

MULTIPLY

CONSTRUCTION MANAGEMENT PLAN (ADDENDUM)

New Sydney Fish Market
Stage 2 Site Accommodation
Sydney Secondary College Carpark

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1. Introduction

1.1 Purpose

The purpose of this addendum to the Construction Management Plan is to detail the scope, methodology, controls and approvals required for the construction, operation and dismantle of a site accommodation complex for the main works stage of the new Sydney Fish Market project. This addendum will form part of the document submission for MOD6 of SSD 8925 which is required due to construction work being undertaken outside the construction site boundary.

1.2 Background

Multiplex have been contracted to construct the New Sydney Fish Market project. One of the challenges on the project is the limited land available on site to accommodate worker amenities, particularly during the earlier stages of construction. The project team have developed a proposal to locate worker amenities within the Sydney Secondary College boundary illustrated below.

This addendum will only cover the site accommodation complex located outside the site boundary for the purposes of MOD 6 submission for SSD 8925.

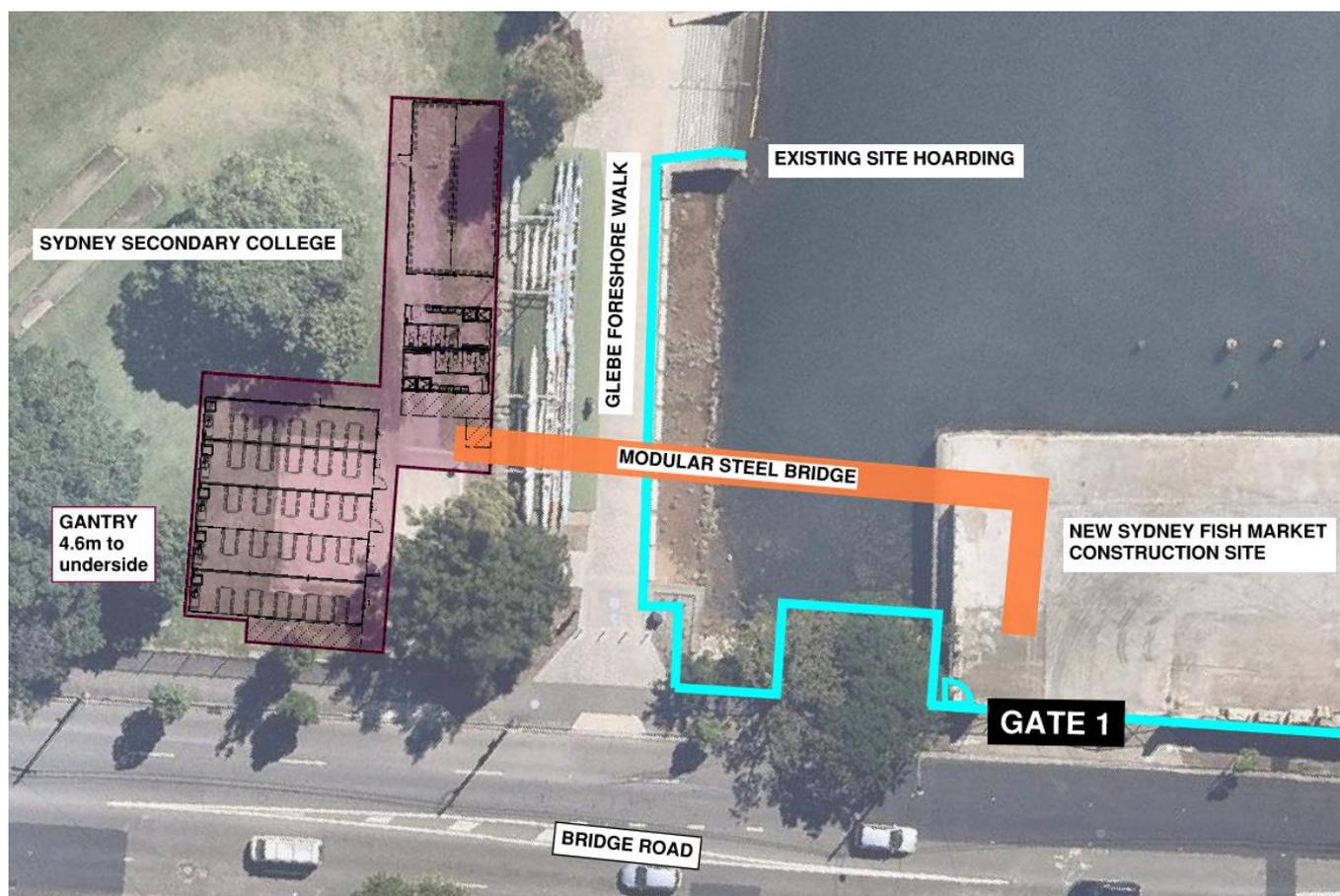


Figure 1 Overall plan for temporary site accommodation complex

1.3

1.3 Interface with other Project Plans and Procedures

This Plan should be read in conjunction with the Construction Management Plan for SSD 8925 and other management plans referenced in this addendum.

1.4 Document Control

This Plan will be monitored and necessary changes will be identified in the table over the page and communicated to all relevant personnel. Amendments and updates to this Management Plan will be made if the strategies and actions described in the plan no longer meet desired outcomes, or if improvements to existing measures can be made.

REVISION	DATE	DESCRIPTION	PAGE	REVIEWED BY	APPROVED BY
1	8/11/2021	Addendum for Stage 2 Site Accommodation		Lucas McKeown	Paul Couani
2	18/11/2021	Site plan updated to only include MOD submission plan	1	Lucas McKeown	Paul Couani
3	19/11/2021	Removal of staging area	9	Lucas McKeown	Paul Couani
4	25/01/2022	Updates for DPIE RFI	1, 3-6, 8, 10-11	Lucas McKeown	Paul Couani

Figure 2 *Revision Table*

2.

2. Pre-Construction Planning

2.1 Site Working Hours

Works will be undertaken within the approved development consent (SSD 8925) hours of construction, including the delivery of materials to and from the site, which will be carried out between the following:

- » Between 7:00am and 5:30pm Monday to Friday
- » Between 7:30am and 3:30pm Saturday
- » No working Sundays or public holidays

Activities such as rock breaking, rock hammering, sheeting piling, pile driving and of the like will only be carried out during the following hours:

- » 9:00am and 12:00pm Monday to Friday
- » 1:00pm and 5:00pm Monday to Friday
- » 9:00am to 1:00pm Saturday

2.2 Out of Hours Procedures

'Out of hours' access is provided for activities that involve the police or a public authority to deliver vehicles, plant or materials, in the case of an emergency to avoid the loss of life, damage to property or to prevent environmental harm.

For planned 'out of hours' work, the Principal and affected stakeholders will be consulted in advance.

2.3 Dilapidation Survey

A dilapidation report will be completed prior to installation and after dismantle works in the area by a qualified dilapidation surveyor.

2.4 Surveys

A survey of the proposed temporary site accommodation area has been completed by a qualified surveyor. An as-built survey will not be required due to the temporary nature of the site accommodation complex.

2.5 Heritage Requirement

There are no known heritage requirements for 1 Taylor St in accordance to the planning information sourced from the City of Sydney Planning Controls Map.

2.6 Geotechnical

Geotechnical investigations have been undertaken by a qualified geotechnical engineer, including a Dynamic Cone Penetration test (DCP) and Cone Piezometer Test (CPT). The results of the geotechnical investigation will be incorporated into the design of the site accommodation structure.

2.7 Acoustic

All work are to be undertaken in accordance to the approved Construction Noise and Vibration Management Plan (CNVMP) for SSD 8925.

An additional Noise and Vibration Impact Assessment has been developed by a qualified acoustic consultant to identify noise and vibration impacts specifically associated with the construction, operation and dismantle of the temporary site accommodation complex, and outlines mitigation and management measures to be employed.

In summary, these works are compliant with the approved CNVMP for SSD 8925.

2.8 Tree Management Controls

An updated Arboricultural Impact Assessment report (AIA) has been developed by a qualified AQF Level 5 arborist to identify impacts to trees from the construction of the temporary accommodation complex. The updated AIA also includes findings from root mapping and a pruning specification as per Council’s request.

One tree (T8) will require removal, while four trees (T3, T4, T9, T10) require pruning as per the arborist advice to allow for the gantry structure. T8 will need to be removed to undertake excavation works to connect to an existing sewer junction point, where excavation work will undermine T8 which poses a safety risk for workers and the public.

The remaining trees will be protected/treated as per the AIA. Multiplex note that Tree 4 is a *Melia azedarach*, which is an exempt species in City of Sydney Council and thus does not require Council permission to prune or remove.

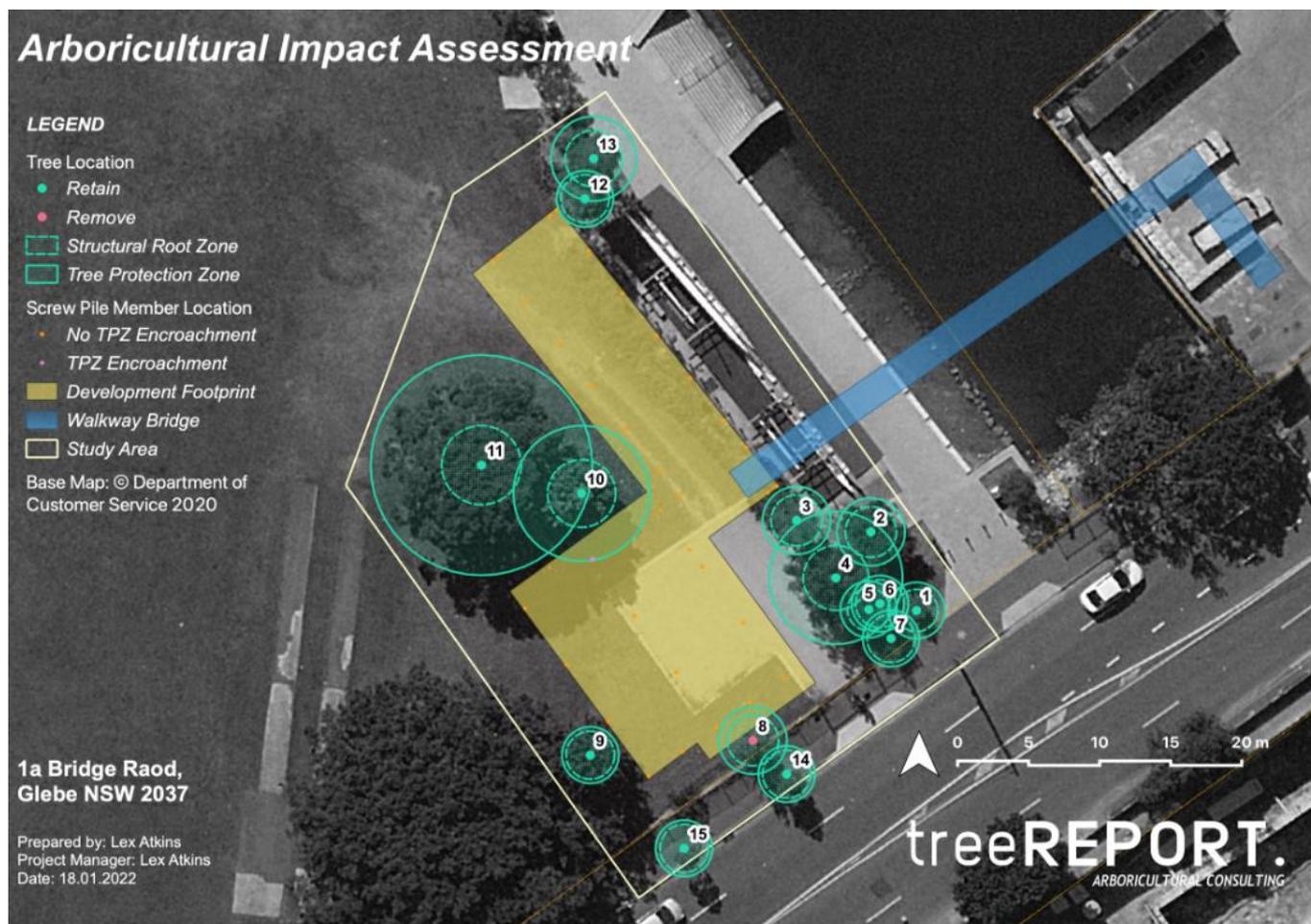


Figure 3 Arboricultural Impact Assessment

2.9 Services Identification, Connections and Diversion

2.9.1 Water and Sewer

Temporary water will be connected from an existing water point within the site boundary, with the water pipe to run along the underside of a modular structural steel bridge spanning between the gantry over the school carpark and the western hardstand within the site boundary. The bridge will be elevated approximately 4.6m from the Glebe Foreshore Walk footpath surface to maintain all vehicle access currently in place.

Temporary sewer will be connected to an existing sewer junction connection point within the school grounds, adjacent to the existing carpark entry. This was identified in Water Dial Before You Dig plans. Excavation is required to make the connection to the junction connection point.

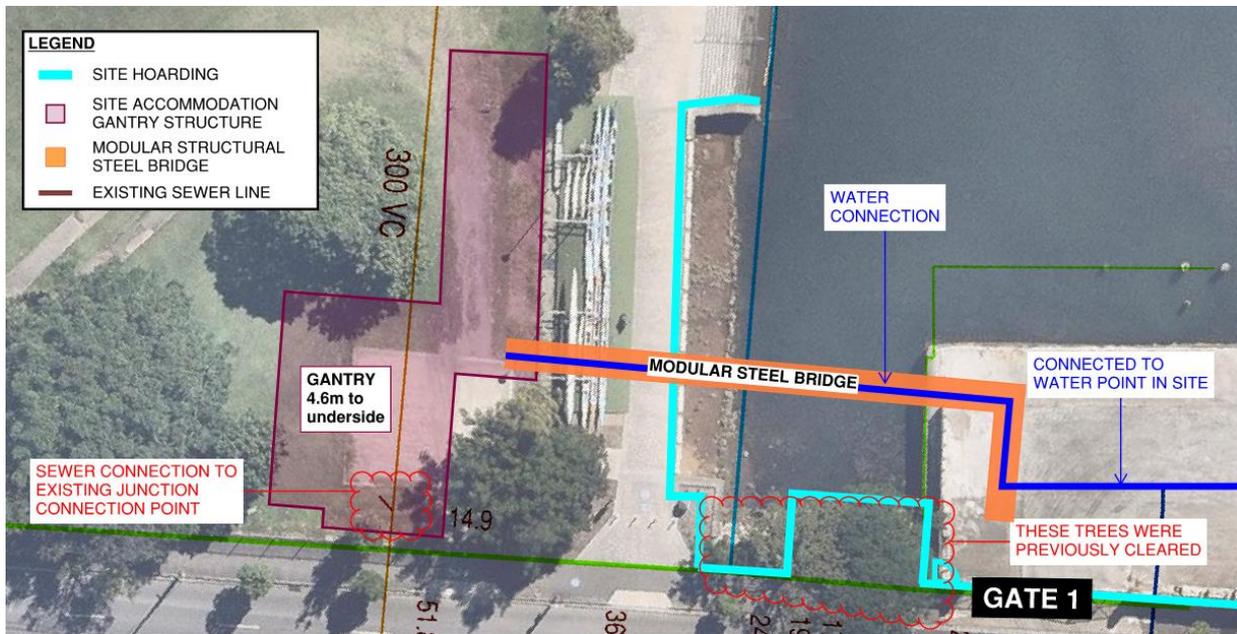


Figure 4 Proposed temporary water services connection

2.9.2 Power

Power will be sourced from the temporary substation kiosk that will be installed for construction power for the main project site (within the site boundary between Glebe Foreshore Walk and Gate 1 of the construction site). All cables and conduits will be run underneath the proposed modular structural steel bridge spanning between the gantry over the school carpark and the western hardstand within the site boundary. The bridge will be elevated approximately 4.6m from the Glebe Foreshore Walk footpath surface to maintain all vehicle access currently in place.

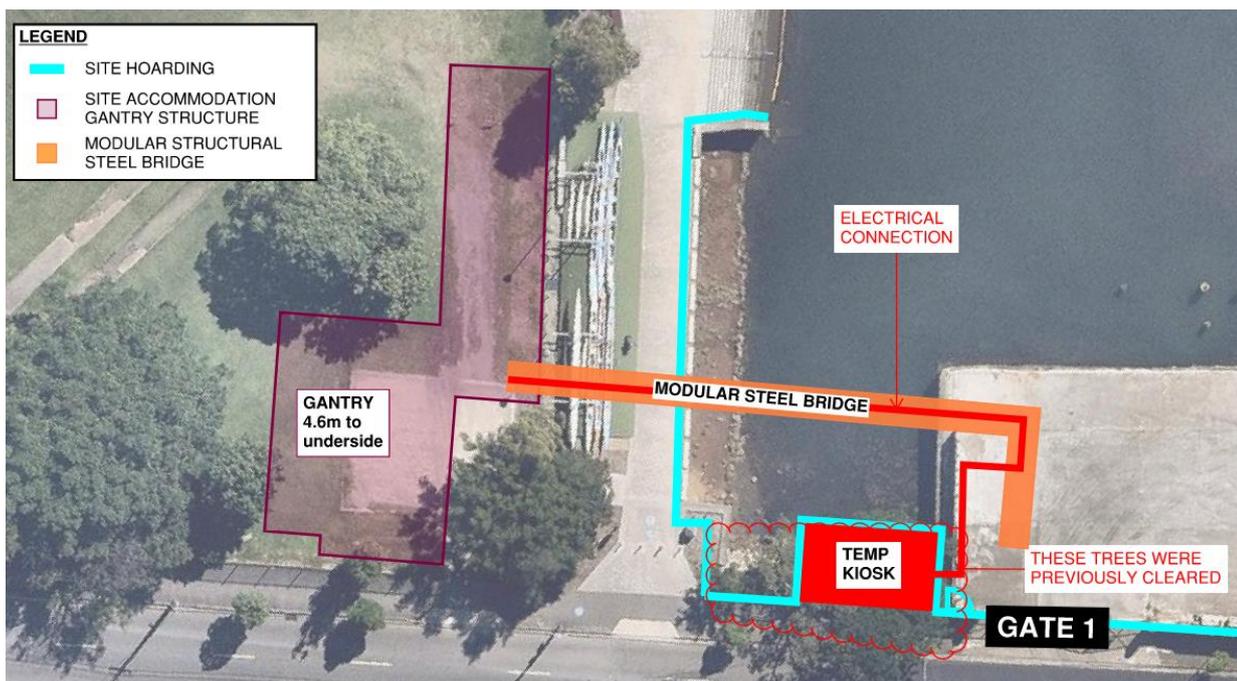


Figure 5 Proposed temporary electrical services connection

2.10 Traffic and Pedestrian Management

2.10.1 Pedestrian and Traffic

All pedestrians and traffic will be managed in accordance with the approved Construction Pedestrian Traffic Management Plan (CPTMP) for the new Sydney Fish Market project.

2.10.1.1 During installation and dismantle

Pedestrian access along Glebe Foreshore Walk will be maintained for the duration of works, with all works being undertaken within the school grounds. An alternative access path for pedestrians will be provided with traffic controller guidance during the installation of a modular structural steel bridge which spans from the gantry to within the project construction site as this will require lifting over Glebe Foreshore Walk. The modular bridge installation is expected to be undertaken as night works in consideration for public safety and to minimise disruptions. Adequate notice will be provided to stakeholders prior to works.

Pedestrian and traffic access along Bridge Road will be maintained for the duration of works, with traffic controllers to guide traffic and pedestrians around construction vehicle movements in and out of the site accommodation site. There is expected to be approximately 12 truck movements per day for a one month period during installation and the same quantity and duration during dismantle works. Trucks will enter and exit the site accommodation site from the existing driveway entry on Bridge Road.

Pedestrian and traffic access to the school oval via the Bridge Road gate will be closed for duration of works, with temporary perimeter fencing to be installed around the work area during install and dismantle of the site accommodation complex.

2.10.1.2 During operation

There will be no impacts to pedestrian and traffic movements during operation of the site accommodation complex, with traffic access to be maintained under the gantry structure for duration of operation of the site accommodation complex.

Workers will enter the site accommodation complex via a modular steel bridge that will span between the site and the accommodation complex to prevent congestion along the existing Bridge Road footpath and Glebe Foreshore Walk.

2.10.2 Emergency Access

2.10.2.1 During installation and dismantle

A vehicle corridor will be maintained in the work zone during installation and dismantle works to ensure access for emergency vehicles.

2.10.2.2 During operation

Vehicle access will be maintained through the carpark for the duration of operation of the site accommodation complex, where cars can enter the gate at Bridge Road and drive into the school oval.

There will be a height restriction of 4.6m to the underside of the gantry which meets minimum overhead clearance for fire brigade vehicle access. Height requirements are for general fire appliance access (4m) and specialist fire appliance access (4.5m) as per Fire and Rescue NSW's *Fire safety guideline – Access for fire brigade vehicles and firefighters (Version 05 – 4 October 2019)*.

2.10.3 Car Parking

2.10.3.1 During installation and dismantle

The existing carpark will be closed during installation and dismantle works. School users will be notified and directed to park their vehicles in the other carpark within the Sydney Secondary College boundary (access via Ferry Rd), or the school carpark on Taylor Street.

Works will be undertaken in consultation with Sydney Secondary College (SSC) to minimise impact to school operations.

2.10.3.2 During operation

The existing carpark will be maintained for Sydney Secondary College use once the site accommodation complex is established. Column spacing in the gantry design has been maximised to reduce spatial impact to the carpark.

Construction workers will not be permitted to park in the school carpark during operation of the site accommodation complex.

2.11 Authority/ External Conditions and Approvals

2.11.1 Council Permits

- Wide load deliveries through City of Sydney only during approved wide load hours and routes
- Pruning permit for tree removal

2.11.2 Services Authorities

- Temporary Services
 - Water: approval as per main works project site
 - Sewer: approval has been obtained from Sydney Water to connect on to existing sewer junction connection point via the project hydraulics contractor
 - Electrical: approval as per main works project site

2.11.3 Road and Transport Authorities

- Wide load deliveries only during approved wide load hours and routes

2.11.4 Environmental

- No environmental approvals are anticipated for the site accommodation complex.

2.11.5 Other Authority and External Approvals

- MOD application for SSD 8925 through DPIE

2.12 Adjoining Owners / Stakeholders

2.12.1 Adjoining Owners Approval

Approval has been obtained from Sydney Secondary College property owners (Department of Education), with a Community Use Agreement currently under development.

City of Sydney approval is not required as per advice from the City of Sydney Construction Liaison Officer, as Department of Education is the landowner.

3. Site Layout and Logistics

3.1 Hoardings and Overhead Protection

3.1.1.1 During installation and dismantle

Temporary perimeter fencing will be installed around the work zone prior to commencement of installation and dismantle of the site accommodation complex to delineate the work zone from public access. The temporary fencing will be removed once installation works or dismantle works are completed to restore public access to the area.

An exclusion zone will be set up with physical barriers along the Glebe Foreshore Walk frontage where required during install and dismantle of the site accommodation complex, whilst maintaining access through the foreshore walk for pedestrians and cyclists.

3.1.1.2 During operation

No additional hoarding will be installed on existing ground level during operation of the temporary site accommodation structure (ie existing palisade retained and current access restored).

Lights installed underneath the gantry structure for carpark users and pedestrians. Decking will be installed on the gantry deck to provide overhead protection for carpark users and pedestrians underneath the gantry.

3.2 Site Access and Egress

Workers will access the site accommodation complex from within the construction site via a modular structural steel bridge. Workers will enter the bridge from ground floor within the site boundary then walk along the bridge into the gantry deck level of the site accommodation complex. The bridge will span over Glebe Foreshore Walk from the site accommodation complex to the existing hardstand within the site boundary for direct worker access, preventing congestion along the public footpath on Bridge Road and Glebe Foreshore Walk.

There will be a set of stairs along the southern face of the site accommodation gantry from the gantry deck level (4.6m above ground) to ground floor (along the existing palisade fence on Bridge Road) as emergency egress. This stair will be fenced off from public access, kept clear at all times and will only be used as an escape route during emergencies.



Figure 6 Worker access to site accommodation complex

3.3 Site Security

The main site security officer will control all access into both the site and the site accommodation complex as workers will access the site accommodation complex via a modular structural steel bridge spanning from the site accommodation complex to the existing hardstand within the site boundary.

3.4 Emergency and Site Communications

All emergency procedures will be as per the Emergency Management Plan for the main works site, with emergency point call systems, PA/Evacuation Systems and site communication devices to be installed throughout the site accommodation complex in accordance to SafeWork NSW requirements.

3.5 Waste Management

A construction waste bin will be placed within the site accommodation boundary during install and dismantle works for construction waste, and will be disposed of accordance with the main site waste management procedures.

No construction waste is expected to be generated within the site accommodation complex during operation. Waste generated from general operations of the site accommodation complex will be disposed within the main site in accordance with the main site Waste Management Plan.

3.6 Screens, Graphics & Edge Protection

3.6.1 Screens & Graphics

Measures will be taken to ensure the privacy of the Sydney Secondary College and neighbouring residents are maintained.

All walkways facing the school and private residences along Bridge Road will be covered with full height screens to prevent views into the school and residences.

All windows facing the school and private residences along Bridge Road will be blacked out to prevent views into the school and residences.

All external faces of screens will be painted black, and no graphics are planned to be installed.

3.6.2 Edge Protection

There will be two floors requiring edge protection for the site accommodation complex.

The first floor (on the gantry deck for first floor sheds) will have a 1m high steel framed and sheeted fence around the perimeter of the complex

The second floor (walkway decking for second floor sheds) will have a 1m high handrail with midrail along all decking areas

3.7 Fire Control Measures

All fire control measures in accordance to the project specific Emergency Management Plan for the main construction site. An addendum will be developed to include the temporary site accommodation complex in the project wide Emergency Management Plan.

Fire extinguishers will be required on each level of the site accommodation due to the temporary nature of the site accommodation complex.

4. Construction Methodology

4.1 Scope of Works

Works for the temporary site accommodation complex will involve the following activities:

- Site establishment
 - Installation of temporary fencing around the work zone
 - Tree removal, pruning and set up of tree protection zones as per the Aborigicultural Assessment Report
 - Service scan in the gantry area for existing underground services
- Surveyor to mark position of footings and gantry structures
- Installation of temporary footings for the structural steel gantry
 - Install screw piles that are installed into position with an excavator.
 - Install pile caps at each screw pile
 - Footings will be cut off and backfilled upon dismantle of the gantry (ie left within the ground). The surface will be restored so there is no impact to access within the carpark
- Installation of structural steel gantry
 - Steel gantry elements are delivered and stored in the material staging zone
 - Set up exclusion zone on Glebe Foreshore Walk to minimise risk of falling objects onto pedestrians
 - The gantry is installed into position with a mobile crane
 - The gantry will be installed in two stages to allow for mobile crane setup
 - Engineer to inspect the gantry and provide certification
- Installation of temporary modular structural steel bridge
 - Bridge modules are preassembled offsite and delivered to site via a marine barge
 - Set up alternative pedestrian route for Glebe Foreshore Walk users to provide safe access during install works
 - The assembled bridge is installed into position with a barge crane from the water
 - Engineer to inspect the bridge and provide certification
- Installation of two storeys of site sheds on the gantry structure
 - Site shed modules are delivered and stored in the material staging zone
 - Set up exclusion zone on Glebe Foreshore Walk to minimise risk of falling objects onto pedestrians
 - Site shed modules are lifted and installed in place with a mobile crane
 - Secure the site sheds on to the gantry structure for structural stability
 - Engineer to inspect the shed tie downs and provide certification
- Temporary sewer connection to existing sewer junction point
 - Install shoring box for excavation
 - Excavate down to the existing sewer junction point (estimated to be approx. 2.5m below existing surface)
 - Connect piping to the sewer junction point and cap off
 - Backfill excavation and restore ground surface

- Temporary water and electrical connection from within the main site
 - Run water pipe and electrical conduit underneath the modular bridge from the site accommodation complex into their respective connection points inside the site boundary
- Roofing and walkway installation for access to site sheds
 - Engineer to inspect walkways and roofing and provide certification
- Demobilisation of plant and equipment
- Handover area back to Sydney Secondary College

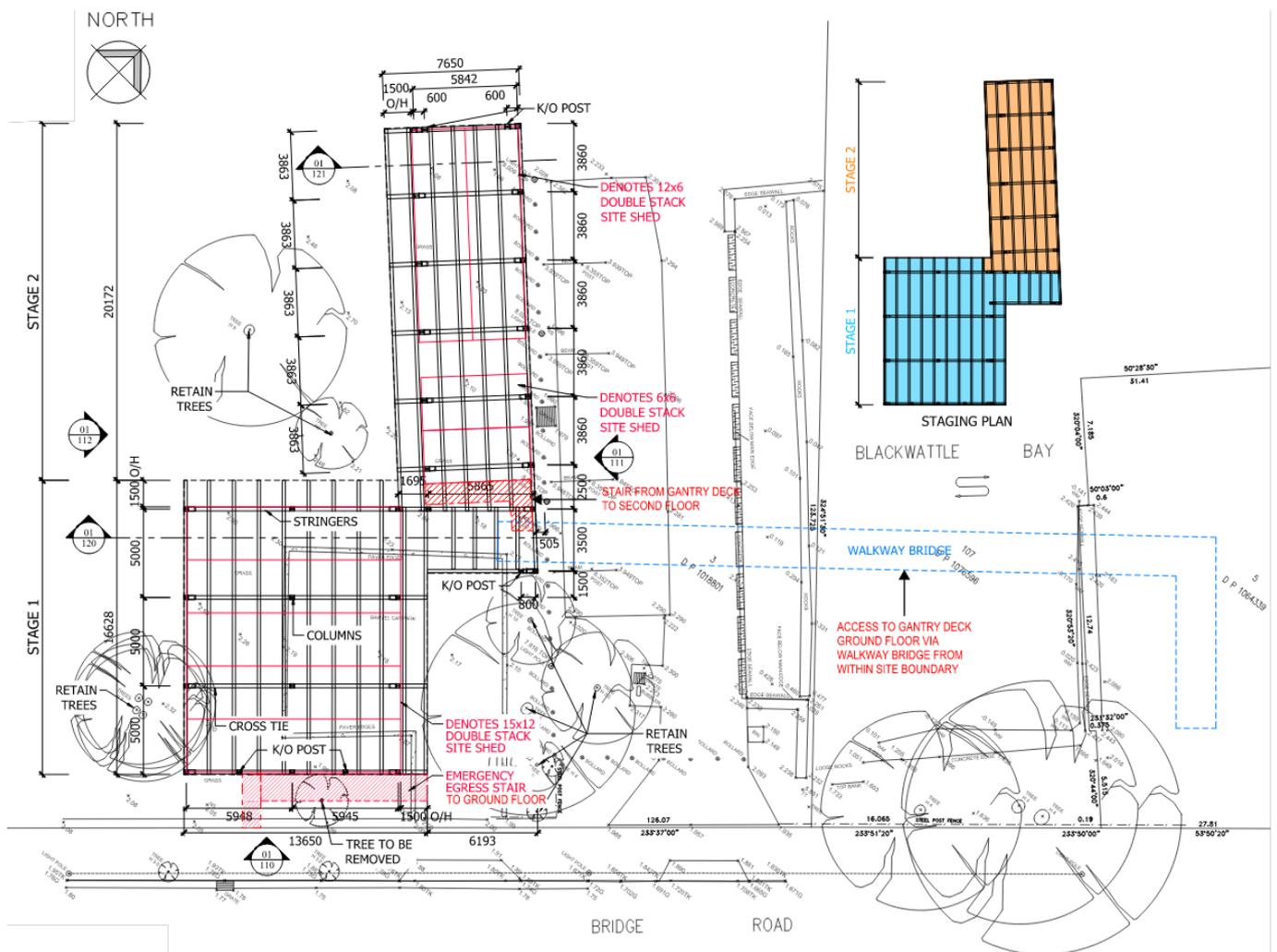


Figure 7 Gantry layout with staged installation

5. Appendices

5.1 **Appendix 1 – Noise and Vibration Impact Statement**

NEW SYDNEY FISH MARKETS

Site Accommodation Sheds Noise and Vibration Impact Assessment

Prepared for:

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SLR Ref: 610.30264-R04
Version No: -v0.1
November 2021



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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Multiplex Constructions Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30264-R01-v1.0	12 November 2021	Adam Sirianni	Mark Irish	Mark Irish
610.30264-R01-v1.0	3 November 2021	Adam Sirianni	Mark Irish	DRAFT

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1 Introduction

1.1 Background

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Multiplex Construction Pty Ltd (Multiplex) to conduct a Noise and Vibration Impact Assessment (NVIA) associated with the construction and operation of the site accommodation complex (the site) for the New Sydney Fish Market. The site is located at the head of Blackwattle Bay over the existing Sydney Secondary College Blackwattle Bay Campus carpark located Bridge Road. The NVIA addresses the potential noise and vibration impacts associated with the construction and operation of the site accommodation sheds and outlines mitigation and management measures to be employed.

Specific acoustic terminology is used in this report. An explanation of common terms is included in **Appendix A**.

1.2 Project Description

Multiplex propose to construct a multi-level site accommodation complex to be installed over the existing Sydney Secondary College Blackwattle Bay Campus carpark located off Bridge Road, on a structural steel gantry structure, with the carpark below the gantry to be maintained for duration of the New Sydney Fish Market project. The proposed site layout is shown in **Figure 1**.

Figure 1 Proposed Site Layout

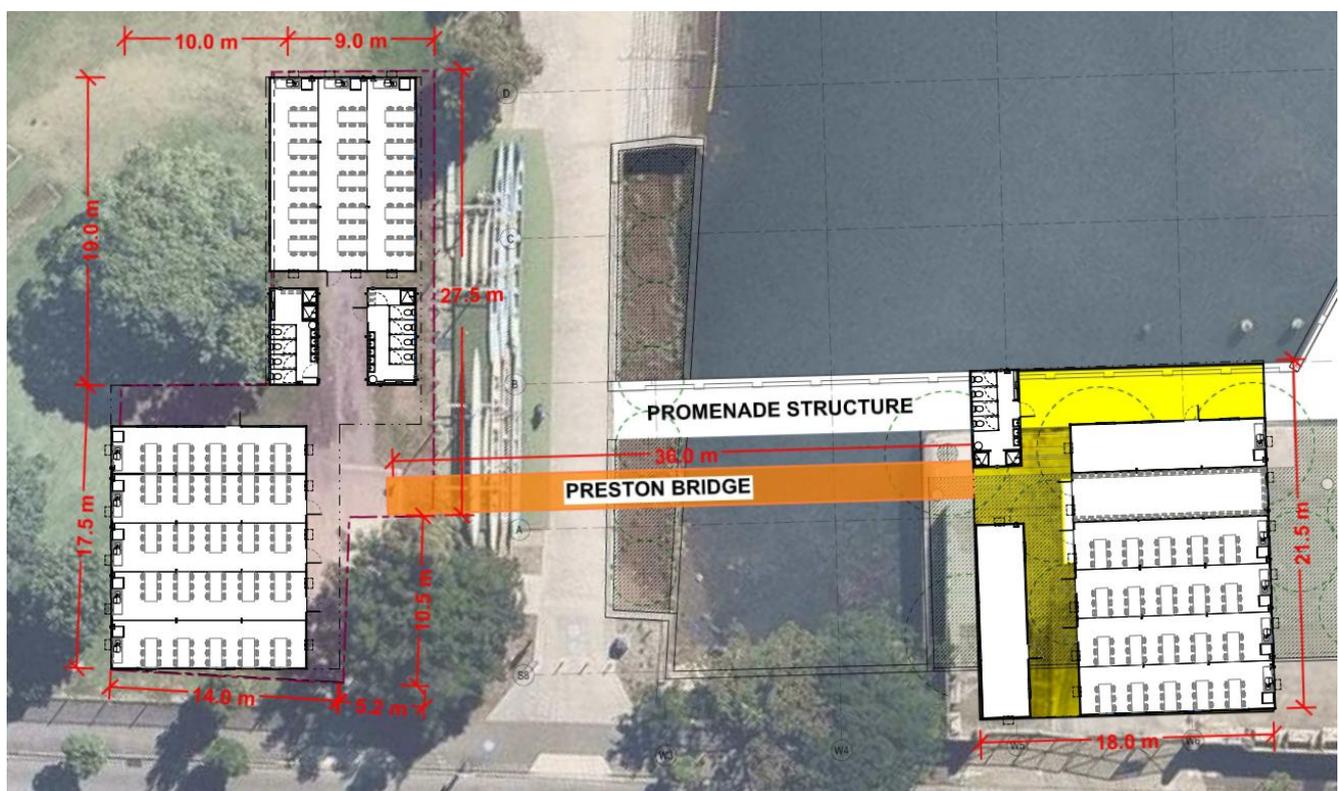


Figure 2 shows the proposed work zone and nearest sensitive receivers that may be affected by the works. The NVIA report has defined all potentially noise sensitive receivers near the proposed construction zone which are summarised in **Figure 2**.

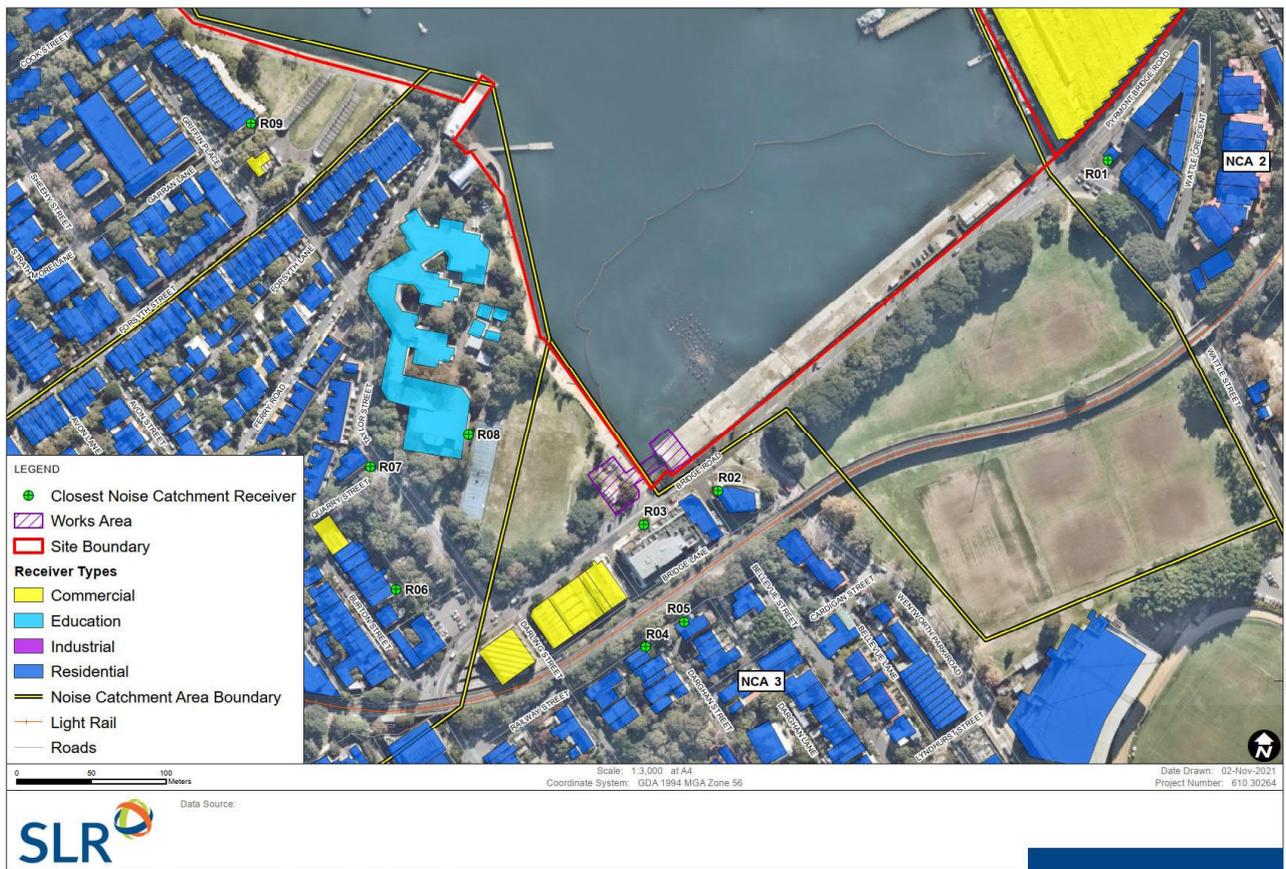
1.3 Nearest Receivers

Representative sensitive receivers where compliance has been assessed are listed below in **Table 1**, and presented in **Figure 2**. These locations were established based on a review of aerial photography and land use zoning information. These locations do not represent every receiver located in the vicinity of the Project but have been selected for this noise assessment as they are considered to be representative of the locations that will potentially experience the highest or worst-case impacts associated with the Project works.

Table 1 Surrounding Sensitive Receivers per Noise Catchment Areas (NCA)

Receiver ID	NCA	Address of Worst-Case Representative Receiver	Property Description	Approx. Distance to Works (m)
R01	NCA2	217/1 Wattle Crescent, Glebe	Residential	420
R02	NCA3	84 Wentworth Park Road, Glebe	Residential	50
R03		4 Bridge Road, Glebe	Residential	20
R04		108 Darghan Street, Glebe	Residential	100
R05		83-85 Darghan Street, Glebe	Residential	90
R06		NCA4	1A Burton Street, Glebe	Residential
R07	Taylor Street, Glebe		Residential	170
R08	Sydney Secondary College, Glebe		Educational	100
R09	NCA5	13 Griffin Place, Glebe	Residential	255

Figure 2 Site Location and Noise Sensitive Receivers



2 Ambient Noise Environment

Unattended noise logging was conducted in 2018 as part of SLR’s 2019 SSDA Acoustic Report (*ref. 610.17656-R01-v1.7*) to quantify and characterise the existing ambient noise environment across the proposal area. The data obtained from the ambient noise monitoring was processed in accordance with the procedures contained in the NSW “*Noise Policy for Industry*” (NPfI) to establish Rating Background Level (RBL, background noise level) at the nearest sensitive receivers. A summary of the results is provided below in **Table 2**

Table 2 Measured Ambient Noise Levels Corresponding to NPfI Assessment Time Periods

ID	Location	Measured Noise Level (dBA)							
		RBL ¹				LAeq(period)			
		Daytime ²	Evening ²	Night-time ²	Early Morning ²	Daytime ²	Evening ²	Night-time ²	Early Morning ²
L01	31-35 Bank St, Pyrmont	66	64	60	62	71	68	65	70
L02	132 Bank St, Pyrmont	70	70	61	66	75	74	70	75
L03	132 Bank St, Pyrmont	71	71	61	65	75	74	70	74
L04	Unit 217 1 Wattle Crescent, Pyrmont	62	57	50	52	71	68	64	69
L05	Sydney Secondary College	55	54	49	50	58	56	52	55
L06	13 Griffin Place, Glebe	50	51	46	48	54	54	50	52
L07	682 Wentworth Park Road, Glebe	54	50	42	44	67	64	58	63

Note 1: The RBL noise level is representative of the “average minimum background sound level” (in the absence of the source under consideration), or simply the background level.

Note 2: As certain operations only occur in the 5:00 am – 7:00 am shoulder period, the following periods have been used in the assessment – for Monday to Saturday, Daytime is 7:00 am - 6:00 pm; Evening is 6:00 pm - 10:00 pm; Night-time is 10:00 pm - 5:00 am; Early Morning Shoulder Period is 5:00 am – 7:00 am.
 On Sundays and Public Holidays, Daytime is 8:00 am - 6:00 pm; Evening is 6:00 pm - 10:00 pm; Night-time is 10:00 pm - 8:00 am.

2.1.1 Development Specific Operational Noise Trigger Levels

The noise emission trigger levels for industrial noise generated by the development are provided in **Table 3**. The Project Noise Trigger Level (PNTL) is the lowest value of the intrusiveness or amenity noise level for each period and are shown below in bold.

Table 3 Project Noise Trigger Levels

NCA	Nearest Receiver Location	Representative Noise Logger Location	Period	Recommended Amenity Noise Level LAeq (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels LAeq(15minute) (dBA)	
					RBL ¹	LAeq(period)	Intrusiveness	Amenity ^{2,3}
NCA1	31-35 Bank St, Pyrmont (Commercial)	L01	When in use	65	66	71	n/a	68
NCA2	217/1 Wattle Crescent, Pyrmont	L04	Day	60	62	71	67	59
			Evening	50	57	68	62	56⁴
			Night	45	50	64	55	52⁴
			Morning	45	52	69	57	57⁴
NCA3	Corner of Wentworth Park and Bridge Road, Glebe	L04 ⁵	Day	60	62	71	67	59
			Evening	50	57	68	62	56⁴
			Night	45	50	64	55	52⁴
			Morning	45	52	69	57	57⁴
NCA4	1A Burton Street, Glebe	L07 ⁶	Day	60	54	67	59	63
			Evening	50	50	64	55	52
			Night	45	42	58	47	46
			Morning	45	44	63	49	51 ⁴
	Sydney Secondary College, Glebe	L05	When in use	55	55	58	n/a	58
NCA5	13 Griffin Place, Glebe	L06	Day	60	50	54	55	63
			Evening	50	51	54	55 ⁷	53
			Night	45	46	50	51	48
			Morning	45	48	52	53	48

Note 1: RBL = Rating Background Level.

Note 2: The recommended amenity noise levels have **not** been reduced by 5 dB to give the project amenity noise levels, as outlined in the NPfI, due to no other sources of industrial noise being present in the area.

Note 3: The project amenity noise levels have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

Note 4: The measured LAeq noise level was dominated by road traffic noise and exceeds the recommended amenity noise level by 10 dB or more, therefore the 'high traffic project amenity noise level' is the existing LAeq(traffic) noise level minus 15 dB.

Note 5: Due to the nearest receivers' proximity to Bridge Road, L04 has been used as the representative noise logger location.

Note 6: Based on site observations of the similarities of the surrounding road network for the nearest receiver, L07 has been used as the representative noise logger location.

Note 8: These values have been lowered to be no greater than the applicable daytime project intrusiveness noise level, as outlined in the NPfI.

3 Noise and Vibration Guidelines

This section summarises the construction noise and vibration standards and guidelines that will be used to develop the applicable noise and vibration criteria. It should be noted that all construction noise and vibration criteria is derived from SSD-8925 Consent Conditions and SLR’s SSDA 2019 Noise Impact Assessment referenced within this approval.

3.1 SSD-8925 Consent Conditions

3.1.1 Hours of Construction

For the construction of the New Sydney Fish Market the SSD-8925 development consent conditions have adopted construction hours within the ICNG standard construction hours. Additionally, SSD-8925 stipulates that certain activities may only be conducted during certain periods of the approved construction hours. The approved construction hours are reproduced below in **Table 4**.

Table 4 Construction Hours

Day	Activity Type	Approved Construction Hours
Monday to Friday	Standard Construction Activities	7 am to 5:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 12 pm 1 pm to 5 pm
Saturdays	Standard Construction Activities	8 am to 1 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 1 pm
Sundays or Public Holidays	All activities	No construction

Any work to be conducted outside these hours must be approved by council, certifier, planning secretary and the community must be notified in accordance with SSD-8925. These works may also require additional mitigation measures discussed further in **Section 5**.

3.1.2 Interim Construction Noise Guideline – NSW Environment Protection Authority

3.1.2.1 Recommended Sound Levels

The ICNG recommends that the $L_{Aeq}(15\text{minute})$ noise levels arising from a construction project measured within the curtilage of an occupied noise-sensitive premises (i.e. at boundary or within 30 m of the residence, whichever is the lesser) should not exceed the levels indicated in **Table 5**.

Table 5 Recommended EPA General Noise Management Levels Affected by Construction works

Period of Noise Exposure	$L_{Aeq}(15\text{minute})$ Construction Noise Management Levels
Recommended Standard Hours	Noise affected ¹ $RBL^2 + 10$ dBA
	Highly noise affected ³ 75 dBA
Outside Recommended Standard Hours	Noise affected ¹ $RBL^2 + 5$ dBA

- Note 1: The noise affected level represents the point above which there may be some community reaction to noise.
- Note 2: The RBL noise level is representative of the “average minimum background sound level” (in the absence of the sources under consideration), or simply the background level.
- Note 3: The highly noise affected level represents the point above which there may be strong community reaction to noise.

3.1.2.2 Sleep Disturbance

The ICNG states that where works are planned to extend over more than two consecutive nights, the potential for sleep disturbance should be considered. Guidance regarding the potential for sleep disturbance at sensitive receivers is provided within the RNP.

The RNP suggests a LA1(1minute) screening level of 15 dB above the prevailing background (LA90) noise level. The RNP also notes that maximum internal noise levels below 50-55 dBA are unlikely to awaken people from sleep.

Assuming windows are open for ventilation purposes, and that the outdoor-to-indoor transmission loss is 10 dB, an “awakening reaction” noise level of 60 to 65 dBA has also been applied.

3.2 Construction Noise Criteria Summary

In accordance with the above and SLR’s 2019 SSDA Acoustic Report, the NMLs derived for the project are detailed in **Table 6**.

Table 6 Receiver NMLs for Construction

NCA	Receiver Type	Standard Construction ¹ (RBL+10dB)	Highly Noise Affected
		Daytime	Daytime
NCA2	Residential	72	75
	Commercial	70	n/a
NCA3	Residential	72	75
NCA4	Residential	64	75
	Educational ²	65 ⁴	n/a
NCA5	Residential	60	75

- Note 1: The standard construction hours are as per SSD-8925 consent condition C7 (See **Table 4**)
- Note 2: Criteria is only applicable when receiver is in use.
- Note 4: An external criterion of 65 dBA has been set for Sydney Secondary College. The ICNG sets an internal level of 45 dBA and 20 dB external to internal transmission loss is assumed.
- Note 5: These values have been lowered to be no greater than the applicable OOH daytime NML, based on the approach for determining RBLs in the NPfI.

3.3 Construction Vibration Guidelines

The effects of vibration on buildings can be divided into the following main assessment categories:

- Those in which the occupants or users of the building are inconvenienced or possibly disturbed (‘tactile vibration’)

- Those where a building’s contents may be affected (for example, the operation of vibration sensitive equipment such as microscopes in hospitals)
- Vibration affecting the buildings and structures in terms of their susceptibility to damage (‘structural damage’).

3.3.1 Human Comfort Vibration

The Department of Environment and Conservation’s (DEC) *Assessing Vibration: a technical guideline* (2006) provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV) rather than a continuous vibration level. The VDV is dependent upon the level and duration of the vibration event, as well as the number of events occurring during the daytime or night-time period.

The VDV’s recommended in the guideline for vibration that is intermittent nature are presented in **Table 7**.

Table 7 Preferred and Maximum Vibration Dose Values for Intermittent Vibration

Building Type	Vibration Dose Value (m/s ^{1.75})	
	Preferred	Maximum
Residential Daytime	0.20	0.40
Residential Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80

Note: Daytime is 7:00 am to 10:00 pm and night-time is 10:00 pm to 7:00 am.

3.3.2 Effects on Building Contents

People can perceive floor vibration at levels well below those likely to cause damage to building contents or affect the operation of typical equipment found in most buildings that is not particularly vibration sensitive. For most receivers, the controlling vibration criterion is the human comfort criterion, and it is therefore not normally required to set separate criteria in relation to the effect of construction vibration on typical building contents.

Where appropriate, objectives for the satisfactory operation of vibration sensitive critical instruments or manufacturing processes should be sourced from manufacturer’s data and/or other published objectives.

3.3.3 Structural Damage Vibration

Structural damage vibration limits are based on Australian Standard AS 2187: Part 2-2006 *Explosives - Storage and Use - Part 2: Use of Explosives* and British Standard BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2*. These standards provide frequency-dependent vibration limits related to cosmetic damage, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building.

The recommended vibration limits from BS 7385 for transient vibration for minimal risk of cosmetic damage to residential and industrial buildings are shown in **Table 8**. The vibration guide values are at the base of the building.

Table 8 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

3.3.4 General Vibration Screening Criterion

The guide values in **Table 8** relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

Rock breaking / hammering activities are considered to have the potential to cause dynamic loading in some structures (eg residences) and it is therefore appropriate to reduce the transient values by 50%.

For construction activities involving intermittent vibration sources such as rock breakers, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receiver type is given below:

- Reinforced or framed structures: **25.0 mm/s**
- Unreinforced or light framed structures: **7.5 mm/s**.

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity) monitoring should be performed during construction. At these locations a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be undertaken to determine the applicable safe vibration level.

3.3.5 Heritage

Heritage buildings should be considered on a case by case basis. A heritage listed structure should not (unless it is structurally unsound) be assumed to be more sensitive to vibration resulting in application of the 7.5 mm/s screening criterion. Where a historic building is deemed to be sensitive to damage from vibration (following inspection), a more conservative superficial cosmetic damage criterion based on DIN 4150 should be applied.

4 Construction Noise and Vibration Assessment

The potential construction noise levels from the Project have been predicted using the CONCAWE algorithm in SoundPLAN v8.1. The model includes ground topography, buildings and representative noise sources from the proposal. The potential impacts have been determined by comparing the predicted noise levels to the NMLs in a 15-minute assessment period.

4.1 Construction Scenarios

4.1.1 Working Hours

All works are proposed to be undertaken during approved construction hours contained in SSD-8925 and are shown above in **Table 4**.

4.1.2 Construction Activity Source Noise Levels

The activities likely required for the Project involve conventional construction equipment such as ground excavation equipment, trucks and cranes. The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that is likely to occur for each work scenario, as required by the ICNG. Representative construction scenarios provided by Multiplex to assess potential impacts during construction and the sound power levels for the construction equipment used in the modelling are provided in **Table 9**; Sound power levels have been reproduced from the Roads and Maritime Services *Construction Noise and Vibration Guideline* (CNVG), as well as those outlined in the New Sydney Fish Markets CNVMP.

Table 9 Sound Power Levels for Construction Equipment

ID	Construction Activity	Equipment	Quantity	Sound Power Level Lw (dBA)	
				Item	Activity
W.001	Foundations	Excavator (with Pile Auger)	1	107	107
W.002 & W.003	Gantry Construction (Stage 1 and Stage 2)	Hiab Trucks	1	104	111
		Semi-Trailers for Delivery	1	109	
		Hand Tools	1	101	
		Elevated Work Platform	2	95	
		Mobile Crane	1	102	
W.004	Preston Bridge	Semi-Trailers for Delivery	1	109	110
		Hand Tools	1	101	
		Mobile Crane	1	102	
W.005	Site Accommodation Sheds	Semi-Trailers for Delivery	1	109	110
		Hand Tools	1	101	
		Elevated Work Platform	2	95	
		Mobile Crane	1	102	

4.2 Predicted Noise Levels

Predicted Construction noise levels for each NCA listed in **Table 1** are presented below in **Table 10**. Note that these noise levels are for the most highly-impacted receiver within each Noise Catchment Area.

Table 10 Predicted Construction Noise Levels During Standard Construction Hours (L_{Aeq}, dBA)

Receiver ID	NCA	Receiver Type	NML Standard Construction Hours	Noise Level for most highly impacted receiver within NCA for each construction scenario				
				W.001	W.002	W.003	W.004	W.005
R01	NCA2	Residential	72	47	51	52	49	48
R02	NCA3	Residential	72	61	66	65	65	64
R03		Residential	72	68	74	69	72	73
R04		Residential	72	57	63	61	60	61
R05		Residential	72	60	66	64	63	63
R06	NCA4	Residential	64	58	63	64	59	60
R07		Residential	64	56	62	62	58	59
R08		Educational	65 ¹	60	65	67	62	63
R09	NCA5	Residential	60	27	32	32	29	29

Note 1: Educational NML Criteria is only applicable when receiver is in use.

Note 2: Red shaded cells indicated predicted noise levels exceed the daytime NMLs at this NCA.

The predicted noise levels above show the following:

- The highest noise levels (i.e. 74 dBA) are predicted at R03 during W.002 (Gantry Stage 1). Noise levels are also predicted to exceed the NML by 1 dB at R03 during W.005. It is noted that an exceedance of 1 dB is considered minor as an increase in up to 2 dB represents a minor impact that is considered imperceptible to the average person.
- Noise levels at other residential receivers in NCA3 are predicted to be below the NML during approved construction hours.
- The highest noise levels at all other NCAs are predicted to be below the NML during approved construction hours.
- Noise levels are predicted to exceed the NML at R08 during W.003 by up to 2 dB. It is noted that works would only occur during Approved Construction Hours, during the school holiday period.

Recommended construction noise mitigation and management measures are discussed in **Section 5**.

4.3 Construction Vibration

Minimum working distances for typical vibration intensive construction equipment are provided in the CNVG and are reproduced in **Table 13**.

The minimum working distances are for both cosmetic damage (from BS 7385 Part 2-1993) and human comfort (AVaTG). Works that occur further from receivers than the minimum distances are unlikely to result in vibration impacts. The minimum working distances are indicative and will vary depending on the particular item of equipment and local geotechnical conditions. The distances apply to human response and/or cosmetic damage of typical buildings under typical geotechnical conditions.

Based on the equipment and activities identified for the proposed construction, potential sources of vibration are limited and would only occur during W.001 (Foundations). Given the minimal nature of the works, cosmetic damage is considered unlikely to occur and does not require further consideration. In relation to human comfort, the safe working distances relate to continuous vibration: for most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are allowed.

It is therefore anticipated that vibration generated by the construction works will comply with the requirements of the AVaTG (human comfort) and BS 7385 (cosmetic and structural damage). No further recommendations for vibration mitigation and management measures are provided in this assessment.

4.4 Traffic Increases on Surrounding Roads

Light and heavy vehicles would access the development directly from Bridge Road. The potential noise impacts from additional traffic are expected to be negligible given the small number of vehicles accessing the development relative to the high existing volumes on this route.

As the predicted noise increase from additional traffic is below the screening assessment of 2dB, no further assessment is required.

5 Mitigation

The ICNG acknowledges that due to the nature of construction works it is inevitable that there will be impacts where construction is near to sensitive receivers. Examples of potential mitigation and management measures which could be applied to the project to minimise the impacts are provided below.

5.1 Standard Mitigation

The Roads and Maritime *Construction Noise and Vibration Guideline* (CNVG) contains a number of standard measures for mitigating and managing construction impacts on development projects. Whilst it is acknowledged that this project is not a road project, the mitigation measures are considered suitable for consideration for all forms of construction works.

The measures are shown in **Table 11** and should be applied where feasible and reasonable to minimise the impacts from the works as far as practicable.

Table 11 Recommended Standard Mitigation and Management Measures

Action Required	Applies To	Details
Management Measures		
Implementation of any project specific mitigation measures required.	Airborne noise	Implementation of any project specific mitigation measures required.
Implement community consultation or notification measures.	Airborne noise Ground-borne noise & vibration	Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required. Website (If required) Contact telephone number for community Email distribution list (if required) Community drop in session (if required by approval conditions).
Site inductions	Airborne noise Ground-borne noise & vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: <ul style="list-style-type: none"> • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Airborne noise Ground-borne noise & vibration	Where specified under Appendix C of the CNVG a noise verification program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Attended vibration measurements	Ground-borne vibration	Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.
Update Construction Environmental Management Plans	Airborne noise Ground-borne noise & vibration	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.
Building condition surveys	Vibration Blasting	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage
Source Controls		
Construction hours and scheduling.	Airborne noise Ground-borne noise & vibration	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.

Action Required	Applies To	Details
Construction respite period during normal hours and out-of-hours work	Ground-borne noise & vibration Airborne noise	Respite Offers should be considered made where there are high noise and vibration generating activities near receivers. As a guide work should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers.
Equipment selection.	Airborne noise Ground-borne noise & vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained.
Plant noise levels.	Airborne-noise	Noise generating equipment will be regularly checked and effectively maintained, including checking of hatches/enclosures regularly to ensure that seals are in good condition and doors close properly against seals
Use and siting of plant.	Airborne-noise	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site.
Plan worksites and activities to minimise noise and vibration.	Airborne noise Ground-borne vibration	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11:00 pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters. If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again.
Reduced equipment power	Airborne noise Ground-borne vibration	Use only the necessary size and power
Non-tonal and ambient sensitive reversing alarms	Airborne noise	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.

Action Required	Applies To	Details
Minimise disturbance arising from delivery of goods to construction sites.	Airborne noise	Compounds and worksites will be designed to promote one-way traffic and minimise the need for vehicle reversing. Where practicable, work compounds, parking areas, and equipment and material stockpiles will be positioned away from noise-sensitive locations and take advantage of existing screening from local topography. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out of hours movements where possible.
Engine compression brakes	Construction vehicles	Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.
Path Controls		
Shield stationary noise sources such as pumps, compressors, fans etc.	Airborne noise	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities.	Airborne noise	Where practicable, work compounds, parking areas, and equipment and material stockpiles will be positioned away from noise-sensitive locations and take advantage of existing screening from local topography.
Receptor Control		
Structural surveys and vibration monitoring	Ground-borne vibration	Pre-construction surveys of the structural integrity of vibration sensitive buildings may be warranted. At locations where there are high-risk receptors, vibration monitoring should be conducted during the activities causing vibration.

SLR recommends consideration of the Transport of NSW 2018 Construction Noise and Vibration Strategy (CNVS), which provides further guidance on appropriate noise mitigation options depending on the level of exceedance predicted (refer **Table 12**).

Table 12 Recommended Triggers for Additional Mitigation Measures – Airborne Noise

Time Period	dB(A) above RBL	dB(A) above NML	Addition Mitigation Measures Type ¹
Standard Hours: Mon - Fri (7am – 5:30pm), Sat (8am – 1pm), Sun/Pub Holiday (Nil)			
Noticeable	5 to 10	0	-
Clearly Audible	10 to 20	< 10	-
Moderately Intrusive	20 to 30	10 to 20	PN, V
High Intrusive	> 30	> 20	PN, V
75dB(A) or greater	-	-	PN, V, SN

Note 1: PN = Project notification
 V = Verification monitoring
 RP = Respite period
 AA = Alternative accommodation
 SN = Specific notification, individual briefings, or phone call
 DR = Duration reduction
 RO = Project specific respite offer

Note 2: Respite periods and duration reduction are not applicable when works are carried out during OOHV Period 1 Day only (i.e Saturday 6:00 am – 7:00 am & 1:00 pm – 6:00 pm, Sundays / Public Holidays 8:00 am – 6:00 pm).

In terms of duration, the most significant exceedances in the NML are those highlighted in **Table 10** of standard hours works. To manage these impacts, in line with the framework in **Table 12**, the following measures are recommended to be employed:

- Project Notification:
 - Notification is also required under development consent condition B79 (I). SLR recommends that a single letterbox drop to all receivers within the impacted NCA's is to occur at the beginning of the project outlining the expected impacts – with information to an online portal which may contain any updates as the project progresses. This Project Notification should also include information that further Specific Notifications may follow to residents most impacted prior to certain works.
- Specific Notification:
 - SLR recommend that specific notification is deemed to be appropriate where during standard construction hours the predicted noise at noise sensitive receivers exceed 75 dB(A), as per the framework in **Table 12**. Notification need only be made to receivers predicted to be exceeding the 75 dB(A) noise level, not the entire NCA. Notification should be made prior to the commencement of each activity which include information on the type of work and what time of day it will be occurring (including any respite periods in line with DA approved hours) as well as the expected duration / programmed completion for the work. No receivers are predicted to exceed 75 dB(A) as part of these works.

6 Vibration Mitigation Measures

6.1.1 Minimum Working Distances for Vibration Intensive Works

Minimum working distances for typical vibration intensive construction equipment are provided in the CNVG and are summarized in **Table 13**. The minimum working distances are for both cosmetic damage (from BS 7358) and human comfort (from the NSW EPA Vibration Guideline) and are based on empirical data which suggests that where works are further from receivers than the quoted minimum distances then impacts are not considered likely.

Table 13 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating / Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (Typically > 18t)	25 m	100 m
Small Hydraulic Hammer	300 kg - 5 to 12t excavator	2 m	7 m
Medium Hydraulic Hammer	900 kg - 12 to 18t excavator	7 m	23 m
Large Hydraulic Hammer	1600 kg - 18 to 34t excavator	22 m	73 m

Plant Item	Rating / Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 to 100 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

The safe working distances for building damage should always be complied with. The distances are noted as being indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to addressing the risk of cosmetic (e.g minor or easily repairable) damage of typical buildings under typical geotechnical conditions.

Where vibration intensive works are required to be undertaken within the specified safe working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied.

In relation to human comfort, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are allowed.

The following vibration mitigation measures will be implemented by the construction contractor:

- Relocate any vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.
- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment to times when vibration levels are less likely to impact nearby vibration sensitive receivers.
- Minimise consecutive works in the same locality (if applicable).
- Schedule a minimum respite period of at least 30 minutes before activities commence which are to be undertaken for a continuous 4-hour period.

7 Operational Noise Assessment

7.1 Mechanical Plant Limits

As the specific mechanical plant required for the facility is unknown at this stage, an overall limit for the combined sound power level of mechanical plant has been provided for compliance at the most impacted receiver.

Noise emissions from mechanical plant have been calculated based on indicative locations around the site accommodation sheds and are shown by the dotted boxes below in **Figure 3**. A total of 49 units have been proposed as part of the project design. Sound power level limits for the units have been provided in **Table 14**. As it is not known whether mechanical plant is required to run 24 hours a day, limits have been provided for day, evening and night-time periods. In order for mechanical plant to operate 24 hours a day, the night-time PNTL will need to be met at the nearest sensitive receiver (R03).

Figure 3 Mechanical Plant Locations



Once plant selections are made, noise emission levels should be checked to ensure the criteria will be achieved. Should any changes be made to the layout, or number of units, these limits should be reviewed to ensure the criteria will be achieved.

Table 14 Cumulative Mechanical Plant Noise Limits

Receiver Location	Period ¹	Project Noise Trigger Levels LAeq(15minute) (dBA)	Predicted SWL limit (per unit) (dBA)
R03 – 4 Bridge Road, Glebe	Daytime	59	82
	Evening	56	79
	Night-time	52	75
	Morning	57	80

Note 1: As outlined in Table 2.

8 Conclusion

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Multiplex Construction Pty Ltd (Multiplex) to conduct a Noise and Vibration Impact Assessment (NVIA) associated with the construction and operation of the site accommodation complex (the site) for the New Sydney Fish Market.

The construction noise assessment identified that $L_{Aeq}(15\text{minute})$ noise levels are predicted to exceed the Noise Management Levels of up to 2 dBA at R03 during the highest impact works associated with the construction of the Site Accommodation Sheds. No exceedances of the NMLs are predicted to occur at any other sensitive receiver locations. The works would be limited to Standard Daytime Construction Hours, with no evening or night-time works required. A number of best-practice mitigation and management measures have been recommended to be applied, where feasible and reasonable, to control and minimise the impacts during construction as far as practicable.

In lieu of detailed mechanical plant specifications, Sound Power Level Limits have been specified for all mechanical plant to control operational noise impacts associated with the project.

Based on the findings of this report and assuming the recommendations are applied, the project is considered appropriate from an acoustic standpoint.

APPENDIX A

Acoustic Terminology

1. Sound Level or Noise Level

The terms ‘sound’ and ‘noise’ are almost interchangeable, except that ‘noise’ often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. ‘A’ Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an ‘A-weighting’ filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	Loud
80	Kerbside of busy street	
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as ‘linear’, and the units are expressed as dB(lin) or dB.

3. Sound Power Level

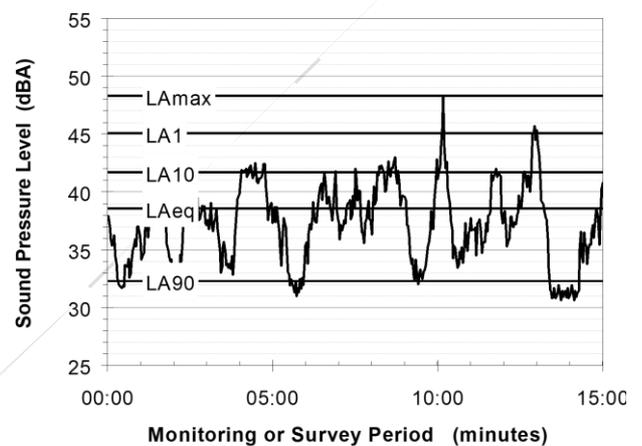
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

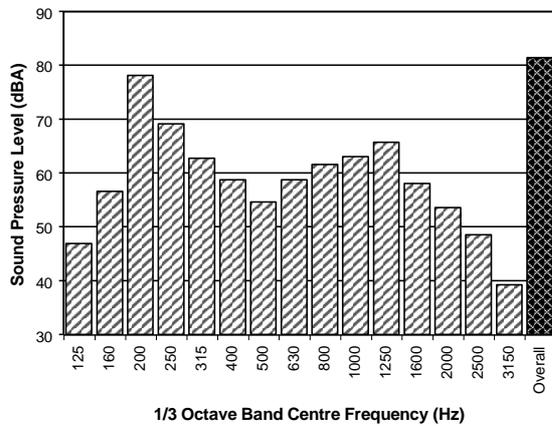
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10⁻⁹ m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

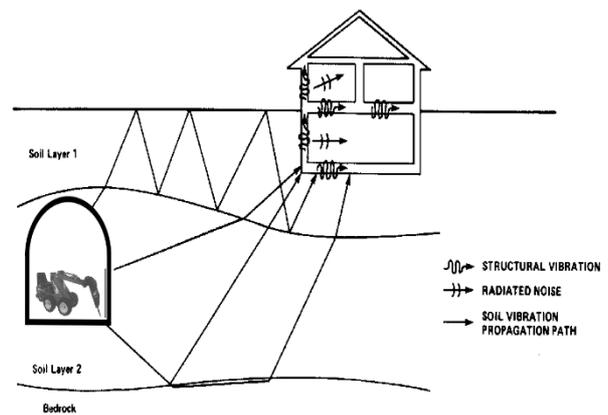
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

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5.2 Appendix 2 – Arboricultural Impact Assessment (AIA)

treeREPORT.

ARBORICULTURAL CONSULTING

Arboricultural Impact Assessment & Tree Protection Plan

Sydney Fish Market – Site Accommodation
Glebe NSW 2037

Version 2

Prepared for:

Multiplex c/o-
FerryCarrig

January 2022



Document information

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Abbreviations

Ø	Diameter
R	Radius
AGL	Above Ground Level
AQF	Australian Qualifications Framework
AS	Australian Standards
BGL	Below Ground Level
DBH	Diameter at Breast Height
DBR	Diameter at Root Flare
Id	Identification
m	Metre
mm	Millimetre
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
SP	Species
SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment

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1 Introduction

Report Purpose

Tree Report has been engaged by Multiplex c/o- FerryCarrig to prepare an Arboricultural Impact Assessment (herein referred to as the 'AIA') and Tree Protection Plan (herein referred to as the 'TPP') for a proposed development located at 1A, 1B & 1C Bridge Road, Glebe NSW 2037 (herein referred to as the 'Site'). The purpose of this report is to:

- Identify trees (herein referred to as the 'Subject Trees') that are likely to be affected by the proposed works.
- Assess the current overall health and condition of the Subject Trees.
- Assess and discuss likely impacts to the Subject Trees as a result of the proposed development.
- Evaluate the significance of the Subject Trees and assess their suitability for retention.

Project Overview

The proposed development relates to the proposed construction of a multi-level site accommodation complex on top of a structural steel gantry structure located within at the Site. Key features of the proposal likely to affect the Subject Trees are summarised as follows:

- Site establishment activities, including installation of temporary fencing around the work zone.
- Installation of temporary screw pile footings; ranging between 101mm x 4mm – 168 x 6.4mm to a depth of ~12m.
- Installation of structural steel gantry.
- Installation of temporary modular structural steel bridge.
- Installation of two storeys of site sheds on the gantry structure.
- Temporary sewer connection to existing sewer junction point.
- Temporary water and electrical connection from within the main site.

The Subject Trees

Inspection of the site was undertaken on the 18th of January 2022.

A total of **fifteen** individual trees were identified and recorded during the site inspection. Of these:

- **five** Subject Trees (**id. 1, 4*, 5, 8 & 9**) are of Low retention value
- **ten** Subject Trees (**id. 2, 3, 6, 7 & 10-15**) are of Medium retention value

** Denotes tree species listed as exempt under conditions prescribed within City of Sydney Council: Sydney Development Control Plan (SDCP) 2012.*

Further information, observations and measurements specific to each of the Subject Trees can be found in **Chapter 6** and **Appendix II**.

The Study Area

The Study Area is located at 1A, 1B & 1C Bridge Road, Glebe NSW 2037. The Site falls within the City of Sydney Council Local Government Area (LGA).

The Site is shown in **Figure 1**.

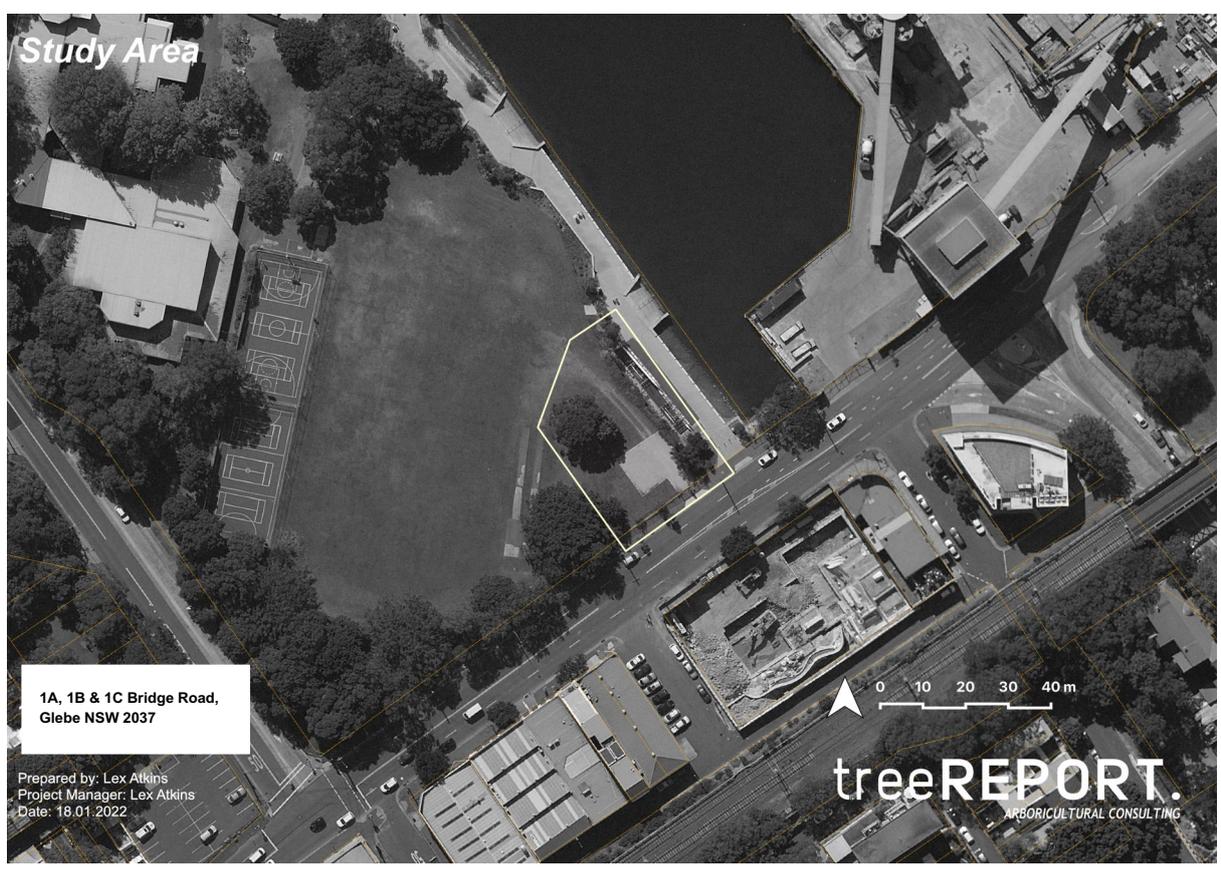


Figure 1: The Study Area (represented in yellow)

2 Method

Visual Tree Assessment

The Subject Trees were assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994)¹, and practices consistent with modern arboriculture.

The following limitations apply to this methodology:

- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing.
- Trees within adjacent properties or restricted areas were not subject to a complete visual inspection (i.e. defects and abnormalities may be present but not recorded).
- Trunk Diameter at Breast Height (DBH) has been accurately measured using a diameter tape measure. Tree height and canopy spread has been estimated unless otherwise stated.
- Tree identification was based on broad taxonomical features present and visible from ground level at the time of inspection.

Retention Value

The retention value of a tree or group of trees is determined using a combination of environmental, cultural, physical and social values.

- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by *Australian Standard AS4970 Protection of trees on development sites*.

This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturalists (IACA) Significance of a Tree, Assessment Rating System (STARS). The system uses a scale of High, Medium and Low significance in the landscape. Once the landscape significance of a tree has been defined, the retention value can be determined. Each tree must meet a minimum of three (3) assessment criteria to be classified within a category. Further details and the assessment criteria are in **Appendix VI**.

¹ VTA is an internationally recognised practice in the visual assessment of trees as formulated by Mattheck & Breloer (1994). Principle explanations and illustrations are contained within the publication, Field Guide for Visual Tree Assessment by Mattheck, C., and Breloer, H. *Arboricultural Journal*, Vol 18 pp 1-23 (1994).

3 Arboricultural Impact Assessment

Impact Assessment

AS 4970-2009 defines two types of 'zones' which have to be considered when undertaking and arboricultural impact assessment. These zones are:

- **Tree protection zone (TPZ):** The TPZ is the optimal combination of crown and root area (as defined by AS 4970-2009) that requires protection during the construction process so that the tree can remain viable. The TPZ is an area that is isolated from the work zone to ensure no disturbance or encroachment occurs into this zone. Tree sensitive construction measures must be implemented if work is to proceed within the Tree Protection Zone.
- **Structural root zone (SRZ):** The SRZ is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support and anchorage of the tree. Severance of structural roots (>50 mm in diameter) within the SRZ is not recommended as it may lead to the destabilisation and/or decline of the tree.
- **Root investigation:** When assessing the potential impacts of encroachment within the TPZ, consideration will need to be given to the location and distribution of the roots, including above or below ground restrictions affecting root growth. Location and distribution of roots may be determined through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), air spade and manual excavation. Root investigation is used to determine the extent and location of roots within the zone of conflict. Root investigation does not guarantee the retention of the tree.

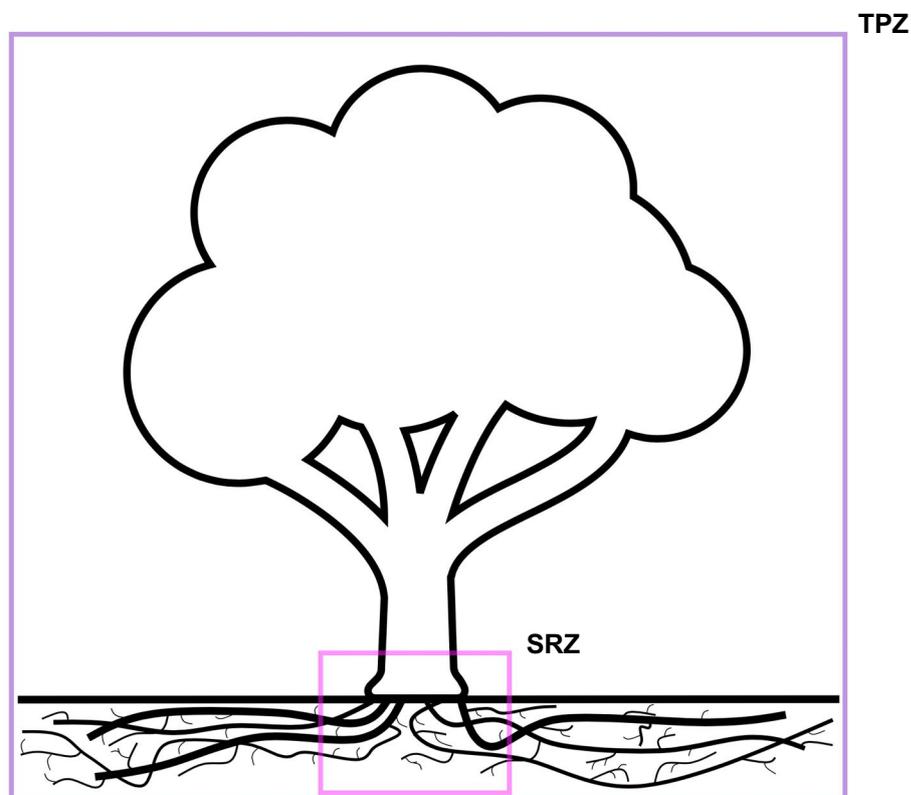


Figure 2: Indicative TPZ and SRZ

Encroachments Within the TPZ

Encroachment within the TPZ of a Subject Tree is acceptable under the *AS4970-22009*, providing that the consulting arborist can demonstrate that the Subject Tree can remain viable. There are four (4) encroachment thresholds to be considered when assessing a proposed development:

- **No encroachment (0%):** There are no likely or foreseeable encroachment within the TPZ as a result of the proposed development.
- **Minor encroachment (<10%):** The proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ.
- **Major encroachment (>10%):** The proposed encroachment is greater than 10% (total area) of the TPZ.
- **Total encroachment:** The Subject Tree(s) located wholly within the proposed development footprint.



Figure 3: Indicative levels of encroachment

Mitigating Development Impacts

Encroachment within the TPZ must be compensated with a range of mitigation measures to ensure that impacts to the Subject Tree(s) are reduced or restricted wherever possible. Mitigation must be increased relative to the level of encroachment within the TPZ to ensure the Subject Tree(s) remain viable. **Table 1** outlines development impact thresholds (based on TPZ encroachment), and mitigation measures required within each impact threshold. These mitigation measures will only apply if trees are proposed to be retained.

<i>Development impact threshold (TPZ encroachment %)</i>	<i>Development impact mitigation measures</i>
No impact (0%)	<ul style="list-style-type: none"> N/A
Minor impact (1-20%)	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Detailed root investigations should not be required. Tree protection should be installed.
Major impact (>20%)	<ul style="list-style-type: none"> The project arborist must demonstrate the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Non-destructive root investigation may be required for any trees proposed for retention. The project arborist will be required to supervise any works within the TPZ. Tree protection must be installed.
Total impact	<ul style="list-style-type: none"> Subject Tree(s) cannot be successfully retained.

Table 1: Impact mitigation measures

4 Results

Nil Impact (0% TPZ encroachment)

A total of **ten** Subject Trees (**id. 1, 2, 5-7 & 11-15**) are located outside of the proposed area of disturbance and there are no foreseeable impacts to the Subject Trees as a result of the proposed development.

Under the current proposal, these trees can be successfully retained.

Minor Impact (1-20% TPZ encroachment)

A total of **two** Subject Trees (**id. 3 & 10**) will require excavation activities <20% of total TPZ area and in order to facilitate site establishment and/or construction of the site accommodation structure. These works are unlikely to have a significant impact on the Subject Tree's ability to store carbohydrates, use stored carbohydrates in times of stress and are unlikely to have a significant impact on the health, condition and/or stability of the subject trees long term.

A total of **four** Subject Trees (**id. 3, 4, 9 & 10**) will require Minor pruning activities <15% total live canopy volume to facilitate the installation of the site accommodation structure. These pruning works are unlikely to have a significant negative impact on the Subject Tree's health or ongoing viability.

Under the current proposal, these trees can be successfully retained.

Major Impact (>20% TPZ encroachment)

Subject Tree **id. 8** will require excavation activities >20% of total TPZ and are likely to have a significant impact on the Subject Tree's ability to store carbohydrates, use stored carbohydrates in times of stress and are likely to have a significant impact on the health, condition and/or stability of the Subject Tree long term.

Under the current proposal, these trees cannot be successfully retained.

*Further information specific to each of the Subject Trees can be found in **Tables 2, 3 & 4 and Appendix II.***

5 Discussion

Trees on development sites

Construction and development can change the way an area is utilised by adding buildings, infrastructure and pedestrians to the location. This can result in an increased potential of damage and harm to property and people. Therefore, trees that contain significant defects, are structurally poor or have a short useful life expectancy should be considered for removal.

Furthermore, it is not always possible or reasonably practicable to retain all trees within a proposed development. It can be better to select the higher retention value trees and protect these well, rather than trying to retain all trees and decreasing the quality of tree protection (Matheny & Clark, 1998).

Trees can be negatively affected in a number of ways during construction. These include root loss, lack of water and oxygen to the root zone, damage to the trunk or canopy and/or poisoning. Failure to protect trees, particularly root zones, during development can lead to an increased risk of tree death and/or failure post construction.

Impacts - Roots

Most tree roots will usually be found in the top 600mm of soil (Harris, Clark & Matheny, 1999). Radiating outwards from the base of the trunk are several large woody roots. These structural roots anchor the tree in the ground. Cutting or affecting those roots is likely to undermine the stability of the tree. The spread of a tree's structural roots, herein termed its Structural Root Zone (SRZ), is generally proportioned to the diameter of its trunk (Matthek & Breloer, 1994).

Beyond this zone extends the network of woody transport roots and fine absorbing roots, which absorb and transport water and nutrients. Most of these roots are found in the top 150mm of soil (Harris, Clark & Matheny, 1999). Trees can lose a portion of their absorbing roots without being significantly affected in the long term.

*Further information following excavations via non-destructive methods adjacent to Subject Trees **id. 3, 9 & 10** can be found in **Appendix VI**.*

Impacts – Canopy

Fundamentally, pruning is the removal of plant parts. Tree pruning involves the removal of living and dead tissues in an attempt to control or redistribute growth and to create a structurally sound mature form. Tree health and the ability to recover from the myriad of urban stressors are directly related to canopy area. The loss of live foliage and woody transport tissue can lead to a significant negative impact a Subject Tree's ability to photosynthesise light energy into chemical energy necessary for the normal physiological functioning and survival of the tree. Live crown ratios of 50%-60% maintain tree vitality while reducing the risk of premature limb/tree failure.

Natural Target Pruning is the removal of branches, stems, and stubs such that final cuts are achieved as close as possible to the branch collar without cutting into the branch collar or leaving a protruding stub. The branch collar is an area of overlapping trunk and branch tissue forming a swelling around the base of many branches. It contains defensive chemicals that can prevent infection from bacterial and/or fungal pathogens. **Figure 2.3** shows final cut locations when undertaking pruning works.

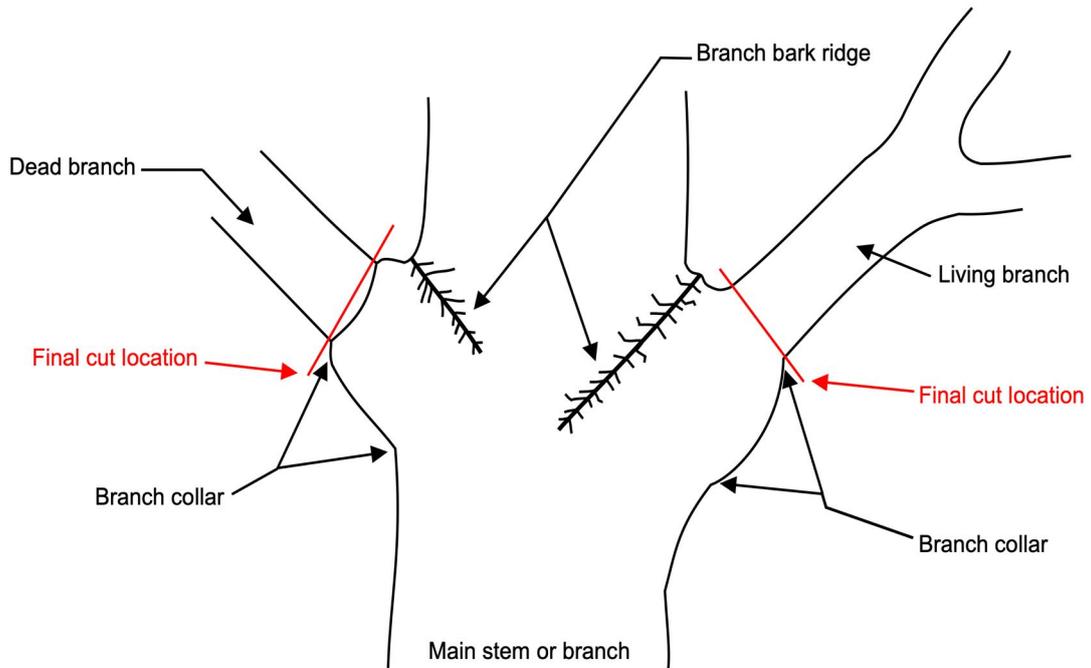


Figure 2.3

On branches where the branch bark collar cannot be found, the branch bark ridge is to be used as a pruning guide. **Figure 2.4** shows final cut location where – Line A to X is a line parallel to the trunk occurring just outside the branch bark ridge. Line A to C indicates the angle of the branch bark ridge and Line A to B represents the angle and location of the final cut. Angle 'a' should equal angle 'b'.

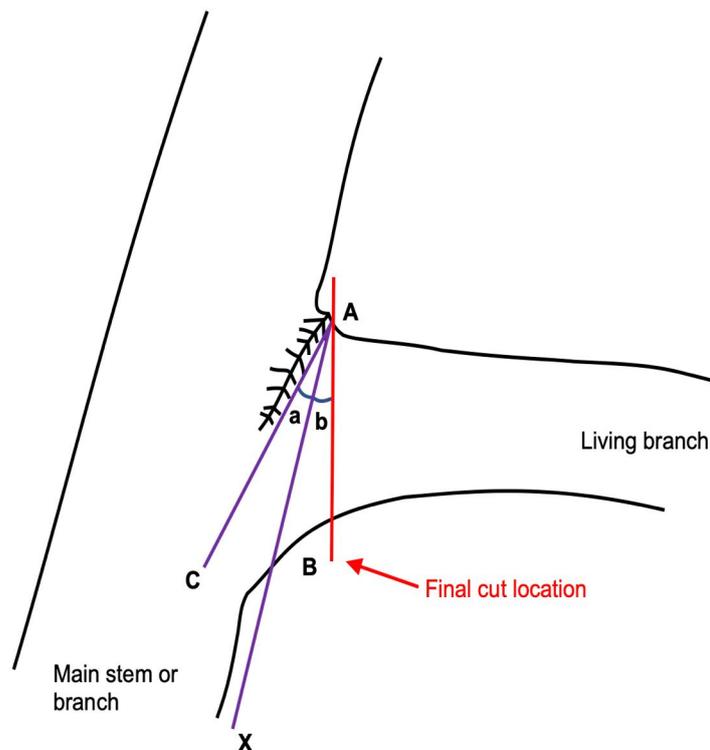


Figure 2.4

The cutting of branches which results in a stub, referred to as lopping is regarded as an unacceptable practice, except in certain circumstances. Lopping may result in:

- An increased rate of shoot production and elongation, which is weakly attached to the parent tree.
- Decay of the stubs.
- Poor form and visual amenity.
- Reduced life expectancy of the tree.
- Pre-disposing the tree to pathogenic infection and insect attack.

Further information regarding tree pruning specifications can be found in V.

Table 2: Results of Arboricultural Assessment – No Impact

Id.	Botanical name	Impact	Encroachment within TPZ (%)	Description of impacts	Impact mitigation	Result
1	<i>Callistemon citrinus</i>					
2	<i>Ficus rubiginosa</i>					
5	<i>Eucalyptus botryoides</i>	Nil	0	<ul style="list-style-type: none"> No foreseeable impacts to this tree as a result of the proposed development. 	<ul style="list-style-type: none"> Detailed root investigations should not be required. Tree protection measures to be installed in accordance with Chapter 4. 	Retain
6	<i>Casuarina glauca</i>					
7	<i>Casuarina glauca</i>					

Table 2: Results of Arboricultural Assessment – No Impact

Id.	Botanical name	Impact	Encroachment within TPZ (%)	Description of impacts	Impact mitigation	Result
11	<i>Ficus rubiginosa</i>					
12	<i>Corymbia maculata</i>					
13	<i>Corymbia maculata</i>	Nil	0	<ul style="list-style-type: none"> No foreseeable impacts to this tree as a result of the proposed development. 	<ul style="list-style-type: none"> Detailed root investigations should not be required. Tree protection measures to be installed in accordance with Chapter 4. 	Retain
14	<i>Lophostemon confertus</i>					
15	<i>Lophostemon confertus</i>					

Table 3: Results of Arboricultural Assessment – Minor Impact

Id.	Botanical name	Impact	Encroachment within TPZ (%)	Description of impacts	Impact mitigation	Result
3	<i>Corymbia citriodora</i>	Minor	<20	<ul style="list-style-type: none"> Subject Tree is located adjacent to the proposed development footprint. Minor impact as a result of required pruning activities – refer to Appendix V. Subject Tree is located adjacent to the proposed development footprint. Minor impact as a result of excavations for screw pile footing 	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Detailed root investigations have been undertaken adjacent to this tree - refer to Appendix VI. Tree protection measures to be installed in accordance with 	Retain
4	<i>Melia azedarach</i>	Minor	<20	<ul style="list-style-type: none"> Subject Tree is located adjacent to the proposed development footprint. Minor impact as a result of required pruning activities – refer to Appendix V. 	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Detailed root investigations should not be required. Tree protection measures to be installed in accordance with Chapter 4. 	Retain
9	<i>Liquidambar styraciflua</i>	Minor	<20	<ul style="list-style-type: none"> Subject Tree is located adjacent to the proposed development footprint. Minor impact as a result of required pruning activities – refer to Appendix V. Subject Tree is located adjacent to the proposed development footprint. Minor impact as a result of excavations for screw pile footing 	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Detailed root investigations have been undertaken adjacent to this tree - refer to Appendix VI. Tree protection measures to be installed in accordance with 	Retain
10	<i>Brachychiton acerifolius</i>	Minor	<20	<ul style="list-style-type: none"> Subject Tree is located adjacent to the proposed development footprint. Minor impact as a result of required pruning activities – refer to Appendix V. Subject Tree is located adjacent to the proposed development footprint. Minor impact as a result of excavations for screw pile footing 	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Detailed root investigations have been undertaken adjacent to this tree - refer to Appendix VI. Tree protection measures to be installed in accordance with 	Retain

Table 4: Results of Arboricultural Assessment – Major Impact

Id.	Botanical name	Impact	Encroachment within TPZ (%)	Description of impacts	Impact mitigation	Result
8	<i>Populus nigra</i>	Major	>20%	<ul style="list-style-type: none"> Major TPZ encroachment from proposed sewer connection. 	<ul style="list-style-type: none"> Subject Tree cannot be successfully retained. 	Remove

6 Recommendations

Trees Proposed for Removal

Major Impact: Subject Tree **id. 8** is located adjacent to a proposed sewer connection and is recommended for removal as part of this development.

Tree Proposed for Retention

Minor Impact: Subject Trees **id. 3, 4, 9 & 10** will be subject to a minor impact as a result of the proposed development. Impact mitigation measures are not required for successful tree retention; **however**, tree protection (**Chapter 7, Appendix III**) should be installed to protect the Subject Trees during the construction phase of the development.

Nil impact: Subject Trees **id. 1, 2, 5-7 & 11-15** are located outside the proposed area of disturbance and there are no foreseeable impacts to these trees as a result of the proposed development. Impact mitigation measures are not required for successful tree retention; **however**, tree protection (**Chapter 7 and Appendix III**) should be installed to protect the Subject Trees during the construction phase of the development.

Vegetation Offset

Offset replacement planting to compensate for the loss of Subject Tree **id. 8** following project completion should be undertaken in accordance with the relevant vegetation offset replacement policy and consist of tree species which are endemic to the local area and suited to the size of the area of which they are planted.

Tree Removal

Where tree removal is proposed, the following is recommended:

- Any approved pruning and/or tree removal work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture.
- Any approved pruning must be in accordance with *AS 4373-2007, Pruning of Amenity Trees*.
- Any approved pruning and/or tree removal work is to be carried out in accordance with the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998).
- Permission must be granted from the relevant consent authority, prior to removing or pruning of any of the subject trees.

Tree Pruning

Refer to **Appendix V** for tree pruning specifications and recommendations.

7 Tree Protection Plan

General Tree Protection Measures

The following general tree protection measures are recommended:

- The approved tree protection plan must be available onsite prior to the commencement of works, and throughout the entirety of the project.
- The Tree Protection Plan (**Chapter 7 and Appendix III**) must be implemented prior to demolition and/or site establishment.
- Tree protection measures are to be installed in accordance with *AS 4970-2009, Protection of Trees on Development Sites*.
- All proposed works within the TPZ (**Appendix I and III**) must be carried out under the supervision of the project arborist.
- The area lost to encroachment should be compensated for elsewhere, contiguous with the TPZ (**Appendix IV**).
- Any underground services proposed within the TPZ should be installed using tree sensitive methods such as: horizontal directional drilling boring, non-destructive excavation and carried out under the supervision of the project arborist.

Specific Tree Protection Measures

The following specific tree protection measures are recommended:

- If, at any time, it is not feasible to carry out works in accordance with this report, an alternative must be agreed in writing with the Project Arborist.
- Subject Trees **id. 1-7 & 9-15** are to be protected via the use of tree protection fencing, in accordance with **Chapter 7** and *AS 4970-2009, Protection of Trees on Development Sites*, and should be installed prior to site establishment and commencement of construction activities.
- It is the responsibility of the Principal Contractor to install and maintain tree protection measures in accordance with this report for the duration of the development.
- Where it is not feasible to install tree protection fencing at the specified location due to unforeseen factors, a modified tree protection specification must be agreed to by the Project Arborist.
- Where possible, footings of existing structures and hardscapes proposed for demolition within the TPZ should remain in situ (just below grade) to prevent damage to existing root material.
- Exposed root material should be clean cut using secateurs, hand saw or similar.
- Structural soil as coarse or slightly coarser than the existing soil should be used for any fill requirements within the TPZ of a Subject Tree proposed for retention.

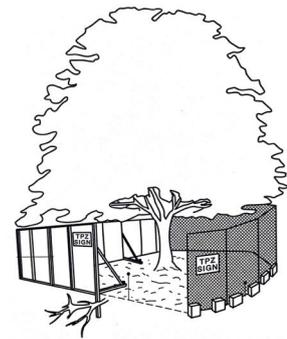
Tree Protection Fencing

Tree protection fencing must be established in the locations shown in **Appendix III**. Existing fencing, site hoarding or structures (such as a wall or building) may be used as tree protection fencing, providing the TPZ remains isolated from construction footprint.

Tree protection fencing must be installed prior to site establishment and remain intact until completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist.

Tree protection fencing shall be:

- Enclosed to the full extent of the TPZ (or as specified in the Recommendations and Tree Protection Plan).
- Temporary mesh panel fencing (minimum height 1.8m).
- Certified and inspected by the project arborist.
- Installed prior to the commencement of works.
- Prominently signposted with 300mm x 450mm boards stating, "NO ACCESS - TREE PROTECTION ZONE".



If tree protection fencing cannot be installed due to sloping or uneven ground, tree protection barriers must be installed as an alternative.

Specifications for tree protection barriers are as follows:

- Star pickets spaced at 2m intervals,
- Connected by a continuous high-visibility barrier/hazard mesh.
- Maintained at a minimum height of 1m.

Where approved works are required within the TPZ, fencing may be setback to provide construction access. Trunk, branch and ground protection shall be installed and must comply with *AS 4970-2009, Protection of Trees on Development Sites*. Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist.

Trunk Protection

Where provision of tree protection fencing is impractical or must be temporarily removed, trunk protection shall be installed to avoid accidental mechanical damage.

Specifications for trunk protection are as follows:

- A thick layer of carpet underfelt, geotextile fabric or similar wrapped around the trunk to a minimum height of 2m.
- 1.8m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with a small gap of approximately 50mm between the timbers).
- The timbers must be secured using galvanised hoop strap (aluminium strapping).

The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage to the tree.

Ground Protection

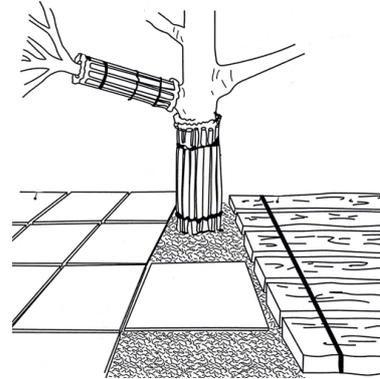
If temporary access for vehicle, plant or machinery is required within the TPZ ground protection shall be installed. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Where possible, areas of existing pavement shall be used as ground protection.

Specifications for light traffic access (<3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- Layer of mulch or crushed rock (at minimum depth of 100mm)

Specifications for heavy traffic access (>3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- Layer of lightly compacted road base (at minimum depth of 200mm)
- Geotextile fabric shall extend a minimum 300mm beyond the edge of the road base.



Pedestrian, vehicular and machinery access within the TPZ shall be restricted solely to areas where ground protection has been installed.

Excavations

All approved excavations (including root investigations) within the TPZ must be carried out using tree sensitive methods under supervision of the project arborist. These methods may include:

- Manual excavation (hand tools).
- Air spade.
- Hydro-vacuum excavations (sucker-truck).

Where approved by the project arborist, excavations using compact machinery fitted with a flat bladed bucket is permissible. Excavations using compact machinery shall be undertaken in small increments and guided by the Project Arborist who is to look for and prevent root damage to roots (>50mm in diameter).

Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with geotextile fabric, and plastic membrane or glad wrap (where practical). Coverings shall be weighted to secure them in place. The geotextile fabric shall be kept damp at all times.

No over-excavation, battering or benching shall be undertaken beyond the footprint of any structure unless approved by the project arborist. Hand excavation and root mapping shall be undertaken along excavation lines within the TPZ prior to the commencement of mechanical excavation (to prevent tearing and shattering of roots from excavation equipment). Any conflicting roots (>50mm in diameter) shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears. All root pruning must be documented and carried out by the project arborist.

Underground Services

All underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they must be installed using tree sensitive excavation methods under supervision of the project arborist. Alternatively, boring methods such as horizontal directional drilling

(HDD) may be used for underground service installation, providing the installation is at minimum depth of 800mm below grade. Excavations for entry/exit pits must be located outside the TPZ

Hold Points, Inspections, and Certification

The approved tree protection plan must be available onsite prior to the commencement of works, and throughout the entirety of the project. To ensure the tree protection plan is implemented, hold points have been specified in the schedule of works (**Table 2**). It is the responsibility of the principle contractor to complete each of the tasks.

Once each stage is reached, the work will be inspected and certified by the project arborist and the next stage may commence. Alterations to this schedule may be required due to necessity, however, this shall be through consultation with the project arborist only.

Table 6: Schedule of works

Pre-construction	1	Engagement of AQF Level 5 (Diploma of Arboriculture) arborist for the role of project arborist.
	2	Prior to demolition and site establishment indicate clearly with spray paint on trunks trees marked for removal only.
	3	Tree protection shall be installed in accordance with approved tree protection plan and certified by the project arborist prior to demolition and site establishment, this will include mulching of areas within the TPZ.
During Construction	4	Inspection and certification of trees by the project arborist should be undertaken monthly during the construction period.
	5	Project arborist to supervise and document all works carried out within the TPZ of trees to be retained.
	6	Inspection and certification of trees by project arborist after all major construction has ceased, following the removal of tree protection measures.
Post Construction	7	Final inspection and certification of trees by project arborist.

8 References

General References

- *Australian Standard, AS 4373-2007, Pruning of Amenity Trees.*
- *Australian Standard, AS 4970-2009, Protection of Trees on Development Sites.*
- *Harris, R., Clark, J., Matheny, N. and Harris, V. 2004. Arboriculture. Upper Saddle River, N.J.: Prentice Hall.*
- *Lonsdale, D. 1999. Principles of tree hazard assessment and management. London: Stationery Office.*
- *Loughran, A. 2007. Native plant or weed. Paterson, N.S.W.: Tocal College, NSW Dept. of Primary Industries.*
- *Mattheck, C. 2007. Updated field guide for visual tree assessment. Karlsruhe: Forschungszentrum Karlsruhe.*
- *Mattheck, C., Bethge, K. and Weber, K. 2015. The body language of trees. Karlsruhe: Karlsruher Inst. für Technologie.*
- *Mattheck, C., Lonsdale, D. and Breloer, H. 1994. The body language of trees. London: H.M.S.O.*
- *MacLeod, R D. and Cram, W J. 1996. Forces Exerted by Tree Roots, Arboriculture Research Information Note, 134/96/EXT.*
- *Smiley, T. and Fite, K. 2008. Managing Trees During Construction. Arborist News. WorkCover NSW. 1998. Code of Practice: Amenity Tree Industry.*

Specific References

The conclusions and recommendations of this report are based on the *Australian Standard, AS 4970-2009, Protection of Trees on Development Sites*, the findings from the site inspections and analysis of the following documents/plans:

- *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017.*
- *City of Sydney Council: Sydney Local Environmental Plan (SLEP) 2012.*
- *City of Sydney Council: Sydney Development Control Plan (SDCP) 2012.*
- *City of Sydney Council: Tree Guidelines for Pruning, Reporting and Using an Arborist 2020.*
- *Alessi Consulting: Proposed Hoarding for: Multiplex – 1a Bridge Road, Glebe; Alessi Job No.: 207000; Drawing No.: 100 (Issue 08); Drawing No.: 110 (Issue 06); Drawing No.: 111 (Issue 03) Drawing No.: 112 (Issue 02); Drawing No.: 120 (Issue 04); Drawing No.: 121 (Issue 04).*
- *Hunter Bruce: Arboricultural Impact Assessment; New Fish Markets Project; Prepared for FerryCarrig; Version 1, dated 11th November 2021.*
- *City of Sydney Council: Response Letter; Sender Reference: SSD-8925-MOD-6 / Council Reference 2021/557868, dated 17.12.2021.*

- *NSW Government – Department of Planning, Industry & Environment: Response Letter; Sender Reference: SSD 8925 MOD-6 / NSW Government – Department of Planning, Industry & Environment Reference DOC21/1088913, dated 15.12.2021.*

*Alessi Consulting: Proposed Hoarding for: Multiplex – 1a Bridge Road, Glebe; Alessi Job No.: 207000; Drawing No.: 100 (Issue 08): Site Plan has been used as a base map for **Appendix I, III & VI (Figure 1)**.*

Appendix I **Impact Assessment**

Arboricultural Impact Assessment

LEGEND

Tree Location

- Retain
- Remove

Structural Root Zone

Tree Protection Zone

Screw Pile Member Location

- No TPZ Encroachment
- TPZ Encroachment

Development Footprint

Walkway Bridge

Study Area

Base Map: © Department of Customer Service 2020

1A, 1B & 1C Bridge Road,
Glebe NSW 2037

Prepared by: Lex Atkins
Project Manager: Lex Atkins
Date: 18.01.2022

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Arboricultural Impact Assessment

LEGEND

Tree Location

- Retain
- Remove

Structural Root Zone

Tree Protection Zone

Screw Pile Member Location

- No TPZ Encroachment
- TPZ Encroachment

Development Footprint

Walkway Bridge

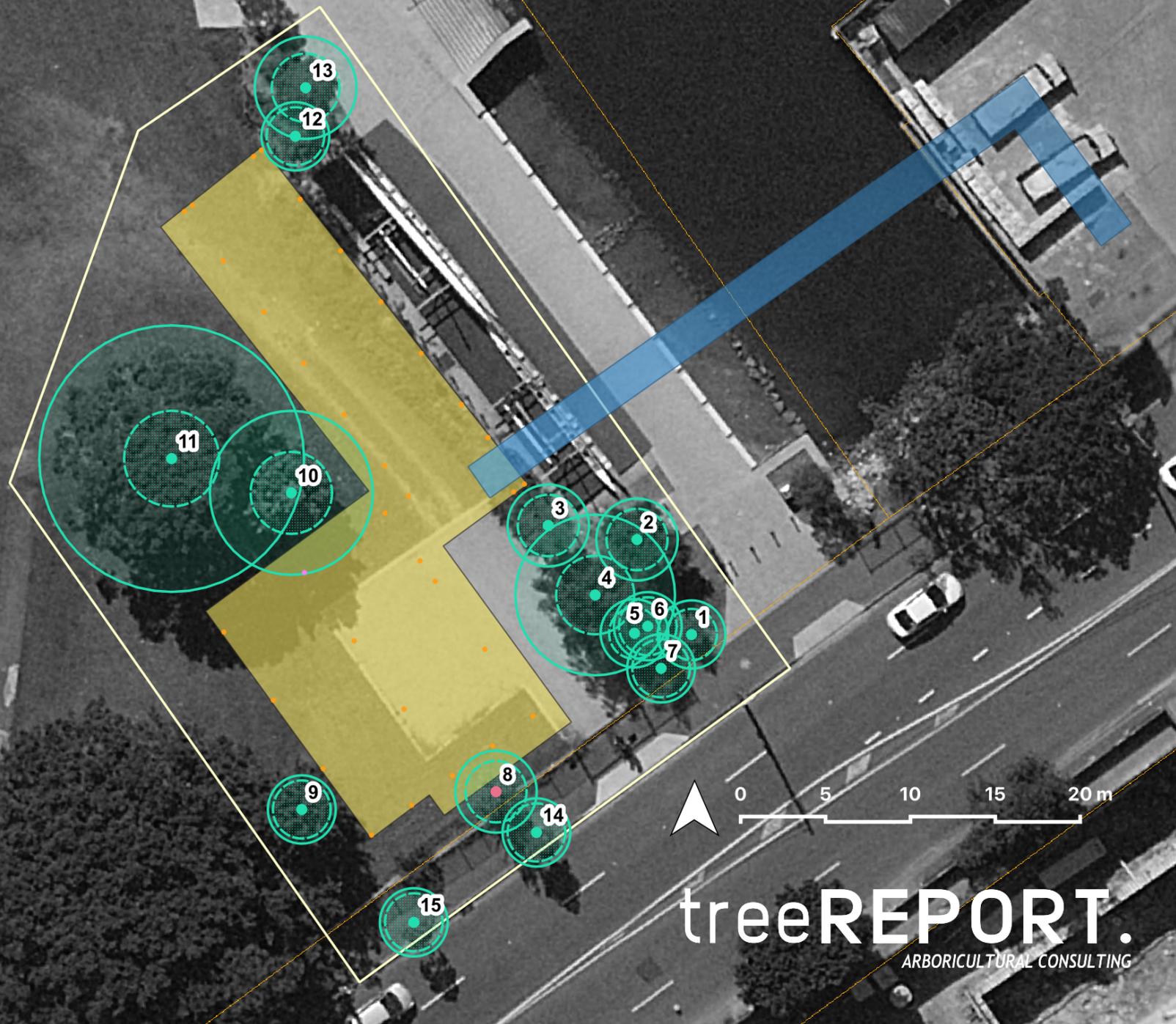
Study Area

Base Map: © Department of Customer Service 2020

1A, 1B & 1C Bridge Road,
Glebe NSW 2037

Prepared by: Lex Atkins
Project Manager: Lex Atkins
Date: 18.01.2022

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Appendix II **Tree Schedule**

Id.	Botanical name	Height (m)	Spread (m)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (Ømm)	DBH 2 (Ømm)	DBH 3 (Ømm)	Calculated DBH (mmØ)	SRZ (Rm)	TPZ (Rm)	Other notes
1	<i>Callistemon citrinus</i>	2	2	Good	Good	Juvenile	Low	Medium	Low	100	-	-	100	2	1.5	• REATIN
2	<i>Ficus rubiginosa</i>	3	5	Good	Good	Semi-mature	Medium	Medium	Medium	200	-	-	200	2.4	1.8	• REATIN
3	<i>Corymbia citriodora</i>	10	4	Good	Good	Semi-mature	Medium	Medium	Medium	200	-	-	200	2.4	1.8	<ul style="list-style-type: none"> • 3x roots found at 250mm depth – unable to dig further without damaging roots. • Roots are 50, 30 and 20mmØ. • Four branches require pruning all are 40mm • REATIN
4	<i>Melia azedarach</i>	10	12	Good	Good	Semi-mature	Low ii	Medium	Low	300	250	-	390	4.7	2.3	<ul style="list-style-type: none"> • 4x branches require pruning for truck access and site establishment (150, 150, 150 and 100mmØ). • Tree species listed as exempt under the conditions prescribed within <i>City of Sydney Council: Sydney Development Control Plan (SDCP) 2012.</i> • RETAIN
5	<i>Eucalyptus botryoides</i>	4	3	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	2	1.5	• REATIN

Id.	Botanical name	Height (m)	Spread (m)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (Ømm)	DBH 2 (Ømm)	DBH 3 (Ømm)	Calculated DBH (mmØ)	SRZ (Rm)	TPZ (Rm)	Other notes
6	<i>Casuarina glauca</i>	10	3	Good	Good	Semi-mature	Low	Medium	Medium	150	-	-	150	2	1.7	<ul style="list-style-type: none"> • REATIN
7	<i>Casuarina glauca</i>	10	3	Good	Good	Semi-mature	Low	Medium	Medium	150	-	-	150	2	1.7	<ul style="list-style-type: none"> • REATIN
8	<i>Populus nigra</i>	12	3	Fair	Fair	Semi-mature	Low	Medium	Low	200	-	-	200	2.4	1.8	<ul style="list-style-type: none"> • Tree proposed for removal for sewer connection. • REMOVE
9	<i>Liquidambar styraciflua</i>	12	10	Good	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	2	1.7	<ul style="list-style-type: none"> • Epicormic stump regrowth comprising of 7x stems. • Mass of roots found could not dig deeper without damaged to roots. • Tip reduction pruning <10% live canopy volume and tie branches back to for site establishment and building clearances. • REATIN
10	<i>Brachychiton acerifolius</i>	9	6	Good	Good	Mature	Medium	Medium	Medium	400	-	-	400	4.8	2.4	<ul style="list-style-type: none"> • One branch 15mmØ needs to be tip pruned. • Two pier locations excavated. • NDE location to the south is approximately 4.8m away (no roots encountered) excavated to 600mm and hard rock. • NDE location to the east is 5.2m away and (no roots encountered) excavated 250mm to hard concrete

Id.	Botanical name	Height (m)	Spread (m)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (Ømm)	DBH 2 (Ømm)	DBH 3 (Ømm)	Calculated DBH (mmØ)	SRZ (Rm)	TPZ (Rm)	Other notes
11	<i>Ficus rubiginosa</i>	12	14	Good	Good	Mature	Medium	Medium	Medium	650	-	-	650	7.8	2.8	• REATIN
12	<i>Corymbia maculata</i>	12	4	Good	Good	Semi-mature	Medium	Medium	Medium	150	-	-	150	2	1.7	• REATIN
13	<i>Corymbia maculata</i>	14	6	Good	Good	Semi-mature	Medium	Medium	Medium	250	-	-	250	3	2	• REATIN
14	<i>Lophostemon confertus</i>	4	2	Good	Good	Semi-mature	Medium	Medium	Medium	150	-	-	150	2	1.7	• REATIN
15	<i>Lophostemon confertus</i>	4	2	Good	Good	Semi-mature	Medium	Medium	Medium	150	-	-	150	2	1.7	• REATIN

Appendix III **Tree Protection Plan**

Tree Protection Plan

LEGEND

Tree Location

- Retain
- Remove

- ▨ Structural Root Zone
- ▨ Tree Protection Zone
- ▨ Tree Protection Fencing

Screw Pile Member Location

- No TPZ Encroachment
- TPZ Encroachment

- Development Footprint
- Walkway Bridge
- ▭ Study Area

Base Map: © Department of Customer Service 2020

1A, 1B & 1C Bridge Road,
Glebe NSW 2037

Prepared by: Lex Atkins
Project Manager: Lex Atkins
Date: 18.01.2022

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Tree Protection Plan

LEGEND

Tree Location

- Retain
- Remove

Structural Root Zone

Tree Protection Zone

Tree Protection Fencing

Screw Pile Member Location

- No TPZ Encroachment
- TPZ Encroachment

Development Footprint

Walkway Bridge

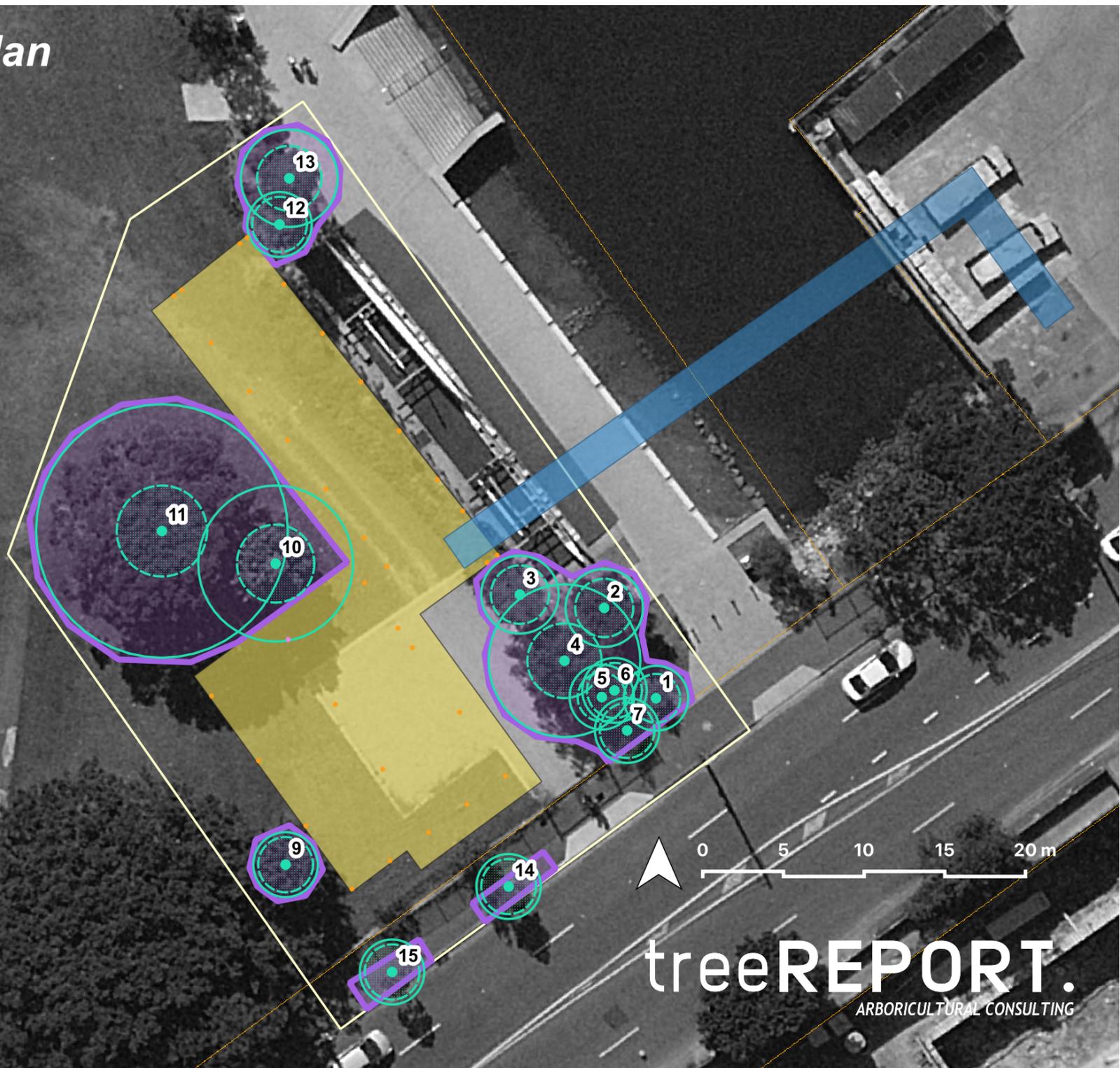
Study Area

Base Map: © Department of
Customer Service 2020

1A, 1B & 1C Bridge Road,
Glebe NSW 2037

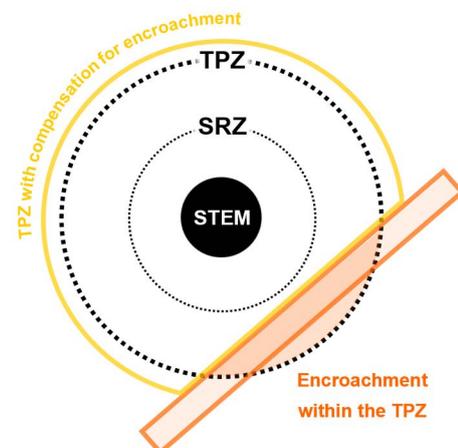
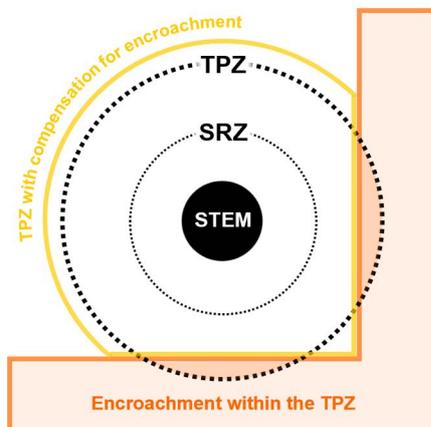
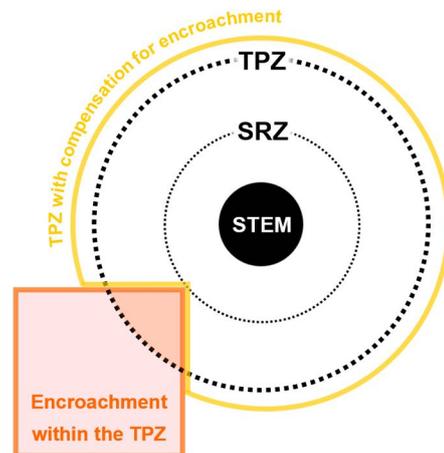
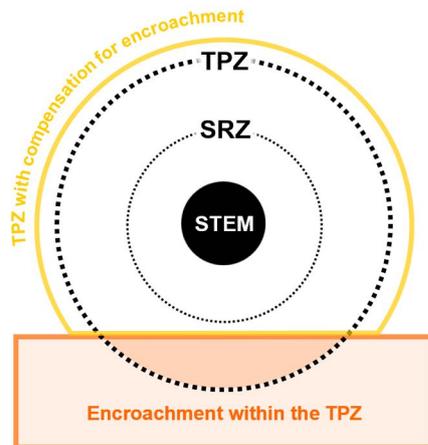
Prepared by: Lex Atkins
Project Manager: Lex Atkins
Date: 18.01.2022

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Appendix IV **Encroachment within the TPZ**

The images below show how encroachment within the tree protection zone can be compensated for elsewhere.



Reference

Council of Standards Australia (August 2009)
AS 4970-2009 Protection of Trees on Development Sites
Standards Australia, Sydney.

Appendix V **Tree Pruning Specification**

Introduction

Tree Report was commissioned by Multiplex c/o- FerryCarrig to prepare a Tree Pruning Specification (TPS) for trees (the Subject Trees) situated within the Study Area. The purpose of this report is to provide tree pruning recommendations, in accordance with the *Australian Standard AS 4373-2007, Pruning of Amenity trees* for the required pruning of Subject Trees in order to accommodate site establishment vehicle/plant movements and construction of a proposed site accommodation structure.

This TPS has been prepared in response to *City of Sydney Council: Response Letter; Sender Reference: SSD-8925-MOD-6 / Council Reference 2021/557868, dated 17.12.2021* and *NSW Government – Department of Planning, Industry & Environment: Response Letter; Sender Reference: SSD 8925 MOD-6 / NSW Government – Department of Planning, Industry & Environment Reference DOC21/1088913, dated 15.12.2021.*

Method

The site inspection was undertaken on 18th of January 2022. The Subject Trees were assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994)², and practices consistent with modern arboriculture. The conclusions and recommendations of this report are based on the findings from the site inspections and analysis of the following documents:

- *Australian Standard: AS 4373-2007 Pruning of Amenity Trees.*
- *Alessi Consulting: Proposed Hoarding for: Multiplex – 1a Bridge Road, Glebe; Alessi Job No.: 207000; Drawing No.: 100 (Issue 08); Drawing No.: 110 (Issue 06); Drawing No.: 111 (Issue 03) Drawing No.: 112 (Issue 02); Drawing No.: 120 (Issue 04); Drawing No.: 121 (Issue 04).*

Observations

Subject Tree id. 3: (*Corymbia citriodora*) is a semi-mature specimen and is approximately 10m in height, with a canopy spread of 4m and a trunk DBH of 300mm and 250mm. The following observations were made during the site inspection:

- The Subject Tree is situated on the eastern side of the proposed site accommodation structure.
- The Subject Tree is a multi-trunk specimen.
- The Subject Tree is in good health and condition.
- 4x first-order lateral branches (4x 40mmØ) extend in a northerly direction and is in conflict with the location of the proposed site accommodation structure.

Subject Tree id. 4: (*Melia azedarach*) is a semi-mature specimen and is approximately 10m in height, with a canopy spread of 12m and a trunk DBH of 200mm. The following observations were made during the site inspection:

- Tree species listed as exempt under the conditions prescribed within *City of Sydney Council: Sydney Development Control Plan (SDCP) 2012.*

² VTA is an internationally recognised practice in the visual assessment of trees as formulated by Mattheck & Breloer (1994). Principle explanations and illustrations are contained within the publication, *Field Guide for Visual Tree Assessment* by Mattheck, C., and Breloer, H. *Arboricultural Journal*, Vol 18 pp 1-23 (1994).

- The Subject Tree is situated on the eastern side of the proposed site accommodation structure.
- The Subject Tree is a single trunk specimen.
- The Subject Tree is in good health and condition.
- 4x first-order lateral branches (3x 150mmØ and 1x 100mmØ) extend in a northerly direction and is in conflict with the location of the proposed site accommodation structure and plant/vehicle access route.

Subject Tree id. 9: (*Liquidambar styraciflua*) is a semi-mature specimen and is approximately 12m in height, with a canopy spread of 10m and a trunk DBH of 150mm. The following observations were made during the site inspection:

- The Subject Tree is situated on the western side of the proposed site accommodation structure.
- The subject tree appears to be epicormic stump regrowth.
- The subject tree is in good health and condition.
- Terminal foliage of multiple 3rd and 4th order branches extend in an easterly direction and are in conflict with the location of the proposed site accommodation structure.

Subject Tree id. 10: (*Brachychiton acerifolius*) is a mature specimen and is approximately 9m in height, with a canopy spread of 6m and a trunk DBH of 400mm. The following observations were made during the site inspection:

- The Subject Tree is situated on the western side of the proposed site accommodation structure.
- The Subject Tree is a single trunk specimen.
- The Subject Tree is in good health and condition.
- Terminal foliage of a 3rd order branch extends in an easterly direction and is in conflict with the location of the proposed site accommodation structure.

Discussion

Subject Tree id. 3: Following the Site inspection and document review, 4x first-order lateral branches (4x 40mmØ) have been identified as conflicting with the proposed site accommodation structure. Selective canopy pruning of the identified branches is required to ascertain the necessary clearances for installation of the proposed site accommodation structure.

The required pruning of the identified branches will result in the loss of approximately 10% of total live canopy volume.

Corymbia citriodora is extremely tolerant of atmospheric pollution, root compaction and heavy pruning, and is often used in the urban environment because of these attributes. The Subject Tree is in good health and vitality and the required pruning is unlikely to have a significant impact on the tree's health and vitality in the long term.

See images for recommended pruning locations.

Subject Tree id. 4: Following the Site inspection and document review, 4x first-order lateral branches (3x 150mmØ and 1x 100mmØ) have been identified as conflicting with the proposed site accommodation structure and plant/vehicle access route. Selective canopy pruning of the identified branches is required to ascertain the necessary clearances for installation of the proposed site accommodation structure.

The required pruning of the identified branches will result in the loss of approximately 15% of total live canopy volume.

Melia azedarach is reasonably tolerant of atmospheric pollution, root compaction and heavy pruning, and is often used in the urban environment because of these attributes. The Subject Tree is in good health and vitality and the required pruning is unlikely to have a significant impact on the tree's health and vitality in the long term.

See images for recommended pruning locations.

Subject Tree id. 9: Following the Site inspection and document review, terminal foliage of multiple 3rd and 4th order branches have been identified as conflicting with the proposed site accommodation structure. Selective canopy pruning of the identified terminal foliage is required to ascertain the necessary clearances for installation of the proposed site accommodation structure.

The required pruning of the terminal foliage will result in the loss of approximately 10% of total live canopy volume.

Liquidambar styraciflua is extremely tolerant of atmospheric pollution, root compaction and heavy pruning, and is often used in the urban environment because of these attributes. The Subject Tree is in good health and vitality and the required pruning is unlikely to have a significant impact on the tree's health and vitality in the long term.

See images for recommended pruning locations.

Subject Tree id. 10: Following the Site inspection and document review, terminal foliage of a 3rd order branch has been identified as conflicting with the proposed site accommodation structure. Selective canopy pruning of the conflicting terminal foliage is required to ascertain the necessary clearances for installation of the proposed site accommodation structure.

The required pruning of the terminal foliage will result in the loss of approximately 1% of total live canopy volume.

Brachychiton acerifolius is reasonably tolerant of atmospheric pollution, root compaction and heavy pruning, and is often used in the urban environment because of these attributes. The Subject Tree is in good health and vitality and the required pruning is unlikely to have a significant impact on the tree's health and vitality in the long term.

See images for recommended pruning location.

Recommendations

Subject Tree id. 3:

- 4x first-order lateral branches (4x 40mm), as shown in **Image II**, are recommended for removal.

Subject Tree id. 4:

- 4x first-order lateral branches (3x 150mmØ and 1x 100mmØ), as shown in **Image IV**, are recommended for removal.

Subject Tree id. 9:

- Terminal foliage pruning of conflicting 3rd and 4th order branches, as shown in **Image V**, are recommended for removal.

Subject Tree id. 10:

- Terminal foliage pruning of conflicting 3rd order branch, as shown in **Image VI**, is recommended for removal.

General:

- All tree work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture under the supervision of the project arborist.
- All tree work must be in accordance with Australian Standard AS 4373-2007, Pruning of Amenity Trees and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998).
- Permission must be granted from the relevant consent authority, prior to pruning of any of the subject trees.

Pruning Schedule:

Branch id.	Diameter (mmØ)	Live canopy %
B3-1	40	2.50
B3-2	40	2.50
B3-3	40	2.50
B3-4	40	3.75
B4-1	150	4

Branch id.	Diameter (mmØ)	Live canopy %
B4-2	150	4
B4-3	150	4
B4-4	100	3
B9-1	~20 <5	10
B10-1	<5	1

Images



Image I: Subject Tree id. 3

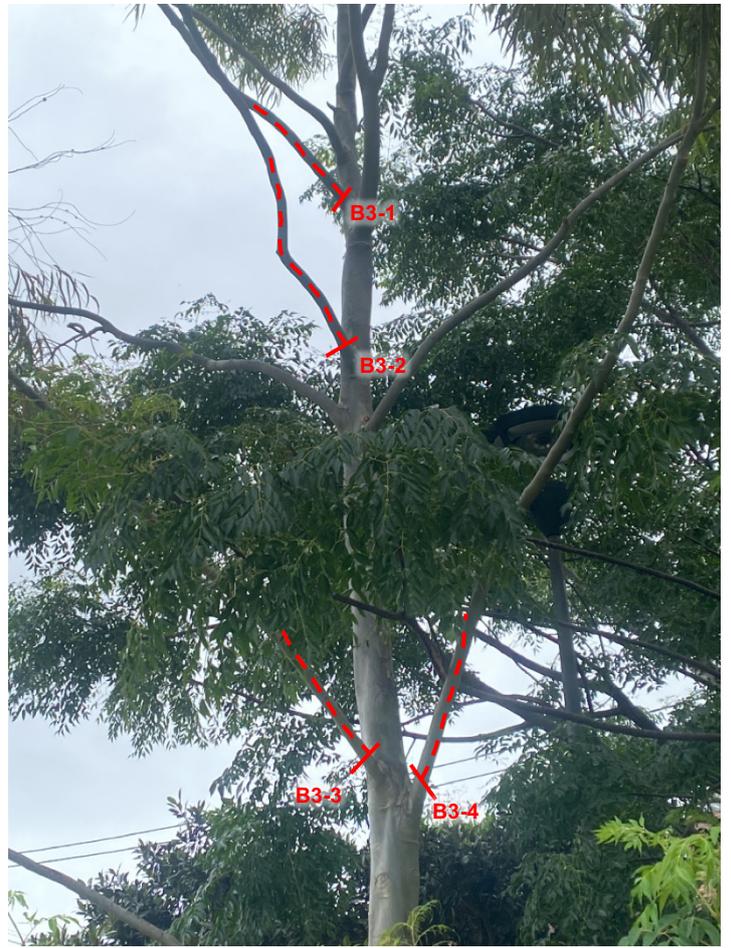


Image II: Subject Tree id. 3 indicative pruning locations



Image III: Subject Tree id. 4



Image IV: Subject Tree id. 4 indicative pruning locations



Image V: Subject Tree **id. 9** indicative terminal foliage pruning locations



Image VI: Subject Tree **id. 10** indicative terminal foliage pruning location

Appendix VI **Root Investigation Report**

Introduction

Tree Report was commissioned by Multiplex c/o- FerryCarrig to undertake root investigation via the use of non-destructive methods (hand excavation) adjacent Subject Trees **id. 3, 9 & 10** situated within the Study Area. The purpose of this report is to assess the extent and location of roots which are likely to be impacted by the construction of a proposed site accommodation structure and to provide recommendations based on the subject tree's suitability for retention.

This RIR has been prepared in response to *City of Sydney Council: Response Letter; Sender Reference: SSD-8925-MOD-6 / Council Reference 2021/557868, dated 17.12.2021* and *NSW Government – Department of Planning, Industry & Environment: Response Letter; Sender Reference: SSD 8925 MOD-6 / NSW Government – Department of Planning, Industry & Environment Reference DOC21/1088913, dated 15.12.2021.*

Locations of the NDE are shown in **Figure 1**.

Method

The site inspection was undertaken on 18th January 2022. The Subject Trees and exposed root material was assessed in accordance with Visual Tree Assessment (VTA) as formulated by Mattheck & Breloer (1994), and practices consistent with modern arboriculture. The conclusions and recommendations of this report are based on the findings from the site inspection and analysis of the following documents:

- *Alessi Consulting; Proposed Hoarding for: Multiplex – 1a Bridge Road, Glebe; Alessi Job No.: 207000; Drawing No.: 100 (Issue 08).*
- *Australian Standard, AS 4970-2007, Protection of Trees on Development Sites.*
- *Mattheck, C. (2007). Updated field guide for visual tree assessment.*
- *Mattheck, C., Bethge, K. and Weber, K. (2015). The body language of trees.*



Figure 1: NDE locations

Observations

Subject Tree id. 3

Localised excavation 600mmØ was undertaken at the proposed location of the closest screw pile footing (as determined onsite by Multiplex engineer) using non-destructive methods (hand digging) to expose root material which will require severance. NDE was abandoned at a depth of 250mm in order to prevent damage to root material encountered. The following root material was exposed during the NDE:

- 1x root **50 mmØ**
- 1x root **30 mmØ**
- 1x root **20 mmØ**

Subject Tree id. 9

Localised excavation 600mmØ was undertaken at the proposed location of the closest screw pile footing (as determined onsite by Multiplex engineer) using non-destructive methods (hand digging) to expose root material which will require severance. NDE was abandoned at a depth of 150mm in order to prevent damage to root material encountered. The following root material was exposed during the NDE:

- 1x root **30 mmØ**
- 1x root **10 mmØ**
- 1x root **50 mmØ**
- Multiple roots **<5mmØ**

Subject Tree id. 10

Localised excavation 600mmØ was undertaken at the proposed location of the 2 closest screw pile footings (as determined onsite by Multiplex engineer) using non-destructive methods (hand digging) to expose root material which will require severance.

NDE Location 1 (to the south of the Subject Tree) was excavated to a depth of 600mm – no root material was encountered.

NDE Location 2 (to the east of the Subject Tree) was abandoned at a depth of 250mm due to a concrete slab substrate. No root material was encountered.

Conclusion

The loss of the identified root material of Subject Trees **id. 3, 9 & 10** to facilitate installation of the proposed site accommodation is approximately 1% of total TPZ area is unlikely to have a significant impact on the subject tree's ability to store carbohydrates, use stored carbohydrates in times of stress and is unlikely to have a significant impact on the health, condition or stability of the tree long term.

Recommendations

- Permission must be granted from the relevant consent authority, prior to the severance of identified roots.

- Where additional root material (other than root material identified within this report) is required to be severed, additional assessment by an AQF 5 arborist should be undertaken.
- All exposed root material should be clean cut using secateurs, hand saw or similar.

Images



Image I: Subject Tree id. 3 in relation to NDE



Image II: Subject Tree id. 3 NDE



Image III: Subject Tree id. 9 in relation to NDE



Image IV: Subject Tree id. 9 NDE



Image V: Subject Tree id. 10 in relation to NDE (south)



Image VI: Subject Tree id. 10 NDE (south)



Image VII: Subject Tree id. 10 in relation to NDE (east)



Image VIII: Subject Tree id. 10 NDE (east)

Appendix VII **STARS® assessment matrix**

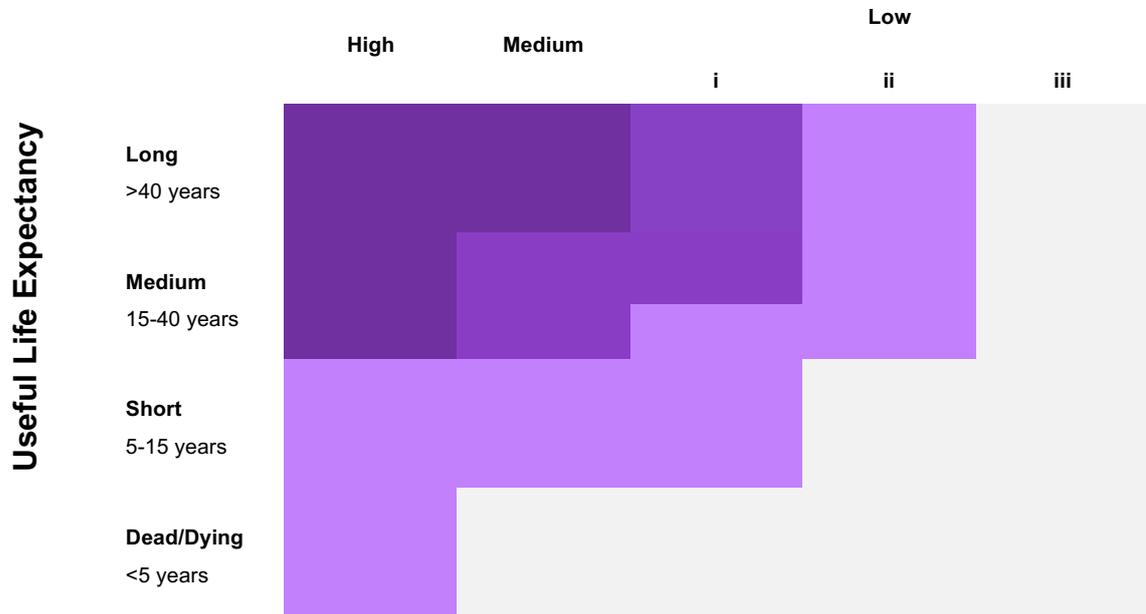
Tree Significance - Assessment Criteria - STARS®

Low	Medium	High
<p>i) Significance in landscape</p>		
<p>The tree is in fair-poor condition and good or low vigour.</p> <p>The tree has form atypical of the species</p> <p>The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings</p> <p>The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area</p> <p>The tree is a young specimen which may or may not have reached dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen</p> <p>The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ – tree is inappropriate to the site conditions</p> <p>The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms</p> <p>The tree has a wound or defect that has the potential to become structurally unsound.</p>	<p>The tree is in fair to good condition</p> <p>The tree has form typical or atypical of the species</p> <p>The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area</p> <p>The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street</p> <p>The tree provides a fair contribution to the visual character and amenity of the local area</p> <p>The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ</p>	<p>The tree is in good condition and good vigour</p> <p>The tree has a form typical for the species</p> <p>The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age.</p> <p>The tree is listed as a heritage item, threatened species or part of an endangered ecological community or listed on councils' significant tree register</p> <p>The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity.</p> <p>The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values.</p> <p>The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ – tree is appropriate to the site conditions.</p>
<p>ii) Environmental Pest/Noxious Weed Species</p>		
<p>The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties.</p> <p>The tree is a declared noxious weed by legislation</p>		
<p>iii) Hazardous/Irreversible Decline</p>		
<p>The tree is structurally unsound and/or unstable and is considered potentially dangerous</p> <p>The tree is dead, or is in irreversible decline</p>		

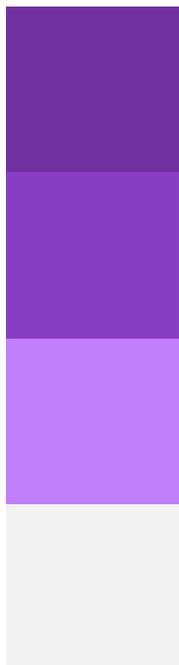
Useful Life Expectancy - Assessment Criteria

Dead / Dying	Short	Medium	Long
Trees with a high level of risk that would need removing within the next 5 years.	Trees that appear to be retainable with an acceptable level of risk for 5-15 years.	Trees that appear to be retainable with an acceptable level of risk for 15-40 years.	Trees that appear to be retainable with an acceptable level of risk for more than 40 years.
Dead trees.	Trees that may only live between 5 and 15 more years.	Trees that may only live between 15 and 40 more years.	Structurally sound trees located in positions that can accommodate future growth.
Trees that should be removed within the next 5 years.	Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals.	Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals.	Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery.
Dying or suppressed or declining trees through disease or inhospitable conditions.	Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons.	Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons.	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.
Dangerous trees through instability or recent loss of adjacent trees.	Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	
Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form.			
Damaged trees that considered unsafe to retain.			
Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.			
Trees that will become dangerous after removal of other trees for the reasons.			

Tree Significance



Legend for Matrix Assessment



Priority for retention (High): These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 Protection of trees on development sites. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.

Consider for retention (Medium): These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with the removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.

Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

Priority for removal (Low): These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of the proposed development.



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