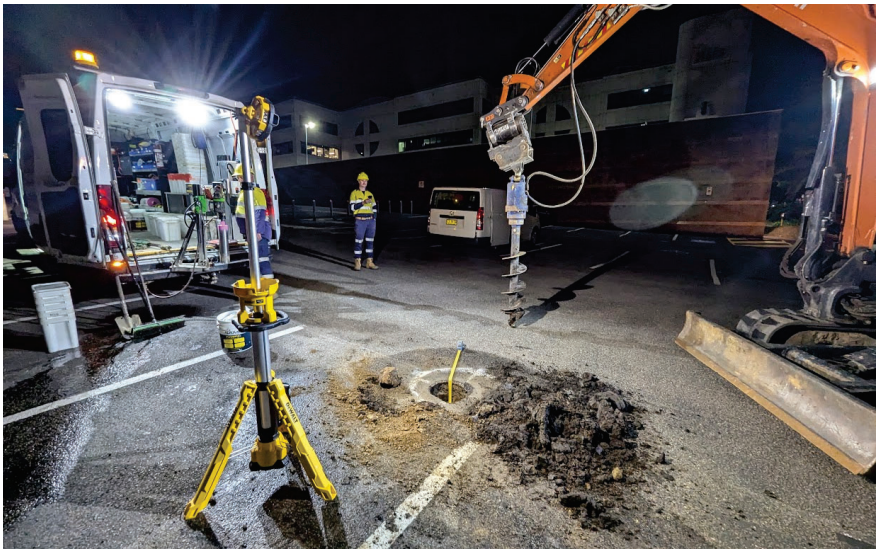
Wollongong Bus Layover Relocation Pavement Investigation

Lot 101 DP814507 Atchison Street Wollongong

Investigation, Interpretive and Design Report

Report No: SG0441
Report Issued Date: 6 February 2025
Prepared for: Lachlan Jones, Project Engineer, Road Maintenance and Resilience

Prepared by: Pavements and Geotechnical South – Wollongong



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Contents

Attachments

1. Introduction

This report presents the results of a pavement investigation undertaken by Pavements and Geotechnical South – Wollongong for the proposed pavement upgrade for the area proposed as the new Wollongong Bus Layover. The site is located between 10 and 24 Atchison Street, Wollongong and extends west to Auburn Street (the site). The site is located on Lot 101 DP814507. The extent of the project area is shown on Drawing A1 (refer to Appendix A).

The purpose of this report is to provide an overview of the existing pavement conditions and subsequently determine a suitable new pavement design to meet a 20-year design life for the proposed Bus Layover. The pavement investigation and design were undertaken at the request of Lachlan Jones, Project Engineer, Road Maintenance and Delivery. Discussions with the project manager and asset manager indicated that the preferred treatment for the site is asphalt over plant mixed cemented basecourse.

2. Background

The landowner of the current location of the Wollongong bus layover on Marine Drive has requested the layover be relocated by June 2025. An options assessment was undertaken and the existing parking area between Auburn and Atchison Streets (owned by Wollongong City Council) was determined as the best location for the relocated bus layover.

Historical aerial imagery indicate that at least part of the site has been used as a carpark since the mid 1970's, and prior to this the primary use appears to be low density residential dwellings. The current arrangement of the site was built in the late 1990's or early 2000's.

Wollongong City Council were contacted for any records of pavement construction or maintenance, but only limited records were found for the carpark. These are included in Appendix E.

3. Site Description and Regional Geology

The site comprises a carpark with bituminous surface and contains roughly 90 car parking spaces which divided into two parking areas with steel bollards. The site has an approximately 5% slope downhill from Auburn Street to Atchison Street with both streets running parallel in North to South at either side of the site. The northern boundary of the site comprised the approximately six-metre-tall masonry wall of the multi-storey SES building. The southern boundary comprises smaller one to two-metre-tall brick retaining walls and brick garage walls of the two adjoining properties.

The NSW Seamless Geology map indicates that the site is underlain by Permian aged sedimentary bedrock, primarily the Broughton Formation. The Broughton formation is characterised as volcaniclastic lithic to feldspathic sandstone, with some interbedded siltstone and pebble conglomerate, some shelly fossils and bioturbation. This unit was formerly named the Budgong sandstone which is still sometimes used in the Wollongong region.

Some residual deposits should also be expected and are developed in-situ as a result of weathering of the underlying bedrock. Alluvial (creek deposits) soils should also be expected due to the site's proximity to the mapped Alluvial Fan deposits which are associated with drainage paths from the nearby hillsides and foothills of the escarpment. Additionally, Fill of variable thickness and quality should be expected in this area due to the known past uses of the site. A geological map is presented in Drawing A1 (refer Appendix A).

4. Fieldwork Methodology

To investigate the existing pavement, four augered test pits and three Dynamic cone penetrometer (DCP) tests carried out at the site on 30th September 2024. A Scientific Officer from TfNSW Pavements & Geotechnical – South (Wollongong) supervised the works and logged the test pits. The test pits were excavated to characterise subsurface conditions, including soil consistency, subgrade support conditions and groundwater.

The test pit logs and DCP plots are attached in Appendix B and the locations of the test pits are shown on Drawing A1 (Appendix A).

Investigation locations are summarised in Table 1.

Table 1 – Summary of Test Pit locations

Test ID	Test Type	Location	Zone: MGA 56 H		RL (m AHD)
			Easting	Northing	
WB01	Auger/DCP	North-west corner	306084.766	6188466.139	16.473
WB02	Auger/DCP	North-east corner	306150.102	6188454.918	13.342
WB03	Auger/DCP	South-east corner	306146.919	6188440.995	13.324
WB04	Auger	20m east of the South-west	306095.762	6188449.081	15.755

Notes:

- All locations were recorded with a differential GPS +/- 50mm accuracy.
- DCP = Dynamic cone penetrometer

4.1 Laboratory Testing

Laboratory testing was undertaken at the TfNSW Laboratory in Russell Vale on seven samples collected from the pavement investigation.

All testing was undertaken using appropriate Australian Standards and TfNSW test methods. Table 2 provides a summary of the testing quantities undertaken with the test results summarised in Table 3 and 4.

All laboratory test results are presented in Appendix B.

Table 2 – Summary of Laboratory Testing Quantities

Test Type	Test Method	Number of Tests
Moisture Content	TS 02795.14[1]	7
Atterberg Limits	AS1289.3.1.2, AS 1289.3.2.1 and AS1289.3.3.1	7
Particle Size Distribution	TS 02795.02 & TS 02795.0[2]	7
California Bearing Ratio	TS 02795.22 [3]	5

1. RMS T120 2.RMS T106 & T107 3. RMS T117

Table 3 - Summary of Soil Laboratory Testing Results (Atterberg and CBR)

Sample Number	Depth below ground level (m)	Layer Type	FMC (%)	OMC (%)	LL (%)	PL (%)	PI (%)	MDD (t/m^3)	CBR Soak (days)	CBR Swell (%)	CBR (%)
WB01A	0.04 to 0.30	Base	7.0	10.4	23	17	6	2.066	4	-0.1	100
WB01B	0.30 to 0.65	Subgrade	27.3	19.6	54	18	36	1.682	10	0.1	1.0
WB02A	0.03 to 0.28	Base	6.9	-	23	21	2	-	-	-	-
WB03B	0.20 to 0.40	Sub-base	9.5	12.8	28	18	10	1.995	4	0.1	40
WB03C	0.40 to 0.70	Subgrade	21.2	14.4	24	19	5	1.782	10	0.2	10
WB04A	0.10 to 0.22	Sub-base	8.4	-	26	24	2	-	-	-	-
WB04C	0.90 to 1.00	Subgrade	28.4	20.4	48	18	30	1.645	10	0.2	2.0

LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index FMC =Field Moisture Content OMC = Optimum Moisture Content

Table 4 - Summary of Soil Laboratory Testing Results (Grading)

Sample Number	Depth below ground level (m)	Layer Type	% Passing 19mm	% Passing 2.36mm	% Passing 0.425mm	% Passing 75 µm
WB01A	0.04 to 0.30	Base	97	56	29	11
WB01B	0.30 to 0.65	Subgrade	100	98	97	66
WB02A	0.03 to 0.28	Base	97	47	22	9
WB03B	0.20 to 0.40	Sub-base	96	65	35	20
WB03C	0.40 to 0.70	Subgrade	100	91	84	47
WB04B	0.10 to 0.22	Sub-base	94	50	24	12
WB04C	0.90 to 1.00	Subgrade	100	96	93	61

5. Investigation Results

5.1 Existing Pavement Surface Condition

The pavement surface was generally in moderate to poor condition, with observable surface deterioration comprising localised ravelling, general oxidation and aging of the seal. Some cracking and deformation were also observed along the most trafficked areas between the carparks.

5.2 Existing Pavement Structure

The existing pavement structure below and in Figure 1.

- Spray seal: 30 to 40mm of spray seal of made up of several layers, and with a bituminous slurry seal applied in 2014 (as per Council records – see Appendix E)
- Basecourse: 70mm to 260mm unbound granular material consisting of Sandy Gravel
- Sub-basecourse: 120mm to 200mm of unbound granular material consisting of Gravelly Sand and only found in the southern half of the carpark in pits WB03 and WB04 where the basecourse was thinner than 160mm.
- Fill: Varying quality fill between 270mm to 610mm in thickness and only found in WB02 and WB04. Fill comprises various materials with slag, brick, asphalt fragments, basalt cobbles up to 100mm.
- Subgrade: Silt overlaying Sandy Clay was observed in all pits with the silt varying between 100-200mm in thickness. The base of the sandy clay was not encountered in any pits. A 100 to 150mm thick layer of silty sand was also encountered in 2 pits (WB01 and WB03).

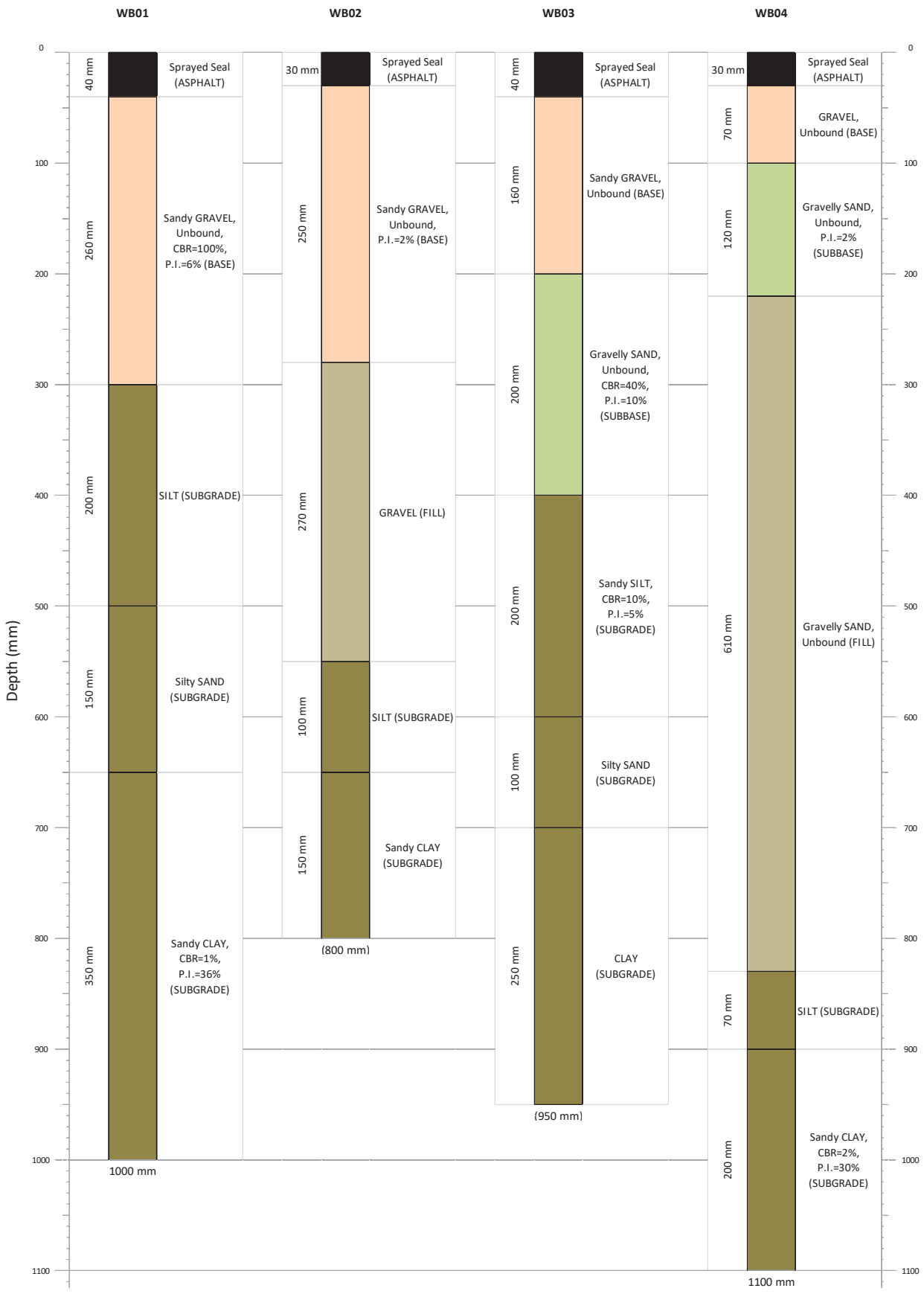


Figure 1 - Pavement Structure Summary

5.3 Groundwater

Groundwater inflows were encountered in all pits between 0.20m and 0.83m below surface level. In three of the pits (WB01, WB02 and WB03) groundwater inflows occurred between 0.20m and 0.30m. The pits were immediately backfilled after sampling and logging which precluded the ability to monitor longer-term groundwater levels.

It must be noted that groundwater levels are transient and would be expected to fluctuate over time with preceding climatic conditions and soil permeability.

The shallow depth of groundwater is expected to create some difficulty in construction is discussed further in Section 7.2 below.

6. Pavement Design and Discussions

6.1 Design Traffic

The traffic projection was made using the count data in the SCT Consulting Wollongong Bus Layover Relocation Assessment undertaken in 2022. From this report the total number of bus movements per day through the bus layover was estimated at an upper limit of 200.

An adjusted Traffic Load Distribution (TLD) was created to simulate the low variability in vehicle type using the bus layover (double and single axles groups only). A 20-year design traffic loading of 6.95 x 10^6 DESA (Design Equivalent Standard Axles) has been calculated based on an annual growth rate of 1.00% and a heavy vehicle percentage of 100.00%. The pavement traffic loading calculations are included in Appendix C.

6.2 Existing Pavement Design Parameters

The existing unbound pavement was modelled as unbound basecourse quality with a design vertical modulus of 250MPa.

The subgrade variably comprised of alluvium or residual soil. Based on the SG0441 investigations, laboratory testing, past-experience, and engineering judgement a design subgrade of 2% (equivalent design modulus of 20MPa) is considered appropriate for design purposes.

Table 5: Existing Pavement Design Parameters

Layer Description	Layer Thickness (mm)	Design Modulus (MPa)
Spray Seal	40	-
Existing Unbound Basecourse Quality Material	250	250
Existing Subgrade	N/A	20

6.3 Pavement Design

It is understood that the proposed pavement is to be designed to achieve a 20-year design life, and that the client's preferred option is asphalt and plant mixed cemented basecourse.

Two options are provided below in Tables 6 and 7.

The asphalt layers (intermediate and wearing course) require a polymer modified binder due to the low-speed movements and heavy wheel loads of the buses. The binder is A35P and is commercially available and commonly used for these types of applications. The Pavement and Geotechnical team should be contacted for advice on alternate binders if there is difficulty sourcing the A35P binder. One alternate binder is the SAMIfalt I-Brid, a proprietary product offered by SAMI (part of Colas Group).

Table 6: Option 1. - Asphalt and Cemented Working Platform - Pavement Design Parameters

Layer Description	Specification	Design Modulus (MPa)	Layer thickness (mm)
DGA AC14 (A35P) – Wearing Course	TS 03283.2(2)	2200	60
DGA AC20 (A35P) – Intermediate layer	TS 03283.2(2)	2400	90
Cemented Working Platform (Sand/Cement)	-	500 (post cracked)	**250**[1]
Existing Subgrade	N/A	20	N/A

* Notes: 1. Inclusive of 10mm construction tolerance 2. Formerly R116 3. Formerly R73 DGA = Dense Graded Asphalt

Note: The Working Platform may be constructed with either sand/cement or HBB. Sand/ Cement shall be a 5:2:1 mix of sand: aggregate: cement. Sand shall be a 50:50 blend of coarse and fine. Aggregate shall be 10mm. Approx moisture content of 7.5% and adjusted to suit site requirements. HBB is to conform to Specification TS03315.1 and TS03267.1

Table 7: Option2: - Asphalt and Lean Mix Concrete - Pavement Design Parameters

Layer Description	Specification	Design Modulus (MPa)	Layer thickness (mm)
DGA AC14 (A35P) – Wearing Course	TS 03283.2(2)	2200	60
DGA AC20 (A35P) – Intermediate layer	TS 03283.2(2)	2400	90
Lean Mix Concrete	TS03270.1(3)	10,000	**230**[1]
Existing Subgrade	N/A	20	N/A

* Notes: 1. Inclusive of 10mm construction tolerance 2. Formerly R116 3. Formerly R82 DGA = Dense Graded Asphalt

7. Construction Considerations

7.1 Foundation Preparation and Unsuitable Material

The pavement should be boxed into the existing formation to the required depth (varies depends on segment and patching) (including 10 mm construction tolerance). Although not expected an allowance for remove and replacement, as per TfNSW TS 02158.1, should be made in the event that unsuitable material is encountered.

A proof roll should be carried out by experienced personnel on the prepared and compacted foundation to ensure there are no areas of perceptible deflection. Pavements and Geotechnical South – Wollongong should be contacted for further advice if there are any concerns over the foundation condition. Where unsuitable material is encountered or the proof roll fails, remove, and replace with Upper Zone (UZF) quality material as per TS 02158.1.

7.2 Drainage

Installation of pavement drainage is recommended due to the presence of shallow groundwater encountered in the pavement investigation. It is highly likely that perched water inflows will occur into any pavement box out excavations through the existing unbound pavement gravels. Therefore, subsoil drains are recommended along both the western and northern boundaries of the site at least 2 weeks prior to any pavement excavations. This will both assist with dewatering any future box out excavations, and in the longer term to intercept groundwater before it reaches the pavement. Care should be taken at the northern boundary, particularly when in close proximity to the masonry wall of the SES building.

Subsoil pavement drains should be built to TfNSW specification T03260.1 (formerly R33). The drain should extend 300 mm below the base of the pavement box out level, or shallower if required in order to ensure sufficient grade is achieved to outlet the drain into the adjacent stormwater systems (kerb and gutters or drainage pits).

Improved drainage would likely improve the long-term condition of the pavement and reduce its susceptibility to damage following prolonged rainfall in the future.

7.3 Material Reuse

Existing base, quality materials from the pavement may be separated and reused as Selected Material (SMZ) or Upper Zone (UZF) (if required) as described in TfNSW TS 02158.1. This may be useful in areas where subgrade/foundation materials are deemed unsuitable and require removal and replacement.

7.4 Pavement Construction Joints

Transverse joints should be formed at right angles to the travel direction of the buses within the layover. Longitudinal joints should not be located under wheel paths of the primary bus movement areas (outside the dedicated bus parking bays).

8. References

Colquhoun G.P., Hughes K.S., Deyssing L., Ballard J.C., Folkes C.B, Phillips G., Troedson A.L. & Fitzherbert J.A. 2021. New South Wales Seamless Geology dataset, version 2.1

[Digital Dataset]. Geological Survey of New South Wales, Department of Regional NSW, Maitland.

Appendix A

Drawing A1 – Test Location Plan and Geological Map

Legend

- SG0441 - Test Pit Locations
- Wollongong-CONT-AHD_56_2m

SURFACE GEOLOGY

Rock Units - colours

- Pshr - Broughton Formation
- Q_avf - Alluvial Fan Deposits

Geological boundaries & misc. boundaries

- Geological boundary, position accurate

20 0 20 40 m

Drawn By: L. Doepel
Reviewed By: D.Horan
Project No.: P.0091926
Date: 30/09/2024

Test Location Plan and Geological Map
Wollongong Bus Bay - Auburn and Atchison Street
Pavement Investigation

Drawing No.: A1
Revision: 1
Client: L.Jones

NSW GOVERNMENT
Transport for NSW

Appendix B

SG0441 – Test Pit Logs and DCP Results Sheets

EXCAVATION - GEOLOGICAL LOG

PIT NO : WB01
FILE / JOB NO : SG0441
SHEET : 1 OF 1

PROJECT : Wollongong Bus Layover Relocation
LOCATION : Atchison and Auburn Street Wollongong

POSITION : E: 306084.766, N: 6188466.139 (56 MGA2020) | SURFACE ELEVATION : RL 16.473
EQUIPMENT TYPE : 5t Excavator - rubber tracked | METHOD : 300mm toothed Auger
DATE EXCAVATED : 30/9/24 | LOGGED BY : LD | CHECKED BY : IA
EXCAVATION DIMENSIONS : 0.30 m LONG 0.30 m WIDE

DRILLING | MATERIAL

DEPTH (m)	PENETRATION (VE E F H)	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION (Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components)	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	HAND PENETROMETER kPa (100 200 300 400)	DCP TEST (AS 1289.6.3.2-1997) Blows/100 mm (5 10 15 20 25)	STRUCTURE & Other Observations
0.0		Nil					0.04m FILL: AC / SPRAYED SEAL	D				ROAD SURFACE
				WB01A		GP	FILL: SANDY GRAVEL: grey, dark grey, fine to coarse basalt gravel, fine to coarse grained sand, low plasticity fines	D	D			BASECOURSE
				0.30m			0.30m					
			water inflow at 0.3m			ML	SILT: dark grey, low plasticity, trace fine grained sand, trace roots	w ~ PL	St		3	OLD TOPSOIL
				0.50m			0.50m				5	
0.5				WB01B		SM	SILTY SAND: grey, fine grained sand, low plasticity silt	W	L		1	ALLUVIUM
							0.65m					
				0.80m		CH	CLAY: grey, yellow grey, high plasticity, trace fine grained sand	w ~ PL	F		2	ALLUVIUM / RESIDUAL SOIL
											3	
									VSt		6	
1.0							1.00m				6	
							EXCAVATION WB01 TERMINATED AT 1.00 m Target depth				5	
1.5											7	
2.0												

PHOTOGRAPHS NOTES ☒ YES ☐ NO

METHOD
N Natural Exposure
E Existing Excavation
BH Backhoe Bucket
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U50 - Undisturbed Sample 50 mm diameter
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense

See Explanatory Notes for details of abbreviations & basis of descriptions.

TRANSPORT FOR NSW

NSW GOVERNMENT Transport for NSW

File: SG0441 WB01 1 OF 1

WB01 Depth Range: 0.00 - 1.00 m

Transport for NSW	TITLE: Transport for NSW Atchison and Auburn Street Wollongong Wollongong Bus Layover Relocation Photo - WB01	DRAWN: RH	DATE: 24/10/2024
		CHECKED:	DATE: 24/10/2024
		SCALE: Not To Scale	A4
		PROJECT No: SG0441	FIGURE No: 1/1

EXCAVATION - GEOLOGICAL LOG

PI RKESu I V YiiY: nY: n Bvk LadYp/ r I / iYbatNY:
LRSOuORH I OtbWNY: a: , Ovwvr: Atr/ / t V YiiY: nY: n

PIT NO I WB02
FOLE cKRB HR I AG0TT~
A- EEu I ~ RF ~

PRAOLORH I EI 401~50.102hHI 1~55T64.918 261 MGO3030;	AUI FOSE ELEoOuORH I RL 13.342
E9 UOPMEHu us PE I 6t E7bapatYr ervww/ r trabX/ ,	MEu- RD I 400mm tYYtW , Ovn/ r
DOuE ExSOoOuED I 40cJc3T	LRGGED Bs I LD — S- ES8ED Bs I IA
ExSOoOuORH DOMEHAORHA I 0.40 m LRHG 0.40 m V ODE	

DI OLLOHG | MOuEI OL

DEPu- 2m;	SLOAAFOSOuORH AsMBRL	MOuEI OL DEASI OPuORH	MROAuUI E SRHDOORH	SRHAOAuEHSs I ELOuOE DEHAOs	DSP uEAu 2DA ~35J.1.4.3e~JJ); BiYg kc~00 mm	AuI USuUI E QRtW r Rwk/ rpatNY: k
0.0–0.04m		OS cAPI OsED AEOLI fN/ tY bYark/ kvwea: nviar tY a: nviar nrap/ ihfN/ tY bYark/ nraN/ , ka: , hwrNi/	D	D		I ROD AUI FOSE BOAESRUI AE
0.04–0.35m	GP	FOLLI AOHDs GI OoELI nr/ dh, arX nr/ dhfN/ tY bYark/ h kvwea: nviar tY a: nviar N: / Yvk nrap/ ihfN/ tY bYark/ nraN/ , ka: , hiYg yiaktNNd fN/ k	D	oD		
0.35–0.66m	GP	FOLLI GI OoELI nr/ dhyai/ nr/ dhfN/ tY bYark/ h kvwerYv: , / , tY a: nviar kian nrap/ ihg NWfN/ tY bYark/ kvwerYv: , / , tY a: nviar kian bYwwi/ kh tY ~00mm	V	oD		FOL — 0.T0I V at/ r NfiYg frYm 0.Tm erayNid rNNn tY 0.35m
0.66–0.16m	ML	AOLuI , arX nr/ dhiYg yiaktNNd htrab/ fN/ nraN/ , ka: ,	g z PL	A tY F		OLLUoOUM
0.16–0.50m	SC	AOHDs SLOs I nr/ dh, arX nr/ dhm/ , Nm yiaktNNd hfN/ tY m/ , Nm nraN/ , ka: , htrab/ fN/ nrap/ i	g z PL	At tY oAt	~	OLLUoOUM Yr I EAODUOL AROL
0.50m		ExSOoOuORH V B03 uEI MOHOuED Ou 0.50 m uarn/ t , / ytW			3, 4, 4, 6	

MEu-RD: HN (to 0.50 m); AUPPRI u; GI RUHD V OuEI LEoELA: gat/ r NfiYg at 0.35m; AOMPLEA Q FOELD uEAuA: V B03O, 0.35m

Depth scale: 0.0, 0.6, ~.0, ~.6, 3.0

P- RuRGI OP- A HRuEA: sEA / HR

METHOD
H Hatvrai E7yYkvr/
E E7NtNn E7bapatNY:
B- BabXWY/ BvbX/ t
B Bvii, Y(/ r Bia, /
I I Njy/ r

SUPPORT
u uNhw/ rNn

PENETRATION
HYI / kNta: b/

WATER
~0 Rbt.h) 4 V at/ r L/ p/ i Y: Dat/ kWYg:
gat/ r NfiYg
gat/ r YvtfiYg

SAMPLES & FIELD TESTS
U60 e U: , Ntvrw , Aamyi/ 60 mm , Nm/ t/ r
D e DNtvrw , Aamyi/
B e BviXDNtvrw , Aamyi/
MS e MYNtvr/ SY: t/ : t
- P e - a: , P/ : / trYm/ t/ r 2USA XPa;
oA e oa: / AW ar&PeP/ aXh I el / mYv, / , 2v: bYrr/ bt/ , XPa;
PBu e Piat/ B/ arNn u/ kt

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Bak/ , Y: U: NN, SiakkNNatNY: Adkt/ m

MOISTURE
D e Drd
M e MYNt
V e V / t

CONSISTENCY/ RELATIVE DENSITY
oA eo/ rd AYft
A eAYft
F eFNm
At eAtNf
oAt eo/ rd AtNf
- e- ar,
oL eo/ rd LYYk/
L eLYYk/
MD eM/ , Nm D/ : k/
D eD/ : k/
oD eo/ rd D/ : k/

A/ / E7yia: atYrd HYt/ k fYr , / taNk Yf awwr/ pNatNY: k Q waklN Yf , / kbrNjtNY: k.

uI OHAPRI u FRI HAV

Transport for NSW

uFHAV T3.~ LOGLB LYnI uOExSOoOuORH AG0TT~ eV RLLRHGRHG BUA LOsRoEI I ELRSOuORH GPK<<Drag NnFN >> 3T6Rbt6303T ~Tl31 ~0.04.00.0J Datn/ i uYYik

WB02 Depth Range: 0.00 - 0.80 m

Transport for NSW	TITLE: Transport for NSW Atchison and Auburn Street Wollongong Wollongong Bus Layover Relocation Photo - WB02	DRAWN: RH	DATE: 24/10/2024
		CHECKED:	DATE: 24/10/2024
		SCALE: Not To Scale	A4
		PROJECT No: SG0441	FIGURE No: 1/1

EXCAVATION - GEOLOGICAL LOG

MOAJBSY y 7 : RRo, : o, Tbs Hak: wdr OdR:catl: o
HASUY/Ai y Utczls: o aop Ubvbro Ltrddt 7 : RRo, : o,

PIT NO y WB03
E/HB gJAT i A y LP044;
LNBBY y ; AE ;

MAL/Y/Ai y By(05; 46.919ni y5; 88440.995 ~G5 CPU3030x	LFOEUSB BHBVUY/Ai yRL 13.324
B9 F/MCBi Y YeMB y G BWcawat: r I rbvvdr tracudp	CBYNAD y (00mm t: : tzdp Ub, dr
DUYB B- SUVUYBD y (0g1g34	HAPPBD Te y HD ; SNBSKBD Te yIA
B- SUVUY/Ai D/CBi L/Ai L y 0.(0 m HAi P 0.(0 m 7 /DB	

DO/HH/i P — CUYBO/UH

Depth (m)	Sample	Graphic	Symbol	CUYBO/UHDBLSO/MY/Ai L: IRYkXdnS: RbrnMRastlcltk : r Martlc R Szaractdrlstlc Ldc: opark aop Clo: r S: mX: odots	CA/LYFOB SAi D/Y/Ai	SAi L/LYBi Se OBHUY/VB DBi L/Ye	DSMYBLY	LYOFSYFOB QAtzdr Avsdrwatl: os
0.0 – 0.04m				ULMNUHY gLMOUeBD LBUH	D			OAUD LFOEUSB
0.04 – 0.30m	7 T0(U 0.30m		PM	E/HHyLUi De POUVBHy, rdknflod t: c: arsd sbvlao, bRar t: ao, bRar l, od: bs , rawdRnflod t: c: arsd , ralodp saopn Rh XRastlcltk flods	D	D		TULBSAFOLB
0.30 – 0.40m	7 T0(T 0.40m		LS	E/HHyPOUVBHHe LUi Dyvr: honflod t: c: arsd , ralodp saopnflod t: c: arsd sbvlr: bopdp t: ao, bRar mlWdp ~sRa, nvrlcux, rawdRwith low plasticity silt	D	CD t: D		LFTITULBSAFOLB
0.40 – 0.50m	7 T0(S		CH	Sandy L/HYyparu , rdknRh XRastlcltknflod , ralodp saopn tracd : r, aolcs	h) MH	L t: E		UHHFV/FC
0.50 – 0.60m	0.60m		LC	L/HYe LUi Dy, rdknXaRd , rdknflod , ralodp saopnRh XRastlcltk slRntracd : r, aolcs	C t: 7	H	3	
0.60 – 0.1Gm			SN	SHUey, rdkn, rddo , rdknzl, z XRastlcltkntracd flod , ralodp saop	h) MH	E / Lt t: VLt	; 3 (	UHHFV/FC : r OBL/DFUH LA/H
0.1Gm				B- SUVUY/Ai 7 T0(YBOC/i UYBD UY 0.1Gm Yar, dt pdXtz			G G	

i IR; hatdr lofRh at 0.4m

Depth scale: 0.0, 0.G, ; .0, ; .G, 3.0

MNAYAPOUMNL i AYBL — eBL — i A

METHOD

i i atbraRBWX: sbrd
B BWlstlo, BWcawatl: o
TN Tacuz: d Tbcudt
T TbRp: 2dr TRapd
O OlXXdr

SUPPORT

Y Ylmvdrlo,

PENETRATION

VB B E N VN — i : Odslstaocd

WATER

; 0 Act.n6(7 atdr HdwdR o Datd sz: ho
hatdr lofRh
hatdr : btfRh

SAMPLES & FIELD TESTS

FG0 I Foplstbrvdp LamXRd G0 mm plamdtdr
D I Dlstbrvdp LamXRd
T I TbRa Dlstbrvdp LamXRd
CS I C: lstbrd S: otdot
NM I Naop Mdodtr: mdtdr ~FSL uMax
VL I Vaod Lzdar&MIMdaun OlOdm: bpdp ~boc: rrdctdp uMax
MTY I MRatd Tdarlo, Ydst

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION

Tasdp : o Folfldp SRassIflcatl: o Lkstdm

MOISTURE

D I Drk
C I C: lst
7 I 7 dt

CONSISTENCY/ RELATIVE DENSITY

VL I Vdrk L: ft
L I L: ft
E I Elrm
Lt I Ltlff
VLt I Vdrk Ltlff
N I Narp
VH I Vdrk H : sd
H I H : sd
CD I Cdplbm Ddosd
D I Ddosd
VD I Vdrk Ddosd

Ldd BWXRoat: rk i : tds f: r pdtalR : f avvrdwatl: os Qvasls : f pdscrlXtl: os.

YOUi LMAOY EAOi L7

WB03 Depth Range: 0.00 - 0.95 m

Transport for NSW	TITLE: Transport for NSW Atchison and Auburn Street Wollongong Wollongong Bus Layover Relocation Photo - WB03	DRAWN: RH	DATE: 24/10/2024
		CHECKED:	DATE: 24/10/2024
		SCALE: Not To Scale	A4
		PROJECT No: SG0441	FIGURE No: 1/1

EXCAVATION - GEOLOGICAL LOG

PROJECV e - : ll: ov: ov Bbs Sap: Xcr Rcl: , ati: o
SOCAVION e At, uis: o aowAbybro Mtrcct - : ll: ov: ov

PIT NO e **WB04**
FISE YJOB NO e MG0nn3
MHEEV e 3 OF 3

POMIVION e Ee408015.762kNe8366n49.081 WJ8 L GA5050; | MURFACE ESE/ AVION eRL 15.755
E9 UIPL ENV VgPE e) t E~, aXat: r Trbyycr tra, dcw | L EVHOD e 400mm t: : tucwAbvcr
DAVE EzCA/ AVED e 40YY5n | SOGGED Bg e SD | CHECKED Bg elA
EzCA/ AVION DIL ENMIONM e 0.40 m SONG 0.40 m - IDE

DRISSING | L AVERIAS

/ E E PENEVRAVION F H	MJPPORV	GROUND - AVER SE/ ESM	MAL PSEMQ FIESD VEMMM	DEPVH Wh;	GRAPHIC SOG	CSAMMFICAVION MgL BOS	L AVERIAS DEMCRIPVION Mt il VpxckC: l: brkPlasti, itp : r Parti, lc Cuara, tcristi, Mc, : owarp aowL io: r C: mx: ocots	L OIMMURE CONDIVION	CONMMMENCg RESAVII/ E DENMMVg	HAND @ PENEVROT L EVER 300 500 400 n00	MVRUCVURE Q Otucr OyscrXati: os
	Nil			0.0			0.04m AC YMPRAgED MEASeyla, dkAC3nkfioc t: , : arsc sbyTaovblar t: aovblar ivoc: bs r: , dkfioc t: , : arsc saowkyrittlc	D			ROAD MURFACE
						GP	0.30m FISSeGRA/ ESevrcpkward vrcp	D	D		BAMECOURME
			0.30m - B0nA			MP	FISSeGRA/ ESSg MANDeyr: hokfioc t: , : arsc vraiocwsaowkfioc t: , : arsc sbyTaovblar t: aovblar vraXcl	D	D		MUBTBAMECOURME
			0.55m				0.55m FISSeGRA/ ESSg MANDeward vrcpkfioc t: , : arsc vraiocwsaowkfioc t: , : arsc sbyTaovblar t: aovblar Whi~cw: rivio vraXclkhitu slavkyri, dk yasaltkhitu l: h xlasti, itp , lapktra, c trcc r: : ts aowasxualt fravmcots				FISS
				0.)		MP		D t: L	L D t: D		
		hatcr iofl: h at 0.64m					0.64m				
			0.10m - B0nC			L S	0.10m MISVeward vrcpkl: h xlasti, itpktra, c fioc vraiocwsaowkhitu : rvaoi, s	h 7 PS	M		OSD VOPMOIS
			3.00m	3.0		CH	Sandy CSAgevrcpkuivu xlasti, itpkfine grained sand, tra, c r: : ts	h 7 PS	F t: Mt		ASSU/ IUL : r REMDUAS MOIS
							3.30m				
							EzCA/ AVION - B0n VERL INAVED AV 3.30 m				
				3.)							
				5.0							

PHOVOGRAPHM NOVEM ☒ gEM ☐ NO

METHOD
N Natbral E~x: sbrc
E E~istiov E~, aXati: o
BH Ba, du: c Bb, dct
B Bbllw: (cr Blawc
R Rixxcr

SUPPORT
V Vimycriov

PENETRATION
/ E E F H H
N: Rcsistao, c

WATER
30 O, t.k24 - atcr
ScXcl : o Datc su: ho
hatcr iofl: h
hatcr : btfl: h

SAMPLES & FIELD TESTS
U) 0 T UowistbrycwMamxlc) 0 mm wiamctcr
D T DistbrycwMamxlc
B T Bbld DistbrycwMamxlc
L C T L : istbrc C: otcot
HP T HaowPcoctr: mctcr WMCMdPa;
/ M T / aoc Mucar&PTPcadk RTRcm: bwcwWo, : rrc, tcwdPa;
PBV T Platc Bcariov Vcst

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Bascw: o Uoificw
Classifi, ati: o Mpstcm

MOISTURE
D T Drp
L T L : ist
- T - ct

CONSISTENCY/ RELATIVE DENSITY

/ M	T/ crp M: ft
M	TM: ft
F	TFirm
Mt	TMtiff
/ Mt	T/ crp Mtiff
H	THarw
/ S	T/ crp S: : sc
S	TS: : sc
L D	TL cwibm Dcosc
D	TDcosc
/ D	T/ crp Dcosc

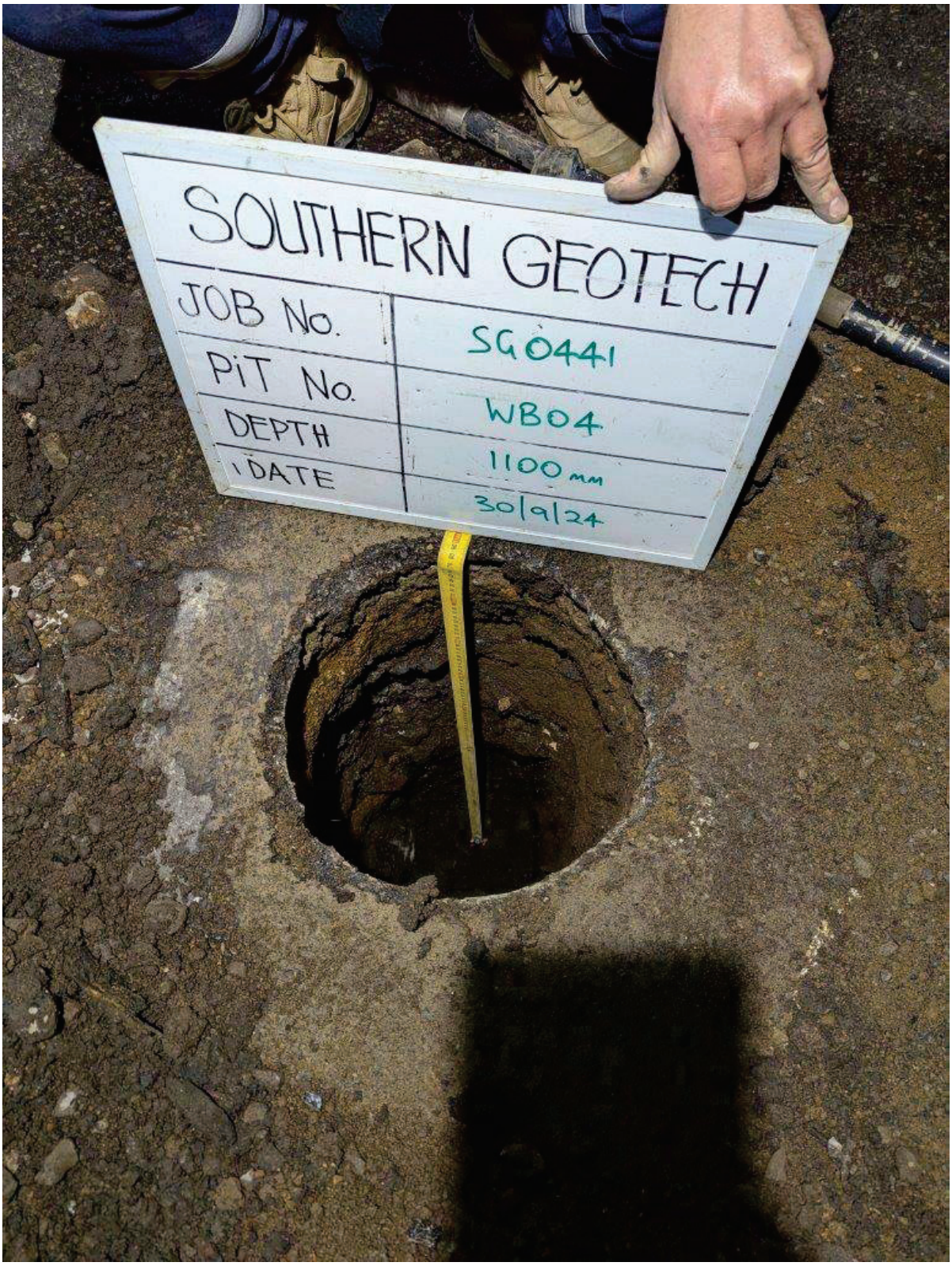
Mcc E~xlaoat: rp N: tcs f: r
wctails : f ayyrcXiati: os
Qyasis : f wcs, rixti: os.

VRANMPORV FOR NM-

NSW GOVERNMENT Transport for NSW

FilceMG0nn3 - B0n 3 OF 3

VFNM- n5:3 SIB.GSB S:v RVA EzCA/ AVION MG0nn3 T- OSSONGONG BUMSAgO/ ER RESOCAVION.GPJ <<Drah iov/Filc>> 5nYO, N505n 3n68 30.04.00.01 Datvcl V: : Is



WB01 Depth Range: 0.00 - mm0 A

Transport for NSW	TITLE: Transport for NSW 4tchison and 4uburn Street Wollongong Wollongong Bus Layover Relocation Photo - WB01	DR4WN: RH	D4TE: 21/m0/2021
		CHECKED:	D4TE: 21/m0/2021
		SC4LE: Not To Scale	41
		PROJECT No: SG011m	FIGURE No: m/m

Appendix C

RV24110-1 – TfNSW Laboratory Material Test Report

Material Test Report

Report Number:	**RV24110-1**
Issue Number:	1
Date Issued:	30/10/2024
Client:	Transport for NSW - Luke Doepel
	Level 5, 90 Crown Street, Wollongong NSW 2500
Contact:	Luke Doepel
Project Number:	RV24110
Project Name:	Pvt Inv - Wollongong Bus Bay, Atchison and Auburn Street
Project Location:	City of Wollongong
Client Reference:	SG0441
Work Request:	2638
Dates Tested:	02/10/2024 - 22/10/2024
Location:	Wollongong Bus Bay, Atchison and Auburn Street

Transport for NSW
Russell Vale Laboratory
21 York Place Russell Vale NSW 2517
Phone: (02) 4222 3256
Email: toni.zdravkovski@transport.nsw.gov.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Toni Zdravkovski
Technical Officer
NATA Accredited Laboratory Number: 2599

Sample Details						
Sample Number	RV24110/001	RV24110/002	RV24110/003	RV24110/004		
Client Sample Number	WB01A	WB01B	WB02A	WB03B		
Date Sampled	30/09/2024	30/09/2024	30/09/2024	30/09/2024		
Lane	**	**	**	**		
Sample Location	E: 306084 N: 6188468	E: 306084 N: 6188468	E: 306149 N: 6188457	E: 306147 N: 6188443		
Sample Depth	0.04 - 0.30m	0.50 - 0.80m	0.03 - 0.28m	0.20 - 0.40m		
Material	Sandy Gravel	Sandy Clay	Sandy Gravel	Clayey Gravelly Sand		
Particle Size Distribution (AS1289 3.6.1)					**Min**	**Max**
Passing 53.0mm (%)	**	**	**	100		
Passing 37.5mm (%)	100	**	100	99		
Passing 26.5mm (%)	99	**	99	98		
Passing 19.0mm (%)	97	100	97	96		
Passing 13.2mm (%)	92	100	94	95		
Passing 9.5mm (%)	84	100	87	92		
Passing 6.7mm (%)	76	99	76	87		
Passing 4.75mm (%)	69	99	65	81		
Passing 2.36mm (%)	56	98	47	65		
Passing 1.18mm (%)	45	97	34	50		
Passing 0.6mm (%)	35	97	25	39		
Passing 0.425mm (%)	29	97	22	35		
Passing 0.3mm (%)	23	96	18	31		
Passing 0.15mm (%)	16	92	13	25		
Passing 0.075mm (%)	11	66	9	20		
Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)					**Min**	**Max**
Sample History	Oven Dried	Oven Dried	Oven Dried	Oven Dried		
Preparation Method	Dry Sieve	Dry Sieve	Dry Sieve	Dry Sieve		
Liquid Limit (%)	23	54	23	28		
Plastic Limit (%)	17	18	21	18		
Plasticity Index (%)	6	36	2	10		
Moisture Content (TS 02795.14)					**Min**	**Max**
Moisture Content (%)	7.0	27.3	6.9	9.5		
Min (%)	**	**	**	**		
Max (%)	**	**	**	**		

Material Test Report

Report Number: RV24110-1
Issue Number: 1
Date Issued: 30/10/2024
Client: Transport for NSW - Luke Doepel
Level 5, 90 Crown Street, Wollongong NSW 2500
Contact: Luke Doepel
Project Number: RV24110
Project Name: Pvt Inv - Wollongong Bus Bay, Atchison and Auburn Street
Project Location: City of Wollongong
Client Reference: SG0441
Work Request: 2638
Dates Tested: 02/10/2024 - 22/10/2024
Location: Wollongong Bus Bay, Atchison and Auburn Street

Transport for NSW
Russell Vale Laboratory
21 York Place Russell Vale NSW 2517
Phone: (02) 4222 3256
Email: toni.zdravkovski@transport.nsw.gov.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Toni Zdravkovski
Technical Officer
NATA Accredited Laboratory Number: 2599

Sample Details						
Sample Number	RV24110/005	RV24110/006	RV24110/007			
Client Sample Number	WB03C	WB04A	WB04C			
Date Sampled	30/09/2024	30/09/2024	30/09/2024			
Lane	**	**	**			
Sample Location	E: 306147 N: 6188443	E: 306096 N: 6188452	E: 306096 N: 6188452			
Sample Depth	0.40 - 0.70m	0.10 - 0.22m	0.90 - 1.00m			
Material	Silt	Gravelly Sand	Clay			
Particle Size Distribution (AS1289 3.6.1)					**Min**	**Max**
Passing 37.5mm (%)	**	100	**			
Passing 26.5mm (%)	**	97	**			
Passing 19.0mm (%)	100	94	100			
Passing 13.2mm (%)	99	88	100			
Passing 9.5mm (%)	98	82	100			
Passing 6.7mm (%)	96	74	99			
Passing 4.75mm (%)	95	66	98			
Passing 2.36mm (%)	91	50	96			
Passing 1.18mm (%)	88	37	94			
Passing 0.6mm (%)	85	28	93			
Passing 0.425mm (%)	84	24	93			
Passing 0.3mm (%)	82	21	91			
Passing 0.15mm (%)	77	16	87			
Passing 0.075mm (%)	47	12	61			
Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)					**Min**	**Max**
Sample History	Oven Dried	Oven Dried	Oven Dried			
Preparation Method	Dry Sieve	Dry Sieve	Dry Sieve			
Liquid Limit (%)	24	26	48			
Plastic Limit (%)	19	24	18			
Plasticity Index (%)	5	2	30			
Moisture Content (TS 02795.14)					**Min**	**Max**
Moisture Content (%)	21.2	8.4	28.4			
Min (%)	**	**	**			
Max (%)	**	**	**			

Material Test Report

Report Number: **RV24110-1**
Issue Number: 1
Date Issued: 30/10/2024
Client: Transport for NSW - Luke Doepel
Level 5, 90 Crown Street, Wollongong NSW 2500
Contact: Luke Doepel
Project Number: RV24110
Project Name: Pvt Inv - Wollongong Bus Bay, Atchison and Auburn Street
Project Location: City of Wollongong
Client Reference: SG0441
Work Request: 2638
Dates Tested: 02/10/2024 - 29/10/2024
Location: Wollongong Bus Bay, Atchison and Auburn Street

Transport for NSW
Russell Vale Laboratory
21 York Place Russell Vale NSW 2517
Phone: (02) 4222 3256
Email: toni.zdravkovski@transport.nsw.gov.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Toni Zdravkovski
Technical Officer
NATA Accredited Laboratory Number: 2599

Sample Details							
Sample Number	RV24110/001	RV24110/002	RV24110/004	RV24110/005	RV24110/007		
Client Sample Number	WB01A	WB01B	WB03B	WB03C	WB04C		
Date Sampled	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024		
Lane	**	**	**	**	**		
Sample Location	E: 306084 N: 6188468	E: 306084 N: 6188468	E: 306147 N: 6188443	E: 306147 N: 6188443	E: 306096 N: 6188452		
Sample Depth	0.04 - 0.30m	0.50 - 0.80m	0.20 - 0.40m	0.40 - 0.70m	0.90 - 1.00m		
Material	Sandy Gravel	Sandy Clay	Clayey Gravelly Sand	Silt	Clay		
California Bearing Ratio (TS 02795.11 & 02795.14)						Min	Max
Material Retained on 19mm (%)	3	0	3	0	0		
Oversize Material Included	Excluded	Excluded	Excluded	Excluded	Excluded		
Additive Type	**	**	**	**	**		
Additive (%)	**	**	**	**	**		
Mass Surcharge (kg)	4.5	4.5	4.5	4.5	4.5		
Soaking Period (days)	4	10	4	10	10		
Method of Compactive Effort	Standard	Standard	Standard	Standard	Standard		
MDD and MC Test Methods	TS 02795.06 & 02795.14	TS 02795.06 & 02795.14	TS 02795.06 & 02795.14	TS 02795.06 & 02795.14	TS 02795.06 & 02795.14		
Maximum Dry Density (t/m^3)	2.066	1.682	1.995	1.782	1.645		
Optimum Moisture Content (%)	10.4	19.6	12.8	14.4	20.4		
Target Laboratory Density Ratio (%)	100	95	98	95	95		
Target Laboratory Moisture Ratio (%)	100	100	100	100	100		
Achieved Dry Density (t/m^3)	2.064	1.598	1.973	1.692	1.562		
Swell (%)	-0.1	0.1	0.1	0.2	0.2		
Moisture Content Top 30mm (%)	10.3	32.1	13.1	18.0	29.1		
Moisture Content Full Depth (%)	9.8	23.2	12.5	17.3	24.8		
Laboratory Density Ratio (%)	100	95	99	95	95		
Laboratory Moisture Ratio (%)	98	99	98	100	100		
California Bearing Ratio (%)	100	1.0	40	10	2.0		
CBR taken at	5 mm	2.5 mm	5 mm	2.5 mm	2.5 mm		

Appendix D

Asphalt Modulus Calculations
Design Traffic Calculation
Pavement Design Calculation

DESIGN ASPHALT MODULUS

Project details:	SG0441 - Wollongong Bus Bay
Date:	2 October 2024
Designer:	L.Doepel
AC Modulus version:	6B (01 March 2018)
Design references:	Roads and Maritime Supplement to Austroads Part 2 Roads and Maritime asphalt and material specifications Austroads Part 2: Pavement Structural Design (AGPT02-17)

Inputs

Mix type:	AC14
Binder grade:	A35P
Modulus adjustment factor:	1.25
Total binder content (by mass):	5.2%
Binder absorption:	0.3%
Binder density:	1.043 tonnes/m3
Insitu air voids:	6.0%
Combined bulk density of mineral aggregate:	2.65 tonnes/m3
Bitumen penetration at 25° C (0.1 mm):	31 (after RTFO)
Bitumen viscosity at 60° C:	970 Pa.s (after RTFO)
Loading speed:	10 km/h
WMAPT:	27.0° C

Results

Time of loading:	0.10 seconds
Bitumen T800 pen:	58.1° C
Bitumen Penetration Index:	-0.4
Binder stiffness:	8.0 MPa
Binder volume:	10.9%
Aggregate volume:	83.1%
Nominal mix modulus:	2,155 MPa
Adjusted mix modulus:	2,200 MPa
CIRCLY (k) value:	0.004510

DESIGN ASPHALT MODULUS

Project details:	
Date:	14 November 2024
Designer:	
AC Modulus version:	6B (01 March 2018)
Design references:	Roads and Maritime Supplement to Austroads Part 2 Roads and Maritime asphalt and material specifications Austroads Part 2: Pavement Structural Design (AGPT02-17)

Inputs

Mix type:	AC20
Binder grade:	A35P
Modulus adjustment factor:	1.25
Total binder content (by mass):	4.9%
Binder absorption:	0.3%
Binder density:	1.043 tonnes/m3
Insitu air voids:	6.0%
Combined bulk density of mineral aggregate:	2.65 tonnes/m3
Bitumen penetration at 25° C (0.1 mm):	31 (after RTFO)
Bitumen viscosity at 60° C:	970 Pa.s (after RTFO)
Loading speed:	10 km/h
WMAPT:	27.0° C

Results

Time of loading:	0.10 seconds
Bitumen T800 pen:	58.1° C
Bitumen Penetration Index:	-0.4
Binder stiffness:	8.0 MPa
Binder volume:	10.3%
Aggregate volume:	83.7%
Nominal mix modulus:	2,362 MPa
Adjusted mix modulus:	2,400 MPa
CIRCLY (k) value:	0.004155

PAVEMENT TRAFFIC LOADING 2 - TRAFFIC LOADING RESULTS

Input Details

Project title :	Wollongong Bus Bay Traffic Volume
Analysis by :	Pavements and Geotechnical South - Wollongong
Analysis date :	6 February 2025
Design Year 1 :	2024
Year 1 AADT :	210 Vehicles
DF - Direction Factor :	1
N_{HVAG} :	2.00 HVAG/HV
%HV - Heavy Vehicles :	100.00%
LDF - Lane Distribution Factor :	1.00
Lane capacity flow rate :	1,700 Passenger cars per hour
Number of lanes in direction of design lane :	1
Average Passenger Cars per Heavy Vehicle :	2.50
Design period :	20 years
Number of design period phases :	1

Phase	Start Year	End Year	Growth Rate	Incremental HV in first year of phase
1	1	20	1.00%	N/A
2	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A

ESA analysis method :	TLD data
ESA per HVAG :	N/A
TLD Title:	Bus TLD for Wollongong Area
TLD workbook filename:	C:\Users\ldoepel\OneDrive - Transport for NSW\TEMP JOB FOLDERS\SG0441 - Wollongong Bus Layover - Investigation and Design - Between Atchison and Auburn St\05- Design\Bus TLD for Wollongong area (conservative TLD).xlsx
TLD worksheet name:	TfNSW template
HVAG proportions:	TLD

SAST	SADT	TAST	TADT	TRDT	QADT
0.5000	0.2500	0.0000	0.2500	0.0000	0.0000

Analysis Details

PTL2 design filename :	C:\Users\ldoepel\OneDrive - Transport for NSW\TEMP JOB FOLDERS\SG0441 - Wollongong Bus Layover - Investigation and Design - Between Atchison and Auburn St\05-Design\SG0441 - PTL Design1 for Bus Bay V3 - Kevin Chim BUS TLD.ptl2
PTL2 software version :	1C (December 2021)
Design reference :	Austroads Guide AGPT02-17

Pavement Design Loadings

	Total at Year 20 (2043)
N_{DT} (HVAG) :	3.38E+06
DESA :	6.95E+06

Heavy Vehicle Capacity Details

Annual HV capacity of design lane :	5.96E+06
HV capacity reached in Design Period? :	NO
Design Year of HV capacity :	N/A

General Details

ESA per Heavy Vehicle :	4.120
ESA per HVAG :	2.060

Bus TLD for Wollongong Area

Axle group load (kN)	Axle group type					
	SAST %	SADT %	TAST %	TADT %	TRDT %	QADT %
10	0	0	0	0	0	0
20	0	0	0	0	0	0
30	0	0	0	0	0	0
40	0	0	0	0	0	0
50	0	0	0	0	0	0
60	100	0	0	0	0	0
70	0	0	0	0	0	0
80	0	0	0	0	0	0
90	0	0	0	0	0	0
100	0	100	0	0	0	0
110	0	0	0	0	0	0
120	0	0	0	0	0	0
130	0	0	0	0	0	0
140	0	0	0	0	0	0
150	0	0	0	0	0	0
160	0	0	0	0	0	0
170	0	0	0	100	0	0
180	0	0	0	0	0	0
190	0	0	0	0	0	0
200	0	0	0	0	0	0
210	0	0	0	0	0	0
220	0	0	0	0	0	0
230	0	0	0	0	0	0
240	0	0	0	0	0	0
250	0	0	0	0	0	0
260	0	0	0	0	0	0
270	0	0	0	0	0	0
280	0	0	0	0	0	0
290	0	0	0	0	0	0
300	0	0	0	0	0	0
310	0	0	0	0	0	0
320	0	0	0	0	0	0
330	0	0	0	0	0	0
340	0	0	0	0	0	0
350	0	0	0	0	0	0
360	0	0	0	0	0	0
370	0	0	0	0	0	0
380	0	0	0	0	0	0
390	0	0	0	0	0	0
400	0	0	0	0	0	0
Total	100.00	100.00	0.00	100.00	0.00	0.00

Group proportions	0.5000	0.2500	0.0000	0.2500	0.0000	0.0000

Flexible Pavement Design 2.0 - Summary Report

Design Filename: C:\Users\ldoepel\OneDrive - Transport for NSW\TEMP JOB FOLDERS\SG0441 - Wollongong Bus Layover - Investigation and Design - Between Atc
FPD software verion: FPD 2.0 Version 1B (12 March 2020)
CIRCLY software version: 5.0u (8 April 2013)

Project Details

Project Title: SG0441 - Wollongong Bus Bay Layover
Location: Atchison and Auburn Streets
Pavement Tag: AC and Sand Cement - Option 1
Comments:
Date of Design: 14/11/2024
Designer: Pavements and Geotechnical South - Wollongong
Project Reliability (%): 95
WMAPT (°C): 27
Design Speed (km/h): 10

Load Details

Single Axle Single Tyre (SAST)	Standard Axle Load:	53 kN	Tyre Contact Stress:	800 kPa
Single Axle Dual Tyre (SADT)	Standard Axle Load:	80 kN	Tyre Contact Stress:	750 kPa

Traffic Details

PTL report: C:\Users\ldoepel\OneDrive - Transport for NSW\TEMP JOB FOLDERS\SG0441 - Wollongong Bus Layover - Investigation and Design - Between Atc
TLD Title: Bus TLD for Wollongong Area

Design Period (yrs):	20	Design Traffic - N_{DT} (HVAG):	3.38E+06	N_{DT} (ESAs):	6.96E+06
Annual growth rate (%):	1.0	N_{DT} for asphalt fatigue (HVAG):	3.38E+06	ESA/HVAG:	2.06

Axle Group Proportions	SAST	SADT	TAST	TADT	TRDT	QADT
From PTL Report	0.5000	0.2500	0.0000	0.2500	0.0000	0.0000

Layer Details

Layer No.	Description	Material	Thickness (mm)	Ev (MPa)	Ev / Eh	Poisson's Ratio	Lower Interface	% Vol. Bitumen	Sublayer?
1	AC14 A35P	Asphalt	150	2,200	1.0	0.40	Rough	10.9	N/A
2	DGB Class 1 (3051.1 NPM SC)	Granular	240	500	2.0	0.35	Rough	N/A	No
3	UZF (other than SMZ)	Selected Subgrade	300	80	2.0	0.45	Rough	N/A	Yes
4	Cohesive Subgrade	Subgrade	S/Inf	20	2.0	0.45	N/A	N/A	N/A

Layer Results

Layer No.	Description	Thickness (mm)	Vertical Modulus (MPa)	Stress Param. f (MPa)	k Factor	Failure Criterion	Maximum Microstrains			Expected Reps (ESAs)	Allowable Reps (ESAs)	CDF (Damage)	Estimated Life in Years
							SAST	SADT					
							Hor.	Hor.	Vert.				
1	**AC14 A35P**	**150**	**2,200**	**N/A**	**4510**	**Fatigue**	**-182.9**	**-186.1**	**N/A**	**6.96E+06**	**N/A**	**0.93**	**21.4**
2	DGB Class 1 (3051.1 NPM SC)	240	500	370	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.1	S/L UZF (other than SMZ)	60	80	55	9150	Rutting	N/A	N/A	418.6	6.96E+06	2.38E+09	0.00	>50
3.2	S/L UZF (other than SMZ)	60	61	42	9150	Rutting	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.3	S/L UZF (other than SMZ)	60	46	32	9150	Rutting	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.4	S/L UZF (other than SMZ)	60	35	24	9150	Rutting	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.5	S/L UZF (other than SMZ)	60	26	18	9150	Rutting	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	Cohesive Subgrade	S/Inf	20	14	9150	Rutting	N/A	N/A	562.9	6.96E+06	3.00E+08	0.02	>50

Note: For construction purposes, an additional 10mm must be added to the critical layer, the damage for which is highlighted in bold above.

Non-conformances

Layer No.	Non-conformance description	Reference
1	Asphalt containing polymer modified binder must only be used over other PMB asphalt layers, or cementitious layers.	RMS Supplement 6.5.2
2	Modulus of RMS Granular material does not match prescribed modulus.	RMS Supplement 6.2.3

Bus TLD for Wollongong Area

Axle group load (kN)	Axle group type					
	SAST %	SADT %	TAST %	TADT %	TRDT %	QADT %
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
60	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000
70	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
90	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	100.0000	0.0000	0.0000	0.0000	0.0000
110	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
130	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
150	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
160	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
170	0.0000	0.0000	0.0000	100.0000	0.0000	0.0000
180	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
190	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
210	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
220	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
230	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
240	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
260	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
270	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
280	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
290	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
310	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
330	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
340	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
350	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
360	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
370	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
380	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
390	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	100.0000	100.0000	0.0000	100.0000	0.0000	0.0000
Group proportions	0.5000	0.2500	0.0000	0.2500	0.0000	0.0000

Flexible Pavement Design 2.0 - Summary Report

Design Filename: C:\Users\ldoepel\OneDrive - Transport for NSW\TEMP JOB FOLDERS\SG0441 - Wollongong Bus Layover - Investigation and Design - Between Atc
FPD software verion: FPD 2.0 Version 1B (12 March 2020)
CIRCLY software version: 5.0u (8 April 2013)

Project Details

Project Title: SG0441 - Wollongong Bus Bay Layover
Location: Atchison and Auburn Streets
Pavement Tag: AC and Lean Mix Concrete - Option 2
Comments:
Date of Design: 14/11/2024
Designer: Pavements and Geotechnical South - Wollongong
Project Reliability (%): 95
WMAPT (°C): 27
Design Speed (km/h): 10

Load Details

Single Axle Single Tyre (SAST)	Standard Axle Load:	53 kN	Tyre Contact Stress:	800 kPa
Single Axle Dual Tyre (SADT)	Standard Axle Load:	80 kN	Tyre Contact Stress:	750 kPa

Traffic Details

PTL report: C:\Users\ldoepel\OneDrive - Transport for NSW\TEMP JOB FOLDERS\SG0441 - Wollongong Bus Layover - Investigation and Design - Between Atc
TLD Title: Bus TLD for Wollongong Area

Design Period (yrs):	20	Design Traffic - N_{DT} (HVAG):	3.38E+06	N_{DT} (ESAs):	6.96E+06
Annual growth rate (%):	1.0	N_{DT} for asphalt fatigue (HVAG):	3.38E+06	ESA/HVAG:	2.06

Axle Group Proportions	SAST	SADT	TAST	TADT	TRDT	QADT
From PTL Report	0.5000	0.2500	0.0000	0.2500	0.0000	0.0000

Layer Details

Layer No.	Description	Material	Thickness (mm)	Ev (MPa)	Ev / Eh	Poisson's Ratio	Lower Interface	% Vol. Bitumen	Sublayer?
1	AC14 A35P	Asphalt	150	2,200	1.0	0.40	Rough	10.9	N/A
2	Lean Mix Concrete	Concrete	220	10,000	1.0	0.20	Rough	N/A	N/A
3	UZF (other than SMZ)	Selected Subgrade	300	80	2.0	0.45	Rough	N/A	Yes
4	Cohesive Subgrade	Subgrade	S/Inf	20	2.0	0.45	N/A	N/A	N/A

Layer Results

Layer No.	Description	Thickness (mm)	Vertical Modulus (MPa)	Stress Param. f (MPa)	k Factor	Failure Criterion	Maximum Microstrains			Expected Reps (ESAs)	Allowable Reps (ESAs)	CDF (Damage)	Estimated Life in Years
							SAST	SADT					
							Hor.	Hor.	Vert.				
1	AC14 A35P	150	2,200	N/A	4510	Fatigue	13.13	24.93	N/A	N/A	N/A	N/A	N/A
2	**Lean Mix Concrete**	**220**	**10,000**	**N/A**	**223**	**Fatigue**	**-38.69**	**-55.6**	**N/A**	**6.96E+06**	**N/A**	**0.92**	**21.6**
3.1	S/L UZF (other than SMZ)	60	80	55	9150	Rutting	N/A	N/A	93.23	6.96E+06	8.77E+13	0.00	>50
3.2	S/L UZF (other than SMZ)	60	61	42	9150	Rutting	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.3	S/L UZF (other than SMZ)	60	46	32	9150	Rutting	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.4	S/L UZF (other than SMZ)	60	35	24	9150	Rutting	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.5	S/L UZF (other than SMZ)	60	26	18	9150	Rutting	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	Cohesive Subgrade	S/Inf	20	14	9150	Rutting	N/A	N/A	227.5	6.96E+06	1.70E+11	0.00	>50

Note: For construction purposes, an additional 10mm must be added to the critical layer, the damage for which is highlighted in bold above.

Non-conformances

Layer No.	Non-conformance description	Reference
-	Thickness of asphalt over concrete or cemented materials is less than the minimum requirement of 175mm.	RMS Supplement Table 1

Bus TLD for Wollongong Area

Axle group load (kN)	Axle group type					
	SAST	SADT	TAST	TADT	TRDT	QADT
	%	%	%	%	%	%
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
60	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000
70	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
90	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	100.0000	0.0000	0.0000	0.0000	0.0000
110	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
130	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
150	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
160	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
170	0.0000	0.0000	0.0000	100.0000	0.0000	0.0000
180	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
190	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
210	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
220	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
230	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
240	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
260	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
270	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
280	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
290	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
310	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
330	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
340	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
350	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
360	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
370	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
380	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
390	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	100.0000	100.0000	0.0000	100.0000	0.0000	0.0000
Group proportions	0.5000	0.2500	0.0000	0.2500	0.0000	0.0000

Appendix E

Summary of Pavement Information Provided by Wollongong City Council

Road Register Old Q&A

Road name ATCHISON ST **Suburb** WOLLONGONG **RTA No**

Division C **Road No** 59 **Link** 20 **Lane Code** A

From BURELLI ST **To** ELLEN ST

Width 13 **Length** 360 **Area** 4680 (Segm

First Construction? 1950 **Research By** T. Huuskes **Dept of Housing?** **Extra Area** **Total Area** 4

Year Constructed

Comment

Intervention PCI	PCI	Seg	
80.5	88.5	1A	A
77.2	84.8	2A	A
78.0	85.8	3A	A

Surface Type AC10 **Date Surfaced** 26/06/2010

Overlay Done GG10 Resurface **Date Treatment** 1/01/2010

Subsoil Drain **Mark** Rate **Beam mark** B0 **See:**

Deflection Mean 1.03 **Std Dev** 0.28 **Rep. Deflection** 1.31 **Tolerable Defl** 1.7

Date of Beaming 23/04/2009 **Beaming by** Deflectograph **Last Report** 25/02/2013

Date Sampled **CBR Range** **Existing Cover**

AADT **State** **Heirarchy** C **ESA's** 1 x 10E5

Road Card

Date Works	Road No 59	Link 20	From BURELLI ST	To ELLEN ST	Car A
1/01/1997	Pavement Evaluation W573				
1/01/1972	AC Waltons - Ellen St				
1/01/1978	Insitu- Densities W1773				
21/06/1989	B&B & Soil Pavement Evaluation W4814 W4821 Existing Cover: 270 is for West Shoulder 550 is fo				
9/11/1996	Cracksealing				
6/03/1997	Deep Lift patches				
5/05/1997	Slurry seal				
21/06/1989	WCC def mean 0.8, std dev 0.3, rep def 1.01, tol def 1.7				
23/04/2009	RTA Deflectograph def mean 1.03, std dev 0.28, rep def 1.13 - W10167 - report 25/02/2013				
26/06/2010	Resurfacing AC14 & AC10 - 350m length, 11.6m wide, 4100m^2 - Profile @ 100mm depth				
1/01/2010	GG10 Resurface				
4/08/2024	Various DL patches (2x 50mm layers)				

Road Register Old Q&A

Road name ATCHISON / AUBURN ST CAR PARK **Suburb** WOLLONGONG **RTA No**

Division C **Road No** 7111 **Link** 10 **Lane Code** U

From ATCHISON ST **To** AUBURN ST

Width 30 **Length** 80 **Area** 2400 (Segm

First Construction? 1970s **Research By** T. Huuskes **Dept of Housing?** **Extra Area** 2460 **Total Area** 48

Year Constructed

Comment Former Tax Office Car Park

Intervention	PCI	PCI	Seg	
?	85.8	1A	T	

Surface Type AC10 **Date Surfaced**

Overlay Done Rejuvenation **Date Treatment** 12/01/2014

Subsoil Drain **Mark** **Beam mark** **See:**

Deflection Mean	**Std Dev**	**Rep. Deflection**	**Tolerable Defl**	2.1
Date of Beaming	**Beaming by**		**Last Report**	
Date Sampled	**CBR Range**	**Existing Cover**		
AADT		**State**	**Heirarchy**	**ESA's** 1 x 10E4

Road Card

Date Works	**Road No**	**Link**	**From**	**To**	**Car**
12/01/2014 Rejuvenation	7111	10	ATCHISON ST	AUBURN ST	U

Road Register Old Q&A

Road name AUBURN ST **Suburb** WOLLONGONG **RTA No**

Division C **Road No** 63 **Link** 10 **Lane Code** A

From BURELLI ST **To** DEAN ST

Width 11.9 **Length** 130 **Area** 1547 (Segm

First Construction? 1950 **Research By** T. Huuskes **Dept of Housing?** **Extra Area** **Total Area** 15

Year Constructed

Comment

Intervention PCI	PCI	Seg	
57.3	**69.9**	**1A**	A
46.9	**57.2**	**2A**	A
65.4	**79.8**	**3A**	A
46.9	**57.2**	**4A**	A

Surface Type AC **Date Surfaced**

Overlay Done AC/14 & AC/10 Waterboard restoration. **Date Treatment** 23/06/1991

Subsoil Drain **Mark** **Beam mark** B0 **See:**

Deflection Mean 0.82 **Std Dev** 0.21 **Rep. Deflection** 1.16 **Tolerable Defl** 1.2

Date of Beaming 13/09/1996 **Beaming by** Deflectograph **Last Report** 20/02/1997

Date Sampled 15/11/1984 **CBR Range** 3 **Existing Cover** 310

AADT **State** **Heirarchy** E **ESA's** 7 x 10E5

Road Card

Date Works	Road No 63	Link 10	From BURELLI ST	To DEAN ST	Car A
1/01/1970	AC Burelli - Ellen				
1/01/1984	Insitu densities W3249				
1/01/1984	Pavement Investigation				
1/01/1986	See dynatest PMS Pilot study on File 6.2.1				
1/01/1991	AC Crown - Dulux Paints (Restoration)				
23/06/1991	AC/14 & AC/10 Waterboard restoration.				
8/07/1994	Deep Lift Patch AC/14 ICC Restoration				
13/10/1994	Gas restoration				
13/09/1996	B&B RTA				
25/06/2009	Centre = 70mm AC14, Shoulders = 30mm GG10				
21/05/2015	AC14 at reconstructed intersection of Burelli St				

W4814
W4821

COUNCIL OF THE
CITY OF WOLLONGONG

PLEASE QUOTE:
E.PRT/GS

21 June 1989

CENTRAL DIVISION ENGINEER
Mr J Rallings

PAVEMENT INVESTIGATION - ATCHISON STREET WOLLONGONG

Deflection testing and pavement sampling of Atchison Street, Wollongong is now complete. The details of testing are attached for your information.

DESIGN PARAMETERS

1. Assumed Traffic Loading:
   - 3×10^6 ESAs — Crown St - Burelli St
   - 1×10^5 ESAs — Burelli St - Ellen St
   - 1×10^4 ESAs — Ellen St - West St

2. Design Maximum Deflection:
   - 1.00mm
   - 1.70mm
   - 2.10mm

3. Representative Pavement Deflection:
   - 1.26mm
   - 1.01mm
   - 1.07mm

4. Typical Profile of Existing Pavement: **(Crown Street - Burelli Street)**

   Central Pavement - East Shoulder

70mm	AC
480mm	Roadbase and Stone

   West Shoulder

10mm	AC
270mm	Mixed Stone

5. Typical Subgrade: C.B.R. 2.5 — Soft Light Brown Silty Clay

6. Design Cover: 640mm

COMMENTS

Atchison Street south of Burelli Streets shows low deflection and the pavement is considered to be in a sound condition. Labortory records show that asphalt surfacing was placed in 1972 north of Ellen Street and 1978 south of Ellen Street. Except for some

Mr J Rallings

minor cracking the surfacing is in good condition. A very high crown was noted south of Ellen Street.

The section of Atchison Street north of Burelli Street, however, is failing in the western shoulder and part of the adjoining lane. The surface has deformed over portions of the remainder of the pavement. Deflections indicate that the central pavement and the eastern shoulder are in a sound condition except that it is considered that the thick layer of AC10 lacks sufficient stability for the high volumes of light traffic. The western shoulder and part of the adjoining lane require reconstruction.

RECOMMENDATION (Section: Crown Street to Burelli Only)

1. Install longitudinal subsoil drainage adjacent to the western kerb.

2. Remove by profiling 50mm of the existing surface of the eastern shoulder and central pavement and replace with 50mm of AC14 using a C320 binder.

3. Reconstruct the western shoulder and part of the adjoining lane to a depth equivalent to a design cover of 640mm.

   Alternative construction profiles include -

   i. Flexible Pavement (EC 2)

50mm	AC14
150mm	DGB20 Base
440mm	DGS20/40 Sub-base

   ii. Bound Pavement (EC 16)

50mm	AC14
280mm	Bound Base

   iii. Full Depth Asphalt (EC 32)

50mm	AC14
170mm	AC28

   iv. Semi-Bound Pavement (EC 23)

50mm	AC14
100mm	DGB20 Base
280mm	Modified Sub-base

   v. Rigid Pavement

150mm	30MPa Concrete
100mm	5MPa Concrete

P Tobin
MATERIALS ENGINEER

Att.

SUMMARY OF TESTING - ATCHISON STREET WOLLONGONG

1. Traffic Loading: a) Crown Street to Burelli Street
Assume: Collector Road 'A' - Estimated Traffic Loading - 3×10^6 ESAs

b) Burelli Street to Ellen Street
Assume: Local Road 'A' - Estimated Traffic Loading - 1×10^5 ESAs

c) Ellen Street to West Street
Assume: Local Road 'B' - Estimated Traffic Loading - 1×10^4 ESAs

2. Deflection Testing

Design Maximum Deflections: 1.00mm - Crown St to Burelli St
1.70mm - Burelli St to Ellen St
2.10mm - Ellen St to West St

Chainage(m)	Location	Maximum Deflection(mm)
15m south of Burelli Street	3m west of kerb	1.56
at House No. 10	2m west of kerb	0.96
at ELP 4	1m west of kerb	0.94
at ELP 5	4.5m west of kerb	0.60
at ELP 7	3m west of kerb	0.68
at ELP 8	5m west of kerb	0.52
at ELP 10	2.5m west of kerb	0.70
at ELP 11	5m west of kerb	0.80
at ELP 12	3m west of kerb	0.76
at ELP 13	5m west of kerb	0.58
at ELP 15	3m west of kerb	0.70
5m south of ELP 16	4m west of kerb	0.64
at ELP 17	2.5m west of kerb	0.72
at ELP 19	5m west of kerb	1.08
t ELP 22	2.5m west of kerb	0.64
ELP 23	4.5m west of kerb	0.86
at ELP 24	2.5m west of kerb	0.50
at House No 70	4.5m west of kerb	1.22
at ELP 26	2.5m west of kerb	0.44
at ELP 27	4.5m west of kerb	0.94
at ELP 28	3m west of kerb	1.36
3m north of West St	2m west of kerb	0.96
10m north of West St	1m east of kerb	0.36
at ELP 28	3m east of kerb	0.86
at ELP 27	1.5m east of kerb	0.74
at ELP 26	4m east of kerb	0.92
at House No. 70	3m east of kerb	0.86
at House No. 66/68	1.5m east of kerb	0.40
at ELP 23	3.5m east of kerb	1.08
at ELP 22	2m east of kerb	0.20
at ELP 19	4m east of kerb	1.02
at ELP 17	2m east of kerb	0.56
m south of Ellen St	4m east of kerb	0.70
t ELP 15	1.5m east of kerb	0.84
t ELP 14	4m east of kerb	0.56
t House No. 38	1.5m east of kerb	1.04
t ELP 11	3.5m east of kerb	0.92
t ELP 10	1.5m east of kerb	0.96

Chainage(m)	Location	Maximum Deflection(mm)
at ELP 8	3.5m east of kerb	0.44
at ELP 7	1.5m east of kerb	0.56
at ELP 5	4m east of kerb	0.66
at ELP 4	3m east of kerb	0.52
at House No. 8	4m east of kerb	0.44
12m south of Crown St	3m west of kerb	0.44
12m north of ELP 2	2m east of kerb	1.26

Representative Deflection:

1.26mm - Crown St - Burelli St
1.01mm - Burelli St - Ellen St
1.07mm - Ellen St - West St

3. Pavement Sampling

Location	Profile		Field Moisture Content(%)	Lab Est. C.B.R.	Additional Cover Required(mm)
Hole 1					
12m south of Crown St, 5m west of kerb	0-70	Asphaltic Concrete			-
	70-550	Mixed Roadbase Spalls Sandstone & bricks			-
	550-1000	Soft Light Brown Silty Clay	29.9%	2.5	+90
Hole 2					
6m north of ELP 2, 2.5m east of kerb	0-10	Asphaltic Concrete			-
	10-280	Mixed Spalls & Sandstone			+180
	280-1000	Soft Light Brown/Grey Silty Clay	22.6%	3	+310

****

WOLLONGONG CITY COUNCIL MATERIALS TESTING LABORATORY	TEST REPORT SUBGRADE SOIL, ROAD GRAVEL, ETC.	LABORATORY NO. W4891
		FILE NO.

JOB/LOCATION: Atchison St Wollongong

NO OF SAMPLES: 2 SUBMITTED BY: GC RECEIVED: 19-5-89

SAMPLE NO:		1C	2C					
Depths between which sample was taken		550-1000	280-1000					
Chainage (in case of samples ex road)			ELP 2					
Pre-treatment (if any)*								
Retained on 19mm Sieve								
Mechanical Analysis of Portion Passing 19mm sieve	Pass.9.4 sieve %							
	Pass.4.75 sieve%							
	Pass.2.36 sieve%	100	98					
"	Pass. No 425μ %	98	92					
	Pass. No 75μ %	74	64					
	Less Than 13.5μ%	55	49					
On pre-dried portion passing No 425μ	LIQUID LIMIT	59	61					
	PLASTIC LIMIT	14	15					
"	PLASTICITY INDEX	45	46					
STANDARD PROCTOR COMPACTION	MAX. DRY DENSITY kg/m³							
	OPT.MOIST.CONT.%							
	C.B.R. AT O.M.C. %							
	FIELD MOISTURE CONTENT %	29.9	22.6					
CALCULATIONS								
RATIOS	R							
	A	98	94					
	B	75	70					
	C	75	76					
LAB ESTIMATED C.B.R.		2.5	3					
GRADING RULE EFFECTIVE COVER								
S.M.R. RULE EFFECTIVE COVER								
MINIMUM COVER NEEDED								

REMARKS Field book 35

*(Presence of micaceous or porous particles, organic matter, flocculated clay, etc. to be noted).

MATERIALS TECHNICIAN: [signature] DATE: 14/6/89

E80

W3249

E.PRT/GP

10th February 1984

CENTRAL DIVISION ENGINEER - Mr J Rallings

IN-SITU DENSITY TESTS - AUBURN STREET/BURELLI STREET
WOLLONGONG ROUNDABOUT

In-situ density tests were carried out at the above location on the 8th February 1984 and the results are listed below for your information.

Sample No	Location	Dry Density	% Standard Density
T1 - 50mm	Triangular median on	2219	103.2
- 100mm	Auburn Street	2181	101.5
- 150mm		2144	99.7
- 200mm		2110	98.1
- 250mm		2120	98.6
T2 - 50mm	Opposite ELP 1, 2½m from	2341	108.9
- 100mm	roundabout	2347	109.2
- 150mm		2323	108.1
- 200mm		2283	106.2
- 250mm		2235	104.0
T3 - 50mm	Stop sign near access road	2415	112.3
- 100mm	to Lowden Square, 3m from	2360	109.8
- 150mm	existing kerb and gutter	2305	107.2
- 200mm		2257	105.0
- 250mm		2232	103.8
T4 - 50mm	Opposite end of Waters	2288	106.4
- 100mm	building, start of Station	2300	107.0
- 150mm	Street, 2m to asphaltic	2253	104.8
- 200mm	concrete	2197	102.2
- 250mm		2199	102.3

P TOBIN
Materials Engineer

WOLLONGONG CITY COUNCIL

DENSE GRADED PAVEMENT MATERIAL

LAB. NO. W3270

WORK: Auburn St. Wollongong

FILE NO.

NO. OF SAMPLES 1 | DATE RECEIVED | SUBMITTED BY GC

NAME OF QUARRY 21 Dump | ROCK TYPE Slag | PROPOSED USE Roadbase

SUPPLIER BMG | QUANTITY REPRESENTED | CLASS DGB20

TEST DETAILS	SPECIFICATION LIMITS Class DGB 20	Class DGS 20	Class DGS 40	SAMPLE NUMBER				
Chainage (for Samples ex road)								
Pass 53.0 mm sieve %	-	-	100					
Pass 37 5 mm sieve %	-	-	95 - 100					
Pass 26.5 mm sieve %	100	100	70 - 90					
Pass 19.0 mm sieve %	95 100	95 - 100	60 - 85	87				
Pass 13.2 mm sieve %	75 90	70 - 90	50 - 75	78				
Pass 6 70 mm sieve %	55 75	50 - 75	35 - 60	63				
Pass 2.36 mm sieve %	35 55	30 - 55	25 - 60	49				
Pass 425 µm sieve %	-	-	-	26				
Pass 75 µm sieve %		-	-	11				
Less than 13.5 µm %		-	-	5				
RATIOS A %	40 - 60	38 - 62	38 - 62	53				
RATIOS B %	40 - 60	38 - 62	38 - 62	42				
RATIOS C %	40 - 60	38 - 62	38 - 62	42				
LOWER LIQUID LIMIT %	20 (max.)	23 (max.)	23 (max.)	16				
LOWER PLASTIC LIMIT %	20 (max)	20 (max.)	20 (max.)	—				
PLASTICITY INDEX	6 (max.)	12 (max.)	12 (max.)	N.P				
M.D.C.S. (MPa)	1.7 (min.)	1.0 (min.)	1.0 (min.)					
PARTICLE SHAPE, 2:1 RATIO (% MISSHAPEN)	35 (max.)	40 (max.)	40 (max.)					
Aggregate Dry Strength (kN) / Aggregate Wet Strength (kN) / Ten Per Cent Fines Value (% variation) Ø	- / 100 (min) / 35 (max.)	- / 100 (min) / 35 (max.)	- / 100 (min) / 35 (max.)					
MAX. DRY DENSITY kg/m³								
O.M.C. %								

REMARKS: Conforms to Specification. W. 3/3/84

Signature [signature] Date 6/3/84

Appendix E: TfNSW Construction Noise Estimator Tool Results

Measure	Monday to Friday	Saturdays	Sunday / Public Holidays
Standard Hours	7am - 6pm	8am – 1pm	-
Out of Hours Day	-	7am – 8am 1pm – 6pm	8am – 6pm
Out of Hours Evening	6pm – 10pm	6pm – 10pm	6pm – 10pm
Out of Hours Night	10pm – 7am	10pm – 8am	6pm – 7am

Figure C-1 - Standard Project Working Hours

Transport Roads & Maritime Services

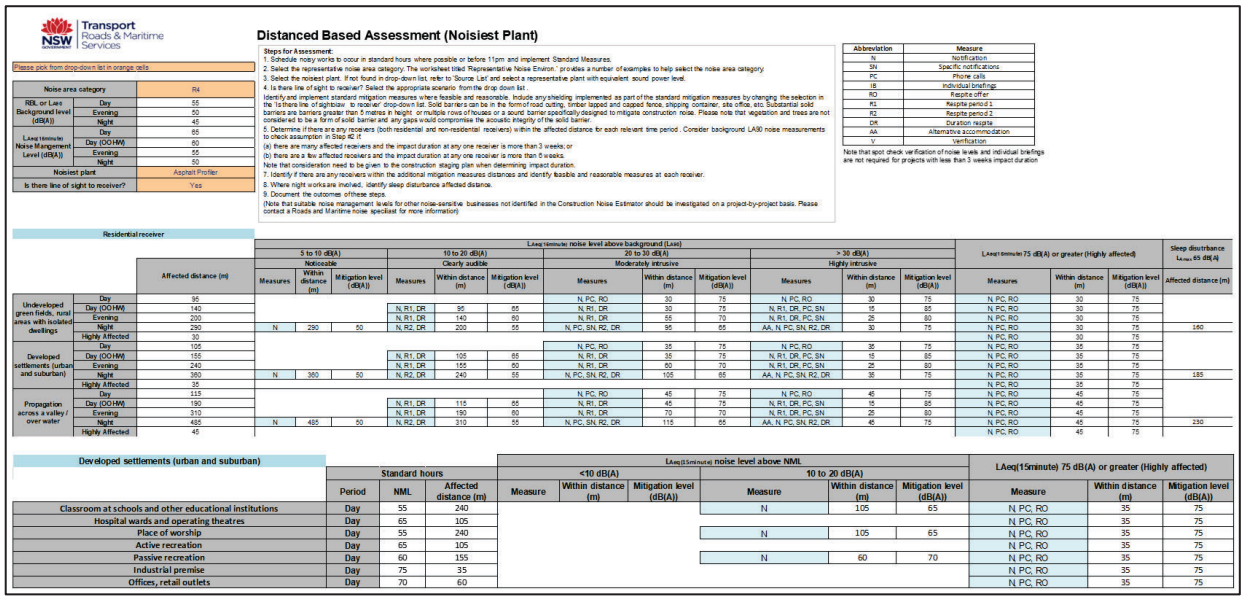
Please pick from drop-down list in orange cells

Noise area category		R4
RBL or L_{A90} Background level (dB(A))	Day	55
	Evening	50
	Night	45
$L_{Aeq(15minute)}$ Noise Mangement Level (dB(A))	Day	65
	Day (OOHW)	60
	Evening	55
	Night	50
Noisiest plant		Asphalt Profiler
Is there line of sight to receiver?		Yes

Figure C-2 - Construction Noise Estimator Parameters

Figure C-3 - LAeq Noise Level vs. Assessment

Figure C-4 - Noise Affected Radius (105m Day Works) – Asphalting



Transport Roads & Maritime Services

Distanced Based Assessment (Noisiest Plant)

Please pick from drop-down list in orange cells

Noise area category		R4
RBL or Laeq Background level (dB(A))	Day	55
	Evening	50
	Night	45
Laeq(15minute) Noise Mangement Level (dB(A))	Day	65
	Day (OOHW)	60
	Evening	55
	Night	50
Noisiest plant		Asphalt Profiler
Is there line of sight to receiver?		Yes

Steps for Assessment:
1. Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
2. Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
3. Select the noisiest plant. If not found in drop-down list, refer to 'Source List' and select a representative plant with equivalent sound power level.
4. Is there line of sight to receiver? Select the appropriate scenario from the drop down list.
Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight/view' to receiver' drop-down list. Solid barriers can be in the form of road cutting, timber lapped and capped fence, shipping container, site office, etc. Substantial solid barriers are barriers greater than 5 metres in height or multiple rows of houses or a sound barrier specifically designed to mitigate construction noise. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.
5. Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period. Consider background LA90 noise measurements to check assumption in Step #2 if:
(a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or
(b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.
Note that consideration need to be given to the construction staging plan when determining impact duration.
7. Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver.
8. Where night works are involved, identify sleep disturbance affected distance.
9. Document the outcomes of these steps.
(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction Noise Estimator should be investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Residential receiver

		Affected distance (m)	LAeq(15minute) noise level above background (Lase): 5 to 10 dB(A) Noticeable – Measures	Within distance (m)	Mitigation level (dB(A))	10 to 20 dB(A) Clearly audible – Measures	Within distance (m)	Mitigation level (dB(A))	20 to 30 dB(A) Moderately intrusive – Measures	Within distance (m)	Mitigation level (dB(A))	> 30 dB(A) Highly intrusive – Measures	Within distance (m)	Mitigation level (dB(A))	LAeq(15minute) 75 dB(A) or greater (Highly affected) – Measures	Within distance (m)	Mitigation level (dB(A))	Sleep disturbance Lamax 65 dB(A) – Affected distance (m)
Undeveloped green fields, rural areas with isolated dwellings	Day	95							N, PC, RO	30	75	N, PC, RO	30	75	N, PC, RO	30	75	
	Day (OOHW)	140				N, R1, DR	95	65	N, R1, DR	30	75	N, R1, DR, PC, SN	15	85	N, PC, RO	30	75	
	Evening	200				N, R1, DR	140	60	N, R1, DR	55	70	N, R1, DR, PC, SN	25	80	N, PC, RO	30	75	
	Night	290	N	290	50	N, R2, DR	200	55	N, PC, SN, R2, DR	95	65	AA, N, PC, SN, R2, DR	30	75	N, PC, RO	30	75	160
	Highly Affected	30													N, PC, RO	30	75	
Developed settlements (urban and suburban)	Day	105							N, PC, RO	35	75	N, PC, RO	35	75	N, PC, RO	35	75	
	Day (OOHW)	155				N, R1, DR	105	65	N, R1, DR	35	75	N, R1, DR, PC, SN	15	85	N, PC, RO	35	75	
	Evening	240				N, R1, DR	155	60	N, R1, DR	60	70	N, R1, DR, PC, SN	25	80	N, PC, RO	35	75	
	Night	360	N	360	50	N, R2, DR	240	55	N, PC, SN, R2, DR	105	65	AA, N, PC, SN, R2, DR	35	75	N, PC, RO	35	75	185
	Highly Affected	35													N, PC, RO	35	75	
Propagation across a valley / over water	Day	115							N, PC, RO	45	75	N, PC, RO	45	75	N, PC, RO	45	75	
	Day (OOHW)	190				N, R1, DR	115	65	N, R1, DR	45	75	N, R1, DR, PC, SN	15	85	N, PC, RO	45	75	
	Evening	310				N, R1, DR	190	60	N, R1, DR	70	70	N, R1, DR, PC, SN	25	80	N, PC, RO	45	75	
	Night	485	N	485	50	N, R2, DR	310	55	N, PC, SN, R2, DR	115	65	AA, N, PC, SN, R2, DR	45	75	N, PC, RO	45	75	230
	Highly Affected	45													N, PC, RO	45	75	

Developed settlements (urban and suburban)

	Standard hours – Period	NML	Affected distance (m)	LAeq(15minute) noise level above NML: <10 dB(A) – Measure	Within distance (m)	Mitigation level (dB(A))	10 to 20 dB(A) – Measure	Within distance (m)	Mitigation level (dB(A))	LAeq(15minute) 75 dB(A) or greater (Highly affected) – Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	240				N	105	65	N, PC, RO	35	75
Hospital wards and operating theatres	Day	65	105							N, PC, RO	35	75
Place of worship	Day	55	240				N	105	65	N, PC, RO	35	75
Active recreation	Day	65	105							N, PC, RO	35	75
Passive recreation	Day	60	155				N	60	70	N, PC, RO	35	75
Industrial premise	Day	75	35							N, PC, RO	35	75
Offices, retail outlets	Day	70	60							N, PC, RO	35	75

Figure C-5 - Construction Noise Assessment Results (Asphalt Profiler)

Appendix F – Operational Noise Assessment

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

WOLLONGONG BUS LAYOVER RELOCATION

Operational Noise Assessment

23 June 2025

Transport for NSW

TP235-01F01 Report (r4)

40 YEARS 1982-2022 ACOUSTIC ENGINEERING EXCELLENCE

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Association of Australian Acoustical Consultants

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1 Introduction

Renzo Tonin & Associates was engaged by Transport for NSW (TfNSW) to conduct an environment noise assessment for the proposed relocation of the existing bus layover facility currently located on Marine Drive, Lang Park in Wollongong to the proposed Atchinson Street / Auburn Street carpark in Wollongong. The relocated facility will consist of 11 bus bays and a dedicated driver's amenity building. More specifically, this report quantifies the noise impact associated with the proposed operations of the relocated facility during operating hours and assesses the potential noise impact on nearby noise sensitive receivers.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project description

2.1 Background information

The relocated bus layover facility will comprise of 11 parallel parking spaces and dedicated driver's amenity building (recreation and toilet facilities). It will also consist of two entry driveways from Auburn Street and two corresponding exiting driveways onto Atchison Street. Two one-way aisles will connect both the entry and exiting driveways. The following are the proposed hours of operation.

- Monday to Friday – 6:00am to 10:30pm
- Saturday – 7:00am to 11:30pm
- Sunday – 7:00am to 10:00pm

2.2 Noise sensitive receivers

The nearest affected sensitive receivers were identified during a site inspection and details are as follows.

Table 2-1 – Noise sensitive receivers

Receiver ID	Receiver Type	Details
R1	Commercial	**4 Auburn Street, Wollongong** Commercial receiver location approximately 15m west of the subject site and across Auburn Street
R2	Commercial	**6 Auburn Street, Wollongong** Commercial receiver location approximately 15m west of the subject site and across Auburn Street
R3	Commercial	**8 Auburn Street, Wollongong** Commercial receiver location approximately 15m west of the subject site and across Auburn Street
R4	Commercial	**13 Auburn Street, Wollongong** First floor commercial receiver location to the south and adjacent to the subject site.
R5A	Commercial	**20 Atchison Street, Wollongong** First floor commercial receiver location (northern facade) of the two storey commercial property located to the south and adjacent to the subject site
R5B	Commercial	**20 Atchison Street, Wollongong** First floor commercial receiver location (eastern facade) of the two storey commercial property located to the south and adjacent to the subject site
R6	Commercial	**25 Atchison Street, Wollongong** First floor commercial receiver location approximately 17m southeast of the subject site and across Atchison Street.
R7	Residential	**19 Atchison Street, Wollongong** First floor residential receiver location approximately 17m east of the subject site and across Atchison Street.

Receiver ID	Receiver Type	Details
R8	Residential	**11 Atchison Street, Wollongong** First floor residential receiver location approximately 20m east of the subject site and across Atchison Street.
R9	Commercial	**10 Atchison Street, Wollongong** First floor commercial receiver location to the north and adjacent to the subject site.
R10	Residential	**14-18 Auburn Street, Wollongong** Ninth floor residential receiver location approximately 57m southwest of the subject site and across Auburn Street.

Figure 1 below shows the site, surrounds and the nominated receivers.

Figure 2-1 – Site, surrounds and receiver & monitoring locations

2.3 Hours of operation

The facility is proposed to have the following hours of operation.

- Monday to Friday – 6:00am to 10:30pm
- Saturday – 7:00am to 11:30pm
- Sunday – 7:00am to 10:00pm

2.4 Noise issues

The facility's operation will mostly involve the movement of buses into and out of the site as well as the parking of buses whilst the bus drivers access the amenity building. It is anticipated that the bus layover facility will be at full capacity during the daytime and evening periods and at limited capacity during the night and morning shoulder periods. It is expected that the earliest buses will arrive at 6am and the latest leaving at approximately 11:17pm.

Based on the current operations and activities at the existing facility at Marine Drive, noise from the relocated bus layover facility will essentially emanate from the following main noise sources.

- Operational noise from on-site activities, including:
  - Intermittent noise from buses including bus startups and air releases whilst idle
  - Noise generated by bus movements entering and exiting the bus layover facility and in and out of parking bays
  - Continuous noise from buses while idling within the allocated parking bays.
- Road traffic noise from additional bus movements associated with the facility travelling on public roads (namely Auburn Street and Atchison Street).

It is noted that due to the design of the relocated bus layover facility, buses will only move in a forward direction, eliminating the need to conduct any reversing manoeuvres.

3 Existing acoustic environment

Criteria for the assessment of operational noise are usually derived from the existing noise environment of an area, excluding noise from the subject development.

Fact Sheet B of the NSW EPA '*Noise Policy for Industry*' (NPfI) outlines two methods for determining the background noise level of an area, being 'B1 – Determining background noise using long term noise measurements' and 'B2 – Determining background noise using short-term noise measurements. This assessment has used short term noise measurements.

As the noise environment of an area almost always varies over time, background and ambient noise levels need to be determined for the operational times of the proposed development. For example, in a suburban or urban area the noise environment is typically at its minimum at 3am and at its maximum during the morning and afternoon traffic peak hours. The NPfI outlines the following standard time periods over which the background and ambient noise levels are to be determined.

- **Day:** 7am to 6pm Monday to Saturday and 8am to 6pm Sundays & Public Holidays
- **Evening:** 6pm to 10pm Monday to Sunday & Public Holidays
- **Night:** 10pm to 7am Monday to Saturday and 10pm to 8am Sundays & Public Holidays

Due to the earliest buses arriving at the facility at 6:00am, the morning shoulder period from 6:00am to 7:00am will be assessed herein. This is due to it being unreasonable to assess against the night time criterion for the morning shoulder period as existing background levels are expected to be steadily rising in these early morning hours as described in the NPfI. Therefore, for assessment purposes the shoulder period is defined as:

- **Shoulder:** 6am to 7am Monday to Sunday & Public Holidays

3.1 Noise monitoring locations

Noise measurements are ideally carried out at the nearest or most potentially affected residential locations surrounding a development. Alternatively, representative locations should be established in the case of access restrictions, or a safe and secure location cannot be identified. Furthermore, representative locations may be established in the case of multiple residential receivers as it is usually impractical to carry out measurements at all locations surrounding a site. As stated earlier, noise monitoring was conducted to establish background and ambient noise levels.

The unattended noise monitoring location is presented in Table 3-1 and shown in Figure 2-1.

Table 3-1 – Noise monitoring location

ID	Location	Description
L1	19 Atchison Street, Wollongong	The noise monitor was located on the first floor balcony facing Atchison Street. The noise monitoring location is considered representative of the nearest affected residential receiver locations.

3.2 Noise monitoring results

Long term unattended noise monitoring was conducted from Wednesday 20th November to Wednesday 4th December 2024. The results of the long term monitoring were analysed and noise level-vs-time graphs of the data were developed and are included in Appendix B.

Table 3-2 presents the overall single Rating Background Levels (RBL) and representative ambient L_{eq} noise levels for each assessment period, determined in accordance with the NPfI.

Table 3-2 – Long-term noise monitoring results, dB(A)

Monitoring Location	L_{A90} Rating Background Noise Level (RBL)				L_{Aeq} Ambient Noise Levels[1]			
	Shoulder[2]	Day	Evening	Night	Shoulder[2]	Day	Evening	Night
L1 – 19 Atchison Street	44	49	46	43	58	60	56	54

Notes: 1. As required by the NPfI, the external ambient noise levels presented are free-field noise levels. (ie. no facade reflection)
2. Shoulder represents the period from 6am to 7am

4 Noise criteria

Operational noise impact is assessed in accordance with the NSW 'Noise Policy for Industry' (NPfI, 2017). The assessment procedure in the NPfI has two components:

- Controlling intrusive noise impacts in the short-term for residences
- Maintaining noise level amenity for residences and other land uses.

In accordance with the NPfI, noise impact should be assessed against the project noise trigger level which is the lower value of the project intrusiveness noise levels and project amenity noise levels.

4.1 Project intrusive noise levels

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A). The project intrusiveness noise level, which is only applicable to residential receivers, is determined as follows:

- $L_{Aeq,15minute}$ **Intrusiveness noise level = Rating Background Level ('RBL') plus 5dB(A)**

Based on the above and the measured L_{A90} background noise level as presented in Table 3-2, the intrusive noise level for the nominated residential receivers are presented in Table 4-1.

Table 4-1 – Intrusive noise levels for residential receivers, dB(A)

Receiver Location	Applicable Intrusive Noise Level			
	Shoulder	Day	Evening	Night
Receiver R7 – 19 Atchison Street	44 + 5 = **49**	49 + 5 = **54**	46 + 5 = **51**	43 + 5 = **48**
Receiver R8 – 11 Atchison Street				
Receiver R10 – 14-18 Auburn Street				

Notes: 1. Based on measured L_{A90} background noise level presented in Table 3-2

4.2 Amenity noise levels

The project amenity noise levels for different time periods of the day are determined in accordance with Section 2.4 of the NPfI. The NPfI recommends amenity noise levels ($L_{Aeq,period}$) for various receivers including residential, commercial and industrial receivers and sensitive receivers such as schools, hotels, hospitals, churches and parks. These "recommended amenity noise levels" represent the objective for total industrial noise experienced at a receiver location. However, when assessing a single industrial development and its impact on an area, "project amenity noise levels" apply.

The recommended amenity noise levels applicable for the subject area are reproduced in Table 4-2 below.

It is noted that the residential receivers R7, R8 and R10 are located within an urban area.

Table 4-2 – Project amenity noise levels

Type of Receiver	Noise Amenity Area	Time of Day	Recommended amenity noise level, L_{Aeq}, dB(A)
Residential	Urban	Day	60
		Evening	50
		Night	45
Commercial premises	All	When in use	65

Notes: 1. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

2. The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration.

To ensure that the total industrial noise level (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level that applies for each new industrial noise source is determined as follows.

$L_{Aeq,period}$ Project amenity noise level = $L_{Aeq,period}$ Recommended amenity noise level – 5dB(A)

Furthermore, given that the intrusiveness noise level is based on a 15 minute assessment period and the project amenity noise level is based on day, evening and night assessment periods, the NPfI provides the following guidance on adjusting the $L_{Aeq,period}$ level to a representative $L_{Aeq,15minute}$ level in order to standardise the time periods.

$$L_{Aeq,15minute} = L_{Aeq,period} + 3dB(A)$$

The project amenity noise levels ($L_{Aeq,\ 15min}$) applied for this project are reproduced in Table 4-3 below, based on a 'urban' noise amenity area.

Table 4-3 – Project amenity noise levels

Type of Receiver	Noise Amenity Area	Time of Day	Project Amenity Noise Level, dB(A)	
			$L_{Aeq,\ Period}$[1]	$L_{Aeq,\ 15min}$
Residence	Urban	Day	60 – 5 = 55	55 + 3 = **58**
		Evening	50 – 5 = 45	45 + 3 = **48**
		Night	45 – 5 = 40	40 + 3 = **43**
Commercial premises	All	When in use	65 – 5 = 60	60 + 3 = **63**

Notes: 1. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

4.3 Project noise trigger levels

In accordance with the NPfI the project noise trigger levels (PNTLs), which are the lower (i.e. more stringent) value of the project intrusiveness noise level and project amenity noise level, have been determined as shown in Table 4-4 below.

Table 4-4 – Applicable project noise trigger levels, dB(A)

		Applicable Noise Criteria			
		Shoulder	Day	Evening	Night
Receiver R1 – 4 Auburn Street	Commercial	63[1]	63[1]	63[1]	63[1]
Receiver R2 – 6 Auburn Street	Commercial	63[1]	63[1]	63[1]	63[1]
Receiver R3 – 8 Auburn Street	Commercial	63[1]	63[1]	63[1]	63[1]
Receiver R4 – 13 Auburn Street	Commercial	63[1]	63[1]	63[1]	63[1]
Receiver R5A – 20 Atchison Street	Commercial	63[1]	63[1]	63[1]	63[1]
Receiver R5B – 20 Atchison Street	Commercial	63[1]	63[1]	63[1]	63[1]
Receiver R6 – 25 Atchison Street	Commercial	63[1]	63[1]	63[1]	63[1]
Receiver R7 – 19 Atchison Street	Residential	49[2]	54[2]	48[3]	43[3]
Receiver R8 – 11 Atchison Street	Residential	49[2]	54[2]	48[3]	43[3]
Receiver R9 – 10 Atchison Street	Commercial	63[1]	63[1]	63[1]	63[1]
Receiver R10 – 14-18 Auburn Street	Residential	49[2]	54[2]	48[3]	43[3]

Notes:
1. Project noise trigger levels are based on the commercial amenity level as it is a commercial premises
2. Project noise trigger levels are based on the intrusive noise levels as they are the more stringent trigger levels
3. Project noise trigger levels are based on the project amenity noise levels as they are the more stringent trigger levels.

4.4 Sleep disturbance noise levels

Given that the proposed operating hours fall within the night time period (ie. 10:00pm to 7:00am) and the morning shoulder period (ie. 6:00am to 7:00am), the potential for sleep disturbance from maximum noise level events from the facility during the night time period needs to be considered. In accordance with the NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development's night time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or
- L_{AFmax} 52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

The sleep disturbance noise levels for the nominated residential receivers (R7, R8 and R10) are presented in Table 4-5.

Table 4-5 – Sleep disturbance assessment levels, dB(A)

Receiver Type	Assessment Level $L_{Aeq,15min}$	Assessment Level L_{AFmax}
Night Period		
Residential Receivers (R7, R8 and R10)	43 + 5 = **48**	43+ 15 = **58**
Morning Shoulder Period		
Residential Receivers (R7, R8 and R10)	44 + 5 = **49**	44+ 15 = **59**

Notes: 1. Based on established RBL for the night period as presented in Table 3-2

5 Noise sources

Attended noise measurements within the existing bus layover facility located at Marine Drive, Lang Park in Wollongong were conducted on Wednesday 20th November 2024 to determine the noise levels of the activities associated with the facility. Noise sources at the existing facility were mainly due to noise from bus movements, air releases, engine startups and idling.

As discussed previously, due to the design of the relocated bus layover facility, buses would only move in a forward direction. Therefore, reversing alarms are not considered as a noise source for the relocated facility.

Sound power levels for the bus activities are based on the noise measurements undertaken at the existing facility and are presented in Table 5-1.

Table 5-1 – Bus activity L_{Aeq} sound power levels

Activity	L_{Aeq} Sound Power Level, dB(A) re.1pW
Bus Idle	103
Bus Air Release	111
Bus Startup	108
Bus Movement (10km/h)	104

The measured maximum sound power levels for the bus activities based on the noise measurements undertaken and used for the sleep disturbance assessment are presented in Table 5-2

Table 5-2 – L_{AFmax} sound power levels

Activity	L_{AFmax} Sound Power Level, dB(A) re.1pW
Bus Idle	108
Bus Air Release	114
Bus Startup	112

6 Meteorological conditions

In accordance with the NPfI, the noise assessment is required to consider the effects of noise enhancing meteorological conditions such as wind and temperature inversions. The NPfI recommends that project noise criteria are to apply under weather conditions characteristic of an area. These may include standard meteorological conditions and noise enhancing meteorological conditions (ie. winds and temperature inversions). In this regard, the increase in noise that results from atmospheric temperature inversions and winds may need to be assessed. The noise levels predicted under characteristic meteorological conditions for each receiver are then compared with the noise limits, to establish whether the meteorological effects will cause a significant impact.

The NPfI permits two approaches for assessing these effects, either use of default parameters or use of site-specific parameters. For a conservative noise assessment, the NPfI's default parameters were used to provide a conservative assessment under noise-enhancing conditions. This approach assumes that meteorological effects are conservative, in that it is likely to predict the upper range of increases in noise levels. Actual noise levels may therefore be less than predicted.

Noise modelling has considered prevailing temperature inversions and prevailing winds implementing the noise enhancing meteorological conditions presented in NPfI Fact Sheet D. In accordance with Table D1 of the NPfI, the following default parameters are recommended when modelling under meteorological conditions.

It is noted that the assessment of noise impacts during temperature inversions is only applicable for the night period (ie. 10pm to 7am) when inversions occur. Hence, temperature inversion will also be assessed during the morning shoulder period.

Table 6-1 – Default parameters for meteorological conditions

Meteorological conditions	Default parameters
Standard conditions	• Stability Category D • 0.5m/s wind speeds[1]
Noise-enhancing conditions	Wind • Stability Category D • 3m/s wind speeds[1]
	Temperature Inversions • Stability Category F • 2m/s wind speeds[1]

Notes: 1. All wind directions considered.

7 Predicted noise levels

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using CadnaA (version 2023) noise modelling computer program. The program calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction model takes into account:

- Location of noise sources and receiver locations
- Height of sources and receivers
- Separation distances between sources and receivers
- Ground type between sources and receivers
- Attenuation from barriers (natural and purpose built).

7.1 Operational noise

Noise levels were modelled based on observations during the noise measurements on site and discussions with Transport for NSW on predicted bus movements within the relocated facility. Furthermore, the following worst case scenario has been assumed for the operation of the proposed relocated bus layover facility during the proposed hours of operation.

Table 7-1 – Worst case scenario assumptions

Time of Day	Worst Case Scenario Assumptions
Morning Shoulder (6:00am to 7:00am)	• 11 buses enter and exit in a 15 minute period • 11 out of 11 parking spaces occupied for whole 15 minute period with buses idling in each parking space for 7 minutes • 1 air release event every 5 minutes for each occupied parking space (based on observations at existing facility) • 1 bus startup for each occupied parking space
Day (7:00am to 6:00pm)	• 11 buses enter and exit in a 15 minute period • 11 out of 11 parking spaces occupied for whole 15 minute period with buses idling in each parking space for 7 minutes • 1 air release event every 5 minutes for each occupied parking space (based on observations at existing facility) • 1 bus startup for each occupied parking space
Evening (6:00pm to 10:00pm)	• 11 buses enter and exit in a 15 minute period • 11 out of 11 parking spaces occupied for whole 15 minute period with buses idling in each parking space for 7 minutes • 1 air release event every 5 minutes for each occupied parking space (based on observations at existing facility) • 1 bus startup for each occupied parking space

Time of Day	Worst Case Scenario Assumptions
Night (10:00pm to 7:00am)	• 5 buses enter and exit in a 15 minute period • 5 out of 11 parking spaces occupied for whole 15 minute period with buses idling in each parking space for 7 minutes • 1 air release event every 5 minutes for each occupied parking space (based on observations at existing facility) • 1 bus startup for each occupied parking space

7.1.1 Predicted noise levels – standard conditions

Based on the measured source noise levels and the above assumptions, Table 7-2 below presents the predicted operational noise levels during standard meteorological conditions at the nearest affected receivers, assessed against the project noise trigger levels.

Table 7-2 – Predicted $L_{Aeq(15min)}$ operational noise levels during standard conditions, dB(A)

Scenario	Predicted $L_{Aeq(15min)}$ Noise Levels										
	R1	R2	R3	R4	R5A	R5B	R6	R7	R8	R9	R10
Morning Shoulder – Standard Conditions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*49*	*49*	*63*	*49*
Predicted	60	60	60	**66**	63	55	58	**56**	**55**	61	**51**
Complies? (Y/N)	Yes	Yes	Yes	**NO**	Yes	Yes	Yes	**NO**	**NO**	Yes	**NO**
Day – Standard Conditions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*54*	*54*	*63*	*54*
Predicted	60	60	60	**66**	63	55	58	**56**	**55**	61	51
Complies? (Y/N)	Yes	Yes	Yes	**NO**	Yes	Yes	Yes	**NO**	**NO**	Yes	Yes
Evening – Standard Conditions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*48*	*48*	*63*	*48*
Predicted	60	60	60	**66**	63	55	58	**56**	**55**	61	**51**
Complies? (Y/N)	Yes	Yes	Yes	**NO**	Yes	Yes	Yes	**NO**	**NO**	Yes	**NO**
Night – Standard Conditions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*43*	*43*	*63*	*43*
Predicted	56	56	55	57	62	52	55	**53**	**51**	56	**48**
Complies? (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**NO**	**NO**	Yes	**NO**

Notes: 1. **Bold** font represents exceedance of the project noise trigger level

The results in the above table indicate that the noise impact from the relocated facility is predicted to exceed the PNTLs at Receivers R4, R7, R8, and R10 during standard meteorological conditions.

Therefore, further noise mitigation measures would be required to reduce noise impacts to acceptable levels.

7.1.2 Predicted noise levels – adverse wind conditions

Based on the noise measurements and the above assumptions, Table 7-3 below presents the predicted operational noise levels during noise enhancing wind conditions at the nearest affected receivers, assessed against the project noise trigger levels.

Table 7-3 – Predicted $L_{Aeq(15min)}$ operational noise levels during adverse wind conditions, dB(A)

Scenario	Predicted $L_{Aeq(15min)}$ Noise Levels										
	R1	R2	R3	R4	R5A	R5B	R6	R7	R8	R9	R10
Morning Shoulder – Noise enhancing wind conditions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*49*	*49*	*63*	*49*
Predicted	60	60	60	**66**	63	55	58	**56**	**55**	61	**52**
Complies? (Y/N)	Yes	Yes	Yes	**NO**	Yes	Yes	Yes	**NO**	**NO**	Yes	**NO**
Day – Noise enhancing wind conditions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*54*	*54*	*63*	*54*
Predicted	60	60	60	**66**	63	55	58	**56**	**55**	61	52
Complies? (Y/N)	Yes	Yes	Yes	**NO**	Yes	Yes	Yes	**NO**	**NO**	Yes	Yes
Evening – Noise enhancing wind conditions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*48*	*48*	*63*	*48*
Predicted	60	60	60	**66**	63	55	58	**56**	**55**	61	**52**
Complies? (Y/N)	Yes	Yes	Yes	**NO**	Yes	Yes	Yes	**NO**	**NO**	Yes	**NO**
Night – Noise enhancing wind conditions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*43*	*43*	*63*	*43*
Predicted	56	57	56	57	62	52	55	**54**	**52**	56	**49**
Complies? (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**NO**	**NO**	Yes	**NO**

Notes: 1. **Bold** font represents exceedance of the project noise trigger level

The results in the above table indicate that the noise impact from the relocated facility is predicted to exceed the PNTLs at Receivers R4, R7, R8 and R10 during adverse wind conditions.

Therefore, further noise mitigation measures would be required to reduce noise impacts to acceptable levels.

7.1.3 Predicted noise levels – temperature inversions

As discussed previously, the assessment of noise impacts during temperature inversion conditions are only applicable during the night time and morning shoulder periods when inversions occur. Table 7-4 below presents the predicted night time and morning shoulder operational noise levels during temperature inversions at the nearest affected receivers and are assessed against the project noise trigger levels.

Table 7-4 – Predicted $L_{Aeq(15min)}$ operational noise levels during temperature inversions, dB(A)

Scenario	Predicted $L_{Aeq(15min)}$ Noise Levels										
	R1	R2	R3	R4	R5A	R5B	R6	R7	R8	R9	R10
Morning Shoulder – Noise enhancing temperature inversions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*49*	*49*	*63*	*49*
Predicted	60	60	60	**66**	63	55	58	**56**	**55**	61	**52**
Complies? (Y/N)	Yes	Yes	Yes	**NO**	Yes	Yes	Yes	**NO**	**NO**	Yes	**NO**
Night – Noise enhancing temperature inversions											
PNTLs	*63*	*63*	*63*	*63*	*63*	*63*	*63*	*43*	*43*	*63*	*43*
Predicted	56	57	56	57	62	52	55	**54**	**52**	56	**49**
Complies? (Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**NO**	**NO**	Yes	**NO**

Notes: 1. **Bold** font represents exceedance of the project noise trigger level

The results in the above table indicate that the noise impact from the relocated facility is predicted to exceed the PNTLs at Receivers R4, R7, R8 and R10 during temperature inversion conditions.

Therefore, further noise mitigation measures would be required to reduce noise impacts to acceptable levels.

7.2 Predicted sleep disturbance noise levels

7.2.1 Predicted $L_{Aeq(15min)}$ noise levels

Sleep disturbance $L_{Aeq(15min)}$ noise levels will be similar to the night time period results presented in Section 7.1 under all three meteorological conditions due to the same bus activities occurring. Therefore, Table 7-5 presents the predicted $L_{Aeq(15min)}$ noise levels at the nearest affected residential receivers during the night time period for the assessment of sleep disturbance.

Table 7-5 – Predicted night time $L_{Aeq(15min)}$ noise levels for sleep disturbance assessment, dB(A)

Scenario	Predicted $L_{Aeq(15min)}$ Noise Levels		
	R7	R8	R10
Night – Standard conditions			
Sleep disturbance assessment levels	*48*	*48*	*48*
Predicted	**53**	**51**	48
Complies? (Y/N)	**NO**	**NO**	Yes
Night – Noise enhancing wind conditions			
Sleep disturbance assessment levels	*48*	*48*	*48*
Predicted	**54**	**52**	**49**
Complies? (Y/N)	**NO**	**NO**	**NO**

Scenario	Predicted $L_{Aeq(15min)}$ Noise Levels		
	R7	R8	R10
Night – Noise enhancing temperature inversions			
Sleep disturbance assessment levels	*48*	*48*	*48*
Predicted	**54**	**52**	**49**
Complies? (Y/N)	**NO**	**NO**	**NO**

Notes: 1. Residential receivers only assessed
2. **Bold** font represents exceedance of the project noise trigger level

The results presented in the above table shows that the $L_{Aeq(15min)}$ noise levels from the facility during the night period would not comply with the nominated $L_{Aeq(15min)}$ sleep disturbance assessment levels at all residential receivers during all meteorological conditions. Therefore, further noise mitigation measures would be considered to reduce noise impacts to acceptable levels.

Table 7-5 presents the predicted $L_{Aeq(15min)}$ noise levels at the nearest affected residential receivers during the morning shoulder period for the assessment of sleep disturbance.

Table 7-6 – Predicted morning shoulder $L_{Aeq(15min)}$ noise levels for sleep disturbance assessment, dB(A)

Scenario	Predicted $L_{Aeq(15min)}$ Noise Levels		
	R7	R8	R10
Morning Shoulder – Standard conditions			
Sleep disturbance assessment levels	*49*	*49*	*49*
Predicted	**56**	**55**	**51**
Complies? (Y/N)	**NO**	**NO**	**NO**
Morning Shoulder – Noise enhancing wind conditions			
Sleep disturbance assessment levels	*49*	*49*	*49*
Predicted	**56**	**56**	**52**
Complies? (Y/N)	**NO**	**NO**	**NO**
Morning Shoulder – Noise enhancing temperature inversions			
Sleep disturbance assessment levels	*49*	*49*	*49*
Predicted	**56**	**56**	**52**
Complies? (Y/N)	**NO**	**NO**	**No**

Notes: 1. Residential receivers only assessed
2. **Bold** font represents exceedance of the project noise trigger level

The results presented in the above table shows that the $L_{Aeq(15min)}$ noise levels from the facility during the morning shoulder period would not comply with the nominated $L_{Aeq(15min)}$ sleep disturbance assessment levels at all the residential receivers during all meteorological conditions. Therefore, further noise mitigation measures would be considered to reduce noise impacts to acceptable levels.

7.2.2 Predicted L_{AFmax} noise levels

Table 7-7 below presents the predicted L_{Amax} noise levels at the nearest affected residential receivers during the night time period, for the assessment of sleep disturbance.

Table 7-7 – Predicted night time L_{Amax} noise levels for sleep disturbance assessment, dB(A)

Scenario	Predicted L_{Amax} Noise Levels		
	R7	R8	R10
Night – Standard conditions			
Sleep disturbance assessment levels	*58*	*58*	*58*
Predicted	**63**	**62**	55
Complies? (Y/N)	**NO**	**NO**	Yes
Night – Noise enhancing wind conditions			
Sleep disturbance assessment levels	*58*	*58*	*58*
Predicted	**63**	**62**	56
Complies? (Y/N)	**NO**	**NO**	Yes
Night – Noise enhancing temperature inversions			
Sleep disturbance assessment levels	*58*	*58*	*58*
Predicted	**63**	**62**	56
Complies? (Y/N)	**NO**	**NO**	Yes

Notes: 1. Residential receivers only assessed
2. **Bold** font represents exceedance of the project noise trigger level

The results presented in the above table shows that L_{Amax} noise levels from the facility during the night period would not comply with the nominated L_{Amax} sleep disturbance assessment levels at Receivers R7 and R8 during all meteorological conditions. Therefore, further noise mitigation measures would be considered to reduce noise impacts to acceptable levels.

Table 7-8 below presents the predicted L_{Amax} noise levels at the nearest affected residential receivers during the morning shoulder time period, for the assessment of sleep disturbance.

Table 7-8 – Predicted morning shoulder L_{Amax} noise levels for sleep disturbance assessment, dB(A)

Scenario	Predicted L_{Amax} Noise Levels		
	R7	R8	R10
Morning Shoulder – Standard conditions			
Sleep disturbance assessment levels	*59*	*59*	*59*
Predicted	**63**	**62**	55
Complies? (Y/N)	**NO**	**NO**	Yes
Morning Shoulder – Noise enhancing wind conditions			
Sleep disturbance assessment levels	*59*	*59*	*59*
Predicted	**63**	**62**	56
Complies? (Y/N)	**NO**	**NO**	Yes

Scenario	Predicted L_{Amax} Noise Levels		
	R7	R8	R10
Morning Shoulder – Noise enhancing temperature inversions			
Sleep disturbance assessment levels	*59*	*59*	*59*
Predicted	**63**	**62**	56
Complies? (Y/N)	**NO**	**NO**	Yes

Notes: 1. Residential receivers only assessed
2. **Bold** font represents exceedance of the project noise trigger level

The results presented in the above table shows that L_{Amax} noise levels from the facility during the morning shoulder period would not comply with the nominated L_{Amax} sleep disturbance assessment levels at Receivers R7 and R8 during all meteorological conditions. Therefore, further noise mitigation measures would be considered to reduce noise impacts to acceptable levels.

8 Noise mitigation and management measures

Due to noise exceedances predicted at the nominated receivers, feasible and reasonable noise mitigation and management measures have been considered to assist in reducing noise to compliant levels at the commercial and residential receivers.

Before committing to any form of construction or committing to any contractor, advice should be sought from an acoustic consultant to ensure that adequate provisions are made for any variations which may occur as a result of changes to the design.

8.1 Noise walls

A noise wall along the eastern boundary of the proposed bus layover site was considered as a noise mitigation measure to reduce noise impacts to the residential receivers R7 and R8. However, given that the egress driveways leading from the site onto Atchinson Street would require gaps in the noise wall, it was determined that a noise wall along the eastern boundary of the site would be ineffective based on an initial incomplete design assessment.

Furthermore, due to Receivers R7 and R8 being multi-storey residential properties (two to seven stories high), the height of the noise wall would need to be significant (> 8m) in order to be effective, making it visually unacceptable and structurally challenging. Therefore, noise walls were considered to not be a feasible or reasonable mitigation measure based on an initial incomplete design assessment. It was also identified that alternative options may provide some mitigation but would require further investigation.

8.2 On site management measures

Limiting and managing on site activities were also considered as a management measure to limit noise emissions from the proposed bus layover. Limiting buses to specific parking bays was not feasible and reasonable since it could not be properly implemented during operation.

Furthermore, limiting the bus access / egress numbers as well as space occupation was also considered in the initial assessment and was deemed feasible or reasonable. This included limiting the number of buses entering and exiting the facility to no more than eight (8) buses every 15 minutes during the evening period, three (3) buses every 15 minutes during the night period and 10 buses every 15 minutes for the entire operational hours. It is also noted that on occasions there may be higher bus movements (eg. service delays, special events); however, these are not expected to be common occurrences.

Additionally, limiting buses from idling whilst parked within the facility was also considered as a management measure. However, it is understood that this is not a feasible and reasonable option as buses are required to remain idling in order for them to meet their operational service requirements.

8.3 Property treatment

Property treatment was considered as a noise mitigation measure to reduce noise impacts to the residential receivers. In-principle property treatment for the impacted apartment dwellings may include the following:

- the installation of courtyard / balcony screen walls
- fresh air ventilation systems that draw air into a building, and meet Building Code of Australia requirements with the windows and doors shut
- Upgraded windows and glazing and solid core doors on the exposed facades
- Upgrading window and door seals
- Sealing ventilation openings in eaves and/or walls
- Roof insulation

The **feasibility** of providing property acoustic treatment to the apartment dwellings depends on it being practical and safe to install and maintain. For example, the installation of upgraded glazing to multi-level residential buildings may require safe access for installation from within the dwelling. Any requirement for external scaffolding and hoarding to access high treatment areas, or to protect pedestrians from falling objects, is likely to not be cost-effective. It would likely also not be feasible to install mechanical ventilation to a tenancy (which allows for its windows and doors to be kept closed) if there are no existing service ducts.

The **reasonableness** of providing property treatment involves assessing whether the overall noise benefit outweighs the cost of the treatment. For example, building element treatments are more effective when they are applied to masonry structures than lightly clad timber framed structures. Additionally, if the apartment dwelling already has sufficient glazing that would provide acoustic benefits, then the cost of replacing the glazing with slightly thicker glazing may only yield marginal noise reductions with no cost-effective benefit.

9 Road traffic noise assessment

Noise impact from the potential increase in traffic on Auburn Street and Atchison Street due to the bus layovers operation is assessed against the NSW 'Road Noise Policy' (RNP, 2011). The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for developments that are potentially affected by road traffic noise associated with the proposed relocated bus layover facility, with the aim of preserving the amenity appropriate to the land use.

9.1 Existing traffic volumes

A traffic count survey along Auburn Street and Atchison Street was undertaken previously by Wollongong City Council, between Tuesday 8th and Monday 14th November 2022. Results of the traffic count survey for the daytime and night time periods are reproduced in the table below.

Table 9-1 – Existing traffic volumes

Road	Direction	No. of Vehicle Movements			
		Daytime (7:00am to 10:00pm)		Nighttime (10:00pm to 7:00am)	
		Total	%HV	Total	%HV
Auburn Street	Northbound	1,966	9.6	170	8.5
	Southbound	1,283	12.4	164	12.6
Atchison Street	Northbound	675	5.5	45	4.8
	Southbound	1,411	5.3	102	4.5

Note: 1. %HV – Heavy vehicle percentage

9.2 Bus movements

Buses will enter the subject site via Auburn Street with buses then existing onto Atchison Street. Based on the information provided by Transport for NSW, the bus movements during the operation of the relocated facility are presented in the following table.

Table 9-2 – Summary of estimated bus movements

Street		Bus Movements Per Day		
		Weekday	Saturday	Sunday
Auburn Street (northbound and southbound)	Day	167	131	66
	Night	3	5	0
Atchison Street (northbound and southbound)	Day	167	131	66
	Night	3	5	0

Based on the above table, the weekday bus movements are the highest during the day period, while the Saturday bus movements are the highest during the night period. Therefore, weekday and Saturday bus movements for the day and night periods, respectively, would be used for the traffic noise assessment.

9.3 Road traffic noise criteria

As mentioned above, access to the bus layover facility will be via Auburn Street with buses exiting onto Atchison Street. Based on functionality, Auburn Street and Atchison Street are categorised as sub-arterial roads. For existing residences affected by additional traffic on existing sub-arterial roads generated by land use developments, the following RNP traffic noise criteria apply.

Table 9-3 – RNP road traffic noise criteria, dB(A)

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day 7am – 10pm	Night 10pm – 7am
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,(15hour)}$ 60 (external)	$L_{Aeq,(9hour)}$ 55 (external)

Further to the above, the RNP states the following for land use developments generating additional traffic:

> *"For existing residences and other sensitive land uses affected by **additional traffic on existing roads generated by land use development**, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'."*

9.4 Predicted road traffic noise

Based on the existing traffic volumes and the estimated additional traffic due to the proposed bus layover facility, road traffic noise levels were predicted for residences located along Auburn Street and Atchison Street and results are presented in Table 9-4 below.

Table 9-4 - Predicted road traffic noise levels along public roads due to bus movements, dB(A)

Assessment Period	RNP Criteria	Movements[1] (%HV)		Distance to Road[2]	Predicted Noise Level		Comply?
		Existing	Future		Existing	Future	
Auburn Street							
Daytime Period	$L_{Aeq,(15hour)}$ 60	3,249 (11%)	3,416 (16.1%)	8 m	63	65	No
Night Period	$L_{Aeq,(9hour)}$ 55	334 (10.6%)	339 (12.1%)	8 m	56	56	Yes
Atchison Street							
Daytime Period	$L_{Aeq,(15hour)}$ 60	2,086 (5.4%)	2,253 (13.8%)	8 m	60	63	No
Night Period	$L_{Aeq,(9hour)}$ 55	147 (4.6%)	152 (9.2%)	8 m	51	52	Yes

Note: 1. Based on total movements in both directions
2. Based on typical distance from facade of dwelling to road.

From the table above, the future (ie. with the bus layover operating) traffic noise levels were predicted to be over the nominated RNP sub-arterial road criteria during the day and night periods for residences along Auburn Street. However, future traffic noise levels due to the additional traffic associated with the bus layover facility are predicted to not increase by more than 2 dB(A) for residences along Auburn Street.

Therefore, traffic noise levels as a result of the operation of the relocated bus layover would acutely increase [ie. not increase more than 2 dB(A)] the existing traffic noise levels at the most affected residences along Auburn Street and would not comply with the requirements of the RNP.

The future traffic noise levels for residences along Atchison Street comply with the relevant RNP noise criteria during the night period and would not increase by more than 2 dB(A). However, during the day period future traffic noise levels are predicted to be over the RNP noise criteria and the bus layover facility is predicted to increase existing traffic noise levels by more than 2 dB(A) at the nearest affected residences along Atchinson Street. The exceedance and increase in traffic noise level by more than 2 dB(A) are due to the high increase in heavy vehicle percentages and the high existing traffic volumes during the day period.

9.5 Traffic noise mitigation measures

In light of the increase in traffic noise levels of more than 2 dB(A) for residences along Atchinson Street due to the operation of the bus layover facility, especially during the day period, a feasible and reasonable approach to noise mitigation measures should be considered.

Property treatment as described in Section 8.3 may be considered for the apartment dwellings that are predicted to experience increases in traffic noise levels of more than 2 dB(A) during the day period along Atchison Street. A review of the feasibility and reasonableness of property treatment would be further investigated accordingly.

10 Conclusion

Renzo Tonin & Associates has completed an assessment of environmental noise impact from the operation of the proposed relocated bus layover facility to be located at the Atchinson Street / Auburn Street carpark in Wollongong. Noise impacts from the proposed relocated facility upon the potentially most affected noise sensitive receivers have been quantified and compared to the noise guidelines set by the NSW EPA.

Operational noise emissions from the existing bus layover facility were measured and a noise model was prepared to predict impacts from the proposed relocated facility to nearby sensitive receivers. Noise impacts were predicted to exceed the applicable noise criteria at some receivers during the morning shoulder, day, evening and night periods. Furthermore, noise emissions from the operation of the relocated bus layover facility during the night time and morning shoulder periods were predicted to exceed with the nominated sleep disturbance assessment levels at the impacted residential receivers.

Therefore, a review of feasible and reasonable noise mitigation and management measures was undertaken for the operation of the bus layover facility.

Road traffic noise impacts due to the additional bus movements from the layover facility along Auburn Street were found not to comply with the relevant RNP traffic noise criteria for residential properties. Future road traffic noise impacts on residential properties along Atchison Street were predicted to be over the RNP noise criteria and the bus layover facility was predicted to increase existing traffic noise levels by more than 2 dB(A) during the day period

Therefore, a review of feasible and reasonable traffic noise mitigation measures has been undertaken for traffic noise impacts along Atchinson Street due to bus movements from the bus layover facility.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 110dB Operating a chainsaw or jackhammer 120dB Deafening
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.

L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Long term noise monitoring results

RENZO TONIN & ASSOCIATES
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Acoustics
Vibration
Structural Dynamics

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19 Atchison Street, Wollongong

Background & Ambient Noise Monitoring Results - NSW 'Noise Policy for Industry', 2017

	L_{A90} Background Noise Levels[4]			L_{Aeq} Ambient Noise Levels		
Date	**Day[1]**	**Evening[2]**	**Night[3]**	**Day[1]**	**Evening[2]**	**Night[3]**
Wednesday-20-November-2024	51	45	42	62	57	54
Thursday-21-November-2024	48	46	42	59	56	53
Friday-22-November-2024	49	45	44	60	56	55
Saturday-23-November-2024	47	46	42	59	56	52
Sunday-24-November-2024	46	45	45	58	57	53
Monday-25-November-2024	50	47	43	59	56	55
Tuesday-26-November-2024	49	46	44	60	56	54
Wednesday-27-November-2024	50	47	43	59	56	54
Thursday-28-November-2024	49	47	43	60	56	54
Friday-29-November-2024	50	-	-	60	-	-
Saturday-30-November-2024	-	-	42	-	-	52
Sunday-01-December-2024	46	46	43	60	56	53
Monday-02-December-2024	50	47	44	59	56	54
Tuesday-03-December-2024	50	48	44	60	57	54
Wednesday-04-December-2024	50	-	-	60	-	-
Representative Weekday[5]	**50**	**47**	**43**	**60**	**56**	**54**
Representative Weekend[5]	**46**	**46**	**42**	**59**	**56**	**53**
Representative Week[5]	**49**	**46**	**43**	**60**	**56**	**54**

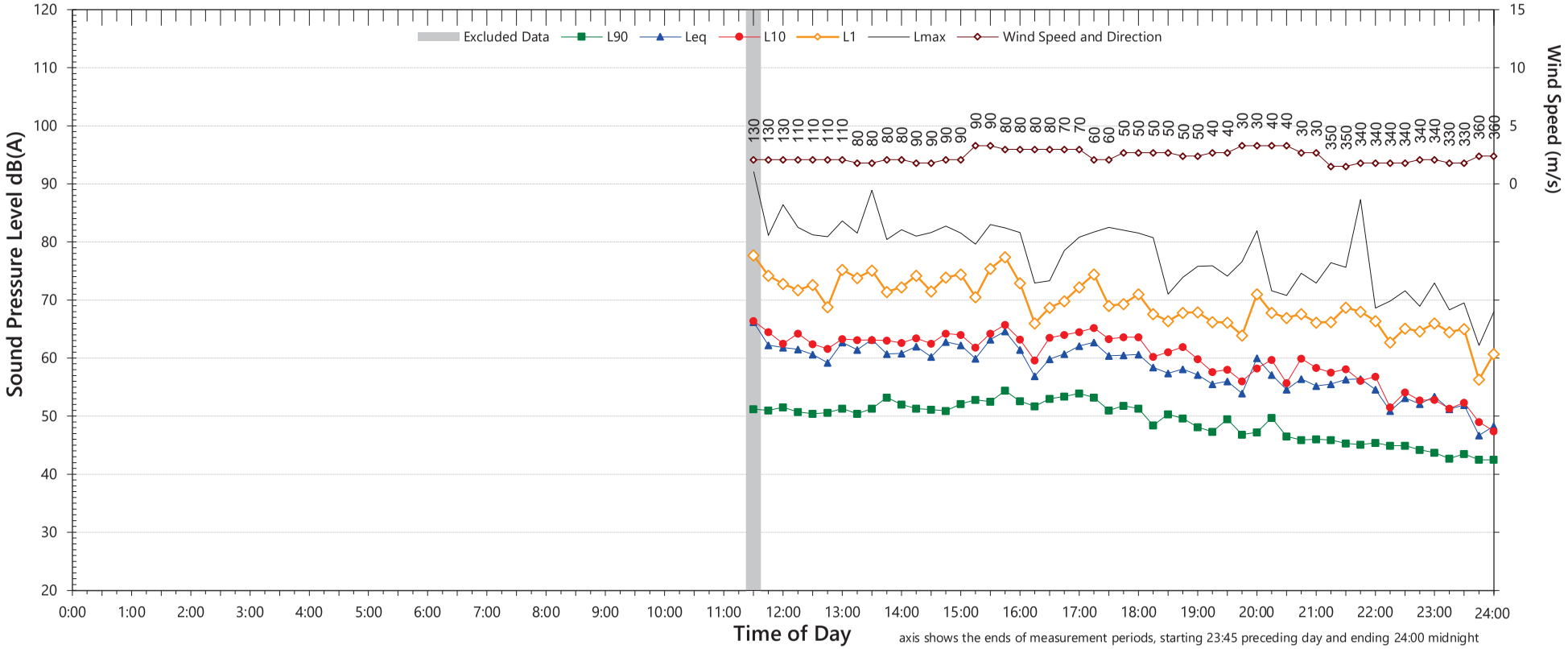
Notes:

1. Day is 7:00am to 6:00pm on all days except Sundays and Public Holidays when it is 8:00am to 6:00pm 2. Evening is 6:00pm to 10:00pm 3. Night is the remaining periods 4. Assessment Background Level (ABL) for individual days 5. Rating Background Level (RBL) for L_{A90} and logarithmic average for L_{Aeq} 6. Leq is calculated in the free field. 2.5dB is subtracted from results if logger is placed at façade 7. Number in brackets represents the measured (actual) RBL value, which is below the minimum policy value of 30 dB(A) during the evening or night period or 35 dB(A) during the day period.

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Wednesday, 20 November 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		51	45	42
L_{Aeq}	#N/A	62	57	54

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

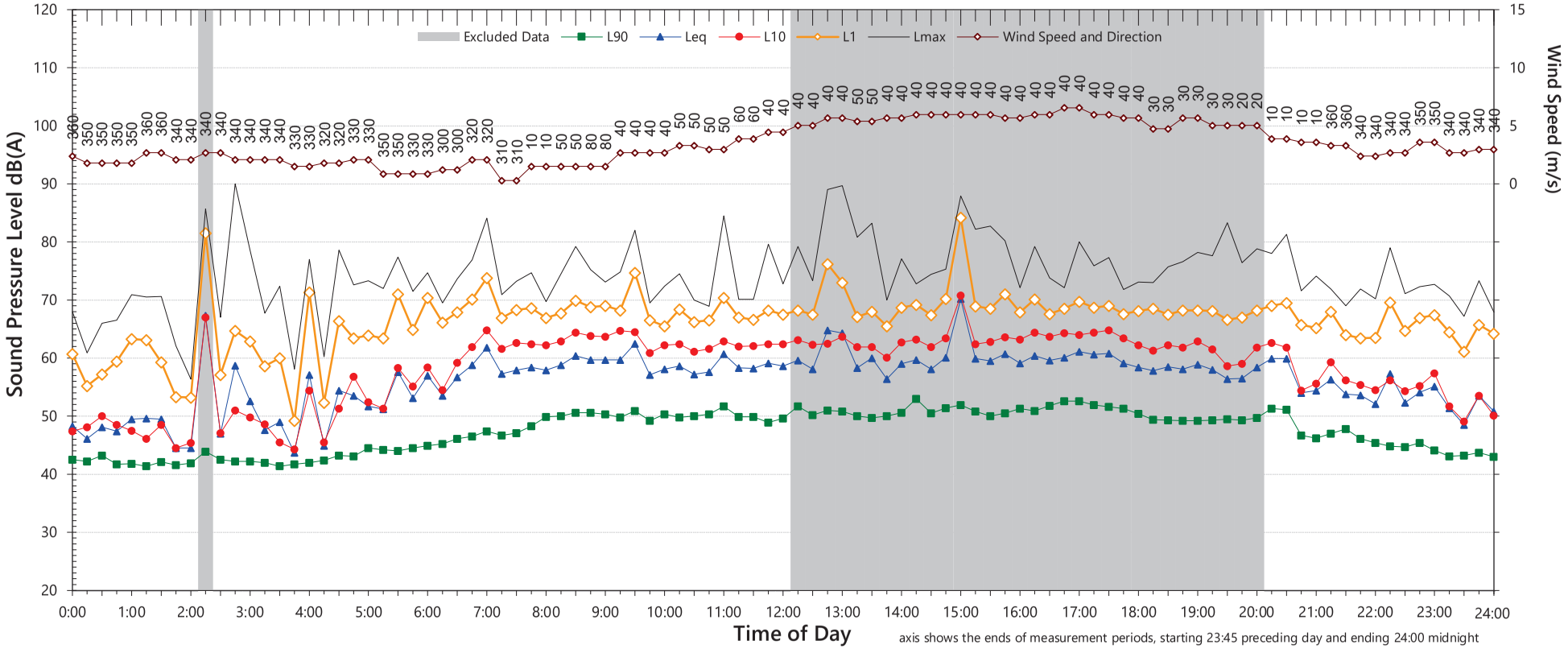
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Thursday, 21 November 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		48	46	42
L_{Aeq}	#N/A	59	56	53

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

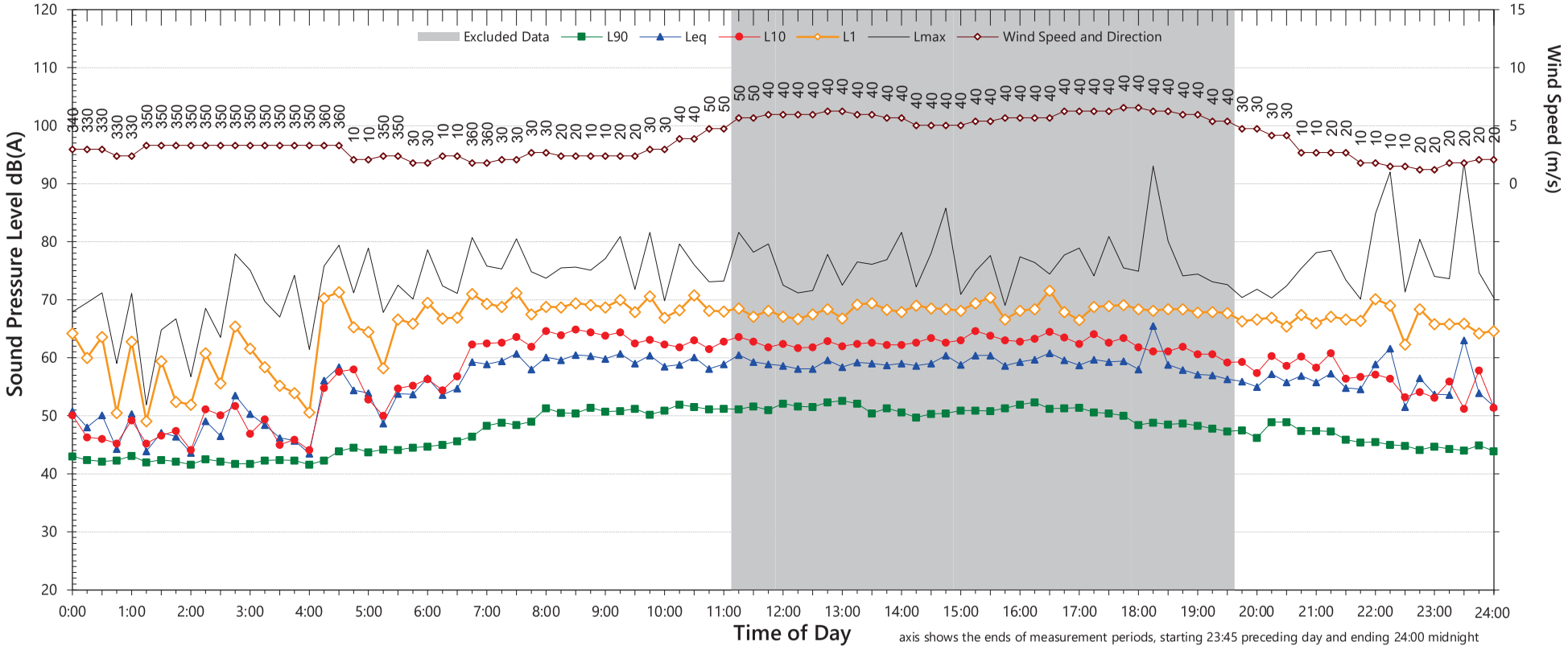
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Friday, 22 November 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		49	45	44
L_{Aeq}	#N/A	60	56	55

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

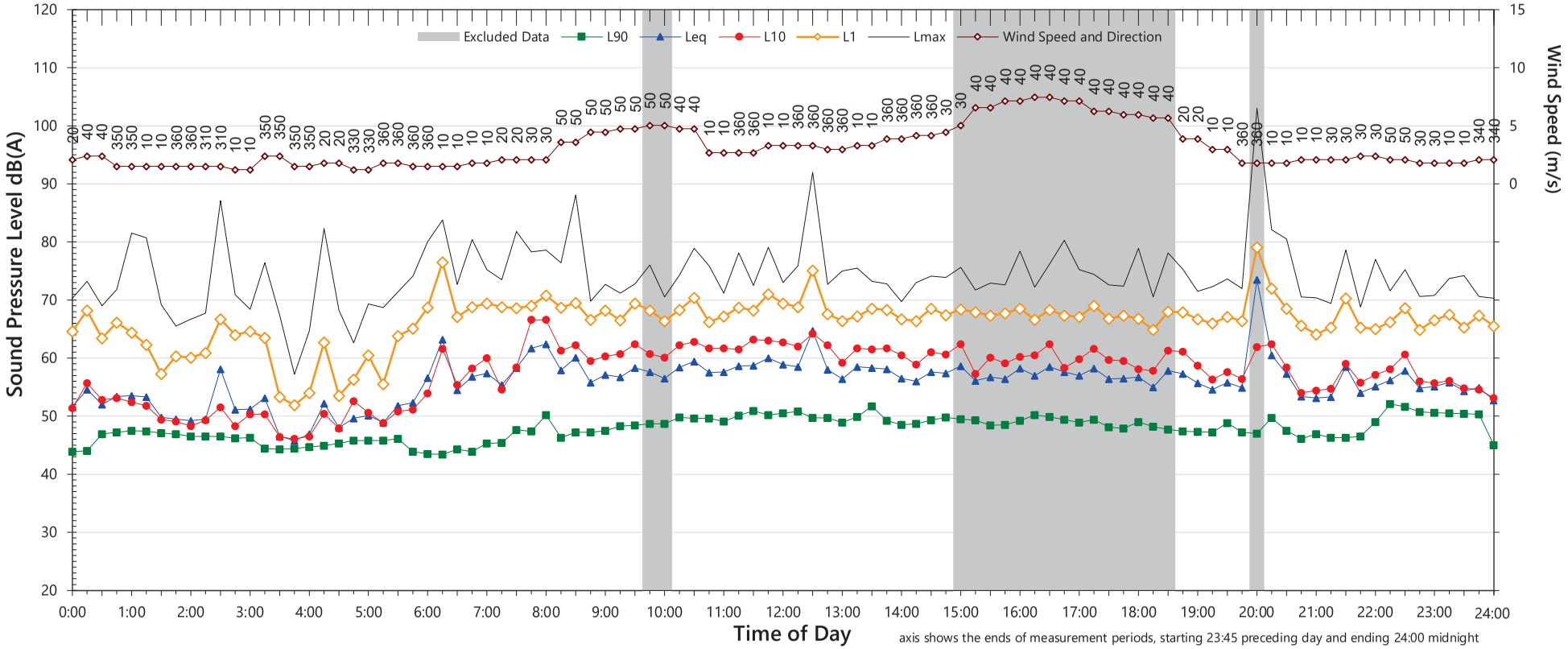
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Saturday, 23 November 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		47	46	42
L_{Aeq}	#N/A	59	56	52

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

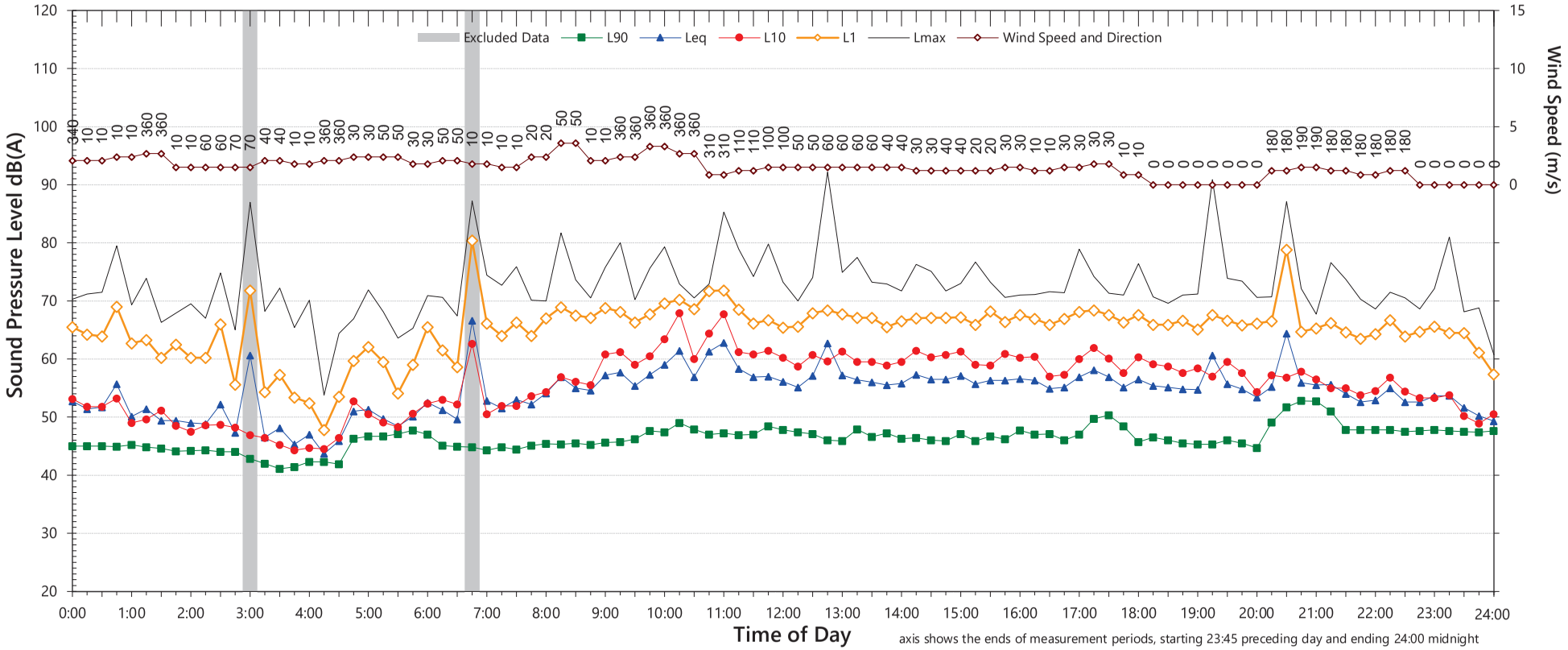
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Sunday, 24 November 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		46	45	45
L_{Aeq}	#N/A	58	57	53

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

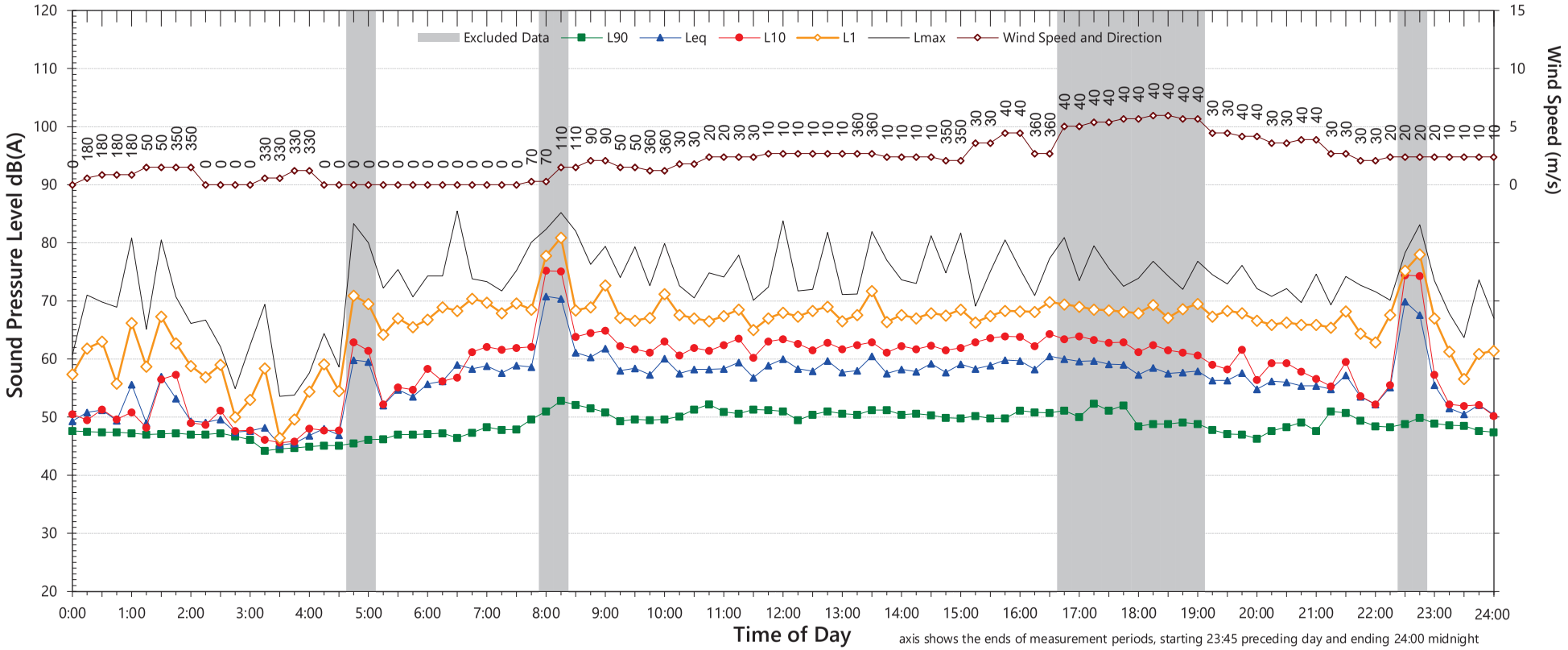
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Monday, 25 November 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		50	47	43
L_{Aeq}	#N/A	59	56	55

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

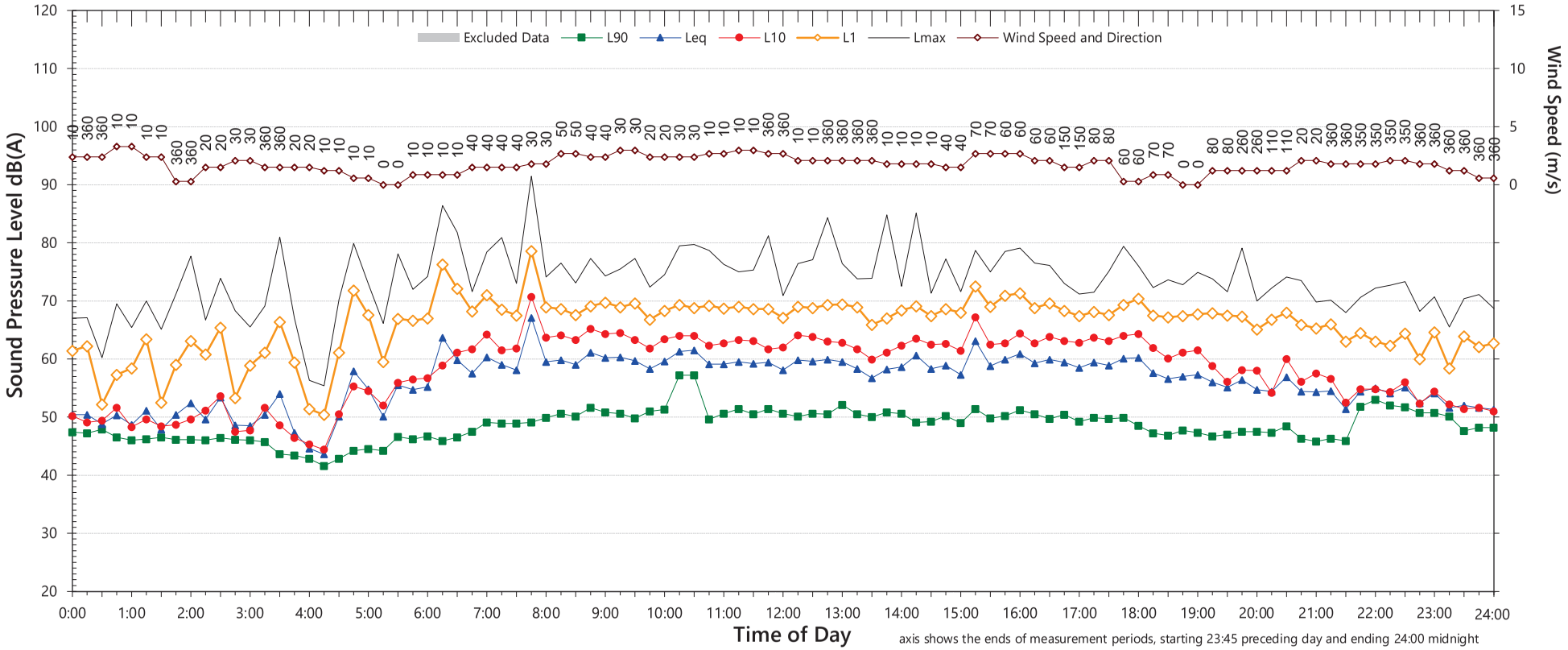
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Tuesday, 26 November 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		49	46	44
L_{Aeq}	#N/A	60	56	54

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

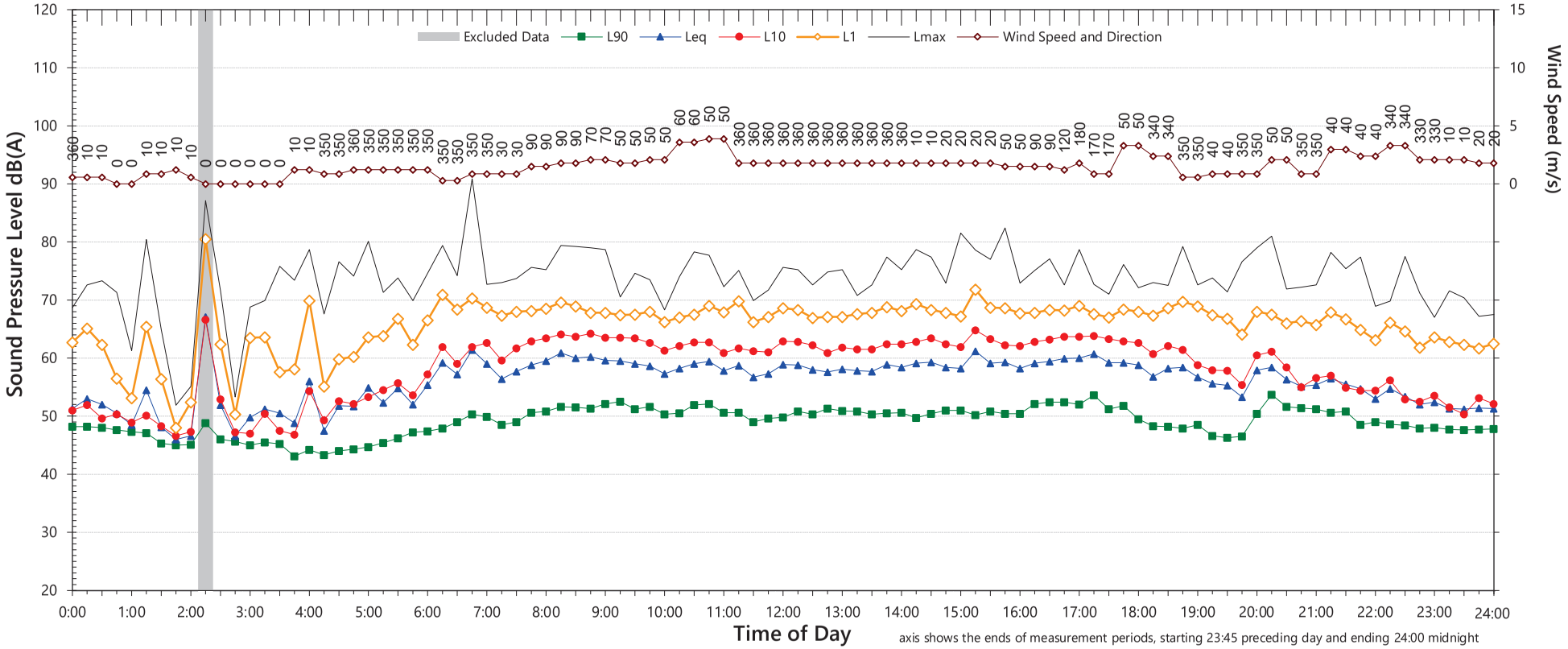
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Wednesday, 27 November 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		50	47	43
L_{Aeq}	#N/A	59	56	54

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

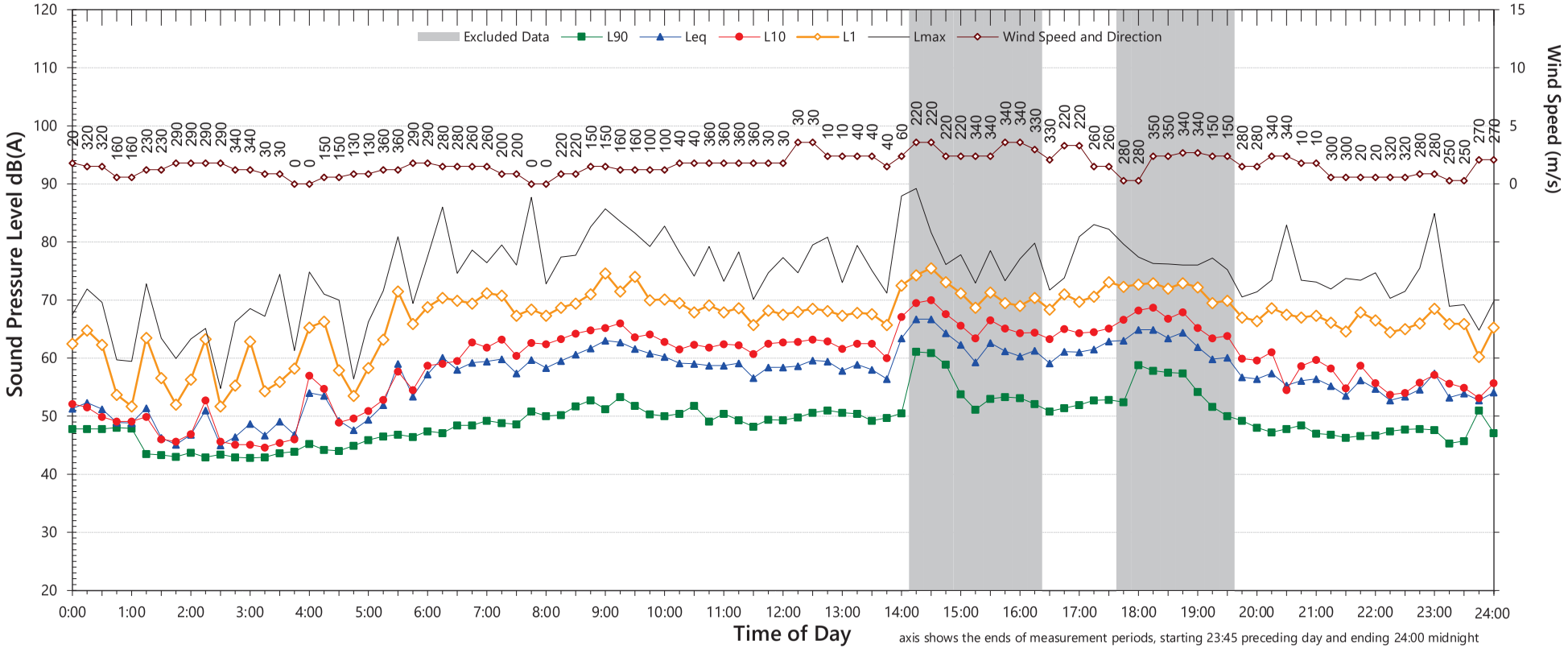
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Thursday, 28 November 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		49	47	43
L_{Aeq}	#N/A	60	56	54

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

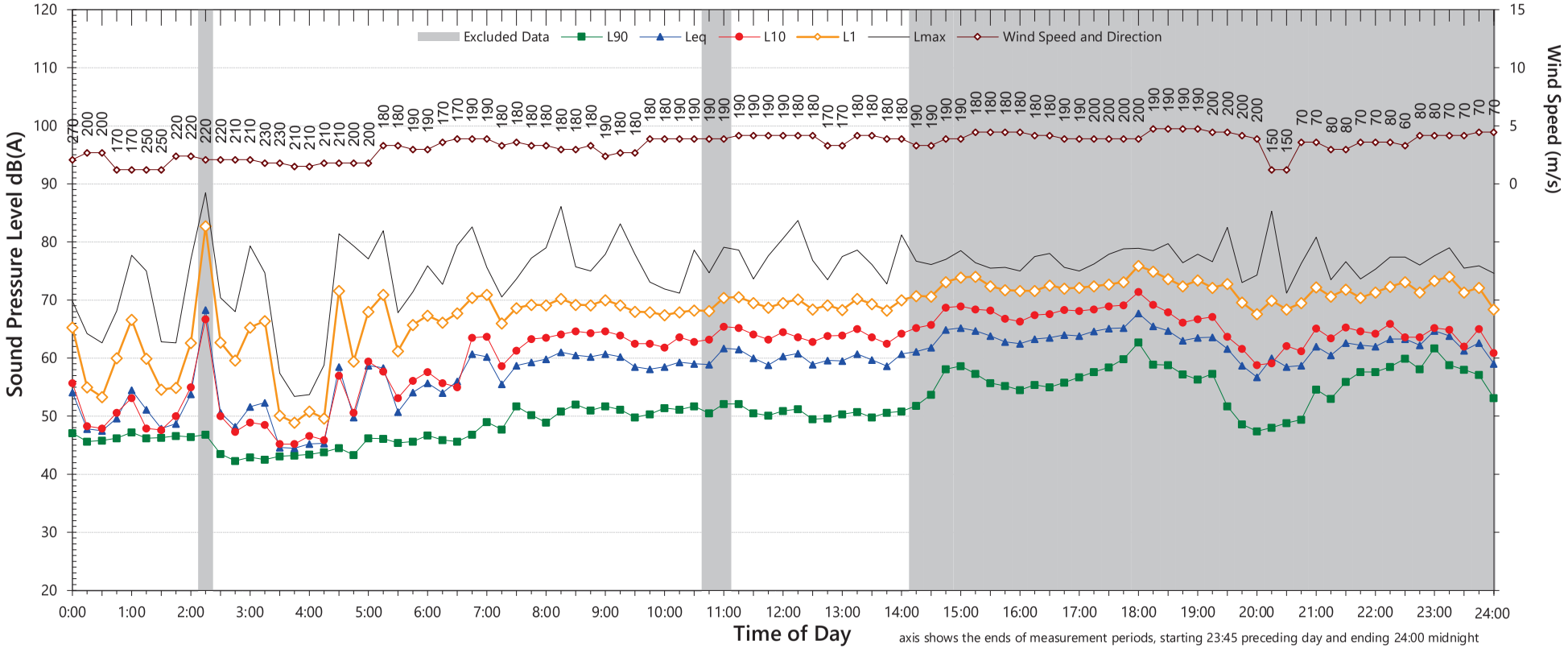
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Friday, 29 November 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		50	-	-
L_{Aeq}	#N/A	60	-	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

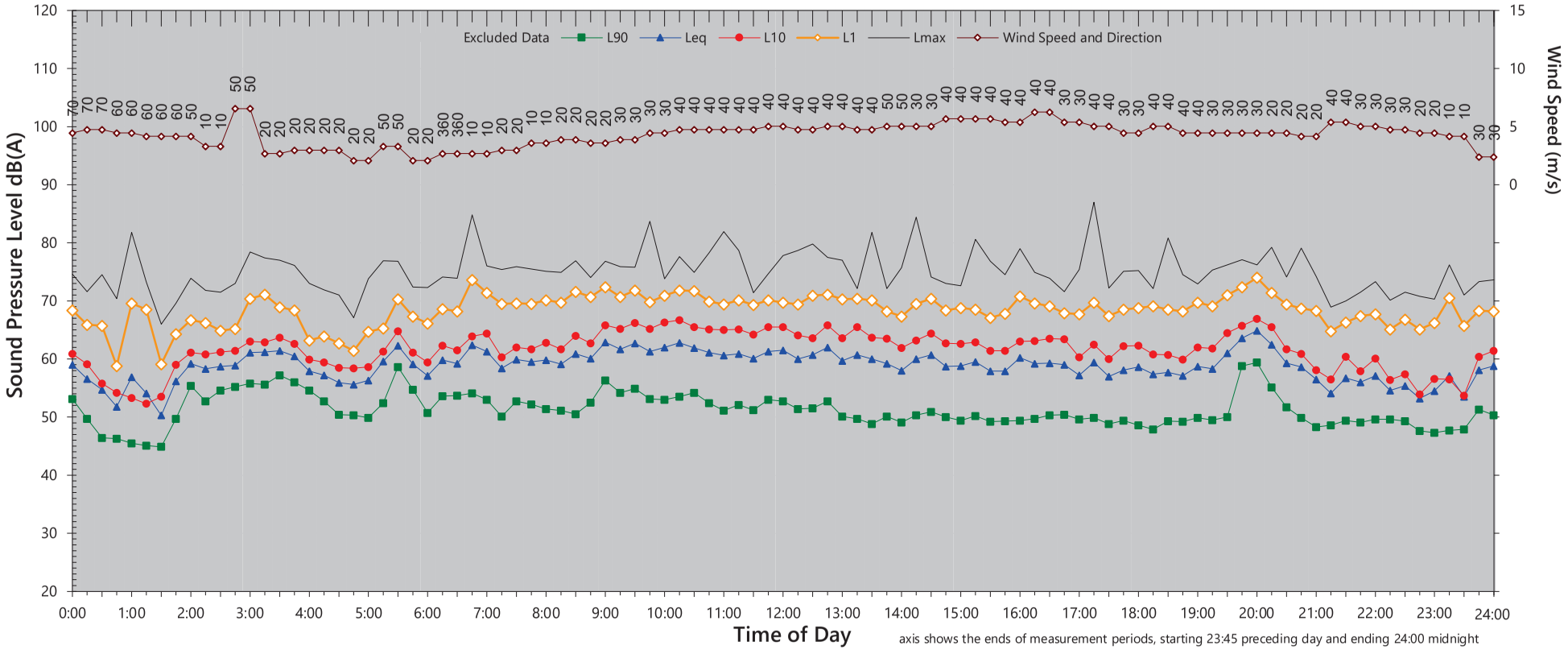
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Saturday, 30 November 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		-	-	42
L_{Aeq}	#N/A	-	-	52

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

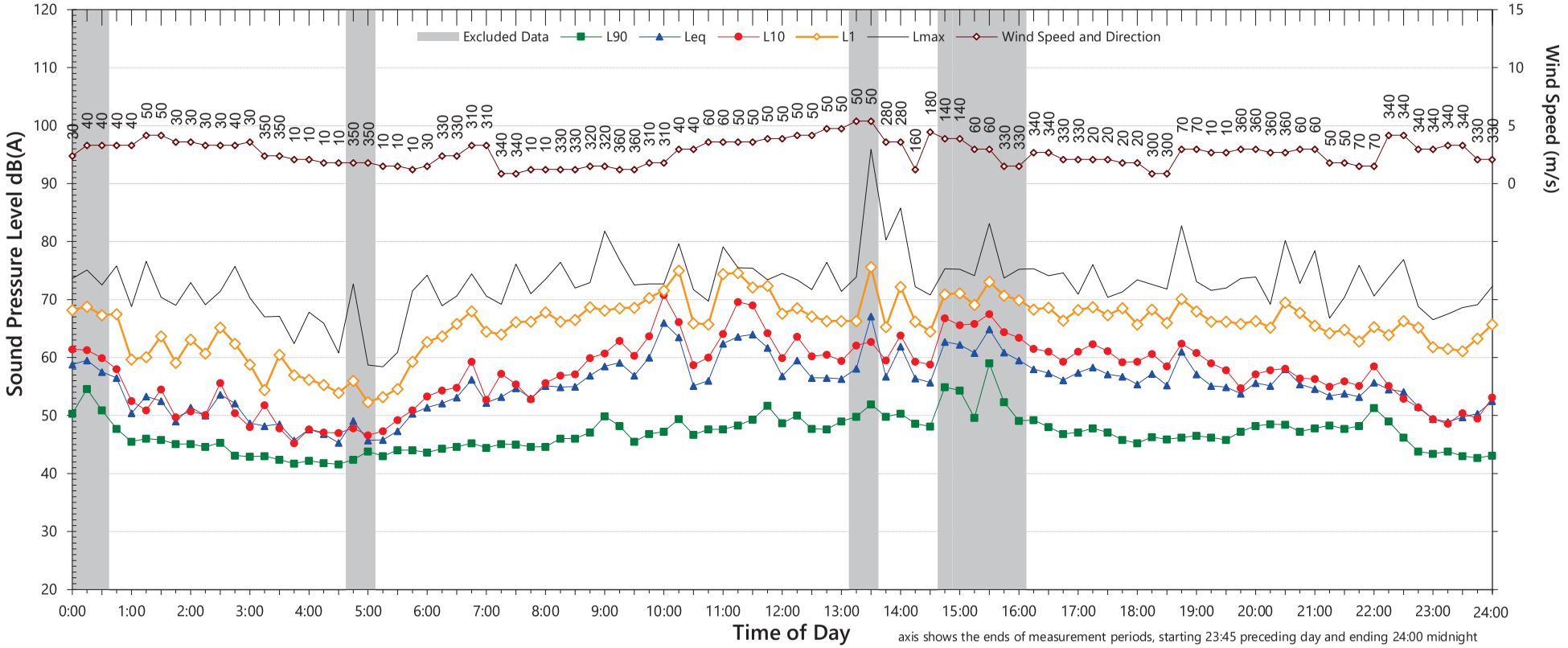
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Sunday, 1 December 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		46	46	43
L_{Aeq}	#N/A	60	56	53

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

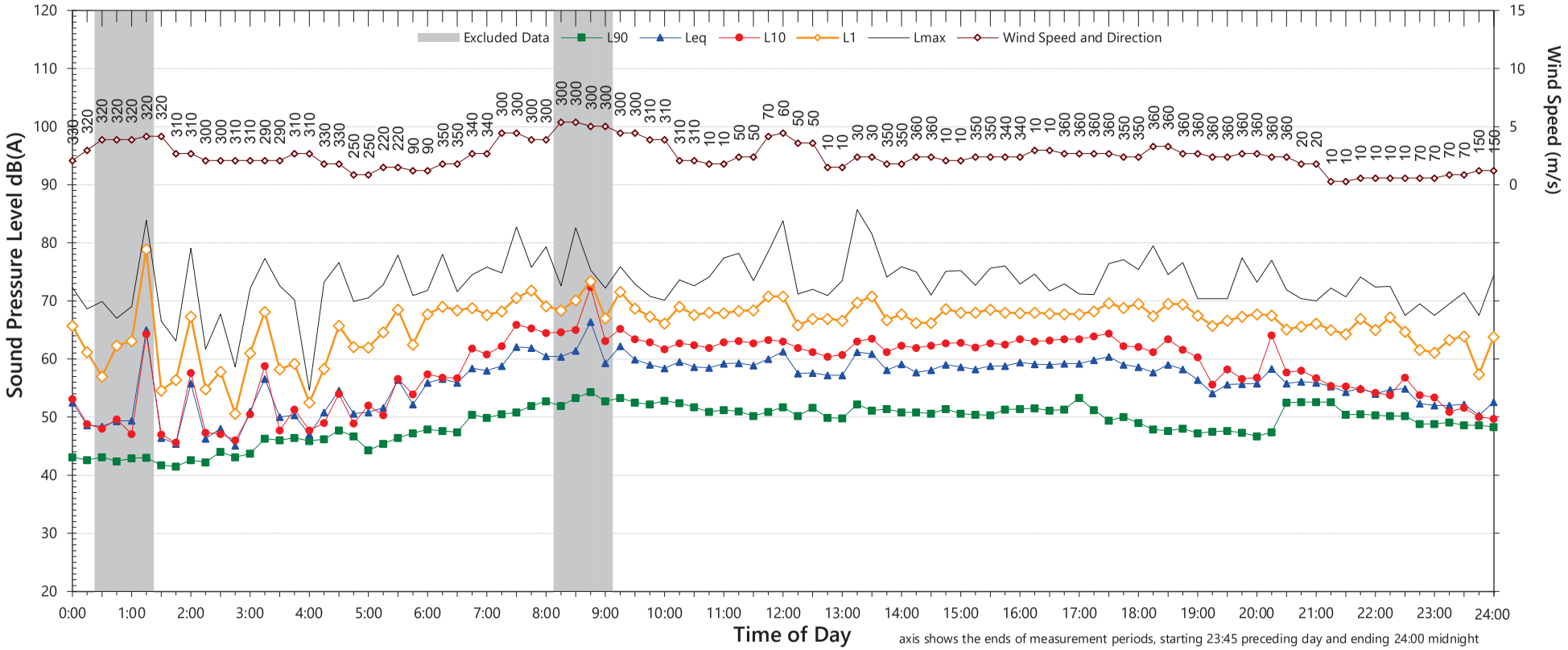
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Monday, 2 December 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		50	47	44
L_{Aeq}	#N/A	59	56	54

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

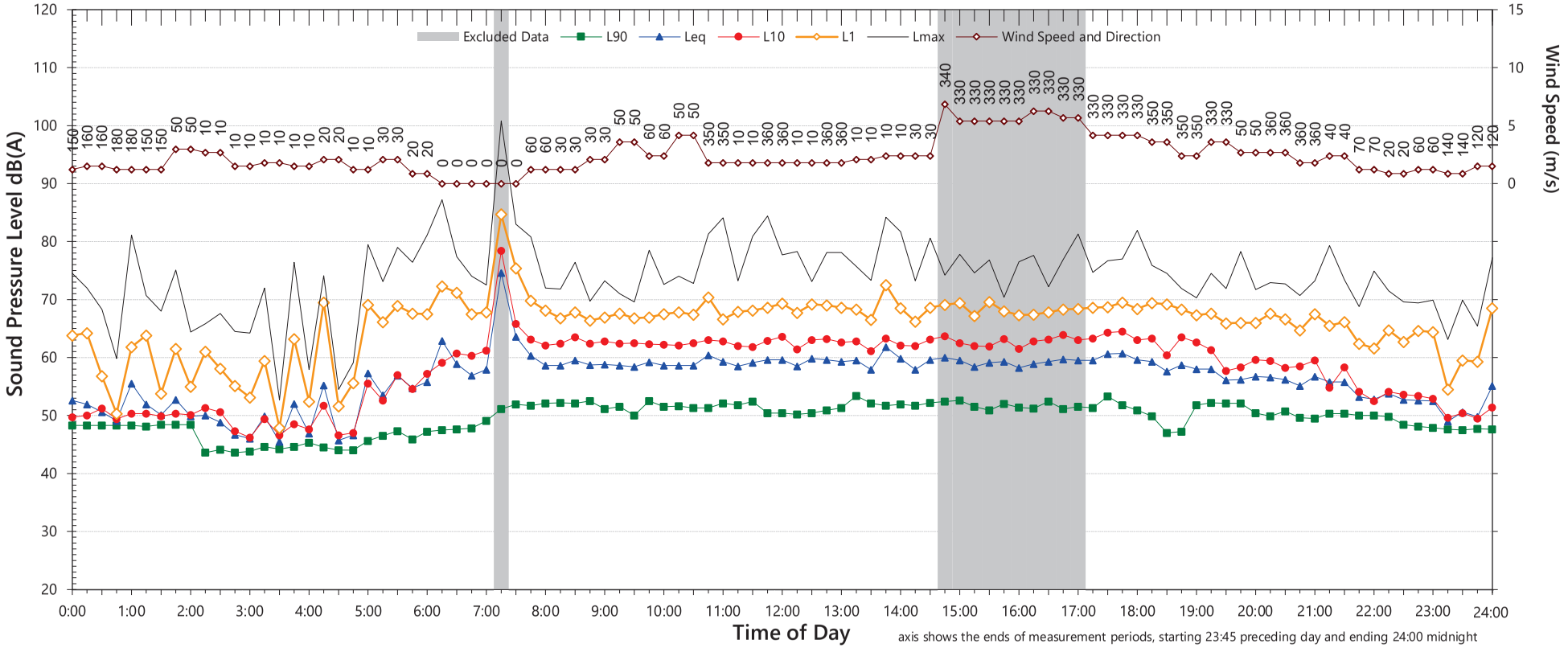
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Tuesday, 3 December 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		50	48	44
L_{Aeq}	#N/A	60	57	54

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

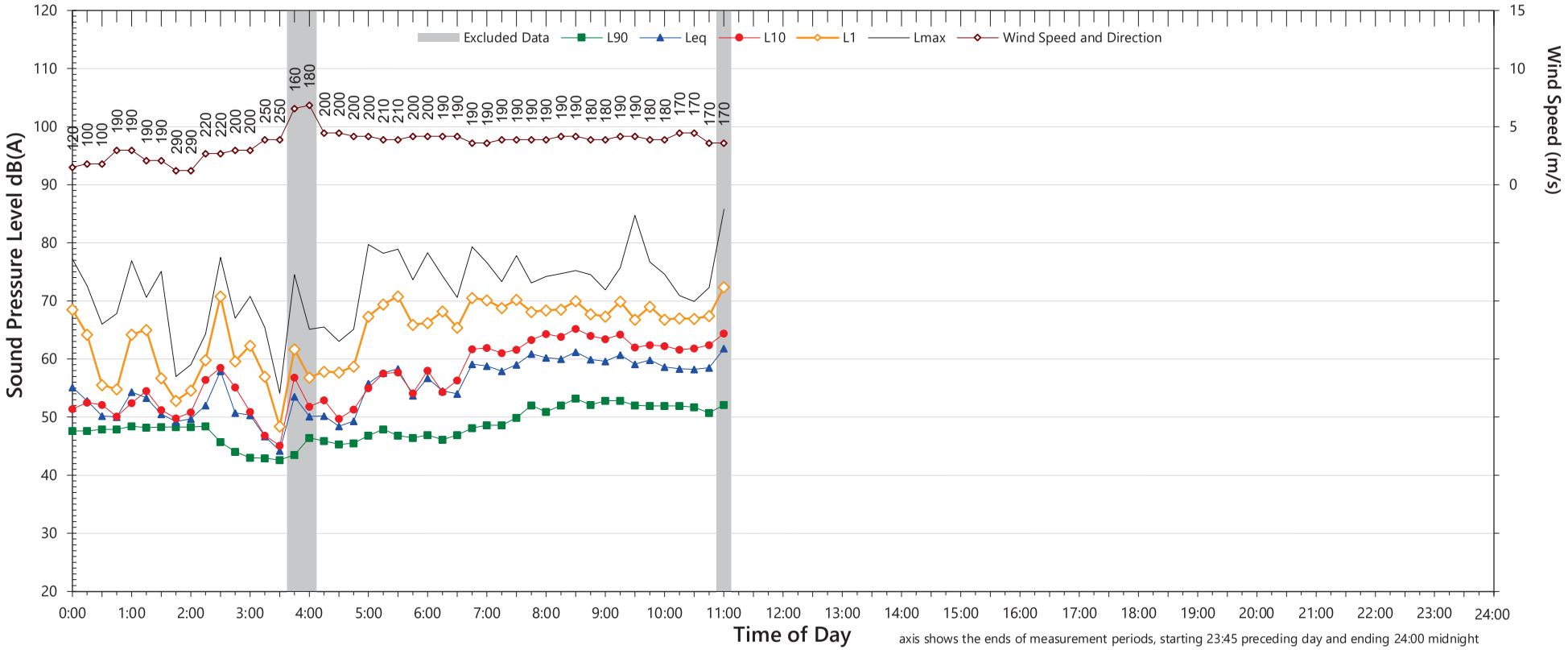
#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

19 Atchison Street, Wollongong - Balcony

Wednesday, 4 December 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		50	-	-
L_{Aeq}	#N/A	60	-	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

#N/A

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Appendix G – Aboriginal Heritage Assessment Results

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : Wollongong Bus Layover
Client Service ID : 960892

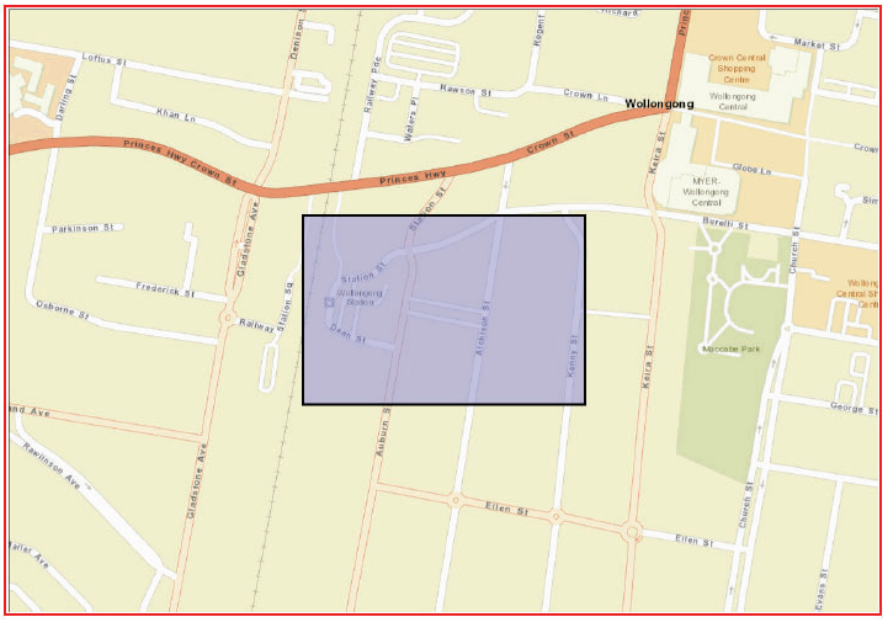
Lachlan Jones
90 Crown Street Wollongong
Wollongong New South Wales 2500
Attention: Lachlan Jones
Email: lachlan.jones@transport.nsw.gov.au

Date: 16 December 2024

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -34.4283, 150.8881 - Lat, Long To : -34.4261, 150.892, conducted by Lachlan Jones on 16 December 2024.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Figure E-1 - AHIMS Basic Search Results

Short name	Case name	Legal process	Determination date	Outcome
Illawarra Local Aboriginal Land Council	New South Wales Aboriginal Land Council v New South Wales Native Title Services Limited	Unopposed	06/02/2007	Native title does not exist

Figure E-2 - Native Title Search Results

Name	NNTT file no	Federal Court file no	Date filed	Application status
South Coast People	NC2017/003	NSD1331/2017	03/08/2017	Active
Sada Services Pty Limited	NN2005/018	NSD2135/2005	07/11/2005	Discontinued
Illawarra Local Aboriginal Land Council	NN2005/011	NSD1272/2005	28/07/2005	Determined
Glenda & Rebecca Chalker	NC2003/002	NSD6007/2003	18/12/2003	Dismissed
NSW Govt #60 (Kembla Grange)	NN2001/010	NSD6013/2001	10/07/2001	Discontinued
Kim Moran #3	NC1999/003	NSD6006/1999	30/04/1999	Dismissed
Cubbitch Barta Clan of the Dharawal People #3	NC1998/023	NSD6111/1998	14/09/1998	Discontinued
NSW Govt.# 47	NN1998/007	NSD6157/1998	22/07/1998	Discontinued
Illawarra Tribal Owners	NC1998/011	NSD6100/1998	01/05/1998	Discontinued
Dariwul People	NC1998/012	NSD6101/1998	01/05/1998	Dismissed
Illawarra (KEJ Tribal Elders)	NC1997/003		13/01/1997	Rejected
Dariwal (KEJ Tribal Elders)	NC1997/001		06/01/1997	Rejected
Gundu-ngura	NC1996/021		26/06/1996	Rejected
Wadi Wadi #2	NC1996/012	NSD6031/1998	23/04/1996	Discontinued
Wadi Wadi #3	NC1996/013		23/04/1996	Withdrawn
Elouera People	NC1996/011	NSD6030/1998	09/04/1996	Struck-out
Wadi Wadi #1	NC1994/004	NSD6007/1998	01/06/1994	Discontinued

Figure E-3 - Native Title Applications, Registration Decisions and Determinations Search Results

4 February 2025

Lachlan Jones
Project Engineer
Level 3, 101 Crown Street
Wollongong NSW 2500

Dear Lachlan,

Preliminary assessment results for Wollongong Bus Layover Relocation, based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

The project, as described in the Stage 1 assessment, was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Heritage NSW's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW's procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me and your regional environmental staff to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW's *Unexpected Archaeological Finds Procedure*.

For further assistance in this matter do not hesitate to contact me.

Yours sincerely

Cheyenne Noble Tovehi
Aboriginal Cultural Heritage Officer – Southern

Transport for NSW
Level 3, 101 Crown Street, Wollongong NSW 2500 | PO Box 477, Wollongong NSW 2520
M 0417 462 507 | **E** Cheyenne.Nobletovehi@transport.nsw.gov.au

Appendix H – Non-Aboriginal Heritage Search Results

Search Results

7 results found.

Illawarra Escarpment Princes Hwy	Wollongong, NSW, Australia	(Indicative place before RNE closed. Record for reference only, no statutory basis) Register of the National Estate (Non-statutory archive)
Mine Sites along Illawarra Escarpment	Wollongong, NSW, Australia	(Place rejected for emergency listing) National Heritage List
Trooper Andrews Memorial Drinking Fountain Church St	Wollongong, NSW, Australia	(Indicative place before RNE closed. Record for reference only, no statutory basis) Register of the National Estate (Non-statutory archive)
Upper Nepean Water Catchment Mount Keira Rd	Mount Keira, NSW, Australia	(Indicative place before RNE closed. Record for reference only, no statutory basis) Register of the National Estate (Non-statutory archive)
Wara-n'hayara Plateau Area - part Mount Kiera Rd	Wollongong, NSW, Australia	(Place not included in NHL) National Heritage List
Wollongong Courthouse Market St	Wollongong, NSW, Australia	(Included place before RNE closed. Record for reference only, no statutory basis) Register of the National Estate (Non-statutory archive)
Wollongong Memorial Arch Church St	Wollongong, NSW, Australia	(Indicative place before RNE closed. Record for reference only, no statutory basis) Register of the National Estate (Non-statutory archive)

Report Produced: Wed Dec 18 10:28:53 2024

Figure F-1 - Australian Heritage Places Inventory Search Results

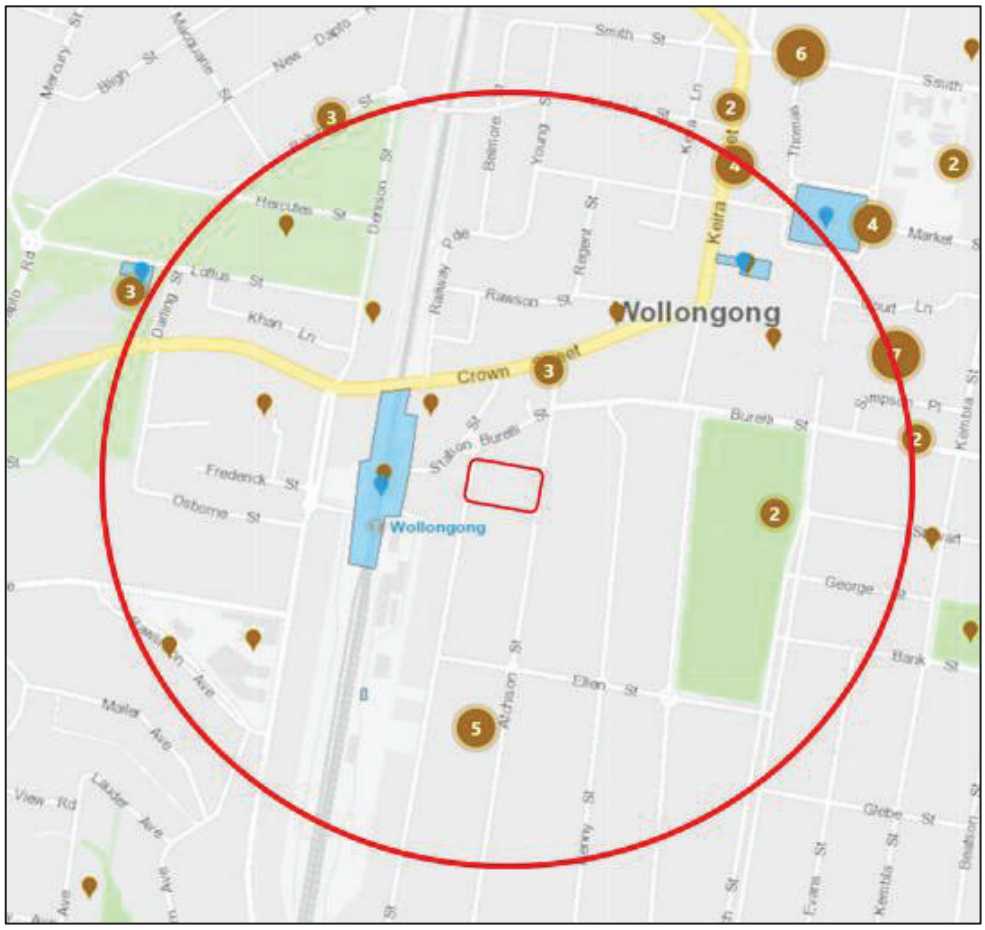


Figure F-2 - State & Local Heritage Items Search Results

Table F-1 - Heritage Data Base Search Results - Place Details

Place Name	Database Search	Listing #	Gazette Date
Wollongong Railway Station Group	State Heritage Register	01289	02/04/1999
St Michael's Cathedral & Rectory	State Heritage Register	00602	02/04/1999
Regent Theatre	State Heritage Register	01735	09/05/2005
Interwar House	Local Environmental Plan	61089	12/08/2022
Former Berlei Building	Local Environmental Plan	61095	12/08/2022
Moreton Bay Fig	Local Environmental Plan	6290	23/04/2021
Tattersall's Hotel	Local Environmental Plan	6242	23/04/2021
Wollongong Railway Station Group	Local Environmental Plan	6382	23/04/2021
Trade School (TAFE)	Local Environmental Plan	6467	26/02/2010
Row of Canary Island Date Palms	Local Environmental Plan	6287	26/02/2010
Caldwell's Building	Local Environmental Plan	61100	12/08/2022
Former Crown Hotel	Local Environmental Plan	6241	23/04/2021
Former Marcus Clark Building	Local Environmental Plan	6474	26/02/2010
Row of Shops	Local Environmental Plan	6240	26/02/2010
House	Local Environmental Plan	6222	26/02/2010
House	Local Environmental Plan	6223	26/02/2010
Carthona	Local Environmental Plan	6224	26/02/2010
House	Local Environmental Plan	6225	26/02/2010
House "Regentville"	Local Environmental Plan	6361	26/02/2010
Shop	Local Environmental Plan	6266	26/02/2010
National Mutural Life Assurance Building	Local Environmental Plan	5936	26/02/2010
Illawarra Hotel	Local Environmental Plan	6380	26/02/2010
Regent Cinema	Local Environmental Plan	5937	26/02/2010
Commercial Frontage	Local Environmental Plan	61103	12/08/2022
Wollongong War Memorial & Frank Andrews Monument	Local Environmental Plan	6324	23/04/2021
Canary Island Date Palms	Local Environmental Plan	6587	23/04/2021
Row of Hill Figs	Local Environmental Plan	6284	23/04/2021
Commercial Frontage	Local Environmental Plan	61102	12/08/2022
Royal Bank	Local Environmental Plan	6239	26/02/2010
Shop known as 83 Church Street	Local Environmental Plan	6232	23/04/2021

Appendix I – Biodiversity Search Results

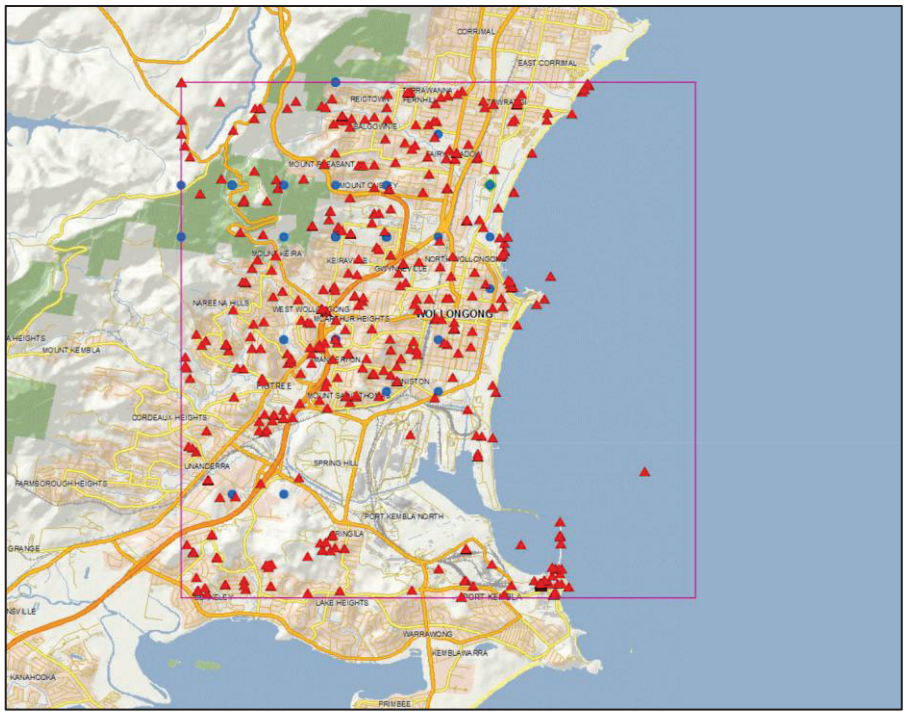


Figure G-1 - BioNet Atlas Basic Search Results (10km x 10km)

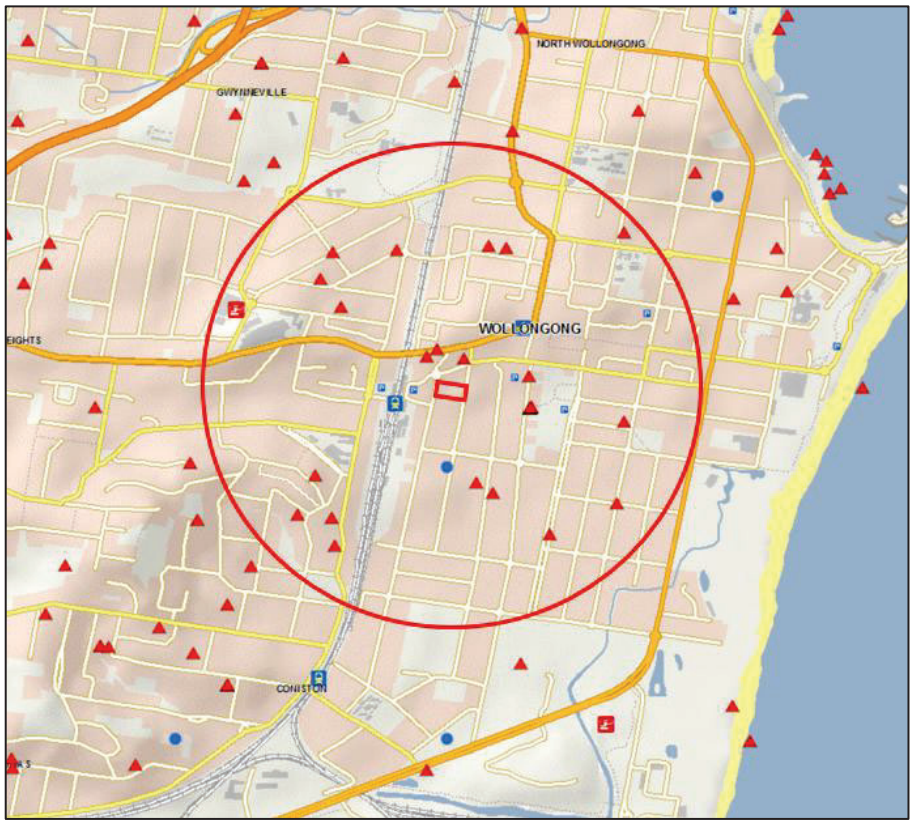


Figure G-2 - BioNet Atlas Search Results (1km Radius)

EPBC Protected Matters Report

Australian Government
Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 17-Dec-2024

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	92
Listed Migratory Species:	54

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	9
Commonwealth Heritage Places:	None
Listed Marine Species:	79
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	5
Key Ecological Features (Marine):	None
Biologically Important Areas:	4
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area
Illawarra and south coast lowland forest and woodland ecological community	Critically Endangered	Community likely to occur within area
Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion	Critically Endangered	Community may occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat likely to occur within area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area
FISH		

Scientific Name	Threatened Category	Presence Text
Epinephelus daemelii		
Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Hippocampus whitei		
White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Seriolella brama		
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area
FROG		
Heleioporus australiacus		
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus		
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area
MAMMAL		
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Isoodon obesulus obesulus		
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area
Notamacropus parma		
Parma Wallaby [89289]	Vulnerable	Species or species habitat may occur within area
Petauroides volans		
Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area
Petaurus australis australis		
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area
Potorous tridactylus trisulcatus		
Long-nosed Potoroo (southern mainland) [86367]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
PLANT		
Acacia bynoeana		
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Caladenia tessellata		
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana		
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Daphnandra johnsonii Illawarra Socketwood [67186]	Endangered	Species or species habitat may occur within area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat may occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat likely to occur within area
Prasophyllum affine Jervis Bay Leek Orchid, Culburra Leek-orchid, Kinghorn Point Leek-orchid [2210]	Endangered	Species or species habitat may occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat likely to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Rhodomyrtus psidioides		
Native Guava [19162]	Critically Endangered	Species or species habitat may occur within area
Syzygium paniculatum		
Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hoplocephalus bungaroides		
Broad-headed Snake [1182]	Endangered	Species or species habitat likely to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
SHARK		
Carcharias taurus (east coast population)		
Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Galeorhinus galeus School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche eremita		
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Marine Species		
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharhinus longimanus		
Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharias taurus		
Grey Nurse Shark [64469]		Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat likely to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Commonwealth Trading Bank of Australia	
Commonwealth Land - Commonwealth Trading Bank of Australia [12224]	NSW
Communications, Information Technology and the Arts - Australian Postal Corporation	
Commonwealth Land - Australian Postal Commission [12225]	NSW
Commonwealth Land - Australian Postal Corporation [12226]	NSW
Commonwealth Land - Australian Postal Corporation [12227]	NSW
Communications, Information Technology and the Arts - Telstra Corporation Limited	
Commonwealth Land - Australian Telecommunications Commission [12223]	NSW
Defence	
Defence - Graovac House [10147]	NSW
Defence - HYDROGRAPHIC OFFICE [10234]	NSW
Defence - TS ALBATROSS-WOLLONGONG [10148]	NSW
Defence - WOLLONGONG MULTI-USER DEPOT [11209]	NSW

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		

Scientific Name	Threatened Category	Presence Text
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area overfly marine area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat may occur within area overfly marine area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammal		

Scientific Name	Threatened Category	Presence Text
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptile		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Whales and Other Cetaceans

[Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
South Pacific Offshore Wind Project	2023/09605		Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Not controlled action (particular manner)			
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Breeding program for Grey Nurse Sharks	2007/3245	Referral Decision	Completed

Biologically Important Areas [Resource Information]

Scientific Name	Behaviour	Presence
Dolphins		
Tursiops aduncus		
Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Likely to occur
Seabirds		
Eudyptula minor		
Little Penguin [1085]	Breeding	Likely to occur
Sharks		
Carcharias taurus		
Grey Nurse Shark [64469]	Foraging	Known to occur
Whales		
Megaptera novaeangliae		
Humpback Whale [38]	Migration (north and south)	Known to occur

Bioregional Assessments [Resource Information]

SubRegion	BioRegion	Website
Sydney	Sydney Basin	BA website

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix J – Project Detailed Design

GDA 2020

NSW GOVERNMENT | Transport for NSW

WOLLONGONG CITY LGA

MR7000 - UNCLASSIFIED ROAD

WOLLONGONG - BUS LAYOVER

BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG

ROAD DESIGN

DETAIL DESIGN

LOCALITY PLAN

PART INDEX

PART NUMBER	CODE	NAME
PART 1	GN	GENERAL
	RW	ROAD ALIGNMENT AND DETAIL
	UT	UTILITIES
	PV	PAVEMENT
	FN	ROADSIDE FURNITURE AND LINEMARKING

ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

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LINEAR REFERENCING
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PLOT BY: simonoat

PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE PROJECTS AND ENGINEERING
TECHNICAL SERVICES
ENGINEERING SERVICES
ROAD DESIGN SOUTHERN

DESIGNED
SIGNED ATANAS SIMONOVSKI
NAME A. SIMONOVSKI
TITLE LEAD ROAD DESIGNER
DATE 22/05/2025

REVIEWED
SIGNED CAILLIN EGAN
NAME C. EGAN
TITLE ROAD DESIGN MANAGER
DATE 22/05/2025

VERIFIED
SIGNED NARELLE COOKE
NAME N. COOKE
TITLE SENIOR ROAD DESIGN MANAGER
DATE 22/05/2025

TFNSW PROJECT MANAGER
NAME L. JONES
TITLE PROJECT / CONTRACT MANAGER

VALIDATION AND ACCEPTANCE OF THESE DRAWINGS AND THE DESIGN SHOWN THEREON IS TO BE CARRIED OUT UNDER SEPARATE PROCESS

CLIENT
NSW GOVERNMENT Transport for NSW

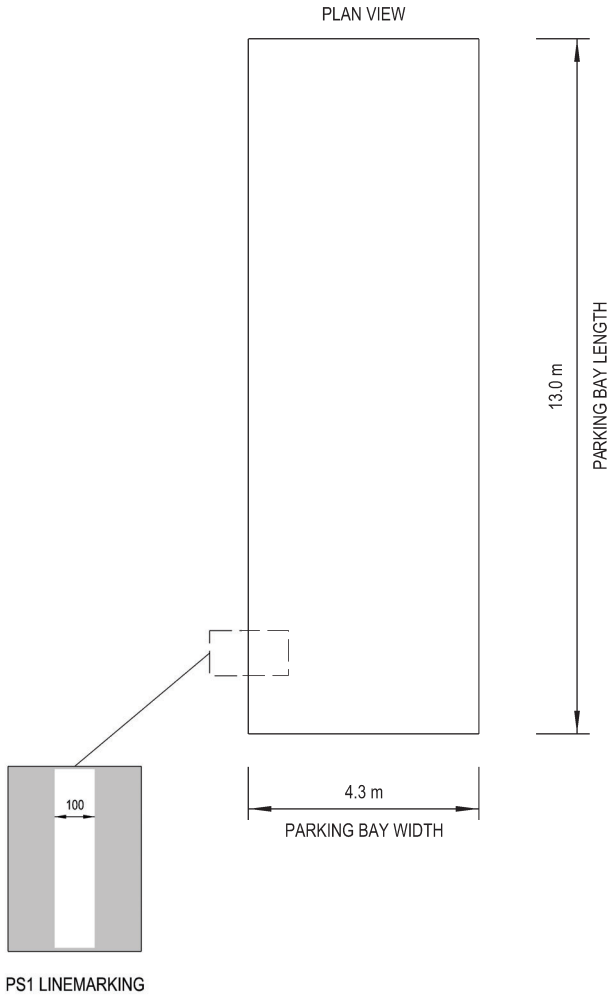
PREPARED FOR
PROJECT MANAGEMENT 1
ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG

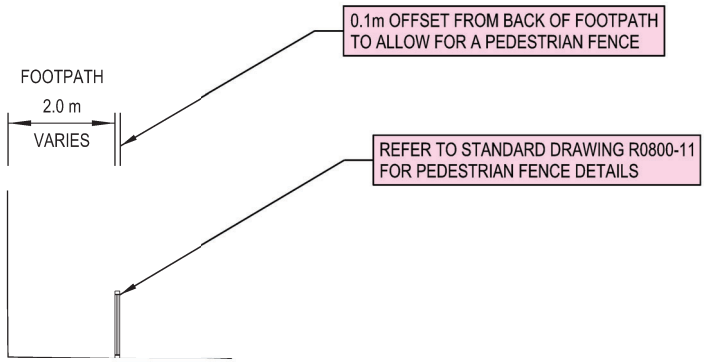
A3

TINSW PROJECT No. P.0091926.04.001.003
DESIGN PROJECT No. P.0091926
TINSW REGISTRATION No. DS2025/000325
PART 1
ISSUE STATUS CONSTRUCTION ISSUE
EDMS No. SF2025/054832
SHEET No. GN-0001
ISSUE B

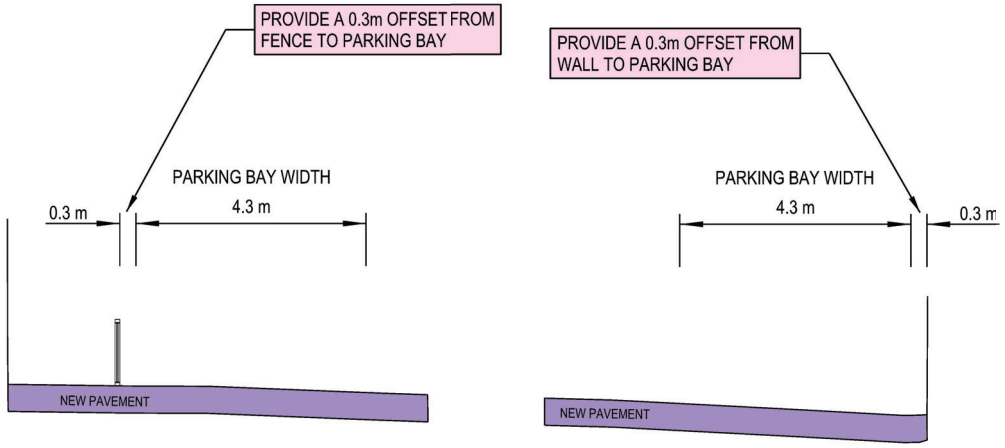
GDA 2020



BUS PARKING BAY - DETAIL A



FOOTPATH AND FENCE - DETAIL B



OFFSET FROM FENCE/WALL TO PARKING BAY - DETAIL C

ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

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03	19-05-25	ISSUED FOR 100% DETAIL DESIGN
A	22-05-25	ISSUED FOR CONSTRUCTION
B	03-06-25	UPDATED FACILITIES AREA

WVR No.: APPROVAL:

SCALES ON A3 SIZE DRAWING: NOT TO SCALE

CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

	NAME	DATE
TITLE		
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DRG CHECK	C. EGAN	XX.XX.XX
DESIGN	A. SIMONOVSKI	XX.XX.XX
DESIGN CHECK	C. EGAN	XX.XX.XX
DESIGN MNGR	C. EGAN	XX.XX.XX
PROJECT MNGR	L. JONES	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
TYPICAL DETAILS

A3

TINSW REGISTRATION No.: DS2025/000325 PART: 1

ISSUE STATUS: CONSTRUCTION ISSUE EDMS No.: SF2025/054832 SHEET No.: RW-0004 ISSUE: B

LEGEND

GDA 2020

- MC?? — DESIGN CONTROL CALLOUT
- XXXX — CONSTRUCTION CALLOUT
- PROPOSED BOLLARD

NOTES

1. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT TINSW QA SPECIFICIATIONS AND AUSTRALIAN STANDARDS UNLESS OTHERWISE STATED.
2. CONTRACTOR TO CONFIRM LOCATION OF ALL SERVICES, DRAINAGE WORKS AND UNDERGROUND INFRASTRUCTURE PRIOR TO COMMENCING WORK. CONTRACTOR TO ENSURE ADOPTED METHOD OF CONSTRUCTION AND PROPOSED WORKS WILL AVOID DAMAGE TO ALL SERVICES AND DRAINAGE WORKS, INCLUDING CLEARANCES TO OVERHEAD POWER LINES.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS, METERAGES, CHAINAGES AND CO-ORDINATES ARE EXPRESSED IN METRES
4. ACCESS TO PROPERTIES TO BE MADE AVAILABLE BY THE CONTRACTOR AT ALL TIMES DURING CONSTRUCTION.
5. PAVEMENT AREAS EXCLUDE PAVEMENT UNDER KERBS AND VERGES. REFER TO SHEET PV-0001 FOR DETAILS.
6. REFER TO SHEET PV-0001 FOR PAVEMENT PROFILES.
7. REFER TO AS 2890.2:2018 FOR GUIDANCE ON OFF-STREET PARKING FACILITIES FOR COMMERCIAL VEHICLES.
8. REFER TO GUIDELINES FOR THE PLANNING OF BUS LAYOVER PARKING FOR BUS LAYOVER DETAILS
9. REFER TO POWDER COATED CAST IN BOLLARDS SPECS FOR BOLLARD DETAILS. BOLLARDS SHOULD NOT BE SPACED OUT MORE THAN 1.5m. BOLLARD TO BE 0.14m IN DIA AND 1.2m ABOVE SURFACE.

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
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PLOT BY: simonoat

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03	19-05-25	ISSUED FOR 100% DETAIL DESIGN
A	22-05-25	ISSUED FOR CONSTRUCTION
B	03-06-25	UPDATED FACILITIES AREA

WVR No.:
APPROVAL:
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CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020)
HEIGHT DATUM: AHD
DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

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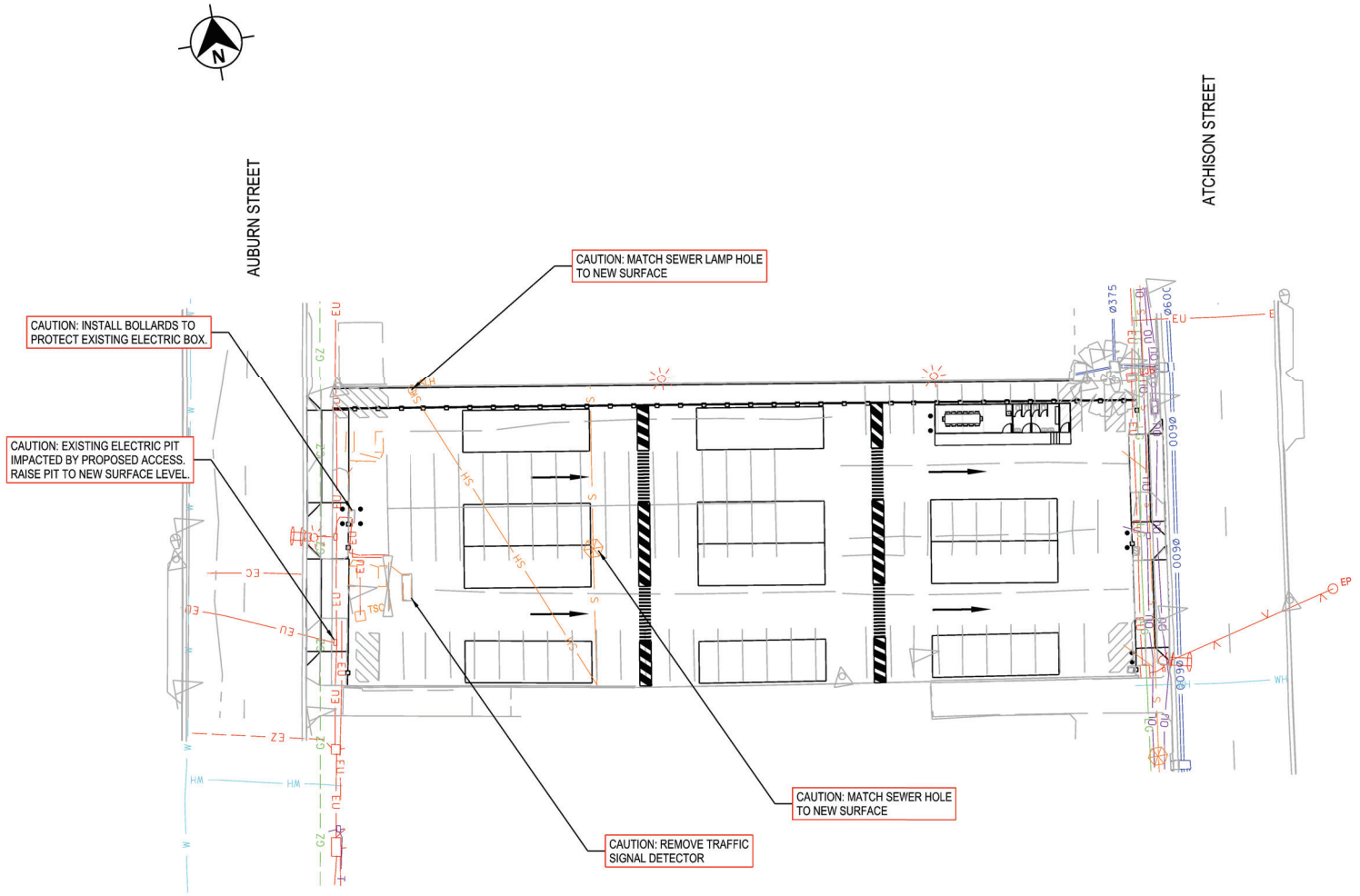
DRAWN	A. SIMONOVSKI		XX.XX.XX
DRG CHECK	C. EGAN		XX.XX.XX
DESIGN	A. SIMONOVSKI		XX.XX.XX
DESIGN CHECK	C. EGAN		XX.XX.XX
DESIGN MNGR	C. EGAN		XX.XX.XX
PROJECT MNGR	L. JONES		XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW
PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
DETAIL PLAN

A3

TINSW REGISTRATION No.: DS2025/000325
PART: 1
ISSUE STATUS: CONSTRUCTION ISSUE
EDMS No.: SF2025/054832
SHEET No.: RW-0101
ISSUE: B



LEGEND

- EXISTING WATER MAIN
- EXISTING WATER HOUSE CONNECTION
- EXISTING DRAINAGE PIPE
- EXISTING OPTIC FIBRE
- EXISTING UNDERGROUND POWER
- EXISTING ELECTRICAL CONDUIT
- EXISTING ELECTRICAL DIGITISED
- EXISTING ABOVEGROUND POWER
- EXISTING SEWER MAIN
- EXISTING SEWER HOUSE CONNECTION
- EXISTING GAS MAIN LOW PRESSURE
- EXISTING SEWER MAIN
- EXISTING TRAFFIC SIGNAL DETECTOR
- EXISTING POWER POLE
- EXISTING POWER POLE WITH OUTREACH
- EXISTING LIGHT POLE

GDA 2020

NOTES

1. EXISTING UNDERGROUND UTILITIES UNDER PROPOSED WORKS, CARE TO BE TAKEN BY CONSTRUCTORS.

ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
50mm ON A3 SIZE ORIGINAL

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DESIGN LOT CODE | WVR No. | APPROVAL

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES

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03	19-05-25	ISSUED FOR 100% DETAIL DESIGN
A	22-05-25	ISSUED FOR CONSTRUCTION
B	03-06-25	UPDATED FACILITIES AREA

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m

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DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

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DRG CHECK	C. EGAN	XX.XX.XX
DESIGN	A. SIMONOVSKI	XX.XX.XX
DESIGN CHECK	C. EGAN	XX.XX.XX
DESIGN MNGR	C. EGAN	XX.XX.XX
PROJECT MNGR	L. JONES	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
UTILITY PLAN

A3

TINSW REGISTRATION No. DS2025/000325 PART 1

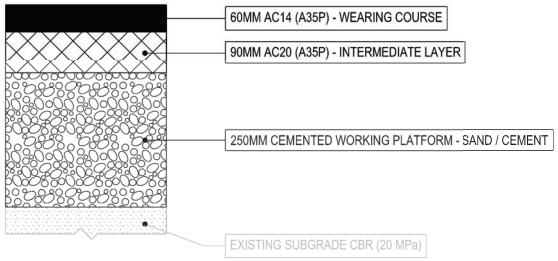
ISSUE STATUS: CONSTRUCTION ISSUE | EDMS No. SF2025/054832 | SHEET No. UT-0001 | ISSUE B

NOTES

1. NO PAVEMENT DESIGN APPROVAL FORM HAS BEEN SIGNED TO DATE.

GDA 2020

PAVEMENT TYPE 1 - P1
NEW PAVEMENT AREA



ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

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EXTERNAL REFERENCE FILES

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03	19-05-25	ISSUED FOR 100% DETAIL DESIGN
A	22-05-25	ISSUED FOR CONSTRUCTION
B	03-06-25	UPDATED FACILITIES AREA

DESIGN LOT CODE | WVR No. | APPROVAL

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

SCALES ON A3 SIZE DRAWING: NOT TO SCALE

CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

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DRG CHECK	C. EGAN	XX.XX.XX
DESIGN	A. SIMONOVSKI	XX.XX.XX
DESIGN CHECK	C. EGAN	XX.XX.XX
DESIGN MNGR	C. EGAN	XX.XX.XX
PROJECT MNGR	L. JONES	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
PAVEMENT DETAILS

A3

TINSW REGISTRATION No. DS2025/000325 PART 1

ISSUE STATUS: CONSTRUCTION ISSUE | EDMS No. SF2025/054832 | SHEET No. PV-0001 | ISSUE B

LEGEND

GDA 2020

PAVEMENT TYPE P1 - PAVEMENT OVERLAY

CONCRETE

NOTES

1. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT TfNSW QA SPECIFICIATIONS AND AUSTRALIAN STANDARDS UNLESS OTHERWISE STATED.
2. PAVEMENT AREAS EXCLUDE PAVEMENT UNDER KERBS AND VERGES. REFER TO SHEET PV-0001 FOR DETAILS.

ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

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PLOT BY: simonoat

CLIENT: NSW GOVERNMENT Transport for NSW

EXTERNAL REFERENCE FILES

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03	19-05-25	ISSUED FOR 100% DETAIL DESIGN
A	22-05-25	ISSUED FOR CONSTRUCTION
B	03-06-25	UPDATED FACILITIES AREA

WVR No. | APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

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DRG CHECK	C. EGAN	XX.XX.XX
DESIGN	A. SIMONOVSKI	XX.XX.XX
DESIGN CHECK	C. EGAN	XX.XX.XX
DESIGN MNGR	C. EGAN	XX.XX.XX
PROJECT MNGR	L. JONES	XX.XX.XX

PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
PAVEMENT PLAN

A3

TINSW REGISTRATION No. DS2025/000325 PART 1

ISSUE STATUS: CONSTRUCTION ISSUE | EDMS No. SF2025/054832 | SHEET No. PV-0101 | ISSUE B

LEGEND

- XXXX — CONSTRUCTION CALLOUT
- BB — LINEMARKING CALLOUT
- PROPOSED LINEMARKING
- PEDESTRIAN FENCE
- EXISTING SIGNAGE LOCATION
- PROPOSED SIGNAGE LOCATION
- PROPOSED BOLLARD

GDA 2020

NOTES

1. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT TfNSW QA SPECIFICATIONS AND AUSTRALIAN STANDARDS UNLESS OTHERWISE STATED. ANY SIGNAGE NOT LABELLED ON THE PLANS IS NOT STANDARD TfNSW SIGNAGE AND SHOULD BE PROVIDED IN CONSULTATION WITH THE PROJECT MANAGER.
2. ALL REDUNDANT LINEMARKING TO BE REMOVED. REINSTATE EXISTING LINEMARKING AFFECTED BY PAVEMENT RE-SHEETING.
3. LINEMARKING AND RETRO REFLECTIVE PAVEMENT MARKERS (RRPM) TO BE INSTALLED IN ACCORDANCE WITH TfNSW DELINEATION GUIDELINES.
4. SIGNPOSTING LOCATION AND ORIENTATION TO BE INSTALLED IN ACCORDANCE WITH AS1742.2 AND TfNSW SUPPLEMENTS.
5. EXISTING SIGNS TO BE REMOVED OR RELOCATED HAVE BEEN IDENTIFIED ONLY. EXISTING SIGNS WHICH ARE NOT NOTED ARE TO REMAIN UNLESS APPROVED BY THE PRINCIPALS REPRESENTATIVE.
6. FOR SIGN POST AND FOOTING DETAILS REFER TO TfNSW ACCEPTANCE DOCUMENT FOR FRANGIBLE SIGN POST PRODUCT.
7. SIGNS WITH TIMES AND DATES ARE EXAMPLE TIME PARAMETERS AND ACTUAL TIME PARAMETERS ARE TO REFLECT THE EXISTING SITE. THIS IS TO BE DONE ON SITE BY CONSTRUCTOR.

ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
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A	22-05-25	ISSUED FOR CONSTRUCTION
B	03-06-25	UPDATED FACILITIES AREA

WVR No.:
APPROVAL:
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HEIGHT DATUM: AHD
DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

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DRG CHECK	C. EGAN		XX.XX.XX
DESIGN	A. SIMONOVSKI		XX.XX.XX
DESIGN CHECK	C. EGAN		XX.XX.XX
DESIGN MNGR	C. EGAN		XX.XX.XX
PROJECT MNGR	L. JONES		XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW
PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
EXISTING SIGNAGE PLAN

A3

TfNSW REGISTRATION No.: DS2025/000325
PART: 1
ISSUE STATUS: CONSTRUCTION ISSUE
EDMS No.: SF2025/054832
SHEET No.: FN-0001
ISSUE: B

LEGEND

- XXXX — CONSTRUCTION CALLOUT
- BB — LINEMARKING CALLOUT
- PROPOSED LINEMARKING
- PEDESTRIAN FENCE
- EXISTING SIGNAGE LOCATION
- PROPOSED SIGNAGE LOCATION
- PROPOSED BOLLARD

GDA 2020

NOTES

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2. ALL REDUNDANT LINEMARKING TO BE REMOVED. REINSTATE EXISTING LINEMARKING AFFECTED BY PAVEMENT RE-SHEETING.
3. LINEMARKING AND RETRO REFLECTIVE PAVEMENT MARKERS (RRPM) TO BE INSTALLED IN ACCORDANCE WITH TfNSW DELINEATION GUIDELINES.
4. SIGNPOSTING LOCATION AND ORIENTATION TO BE INSTALLED IN ACCORDANCE WITH AS1742.2 AND TfNSW SUPPLEMENTS.
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ACCEPTED FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

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PLOT BY: simonoat

EXTERNAL REFERENCE FILES:

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03	19-05-25	ISSUED FOR 100% DETAIL DESIGN
A	22-05-25	ISSUED FOR CONSTRUCTION
B	03-06-25	UPDATED FACILITIES AREA

WVR No.:
APPROVAL:
SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m
CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020)
HEIGHT DATUM: AHD
DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

	TITLE	NAME	DATE
DRAWN	A. SIMONOVSKI		XX.XX.XX
DRG CHECK	C. EGAN		XX.XX.XX
DESIGN	A. SIMONOVSKI		XX.XX.XX
DESIGN CHECK	C. EGAN		XX.XX.XX
DESIGN MNGR	C. EGAN		XX.XX.XX
PROJECT MNGR	L. JONES		XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW
PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
PROPOSED SIGNAGE PLAN - BUS LAYOVER SIGNAGE
SHEET 1 OF 4

A3

TINSW REGISTRATION No.: DS2025/000325 PART 1
ISSUE STATUS: CONSTRUCTION ISSUE
EDMS No.: SF2025/054832
SHEET No.: FN-0002
ISSUE: B

LEGEND

- XXXX — CONSTRUCTION CALLOUT
- BB — LINEMARKING CALLOUT
- PROPOSED LINEMARKING
- PEDESTRIAN FENCE
- EXISTING SIGNAGE LOCATION
- PROPOSED SIGNAGE LOCATION
- PROPOSED BOLLARD

GDA 2020

NOTES

1. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT TfNSW QA SPECIFICIATIONS AND AUSTRALIAN STANDARDS UNLESS OTHERWISE STATED. ANY SIGNAGE NOT LABELLED ON THE PLANS IS NOT STANDARD TfNSW SIGNAGE AND SHOULD BE PROVIDED IN CONSULTATION WITH THE PROJECT MANAGER.
2. ALL REDUNDANT LINEMARKING TO BE REMOVED. REINSTATE EXISTING LINEMARKING AFFECTED BY PAVEMENT RE-SHEETING.
3. LINEMARKING AND RETRO REFLECTIVE PAVEMENT MARKERS (RRPM) TO BE INSTALLED IN ACCORDANCE WITH TfNSW DELINEATION GUIDELINES.
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03	19-05-25	ISSUED FOR 100% DETAIL DESIGN		
A	22-05-25	ISSUED FOR CONSTRUCTION		
B	03-06-25	UPDATED FACILITIES AREA		

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m
CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

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TITLE		
DRAWN	A. SIMONOVSKI	XX.XX.XX
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DESIGN MNGR	C. EGAN	XX.XX.XX
PROJECT MNGR	L. JONES	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW
PREPARED FOR: PROJECT MANAGEMENT 1, ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
PROPOSED SIGNAGE PLAN - ON-STREET SIGNAGE AT AUBURN ST AND DEAN ST - SHEET 2 OF 4

A3

TfNSW REGISTRATION No.: DS2025/000325 PART: 1
ISSUE STATUS: CONSTRUCTION ISSUE
EDMS No.: SF2025/054832
SHEET No.: FN-0003
ISSUE: B

LEGEND

- XXXX — CONSTRUCTION CALLOUT
- BB — LINEMARKING CALLOUT
- PROPOSED LINEMARKING
- PEDESTRIAN FENCE
- EXISTING SIGNAGE LOCATION
- PROPOSED SIGNAGE LOCATION
- PROPOSED BOLLARD

GDA 2020

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PLOT BY: simonoat

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WVR No.:

APPROVAL:

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

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DESIGN MNGR	C. EGAN	XX.XX.XX
PROJECT MNGR	L. JONES	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD

BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
PROPOSED SIGNAGE PLAN - ON-STREET SIGNAGE AT STATION ST - SHEET 3 OF 4

A3

TfNSW REGISTRATION No.: DS2025/000325

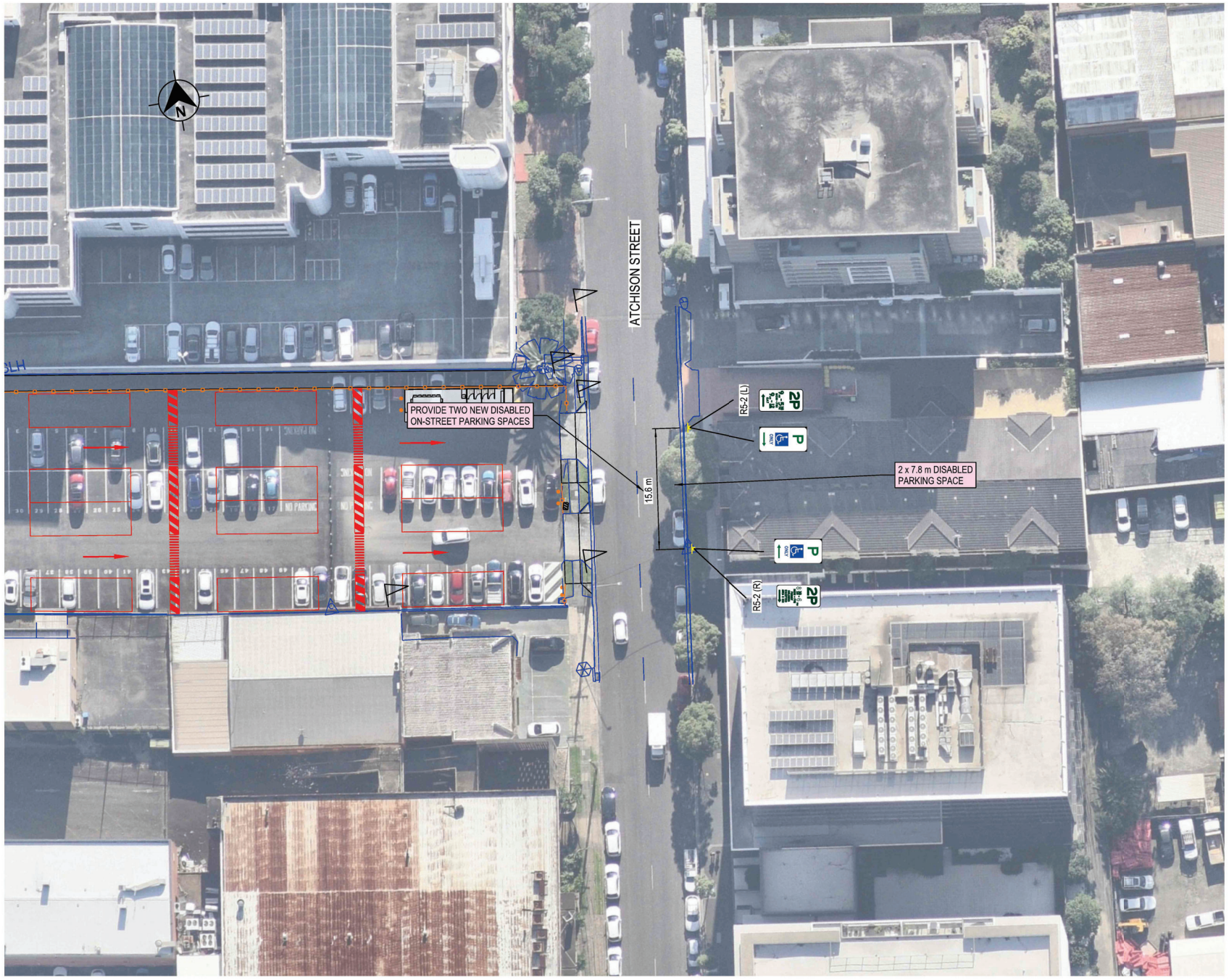
PART: 1

ISSUE STATUS: CONSTRUCTION ISSUE

EDMS No.: SF2025/054832

SHEET No.: FN-0004

ISSUE: B



LEGEND

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GDA 2020

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WVR No. | APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 — SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) — HEIGHT DATUM: AHD

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DESIGN MNGR	C. EGAN	XX.XX.XX
PROJECT MNGR	L. JONES	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: PROJECT MANAGEMENT 1 ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
PROPOSED SIGNAGE PLAN - ON-STREET DISABLED PARKING SIGNAGE AT ATCHISON ST - SHEET 4 OF 4

A3

TfNSW REGISTRATION No.: DS2025/000325 — PART: 1

ISSUE STATUS: CONSTRUCTION ISSUE — EDMS No.: SF2025/054832 — SHEET No.: FN-0005 — ISSUE: B

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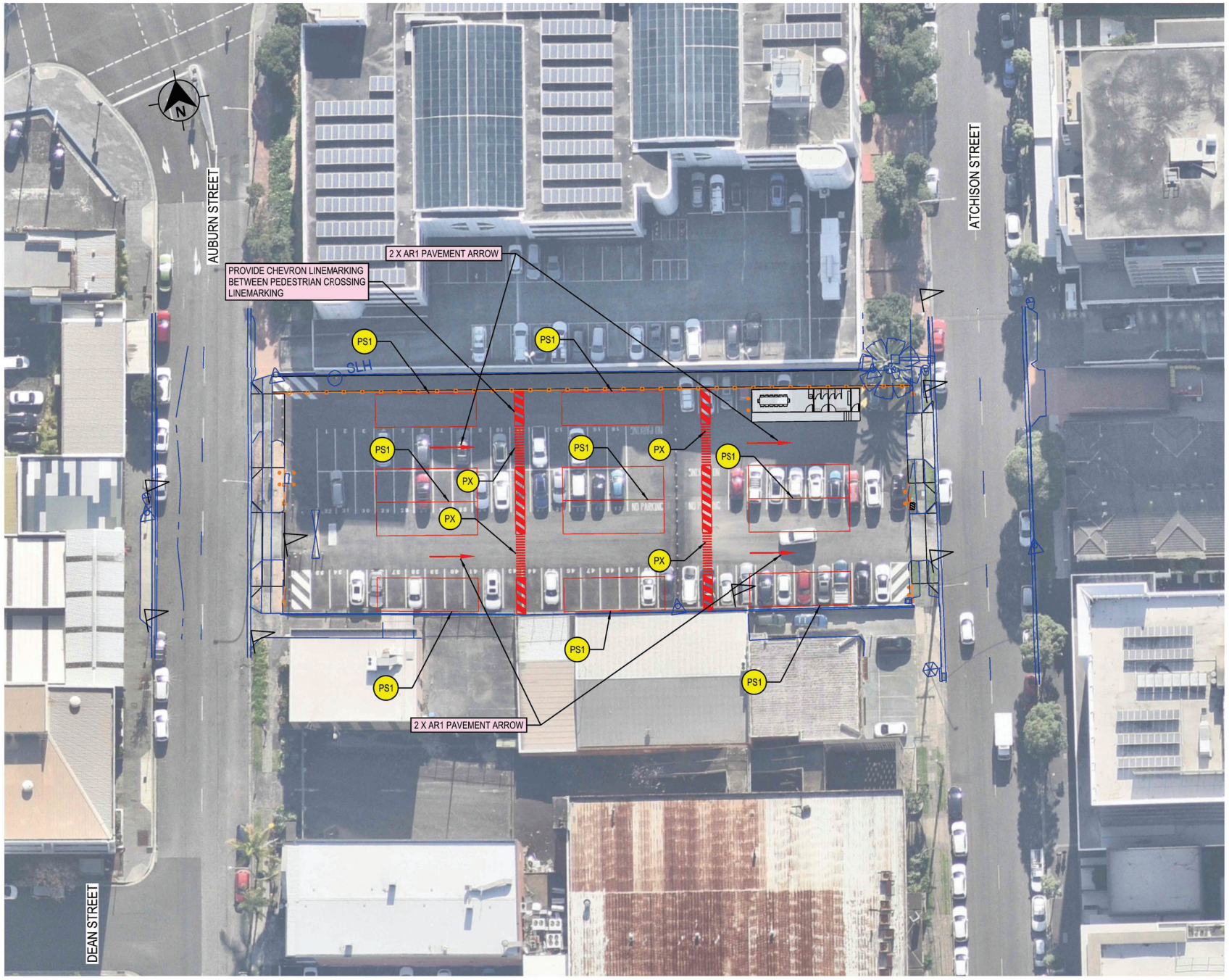

LEGEND

GDA 2020

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- PROPOSED LINEMARKING
- PEDESTRIAN FENCE
- EXISTING SIGNAGE LOCATION
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PLOT BY: simonoat

EXTERNAL REFERENCE FILES:

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WVR No.:
APPROVAL:
SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m
CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020)
HEIGHT DATUM: AHD
DRAWINGS / DESIGN PREPARED BY: NSW GOVERNMENT Transport for NSW

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DRG CHECK	C. EGAN		XX.XX.XX
DESIGN	A. SIMONOVSKI		XX.XX.XX
DESIGN CHECK	C. EGAN		XX.XX.XX
DESIGN MNGR	C. EGAN		XX.XX.XX
PROJECT MNGR	L. JONES		XX.XX.XX

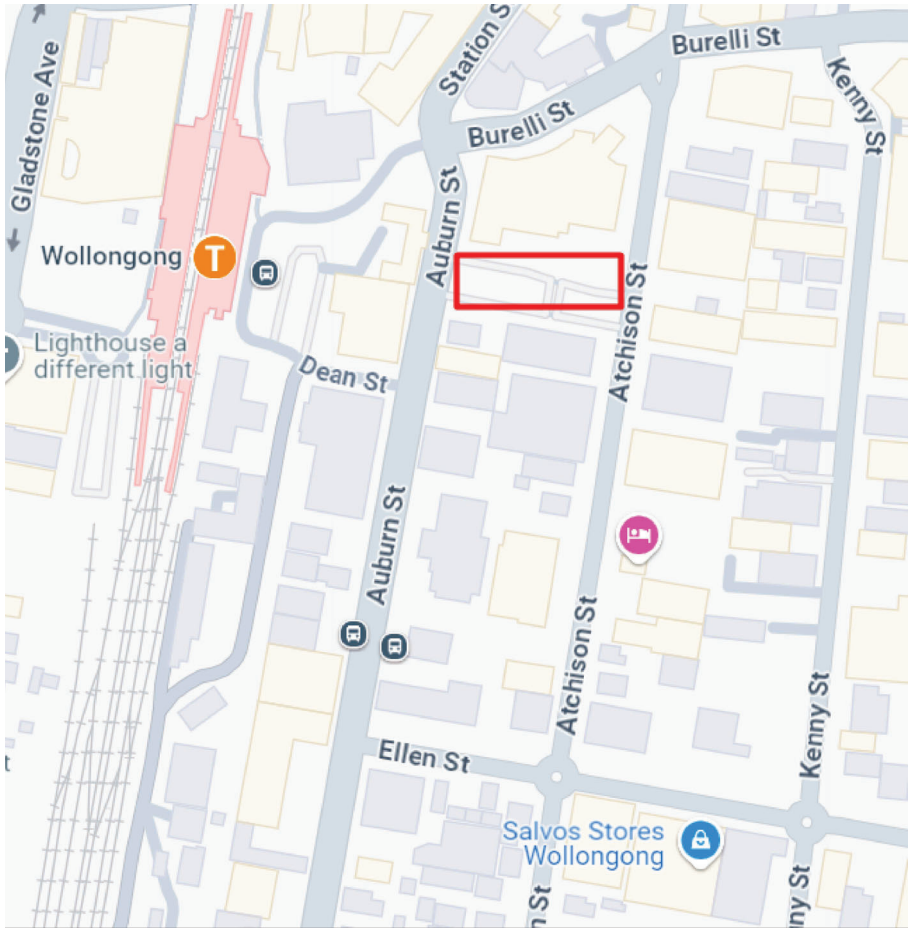
CLIENT: NSW GOVERNMENT Transport for NSW
PREPARED FOR: PROJECT MANAGEMENT 1, ROAD MAINTENANCE & RESILIENCE

WOLLONGONG CITY LGA
MR7000 - UNCLASSIFIED ROAD
BUS LAYOVER BETWEEN AUBURN ST AND ATCHISON ST, WOLLONGONG
PAVEMENT MARKING PLAN

A3

TfNSW REGISTRATION No.: DS2025/000325 PART 1
ISSUE STATUS: CONSTRUCTION ISSUE
EDMS No.: SF2025/054832
SHEET No.: FN-0006
ISSUE: B

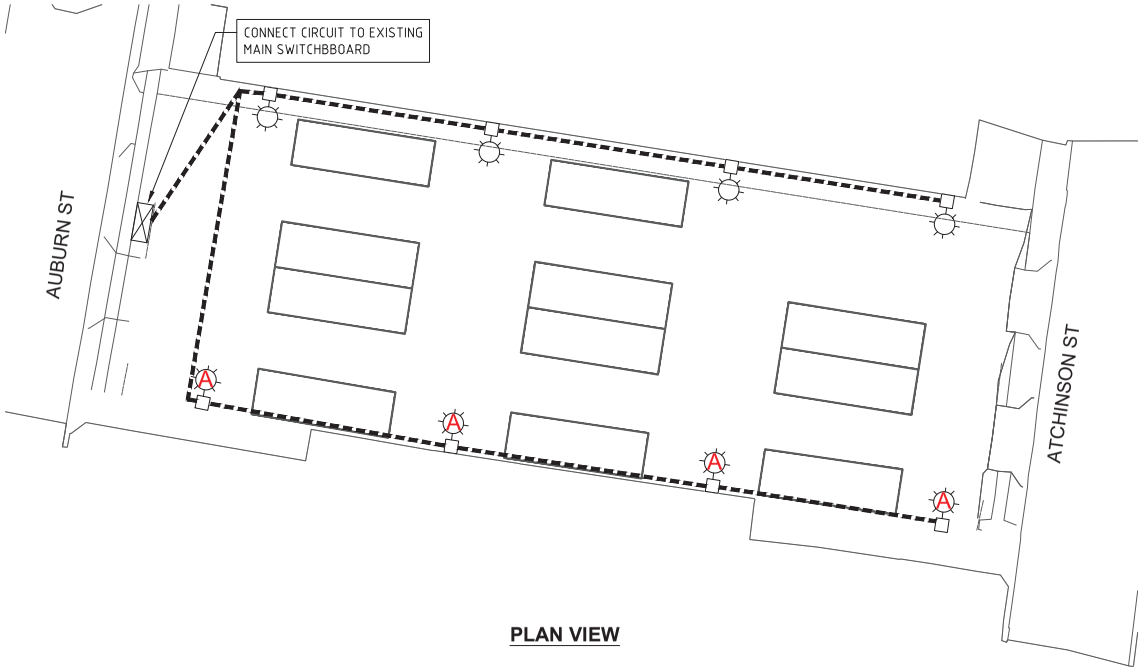
WOLLONGONG BUS LAYOVER
CAR PARK LIGHTING



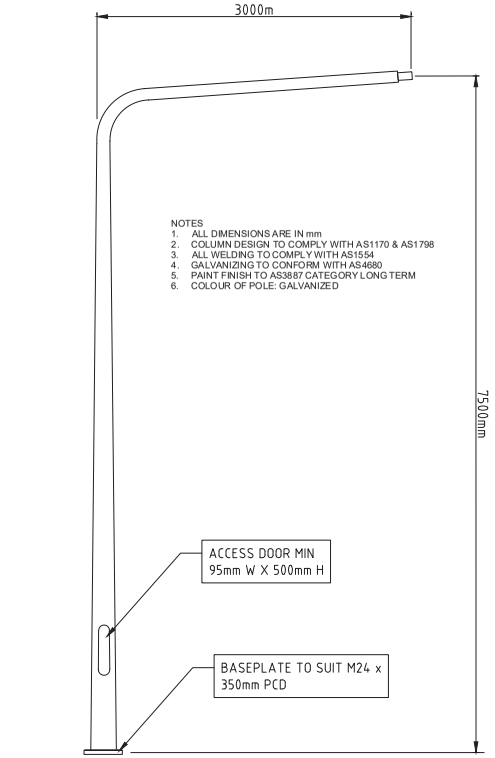
NOTES:

1. ALL SERVICE WORK TO BE INSTALLED IN ACCORDANCE WITH AS3000:2007 AND THE NSW SERVICE AND INSTALLATION RULES. LIGHTING INSTALLATION TO BE CONSTRUCTED IN ACCORDANCE WITH ENDEAVOUR ENERGY STANDARDS
2. DO NOT PLACE ANY RELIANCE ON ANY QUANTITIES OR DIMENSIONS GIVEN IN THIS DRAWING QUANTITIES AND DIMENSIONS GIVEN ON THIS DRAWING ARE BASED ON DESIGN INFORMATION AND SITE CONDITIONS AT THE TIME OF DESIGN. AS QUANTITIES AND DIMENSIONS ARE SUBJECT TO CHANGE, THE BUILDER OF THIS PROJECT MUST CHECK ALL QUANTITIES AND DIMENSIONS ON SITE PRIOR TO TENDERING AND PRIOR TO CONSTRUCTION.
3. ATTENTION:
   PERMANENT SURVEY MARKS MAY EXIST IN THIS AREA. THESE ARE TO BE LOCATED BY A SURVEYOR PRIOR TO COMMENCEMENT OF WORK.
4. LIVE ENDEAVOUR ENERGY'S CABLES & SERVICES IN THIS AREA. LOCATE PRIOR TO DIGGING. CONTACT 'DIAL BEFORE YOU DIG' TELEPHONE 1100 FOR SERVICES TWO DAYS PRIOR TO EXCAVATION.
5. ATTENTION:
   THE PREPARATION OF THIS DESIGN, HAS BEEN UNDERTAKEN GIVING DUE CONSIDERATION TO THE EXISTING SERVICES. THE PROJECT CONSTRUCTOR IS, HOWEVER, WHOLLY RESPONSIBLE FOR VERIFYING THE EXACT LOCATION OF EXISTING SERVICES AND PERMANENT SURVEY MARKS BEFORE CONSTRUCTION COMMENCES, AND NO RESPONSIBILITY NOR LIABILITY WILL BE ACCEPTED BY THE DESIGNER OF THIS PROJECT FOR DAMAGE TO EXISTING SERVICES AS A RESULT OF THIS DESIGN AND/OR POLE PEGGING.
6. ATTENTION:
   ALL SERVICES SEARCHES MUST BE CHECKED BEFORE CONSTRUCTION.
7. ALL CONDUITS ARE TO BE CONTINUOUS AND HAVE A MINIMUM COVER OF 600mm.
8. DISPOSAL OF ALL WASTES TO BE HANDLED IN A SAFE OPERATING MANNER.
9. ALL DRAINS AND WATER WAYS TO BE PROTECTED DURING CONSTRUCTION. ALL WORK TO BE IN ACCORDANCE WITH THE LOCAL COUNCIL'S ENVIRONMENTAL GUIDELINES.
10. ALL CONDUITS ARE TO BE HEAVY DUTY RIGID PVC COMPLYING WITH AS2053 AND BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF AS3000. USING MAXIMUM RADIUS BENDS (IF REQUIRED) , MARKER TAPE & MECHANICAL PROTECTION COMPLYING WITH THE APPROPRIATE AUSTRALIAN STANDARD IS TO BE INSTALLED TO ALL PRIVATE UNDERGROUND CONDUIT INSTALLATIONS.
11. MAIN SWITCHBOARD TO COMPLY WITH CONTRACTOR/MANUFACTURER;S SPECIFICATION, AS3000 AND THE REQUIREMENTS OF ENDEAVOUR ENERGY AND BE ACCEPTABLE TO THE CLIENT PRIOR TO MANUFACTURE.
12. MAIN SWITCHBOARD IS TO BE CLEARLY & PERMANENTLY LABELED.
13. ALL WORKS ARE TO BE COMPLETED BY A LICENSED ELECTRICAL CONTRACTOR.
14. ALL NEW SL LANTERNS TO HAVE INTEGRAL P.E CELL INSTALLED.
15. CONSTRUCTOR TO CONFIRM FINISHED GROUND LEVELS WITH DEVELOPER PRIOR TO COMMENCING CONSTRUCTION.
16. DISPOSAL OF ALL WASTES TO BE HANDLED IN A SAFE OPERATING MANNER.
17. ALL DRAINS AND WATER WAYS TO BE PROTECTED DURING CONSTRUCTION. ALL WORK TO BE IN ACCORDANCE WITH THE LOCAL COUNCIL'S ENVIRONMENTAL GUIDELINES.
18. SEDIMENT CONTROL AND WASTE MATERIAL MANAGEMENT IS REQUIRED DURING CONSTRUCTION PERIOD.
19. IF THERE ARE DOUBTS ABOUT THE TYPE OF THE SOIL, THE AREA IN QUESTION IS TO HAVE TRIAL HOLES TO ASSESS THE TYPE OF CONTAMINATING MATERIALS, IF ANY, ARE PRESENT. ACCORDINGLY A PLAN OF PROPER DISPOSAL CAN BE DEVISED.

A1



PLAN VIEW

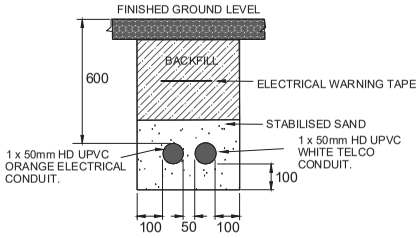


NOTES
1. ALL DIMENSIONS ARE IN mm
2. COLUMN DESIGN TO COMPLY WITH AS1170 & AS1798
3. ALL WELDING TO COMPLY WITH AS1554
4. GALVANIZING TO CONFORM WITH AS4680
5. PAINT FINISH TO AS3887 CATEGORY LONG TERM
6. COLOUR OF POLE: GALVANIZED

TYPICAL LIGHT POLE DETAIL

LEGEND

- NEW LUMINAIRE ON NEW POLE
- NEW TRENCH ROUTE - REFER TO DETAIL BELOW
- EXISTING MAIN SWITCHBOARD



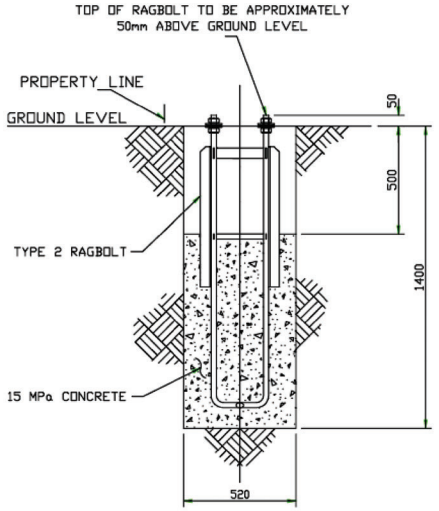
TYPICAL TRENCH DETAIL

SCALE - NTS

THE LIGHTING INSTALLED TO BE INSTALLED IN ACCORDANCE WITH ENDEAVOUR ENERGY STANDARDS

LIGHTING EQUIPMENT SCHEDULE

SYMBOL	STATE	LUMINAIRE				COLUMN/POLE		BRACKET/OUTREACH			LUMINAIRE MOUNTING HEIGHT (m)
		DESCRIPTION	MANUFACTURER	PART NO	LLF	DESCRIPTION	FOOTING (BOLT/FOUNDATION)	DESCRIPTION	UPCAST	CATEGORY	
	NEW	60w ROADLED MIDI AEROSCREEN OPTIC TUNER	SYLVANIA/SCHREDER	PM99G25L60	0.8	5.5m SLIM LINE MAST	TYPE 2/TYPE 2 FOUNDATION	3m OUTREACH ARM	5°	PC3 + PP1	7.5m
A	NEW	24w STREETLED AEROSCREEN	SYLVANIA/SCHREDER	JLC99G11L24	0.8	5.5m SLIM LINE MAST	TYPE 2/TYPE 2 FOUNDATION	3m OUTREACH ARM	5°	PC3	7.5m



TYPE 2 RAGBOLT FOUNDATION DETAIL

AMENDMENTS/REVISIONS

Rev	Description	Initials	Date
01	Initial Release	BH	5/5/25

ies Member 2024/2025

Road Lighting Certification

This design has been produced by bransonjames and is certified to comply with the design brief and relevant current sections of AS/NZS 1158, except at locations noted on the design.

bransonjames disclaims any responsibility or liability in connection with the following;

1. The design has been based on information received by bransonjames from third parties. Such information has not be verified by bransonjames for completeness or correctness.
2. In producing this design, no account has been taken by bransonjames for sloping terrain/carriageways, crests, vehicular barriers, trees and vegetation, or any other object that may interfere with the lighting design.
3. The design must be installed as specified on this drawing, and no variations allowed without written consent from bransonjmaes.
4. bransonjames cannot be responsible for environmental conditions, which may compromise the compliance of the design.
5. Calculated results, shown herein are subject to practical tolerances such as photometric measurement, manufacturing variation, lamp and control gear characteristics, supply voltage and frequency variation.
6. The compliance of this design is dependent upon the luminaire manufacturer supplying luminaires that are representative of the data contained with the appropriate registered laboratory photometric test report.
7. The design is predicated upon the adoption of a maintenance regime that will maintain the performance of the luminaire to a level equal to or above the Maintenance factors used in the design.

Company: Brendon Hince MIES 2733

Signed .....

Date ..... 2/6/25.....

bransonjames CONSULTING
Public Lighting Certification, Design & Consultancy
Tel: 0422 563 689
Email: design@bransonjames.com.au

DRAWING TITLE

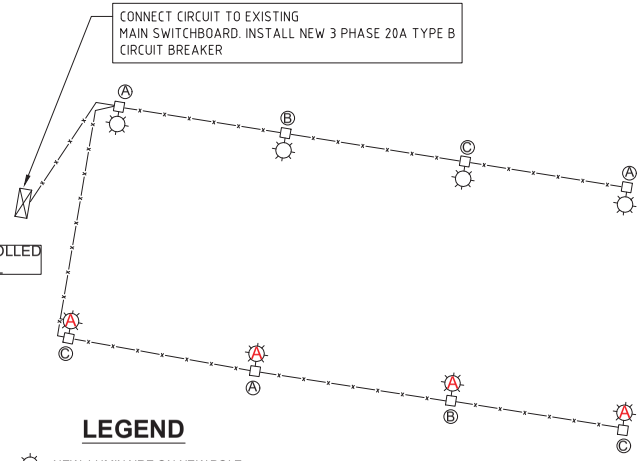
WOLLONGONG BUSLAYOVER
AUBURN ST & ATCHINSON ST
WOLLONGONG
CARPARK LIGHTING

LIGHTING DESIGN

DRAWN	DESIGNED	CHECKED	SCALE (AT FULL SIZE)	DATE
BH	BH		1:250@A1	2/6/25

PROJECT No.	DRAWING No.	REVISION
BJ1430	BJ1430-01	V02

A1



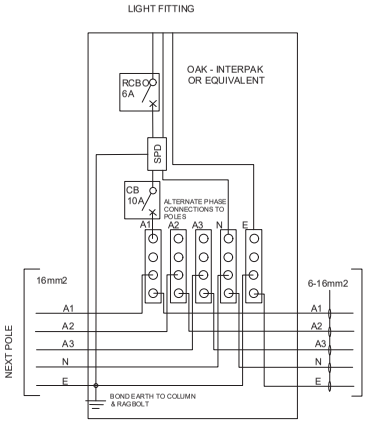
NOTE:ALL NEW LUMINAIRES TO BE CONTROLLED BY INDIVIDUAL PHOTO ELECTRIC CELL

LEGEND

- NEW LUMINAIRE ON NEW POLE
- LAY 4 x 16mm2 Cu PVC/PVC + 6mm2 Cu EARTH
  R.L 182m C.L 400m
- EXISTING MAIN SWITCHBOARD
- Ⓑ DENOTES PHASE CONNECTION

SYLVANIA/SCHREDER - ROADLED MIDI

SYLVANIA/SCHREDER - STREEDLED III



TYPICAL LIGHT POLE WIRING DIAGRAM
SCALE - NTS

THE LIGHTING INSTALLED TO BE INSTALLED IN ACCORDANCE WITH ENDEAVOUR ENERGY STANDARDS

LIGHTING EQUIPMENT SCHEDULE

SYMBOL	STATE	LUMINAIRE				COLUMN/POLE		BRACKET/OUTREACH	UPCAST	CATEGORY	LUMINAIRE MOUNTING HEIGHT (m)
		DESCRIPTION	MANUFACTURER	PART NO	LLF	DESCRIPTION	FOOTING (BOLT/FOUNDATION)	DESCRIPTION			
	NEW	60w ROADLED MIDI AEROSCREEN OPTIC TUNER	SYLVANIA/SCHREDER	PM99G25L60	0.8	5.5m SLIM LINE MAST	TYPE 2/TYPE 2 FOUNDATION	3m OUTREACH ARM	5°	PC3 + PP1	7.5m
	NEW	24w STREETLED AEROSCREEN	SYLVANIA/SCHREDER	JLC99G11L24	0.8	5.5m SLIM LINE MAST	TYPE 2/TYPE 2 FOUNDATION	3m OUTREACH ARM	5°	PC3	7.5m

THE LIGHTING HAS BEEN DESIGNED TO ACHIEVE COMPLIANCE WITH FOLLOWING
- PEDESTRIAN LINK - PP1 OF AS1158.3.1;2020
- CAR PARK - PC3 OF AS1158.3.1:2020

AMENDMENTS/REVISIONS

Rev	Description	Initials	Date
01	Initial Release	BH	5/5/25

ies Member 2024/2025

Road Lighting Certification

This design has been produced by bransonjames and is certified to comply with the design brief and relevant current sections of AS/NZS 1158, except at locations noted on the design.

bransonjames disclaims any responsibility or liability in connection with the following;

1. The design has been based on information received by bransonjames from third parties. Such information has not be verified by bransonjames for completeness or correctness.
2. In producing this design, no account has been taken by bransonjames for sloping terrain/carriageways, crests, vehicular barriers, trees and vegetation, or any other object that may interfere with the lighting design.
3. The design must be installed as specified on this drawing, and no variations allowed without written consent from bransonjmaes.
4. bransonjames cannot be responsible for environmental conditions, which may compromise the compliance of the design.
5. Calculated results, shown herein are subject to practical tolerances such as photometric measurement, manufacturing variation, lamp and control gear characteristics, supply voltage and frequency variation.
6. The compliance of this design is dependent upon the luminaire manufacturer supplying luminaires that are representative of the data contained with the appropriate registered laboratory photometric test report.
7. The design is predicated upon the adoption of a maintenance regime that will maintain the performance of the luminaire to a level equal to or above the Maintenance factors used in the design.

Company: Brendon Hince MIES 2733

Signed .....

Date .....2/6/25.....

bransonjames CONSULTING
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DRAWING TITLE
WOLLONGONG BUSLAYOVER
AUBURN ST & ATCHINSON ST
WOLLONGONG
CARPARK LIGHTING

LIGHTING DESIGN

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BJ1430	BJ1430-02	V02

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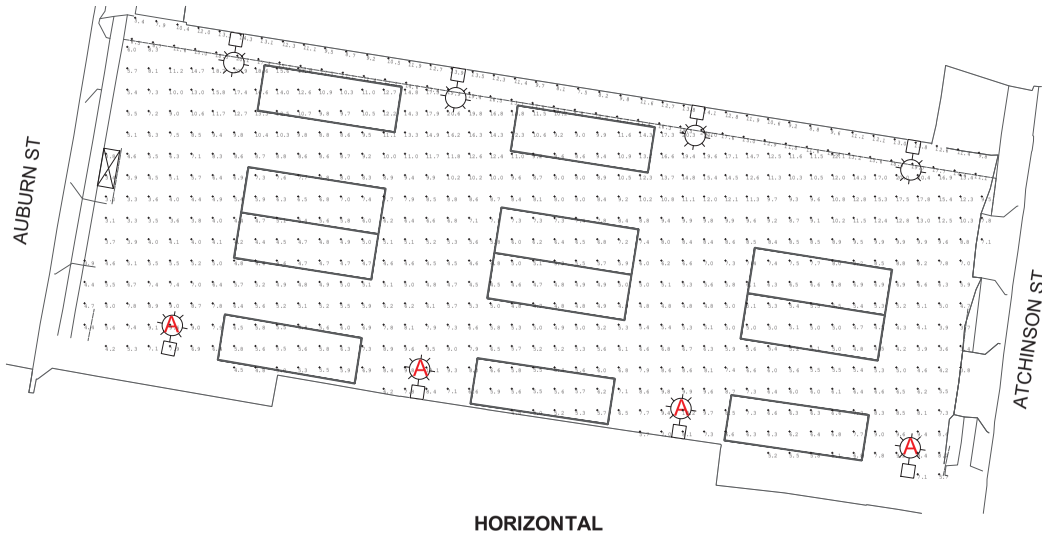
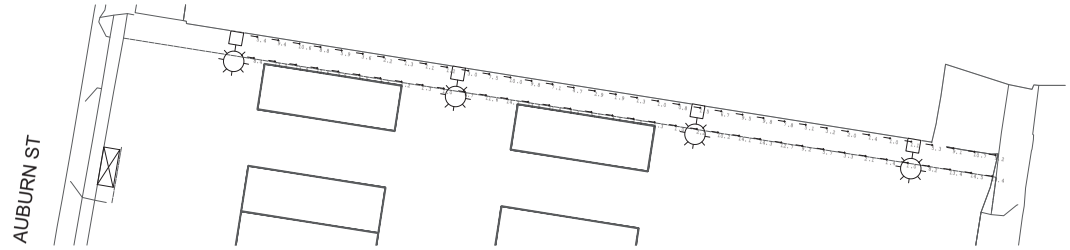
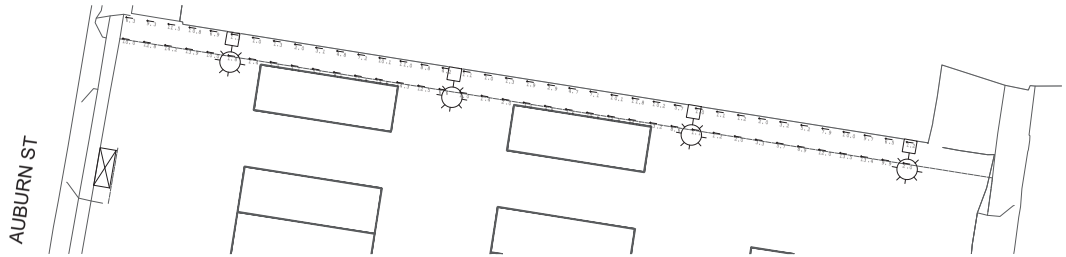


HORIZONTAL ILLUMINATION -Eh



VERTICAL ILLUMINATION -Ev WEST



VERTICAL ILLUMINATION -Ev EAST

Minimum value Light Technical Parameters required for category PC3

Avg Horizontal Illumination (Eh)	3.5 lux
Point Horizontal Illumination (Eph)	0.7 lux
Illumination (horizontal) Uniformity (UE2) Max/Avg	<8

Minimum value Light Technical Parameters required for category PP1

Avg Horizontal Illumination (Eh)	10 lux
Point Horizontal Illumination (Eph)	2 lux
Illumination (horizontal) Uniformity (UE2) Max/Avg	<5
Point Vertical Illumination (Epv)	1 lux

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Max/Min
Carpark	Illuminance	Lux	7.81	20.9	3.0	N.A.
Pedestrian link	Illuminance	Lux	12.72	20.1	5.4	3.72
Pedestrian link_Ev E	Illuminance	Lux	N.A.	14.3	1.0	N.A.
Pedestrian link_Ev W	Illuminance	Lux	N.A.	14.5	1.0	N.A.

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A1

NSW GOVERNMENT