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Roseville Anglican College Sports & Wellbeing Centre

Construction Noise and Vibration Management Sub Plan

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1 INTRODUCTION

Acoustic Logic (AL) has been engaged to prepare a Noise and Vibration Management Sub Plan for Roseville Anglican College Sports & Wellbeing Centre to satisfy consent conditions B-15, C7 and C4 for SSD-9912.

The principal issues will be addressed in this report are:

- Identification of the noise and vibration standards which will be applicable to this project.
- Identification of sensitive receivers near to the site.
- Description of hours of work and type of works undertaken.
- Identify likely sources of noise and vibration generation and predicted noise levels at nearby development.
- Formulation of a strategy to comply with the standards identified and mitigation treatments in the event that compliance is not achievable.

The discussion of the processes to manage noise and vibration from the proposed demolition, excavation, pilling and construction fit out works will be referencing with the following documents:

- Development Application Acoustic Assessment Revision 3 prepared by Acoustic Dynamics (dated 2nd November 2020)
- NSW EPA '*Interim Construction Noise Guideline*' (ICNG)
- Australian Standard AS2436:2010 *"Guide to Noise Control on Construction, Maintenance and Demolition Sites"*
- DIN4150, '*Vibration in Buildings (2016-12)*
- EPA "*Assessing Vibration: A Technical guideline*".

2 SITE DESCRIPTION

The project site is surrounded by existing residential dwellings as well as existing commercial buildings of Roseville College. The proposed works on site are presented below:

- Demolition of outdoor sports courts at 27-29 Bancroft Avenue.
- Demolition of a dwelling, ancillary structures, and hardstand areas at 37 Bancroft Avenue,
- Tree removal and excavation works,
- Construction of a three-storey building comprising:
    - 48 basement car parking spaces
    - Eight- lane swimming pool, associated concourse and grandstand
    - Gymnasium
    - Food technology space
    - General learning areas
    - Change facilities, amenities and storage,
    - Mechanical plant, on-site detention, filtration plant and
    - Chemical store; and
    - Rooftop multi-purpose sports courts.
- Landscaping and Signage

2.1 RECEIVER LOCATIONS

Acoustic Logic (AL) has identified sensitive receiver locations detailed below. These locations will be used as a basis for this assessment.

- **R1**: Residential dwellings along the north-western boundary along Bancroft Avenue
- **R2**: Residential dwellings along the western boundary at 15-23 Bancroft Avenue, Roseville
- **R3**: Residential dwellings along the north-eastern boundary along Bancroft Avenue at 30-24 Bancroft Avenue
- **R4**: Residential dwellings along the eastern boundary at 39 Bancroft Avenue, Roseville.
- **C1**: Multi-storey commercial dwelling on the south-western boundary
- **A1**: Active recreational area on the south-eastern boundary

Refer to Figure 1 for the arial view of the project site and sensitive receivers.

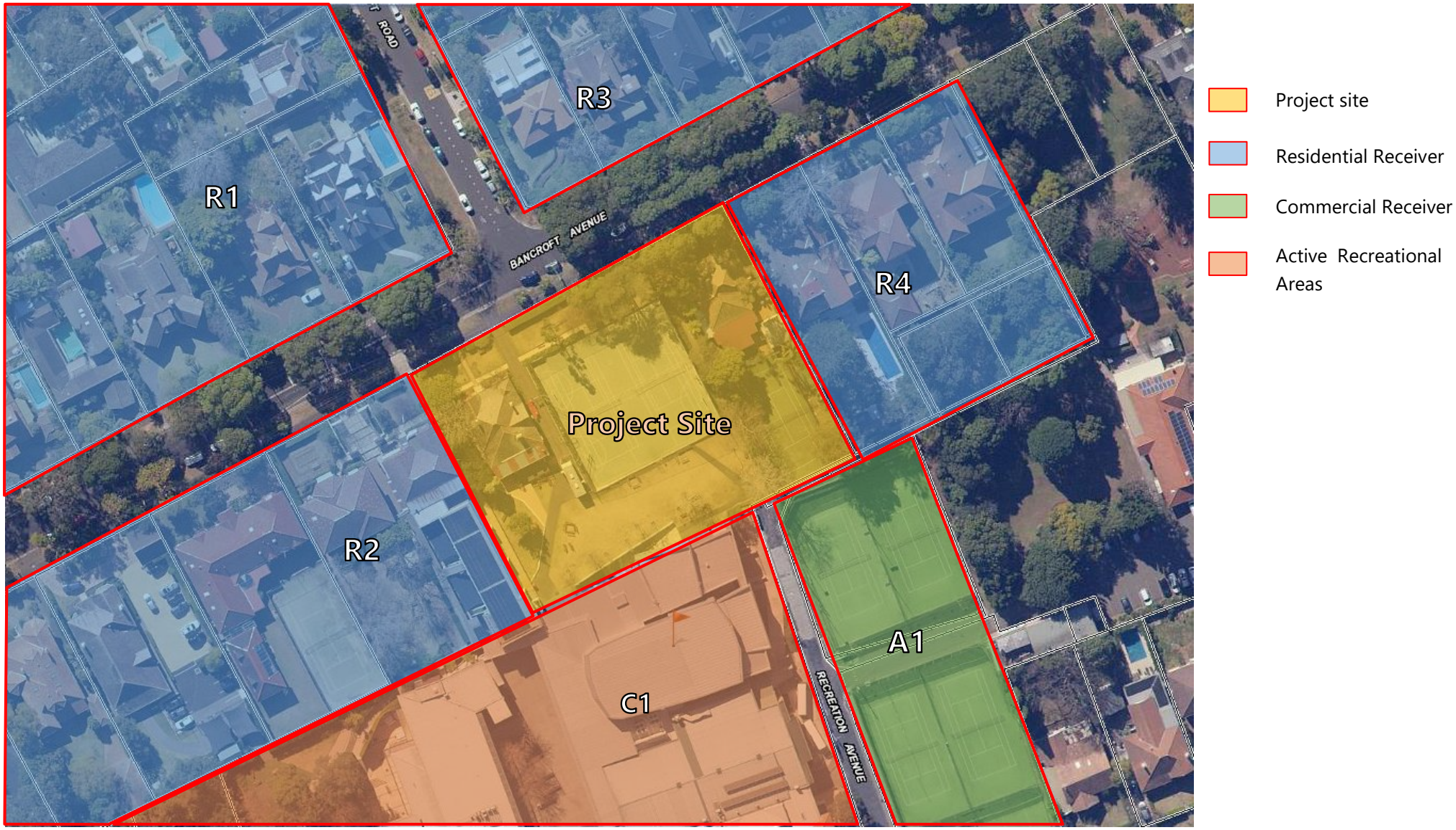


Figure 1: Arial view of the project site and the sensitive receivers (Soured : SixMaps)

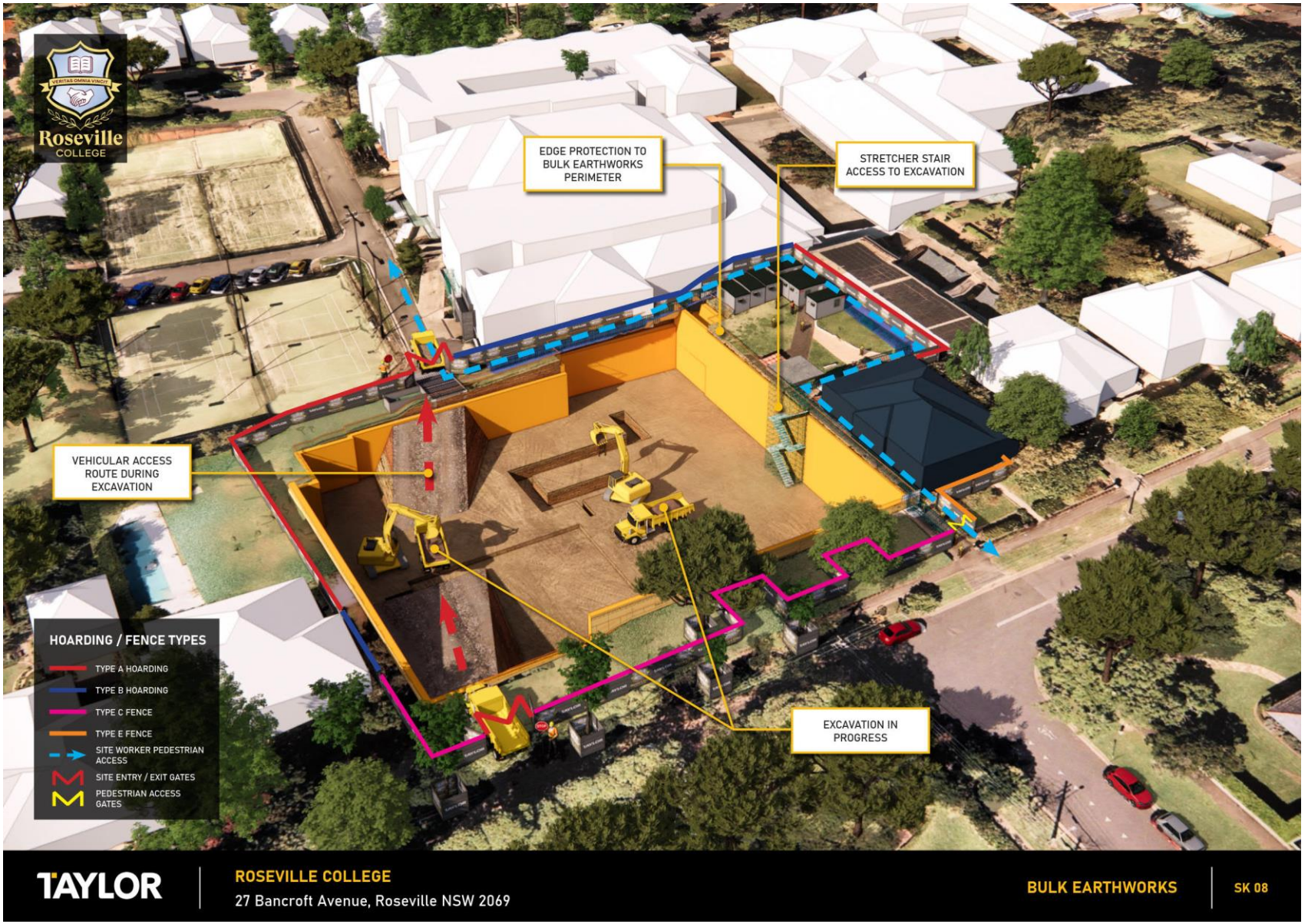


Figure 2: Site Plan and the proposed excavation works to be located

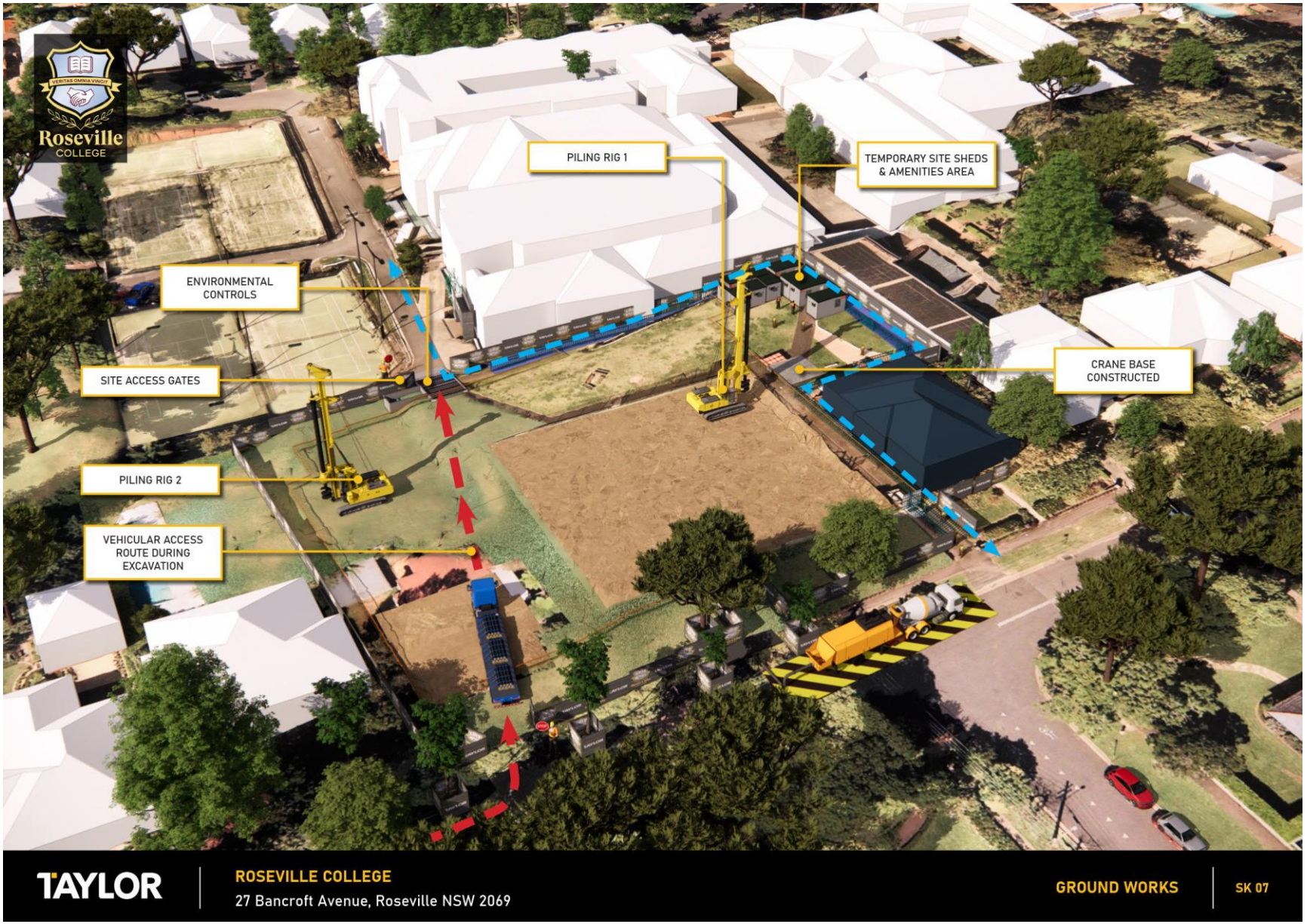


Figure 3: Proposed location of piling rigs and trucks driveway

3 CONSTRUCTION ACTIVITIES

The following information was provided to the office by Taylor's of the primary noise producing activities are as follows:

- Bulk excavation of intersect filing, natural clays and rocks with excavator. Any medium to high strength rock will require heavy bulldozer. All site vehicles are proposed to enter via Bancroft Road.
- Rock hammering may be necessary during excavation and demolition works.
- Two (2) Auger piling rigs will be used during piling phase. Refer to figure 3 for the proposed location of the piling rigs.
- Use of electrical cranes
- Erection of building structure (powered hand tools for formwork, concrete pump, vibrators).
- Façade/ roof construction (powered hand tools)
- Internal fit out of the wellbeing centre building
- Edge protecting during excavation and barriers to be erected to all boundaries of the site which adjoin to the surrounding receivers.

The duration of each phase of construction works are presented below:

- Demolition Phase (10 days)
- Excavation Phase (54 days)
- Piling Phase (41 days)
- Construction Phase (77 weeks)

4 CONDITIONS OF CONSENT

The purpose of this construction noise and vibration management sub plan (CNVMP) is to satisfy the conditions of consent SSD 9912. The following conditions are presented below:

B15. The Construction Noise and Vibration Management Sub-Plan must address, but not be limited to, the following:

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

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

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

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

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

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

(g) include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the implemented management measures in accordance with the requirements of condition B12.

4.1 HOURS OF WORK

Based on the consents of condition SSD 9912, the construction hours are as follows:

Construction Hours

C4 *Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:*

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

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

No work may be carried out on Sundays or public holidays.

C7. *Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:*

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

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

(c) 9am to 12pm, Saturday.

4.2 NOISE AND VIBRATION LIMITS

Construction Noise Limits

C12. *The development must be constructed to achieve the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009). All feasible and reasonable noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the management and mitigation measures identified in the approved Construction Noise and Vibration Management Plan.*

C13. *The Applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the site or surrounding residential precincts outside of the construction hours of work outlined under condition C4.*

C14. *The Applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use of 'quackers' to ensure noise impacts on surrounding noise sensitive receivers are minimised.*

Vibration Criteria

C15. Vibration caused by construction at any residence or structure outside the site must be limited to:

(a) for structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999); and

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

C16. *Vibratory compactors must not be used closer than 30 metres from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in condition C15.*

C17*. The limits in conditions C15 and C16 apply unless otherwise specified in a Construction Noise and Vibration Management Plan, approved as part of the CEMP required by condition B15 of this consent.*

5 BACKGROUND NOISE MEASUREMENT

Background noise measurement was conducted by Acoustic Dynamics (ref: Roseville College SWELL Centre Development Application Acoustic Assessment 29-37 Bancroft Avenue, Roseville,dated 2 November 2020 (Revision 3)). The following figure summarises the rating background levels obtained.

Table 2.1 Summary of Measured Noise Levels and Noise Emission Criteria – At Residences

Location	Time of Day	L_{A90} Rating Background Noise Level (RBL) [dB]	Measured L_{Aeq} [dB]	Project Intrusive Noise Level [dB]	Project Amenity Noise Level[2] L_{Aeq} [dB]	Project Noise Trigger Level L_{Aeq} [dB]
Location 1 Southern Boundary of 26 Bancroft Ave	Daytime[1] (7am to 6pm)	38	53	43	58	**43**
	Evening (6pm to 10pm)	36	52	41	48	**41**
	Night time (10pm to 7am)	31	47	36	43	**36**
Location 2 Eastern Boundary of 37 Bancroft Ave	Daytime[1] (7am to 6pm)	36	50	41	58	**41**
	Evening (6pm to 10pm)	37	47	42	48	**42**
	Night time (10pm to 7am)	31	43	36	43	**36**
School Classroom (Internal)	Daytime	-	-	35	-	**35**[3]

Figure 4: Background noise levels obtained at the residential receivers

6 NOISE AND VIBRATION CRITERIA

6.1 EPA INNTERIM CONSTRUCTION NOISE GUIDELINE

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise generation goals (based on ambient noise monitoring).
- Review of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission goals is not possible.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise effected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise effected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)$L_{eq(15min)}$.
- "*Highly noise affected level"*. Where noise emissions are such that nearby properties are "highly noise effected", noise controls such as respite periods should be considered. For residential properties, the "highly noise effected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

Table 1 – Summarised Noise Management Levels - Residential

Receivers	**Noise Affected Level – dB(A)$L_{eq(15min)}$ BG + 10**	**Highly Noise Affected Level – dB(A)$L_{eq(15min)}$**
Residential Receivers R1 and R2,	BG(38) + 10 = 48	75
Residential Receivers R3 and R4	BG(36) + 10 = 46	75

If noise levels exceeded the management levels identified in the table above, reasonable and feasible noise management techniques will be reviewed.

6.1.1 To Active Recreational Receivers and Classrooms

In section 4.1.2 of the ICNG outlines the following noise management noise levels to active recreation areas and classrooms at schools and other educational institutions.

Table 2 – Noise Management Level – other receivers

Receivers	**Noise Management Level dB(A)$L_{eq(15min)}$**
Active Recreational Area A1	65 (external)
Classroom	45 (internal)

6.2 VIBRATION CRITERIA

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

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration, the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment.

6.2.1 Structure Borne Vibrations (Building Damage Criteria)

German Standard DIN 4150-3 (1992-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1992-02) are presented in Table 3.

It is noted that the peak velocity is the value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 3 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

The surrounding educational buildings would be considered a Type 1 structure, whilst residences would be considered a Type 2 structure.

6.2.2 Assessing Amenity

The NSW EPA document "*Assessing Vibration: A Technical Guideline*" provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings and is used in the assessment of vibration impact on amenity.

Relevant criteria are presented below.

Table 4 – EPA Recommended Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices, schools, educational institutions, and place of worship		0.02	0.04	0.4	0.8	0.56	1.1
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices, schools, educational institutions, and place of worship		0.64	1.28	13.0	26.0	18.0	36.0

7 NOISE AND VIBRATION ASSESSMENT AND RECOMMENDATIONS

7.1 ACTIVITIES TO BE CONDUCTION AND THE ASSOCIATED NOISE SOURCES

Typically, the most significant sources of noise generated during a construction project will be excavation, civil works and piling. A summary of sound power levels of major construction processes/equipment is detailed in Table 5.

The highest noise levels are likely to be generated during bulk excavation and piling phases.

With respect to construction noise, the impact on nearby development will be dependent on the activity in question and where on the site the activity is undertaken. The primary construction equipment and sound power levels associated with the works are as follows:

Table 5 – Sound Power Levels of the Proposed Equipment

EQUIPMENT / PROCESS	SOUND POWER LEVEL dB(A)
Excavator with Bucket	105
Excavator with Hydraulic Hammer	118
Truck with Semi-Trailer	105
Demolition Saw	118*
Concrete Pump	108
Concrete Boom	105
Cement Mixing Truck	105
Electric Tower Crane	95
CFA Piling	103
Angle Grinder	105
General Hand Tools	95
Asphalter	105

***Noise levels take into account correction factors (for tonality, intermittency where necessary).**

The noise levels presented in the above table are derived from the following sources, namely:

- Table A1 of Australian Standard 2436-2010.
- Data held by this office from other similar studies.

Noise levels take into account correction factors (for tonality, intermittency where necessary).

7.2 PREDICTED NOISE LEVELS AND THE ASSOCIATED NOISE SOURCES

7.2.1 Noise Emission Predictions to Receiver 1 (R1)

Activity	**Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)**	**Criteria dB(A)$L_{eq(15min)}$**	**Comment**
Excavator with Bucket	58-72	Noise Management Level **<48(A)$L_{eq(15min)}$** Highly Noise Affected Level **<75(A)$L_{eq(15min)}$**	Generally, exceeds Noise Management Level
Excavator with Hydraulic Hammer	71-85		Exceeds Highly Noise Affected Level.
Truck with Semi-Trailer	58-72		Generally exceeds Noise Management Level
Demolition Saw	71-85		Exceeds Highly Noise Affected Level
Concrete Pump	61-75		Generally, exceeds Noise Management Level
Concrete Boom	58-72		
Cement Mixing Truck			
Electric Tower Crane	48-72		
CFA Piling	56-70		
Angle Grinder	58-72		
General Hand Tools	48-62		
Asphalter	58-72		

See section 7.3 for discussion and recommendations.

7.2.2 Noise Emission Prediction to Receiver 2 (R2)

Activity	**Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)**	**Criteria dB(A)$L_{eq(15min)}$**	**Comment**
Excavator with Bucket	57-69	Noise Management Level **<48(A)$L_{eq(15min)}$** Highly Noise Affected Level **<75(A)$L_{eq(15min)}$**	Generally, exceeds Noise Management Level.
Excavator with Hydraulic Hammer	70-82		Exceeds Highly Noise Affected Level.
Truck with Semi-Trailer	57-69		Generally, exceeds Noise Management Level
Demolition Saw	70-82		Exceeds Highly Noise Affected Level
Concrete Pump	60-72		Generally, exceeds Noise Management Level
Concrete Boom	57-69		
Cement Mixing Truck			
Electric Tower Crane	47-59		
CFA Piling	55-67		
Angle Grinder	57-69		
General Hand Tools	47-59		
Asphalter	57-69		

See section 7.3 for discussion and recommendations.

7.2.3 Noise Emission Prediction to Receiver 3(R3)

Activity	**Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)**	**Criteria dB(A)$L_{eq(15min)}$**	**Comment**
Excavator with Bucket	57-71	Noise Management Level **<46(A)$L_{eq(15min)}$** Highly Noise Affected Level **<75(A)$L_{eq(15min)}$**	Generally, exceeds Noise Management Level
Excavator with Hydraulic Hammer	70-84		Exceeds Highly Noise Affected Level
Truck with Semi-Trailer	57-71		Generally, exceeds Noise Management Level
Demolition Saw	70-84		Exceeds Highly Noise Affected Level
Concrete Pump	60-74		Generally, exceeds Noise Management Level
Concrete Boom	57-71		
Cement Mixing Truck			
Electric Tower Crane	47-61		
CFA Piling	55-69		
Angle Grinder	57-71		
General Hand Tools	47-61		
Asphalter	57-71		

See section 7.3 for discussion and recommendations.

7.2.4 Noise Emission Prediction to Receiver 4 (R4)

Activity	**Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)**	**Criteria dB(A)$L_{eq(15min)}$**	**Comment**
Excavator with Bucket	59-77	Noise Management Level **<46(A)$L_{eq(15min)}$** Highly Noise Affected Level **<75(A)$L_{eq(15min)}$**	Generally exceeds Noise Management Level and slightly exceeds Highly Noise Affected Level.
Excavator with Hydraulic Hammer	72-90		
Truck with Semi-Trailer	59-77		
Demolition Saw	72-90		
Concrete Pump	62-80		
Concrete Boom	59-77		
Cement Mixing Truck			
Electric Tower Crane	49-67		
CFA Piling	57-75		
Angle Grinder	59-77		
General Hand Tools	49-67		
Asphalter	59-77		

See section 7.3 for discussion and recommendations.

7.2.5 Noise Emission Prediction to Commercial (school) building - C1

Activity	**Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)**	**Criteria dB(A)$L_{eq(15min)}$**	**Comment**
Excavator with Bucket	62-81	Noise Management Level (internal) **<45dB(A)$L_{eq(15min)}$** Highly Noise Affected Level (external) **<75dB(A)$L_{ea(15min)}$**	Generally exceeds Noise Management Level and Highly Noise Affected Level.
Excavator with Hydraulic Hammer	75-94		
Truck with Semi-Trailer	62-81		
Demolition Saw	75-94		
Concrete Pump	65-84		
Concrete Boom	62-81		
Cement Mixing Truck			
Electric Tower Crane	52-71		
CFA Piling	60-79		
Angle Grinder	62-81		
General Hand Tools	52-71		
Asphalter	62-81		

See section 7.3 for discussion and recommendations.

7.2.6 Noise Emission Prediction to Active Recreational Area – A1

Activity	**Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)**	**Criteria dB(A)$L_{eq(15min)}$**	**Comment**
Excavator with Bucket	58-77	Noise Management Level **<65(A)$L_{eq(15min)}$** Highly Noise Affected Level **<75(A)$L_{eq(15min)}$**	Exceeds Highly Noise Affected Level
Excavator with Hydraulic Hammer	71-90		Generally exceeds Noise Management Level and Highly Noise Affected Level
Truck with Semi-Trailer	58-77		Exceeds Highly Noise Affected Level.
Demolition Saw	71-90		Generally exceeds Noise Management Level and Highly Affected Level
Concrete Pump	61-80		Generally exceeds Noise Management Level and slightly exceeds Highly Noise Affected Level.
Concrete Boom	58-77		
Cement Mixing Truck			
Electric Tower Crane	48-67		
CFA Piling	56-75		
Angle Grinder	58-77		
General Hand Tools	48-67		Exceeds Noise Management Level
Asphalter	58-77		Exceeds Highly Noise Affected Level.

See section 7.3 for discussion and recommendations.

7.3 DISCUSSION- NOISE

The proposed equipment to be used during the demolition, excavation and piling phase of the development (excavator, CFA piling rig, rock hammering) is expected to exceed highly noise affected management levels. Noise impacts to the surrounding sensitive receivers is expected during this time.

Notwithstanding we note the following:

- Excavation of intersect filling, natural clays and extremely low strength rocks are to be expected. The anticipated depth of excavation will be 6 to 8m deep for the proposed basement levels and car park. In the event where high strength rock is required to be pulled, bulldozer or rock hammering to be used. However, the demolition and excavation works are anticipated to last for only 64 days.
- Due to the proximity of the surrounding sensitive receivers, it is expected that piling works will exceed the highly noise affected level. See section 8 for recommendations. We note that piling works will only last for 41 days.
- Other work practices which are above the noise affected management level (but generally below the 'highly noise affected level') are expected to be of a shorter duration (piling, hydraulic hammering) or are able to be effectively scheduled to minimise impact (concrete pump, deliveries).
- Once the façade is erected, fit-out work and other activities caried out internally will have a lesser impact on the amenity of neighbouring receivers and is expected to generally comply with the noise level. See Section 8.2 for further recommendations.

7.4 DISCUSSION- VIBRATION

Typically, the greatest potential for generation of vibration are excavation of rocks and vibration from piling rigs.

For this project, due to the expected demolition, excavation and piling works on site and the proximity of the nearest sensitive receivers, the vibration levels are expected to reach or exceed the criteria set out in section 6.2, 6.3 and 6.4. See section 8.1.1 for recommendation for vibration monitoring.

8 MITIGATION RECOMMENDATIONS

8.1 RECOMMENDATIONS

In light of the above assessment, and to mitigate any potential noise impacts from the development, we recommend the following management controls be implemented:

- The scheduling of construction activities should be undertaken to reasonably minimise noise impacts to all surrounding residents.
    - Based on condition C7 of the Consent Conditions SSD9912, a respite period is to be implemented where rock hammering, piling or rock cutting works are required as follows:
        - Monday – Friday: 9:00am – 12:00pm
        - Monday – Friday: 2:00pm – 5:00pm
        - Saturday: 9:00am – 12:00pm
- Community consultation is proposed be undertaken throughout the construction process. In this regard regular letterbox drops detailing site progress and scheduled works is proposed. In particular, these should detail the extent and times of rock hammering which is planned to be undertaken.
- Quiet work methods/technologies:
    - The primary noise generating activity at the site will be the bulk excavation period. As much as practicable, use of quieter excavation methods is adopted.
    - Excavation is conducted initially using excavator with bucket (quietest excavation method), then use of rock rippers (as opposed to hydraulic hammers and rock saws) when rock strength permits. Use of the loudest excavation equipment (hydraulic hammers/rock saws) is used only with other options are not available.
- Materials handling/vehicles:
    - Trucks and forklifts in general use on site are to use a non-tonal reversing beacon where possible (subject to OH&S requirements) to minimise potential disturbance of surrounding receivers.
    - Avoid careless dropping of construction materials into empty trucks.
    - As per Condition C13, trucks are not to arrive at the site or surrounding residential precincts outside of the construction hours of work outlined under condition C4.
    - Trucks, trailers and delivery vehicles are to turn off engines when idling to reduce noise impacts (unless required for concrete pumping or similar).
    - Deliveries should use straps in place of chains for handling materials wherever possible.
- A conscientious effort should be made to avoid works near the nearest sensitive receivers (R4 when occupied and C1) wherever feasible. Compounding various high generating activities simultaneously near receivers should be avoided where possible.
- Unnecessary shouting should be avoided on site, and appropriate signage should be installed to remind workers of their responsibility to reduce noise impacts where feasible. Loud music from radios and stereos should not be permitted.
- When selecting construction equipment to be used on the project, the noise levels of plant and equipment should be considered, whereby equipment selected has an equivalent or lower sound power level than the predictive sound power levels of equipment maintained within this report.

- Complaints handling:
    - An after-hours contact number is displayed outside of the building site, so that in the event that surrounding development believes that a noise breach is occurring, they may contact the site.
    - In the event of complaint, the procedures outlined in Section 8 are adopted.
- Maximum delivery vehicle speed of 10km/h through service road.
- Site Induction:
    - A copy of the Noise Management Plan is to be available to contractors. The location of the Noise Management Plan should be advised in any site induction.
    - Site induction should also detail the site contact to be notified in the event of noise complaint.

8.1.1 Vibration Monitoring

During the demolition, excavation and piling stage, vibration monitoring is recommended to be conducted along the western and eastern boundary of the project site. AL also recommends that if any complaint relevant to vibration is made by any other surrounding receivers, vibration monitoring be undertaken to monitor vibration levels at sensitive receivers.

Monitor locations are recommended to be regularly discussed and reviewed together by both the builder and the relevant stakeholders to ensure monitors follow the path of construction activities.

Vibration monitoring (attended or unattended) can also be conducted at other surrounding residential/commercial receivers if complaints arise.

8.1.1.1 Equipment

Vibration monitoring at receivers or site boundaries are to be conducted using Texcel ETM type monitors with externally mounted tri-axial geophones.

Vibration monitoring inside sensitive rooms are to be conducted using Bruel & Kjaer 3680 terminals using Bruel & Kjaer 8380 tri-axial geophones.

The monitors are to be set to send an SMS message when alert levels have reached 75% of the vibration criteria at the location of the geophone.

8.1.1.2 Results

The ETM vibration monitors can be downloaded remotely to actively review all monitoring data recorded at the monitoring location, including any vibration events found to exceed the trigger levels nominated in Section 6.2.1.

In the event multiple events exceeding the nominated trigger levels are recorded, all data recorded by the monitor is to be reviewed and forwarded to a nominated representative of the building contractor. It is proposed that reports are to be provided at regular intervals (e.g. fortnightly), with any exceedance in the nominated vibration criteria documented.

8.1.1.3 Presentation of Vibration Monitor Results

A fortnightly report will be submitted to the client via email summarising the vibration events. The vibration exceedance of criteria is recorded, and the report shall be submitted within 24 hours. Complete results of the continuous vibration logging will be presented in fortnight reports including graphs of the collected data.

8.1.1.4 Vibration Monitoring Alerts

The following personnel will receive alarms in the event that the nominated vibration trigger level of 75% are exceeded at the site:

1. Acoustic consultant/advisor.
2. Project site foreman.
3. Project Manager.

8.2 GENERAL RECOMMENDATIONS

Other noise management practices which may be adopted are discussed below. In addition, notification, reporting and complaints handling procedures should be adopted as recommended in section in this report.

8.2.1 Acoustic Barrier

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

The placement of barriers at the source is generally only effective for static plant (tower cranes). Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source. Barriers can also be placed between the source and the receiver.

The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be affected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers.

8.2.2 Silencing Devices

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

8.2.3 Material Handling

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

8.2.4 Treatment of Specific Equipment

In certain cases, it may be possible to specially treat a piece of equipment to reduce the sound levels emitted. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

8.2.5 Establishment of Site Practices

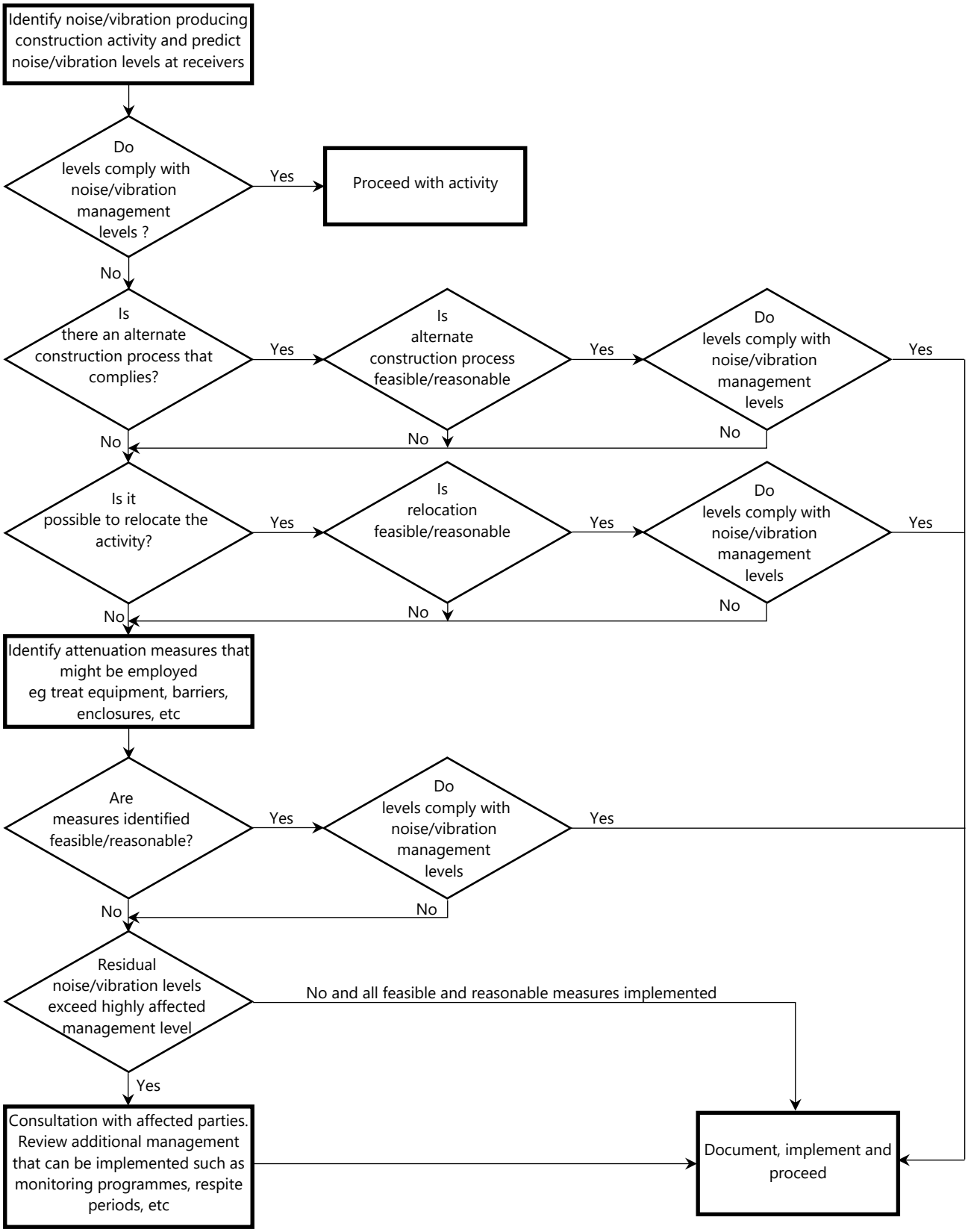
This involves the formulation of work practices to reduce noise generation. This includes locating fixed plant items as far as possible from residents as well as rotating plant and equipment to provide respite to receivers.

Construction vehicles accessing the site should not queue in residential streets and should only use the designated construction vehicle routes. Loading of these vehicles should occur as far as possible from any sensitive receiver.

9 ASSESSMENT METHODOLOGY AND MITIGATION METHODS

The flow chart that follows illustrates the process to be followed to minimise the impact associated with these activities.

Noise sources with the potential to exceed the criteria set out in section 6 have been identified and discussed in section 8.



10 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

10.1 ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

In order for any construction noise management programme to work effectively, continuous communication is required between; all parties which may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation process is to:

- Inform and educate the groups about the project and the noise controls being implemented.
- Increase understanding of all acoustic issues related to the project and options available.
- Identify group concerns generated by the project, so that they can be addressed.
- Ensure that concerned individuals or groups are aware of and have access to the Site Complaints Register which will be used to address any construction noise related problems should they arise.

To ensure that this process is effective, regular scheduled meetings may be required for a finite period, until all issues have been addressed and the evidence of successful implementation is embraced by all parties.

An additional step in this process is to produce a newsletter informing nearby residents of upcoming activities that are likely to generate higher noise/vibration levels.

10.2 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise, vibration or dust occur, immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices. In the case of exceedances of the vibration and dust limits, all work potentially producing vibration or dust shall cease until the exceedance is investigated. The effectiveness of any changes shall be verified before continuing. Documentation and training of site staff shall occur to ensure the practices that produced the exceedances are not repeated.

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint, and a summary of the results of the investigation.
- Required remedial action, if required.
- Validation of the remedial action.
- If necessary, setup vibration monitoring at the location representing the nearest affected vibration receiver, with alarm device which can inform the project manager on site if the vibration exceedance happened.
- Summary of feedback to the complainant.

A permanent register of complaints should be held.

All complaints received should be fully investigated and reported to management. The complainant should also be notified of the results and actions arising from the investigation.

The investigation of a complaint shall involve where applicable.

- noise measurements at the affected receiver.

- an investigation of the activities occurring at the time of the incident.
- inspection of the activity to determine whether any undue noise is being emitted by equipment; and
- Whether work practices were being carried out either within established guidelines or outside these guidelines.

Where an item of plant is found to be emitting excessive noise, the cause is to be rectified as soon as possible. Where work practices within established guidelines are found to result in excessive noise being generated then the guidelines should be modified so as to reduce noise emissions to acceptable levels. Where guidelines are not being followed, the additional training and counselling of employees should be carried out.

Measurement or other methods shall validate the results of any corrective actions arising from a complaint where applicable.

10.3 NOISE MONITORING TECHNIQUES

Where noise monitoring is undertaken (either by attended short term measurements or long term unattended noise monitoring), it should be conducted at a practical location representative of the impact to nearby noise sensitive receivers. Where this is not possible, noise measurements of construction processes should be taken such that noise levels can be accurately predicted to receivers. Any reporting of noise measurement results may include the following information:

- The date and time that the measurements were undertaken;
- The location of measurements, noise receivers and construction processes. A site map should be included for clarity.
- A description of the construction processes being undertaken during the measurement period.
- The measured noise construction noise levels, and the noise level at the façade of nearby receivers (if noise levels are predicted).
- A comparison to the NSW EPA Interim Construction Noise Guideline noise management levels.

11 CONTINGENCY PLANS

Where non-compliances or noise complaints are raised the following methodology will be implemented.

1. Determine the offending plant/equipment/process
2. Locate the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implement additional acoustic treatment in the form of localised barriers, silencers etc where practical.
4. Selecting alternative equipment/processes where practical
5. If necessary, setup noise and vibration monitoring devices at locations representing the nearest noise/vibration and dust affected receivers and provide data for each complain time period. Analysis is required to determine suitable mitigation measures.

Complaints associated with noise and vibration generated by site activities shall be recorded on a Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the Site Manager to the general public and their contact telephone number.

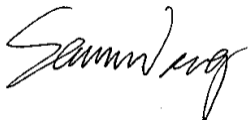
12 CONCLUSION

A noise and vibration assessment has been undertaken of the proposed construction works at Roseville College Wellbeing Centre Plans to address the consent conditions B15, C4 and C7 (SSD 9912).

Potential noise and vibration impacts at the nearby sensitive receivers have been assessed. Mitigation techniques have been recommended in Sections 8, 9 and 10 of this report are to be adopted, noise and vibration impacts on the adjacent and nearby receivers are expected to be implemented.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,



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