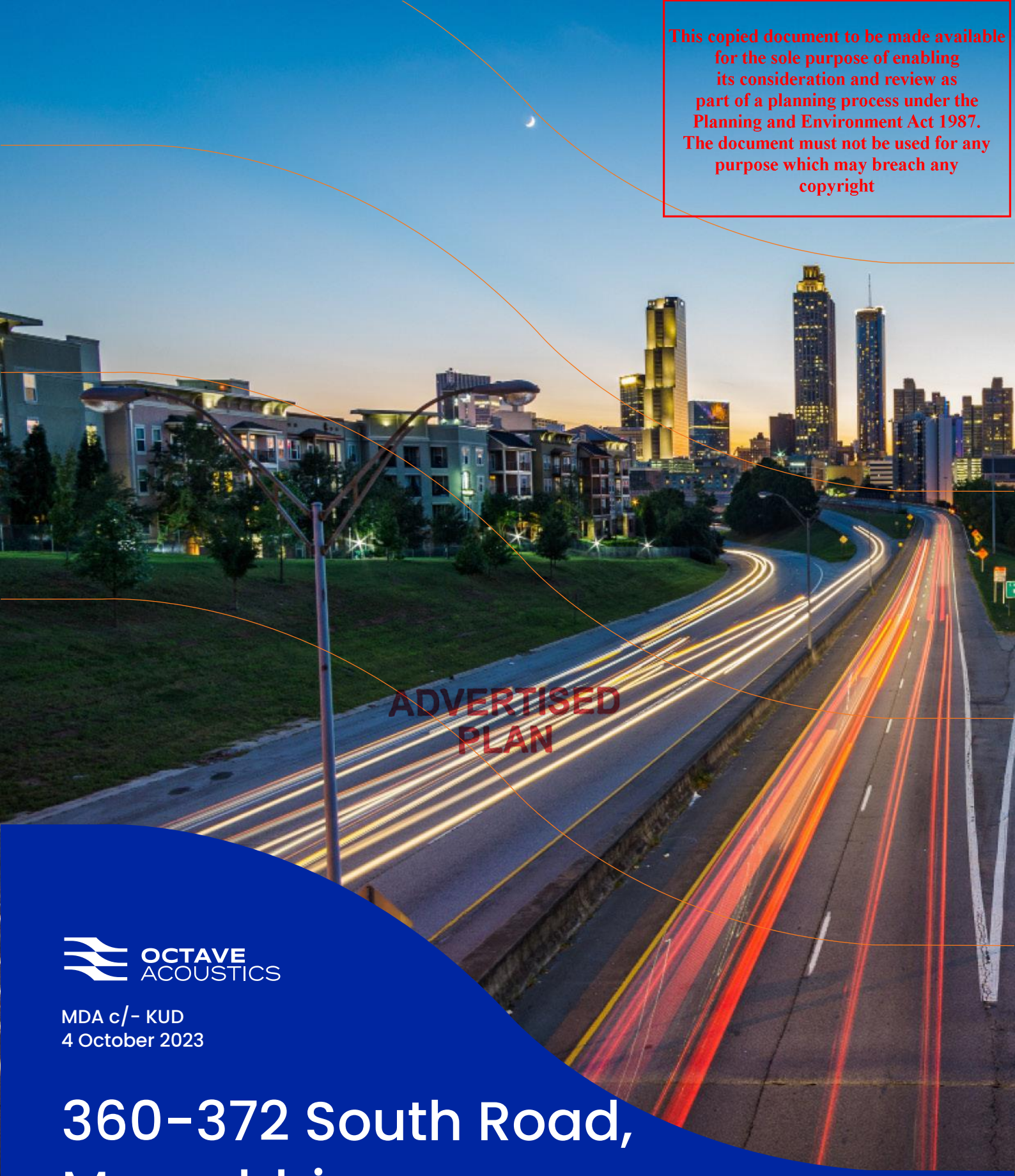

OCTAVE ACOUSTICS

MDA c/- KUD
4 October 2023

360-372 South Road, Moorabbin

Acoustic Impact Assessment

www.octaveacoustics.com.au

[redacted]

Association of Australasian Acoustical Consultants

Project	360-372 South Road, Moorabbin
Client	MDA c/- KUD
Document Number	AC383MB-01E02 Acoustic Impact Assessment (r0)

Revision	Date	Comment	Author	Reviewer
[redacted]				

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Contents

1. Introduction

Octave Acoustics were engaged by MDA c/- KUD to provide an acoustic impact assessment for the proposed commercial development to be constructed at 360-372 South Road, Moorabbin (Subject Site / Subject Development).

The proposed development will provide:

- Car parking, storage and end-of-trip facilities on 5 basement levels;
- Two retail tenancies and a café on the ground floor;
- Commercial office tenancies from Level 1 to Level 14; and
- A terrace and mechanical services area on the rooftop level.

2. Proposed Site and Development

The Subject Site is zoned Activity Zone 3 (ACZ3) and is abutted:

- To the north by South Road (zoned TRZ2) and beyond that by a series commercial and residential developments (zoned C1Z);
- To the east by Taylor Street and beyond that by a carwash (zoned ACZ3);
- To the south by a laneway and beyond that by a multi-storey residential development at 17 Taylor Street (zoned ACZ3);
- To the west by Macs Lane and beyond that by predominantly single storey commercial developments (zoned ACZ3);

The nearest identified noise sensitive residential dwellings have been identified in Figure 1 below.

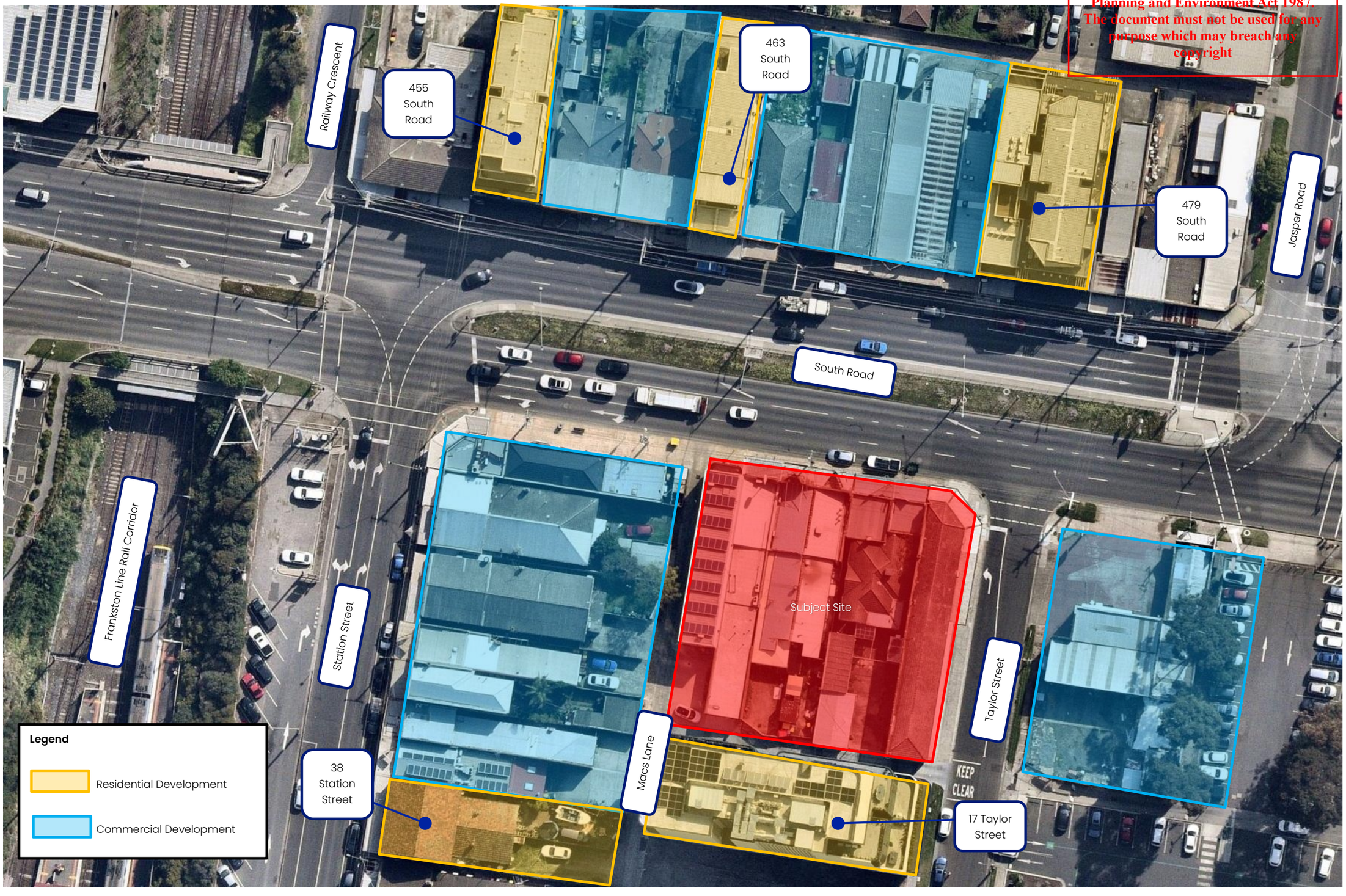

Figure 1 - Site Context

3. Criteria

3.1. Environmental Protection Regulations 2021

Noise emissions associated with the operation with plant and services are required to comply with Part 5.3 of the Environment Protection Regulations 2021 (EPR 2021). EPA Victoria Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues Publication 1826.4 (Publication 1826.4) provides a protocol for determining EPR 2021 noise limits and carrying out subsequent assessment of noise impacts.

EPR 2021 is a regulation under the Environment Protection Act 2017 (EP Act) and compliance is mandatory when noise levels are assessed at noise sensitive areas which includes residential properties. The applicable EPR 2021 noise limits for plant and services noise emissions have been calculated based on neutral zoning levels and are provided in Table 1 below.

Table 1 – EPR 2021 Mechanical Plant Noise Limits Based on Neutral Zoning Levels

Period	Zoning Level, L_{Aeq}	Background Classification	Applicable Noise Limit[4], dB L_{Aeq}
Day[1]	60	Neutral	60
Evening[2]	53	Neutral	53
Night[3]	48	Neutral	48

Notes:

1. *Day period is:*
   - *07:00 – 18:00 Monday – Saturday (except public holidays)*
2. *Evening period is:*
   - *18:00 – 22:00 Monday – Saturday*
   - *07:00 – 22:00 Sunday and public holidays*
3. *Night period is:*
   - *22:00 – 07:00 Monday – Sunday*
4. *Where the noise source under consideration is equipment used solely in relation to emergencies (such as fire pumps, standby generators, stair pressurisation and smoke spill fans), the relevant noise limit applying to the testing or maintenance of such equipment is increased by 10dB for the day period and 5dB for the evening and night periods.*

3.1.1. General Environmental Duty

Under Part 3.2 of the EP Act, a person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste [including noise] must minimise those risks, so far as reasonably practicable.

With respect to noise, to determine what is (or was at a particular time) reasonably practicable in relation to the minimisation of risks of harm to human health and the environment, regard must be given to:

- The likelihood of those risks eventuating,
- The degree of harm that would result if those risks eventuated,
- What the concerned person knows, or ought reasonably to know, about the harm or risks of harm and any ways of eliminating or reducing those risks,
- The availability and suitability of ways to eliminate or reduce those risks,
- The cost of eliminating or reducing those risks.

It should be noted that the General Environmental Duty requirement applies irrespective of whether compliance with EPR 2021 noise limits is achieved. Compliance with EPR noise limits does not necessarily infer adequate conduct under General Environmental Duty.

3.2. EPA Publication 1254.2

EPA Victoria Publication 1254.2 *Noise Control Guidelines* May 2021 (Publication 1254.2) sets out best practice guidelines for management of noise associated with waste collections and deliveries. The relevant sections of Publication 1254.2 are set out below. It is important to understand that Publication 1254.2 is primarily intended to be used by municipal officers to assist in the resolution of complaints or to avert possible noise nuisance. As such, where noise sources dealt with below are also subject to EPR 2021, then requirements under the latter take precedence. For example, Publication 1254.2 states that delivery activities should be inaudible at adjacent dwellings during the night period. However, EPR 2021 also applies to delivery noise and permits up to 48 dB(A) at adjacent dwellings during the night, a level that may be audible. In this instance, the applicable criteria would be 48 dB(A) and not a requirement for inaudibility.

3.2.1. Deliveries

Where a residential area will be impacted by noise from deliveries, then deliveries should be inaudible in a habitable room of any residential premises (regardless of whether any door or window giving access to the room is open) outside the hours contained in the schedule.

Schedule: Deliveries to shops, supermarkets & service stations

7am – 10pm Monday to Saturday

9am – 10pm Sundays and public holidays

Note: All ancillary motors or trucks should be turned off whilst making the delivery

3.2.2. Truck-Mounted Refrigeration Units

Whether parked on residential or non-residential premises, the noise from the operation of a truck-mounted refrigeration unit must not be audible within a habitable room of any other residence (regardless of whether any door or window giving access to the room is open) during the hours contained in the schedule.

Schedule: Truck mounted refrigeration units

Non-residential premises (e.g., noise from a delivery truck, whether moving or parked on the street)

10pm – 7am Monday to Saturday

10pm – 9am Sundays and public holidays

Residential premises (including a truck owner keeping their vehicle on the street outside their home)

8pm – 7am Monday to Saturday

8pm – 9am Weekends and public holidays

3.2.3. Industrial Waste Collection

EPA Victoria state that industrial waste includes waste from commercial, industrial and trade activities (including cafes and restaurants).

It is understood that the proposed use for the tenancy space on the Ground Floor will be a Café / Restaurant. As such, waste collection from the SRV bay on Ground Floor is considered to be industrial waste collection.

Annoyance created by industrial waste collection tends to intensify in the early morning period. To this end, early-morning collections should be restricted to non-residential areas to minimise early morning disturbances. Where a residential area is impacted by noise from the collection of refuse, then collections should be restricted to the times contained within the schedule.

- *Refuse bins should be located at sites that provide minimal annoyance to residential premises.*

- *Compaction should be carried out while the vehicle is moving.*
- *Bottles should not be broken up at collection site.*
- *Routes which service predominantly residential areas should be altered regularly to reduce early morning disturbances.*
- *Noisy verbal communication between operators should be avoided where possible.*

Schedule: Industrial waste collection

One collection per week

6:30am – 8pm Monday to Saturday

9am – 8pm Sundays and public holidays

Two or more collections per week

7am – 8pm Monday to Saturday

9am – 8pm Sundays and public holidays

4. Assessment

A 3-D computer noise model of the Subject Development and surrounds was built in CadnaA software and calculations run implementing the ISO9613 algorithms. The ISO9613 algorithms calculate the propagation of noise between source and receiver, taking into account propagation effects associated with:

- Source sound power
- Geometrical spreading
- Atmospheric conditions
- Air-absorption
- Ground absorption (a conservative value of zero was used)
- Reflections
- Barrier effects associated with the built form of the venue and adjacent structures.

4.1. Environmental Protection Regulations 2021

4.1.1. Noise From Rooftop Mechanical Services

It is important to note that at this stage of the building design process, a full quantitative assessment of mechanical plant and equipment is not possible as detailed equipment selections are not available. Car park exhaust fans, bin room fans, kitchen exhaust fans and toilet exhaust fans can all be acoustically treated with lined duct or attenuators. However, rooftop condensers are typically difficult to treat other than with acoustic screening, due to the requirement for airflow.

As such, it is considered appropriate to conduct a preliminary assessment of the major plant items. This preliminary assessment assumes that a single large condensing unit serves each floor level, and which are located on the rooftop. In addition, a standby generator is assumed to be located centrally on the rooftop. The condensing units were assumed to be distributed equally within the proposed services area on the south of the rooftop. The assumed sound power levels of each item of plant are as presented below in Table 2.

Table 2 - Sound Power Levels

Source	No. of units	SWL dB(A)	Octave Band Centre Frequency, Hz							
			63	125	250	500	1000	2000	4000	8000
200kW Standby Generator[1]	1	92	87	88	88	88	86	84	81	76
Condensers (each)[2]	15	81	98	83	82	79	72	69	69	63

Mechanical services noise emissions predicted at the potentially most affected residential receivers have been conservatively calculated on the basis of all items operating concurrently and are as shown in Table 3 below. The calculated noise levels have been assessed against the EPR 2021 night noise limits. If compliance is achieved during the night period, then compliance is expected to be comfortably achieved during the day and evening periods.

[1] Spectrum taken from Strutt empirical database, referencing Bies & Hansen Section 11.5.

[2] Spectrum based on Daikin REYQ14U condensing units

Table 3 – Preliminary Assessment of Mechanical Noise Levels Assuming all Rooftop Plant Operating Concurrently

Address	Calculated noise level at residential dwelling, L_{Aeq} dB	EPR 2021 Night Noise Limit L_{Aeq} dB	Complies?
Without standby generator operating			
455 South Road	38	48	Y
463 South Road	33	48	Y
479 South Road	32	48	Y
17 Taylor Street	48	48	Y
38 Station Street	40	48	Y
With standby generator operating			
455 South Road	39	53	Y
463 South Road	35	53	Y
479 South Road	34	53	Y
17 Taylor Street	50	53	Y
38 Station Street	40	53	Y

The calculated noise levels at the potentially most affected receivers achieve compliance with the EPR 2021 night limit (and therefore the day and evening limits) at all locations. The calculation is considered to be conservative as it is based on all units operating concurrently during the night period, nevertheless due to the calculated marginal compliance at 17 Taylor street, it is recommended that the rooftop condensers are set to operate in "quiet mode" during the night period. While compliance with the criteria has been calculated, if additional acoustic treatment is found to be required during the Design Development phase, then standard acoustic treatment such as plant screens, acoustically lined ductwork or attenuators can be installed as required to further reduce noise emissions.

4.1.2. Assessment of Noise Emission from Waste Collection / Deliveries

Noise associated with delivery and waste collection activities within the loading bay is required to comply with Part 5.3 of EPR 2021. It is important to note that, in accordance with EPR 2021:

- Non-commercial vehicles are exempt from assessment; and
- A commercial premises excludes *a street or road, including every carriageway, footpath, reservation and traffic island on any street or road.*

To this end, noise from delivery and waste collection trucks has been assessed in accordance with EPR 2021, however, only when they are on commercial land (i.e. within the loading dock). It is recommended that the loading dock is not used for the purposes of delivery and waste collection during the night period and, as such, an assessment of noise impacts has not been conducted with respect to sleep disturbance triggers within the bedrooms of adjacent dwellings. Further, it is expected that the highest noise level will be associated with waste collection.

To provide an objective assessment of noise impacts from use of the loading bay, Octave Acoustics has carried out 3-D computer noise modelling in order to predict noise impacts at the closest affected residential receivers.

For purposes of assessment, it is assumed that it takes 4 minutes total for a waste truck to enter and exit the loading bay, and that truck engines are switched off when the vehicle has stopped. The activities in the loading bay were modelled with the following assumptions, as follows:

- One waste collection occurring in any 30-minute period;
- Garbage truck engine running for 4 minutes per collection while manoeuvring in and out of the loading bay;
- Garbage truck emptying 4 waste bins per collection, assuming 30 seconds per bin emptying cycle;
- That an impervious roller door is installed to the loading dock which is constructed using non-perforated materials (such as steel or aluminium);
- The roller door is closed when a vehicle is within the loading bay;
- That an acoustically absorptive ceiling, as detailed in Section 4.1.2.1, is installed within the loading bay;
- Vehicle sound power levels in accordance with those presented in Table 4;
- That waste collection and deliveries only occur during the day and evening periods as specified in EPA Publication 1254.2; and
- A 2dB penalty for impulsive noise character.

Table 4 - Loading Dock Octave Band Sound Power Levels, re 10^{-12} W

Activity	Noise descriptor	SWL, dB(A)	Octave Band Centre Frequency (Hz)						
			63	125	250	500	1000	2000	4000
Medium Truck engine idling	L_{eq}	100	100	98	96	96	96	93	86
Garbage Truck emptying waste bin	$L_{eq\ 30\text{-}sec\ bin\ emptying\ cycle}$	104	108	99	98	95	96	97	99

The reverberant effects of the enclosed loading bays were taken into account using standard reverberant field theory. Noise breakout from the enclosed loading bay was calculated, and the resultant sound power was input to the 3D noise model to calculate noise impacts at the nearest residential receivers.

Table 5 - Loading Bay Noise Impacts with Recommended Treatment

Residential Dwelling	Noise Level at Nearest Residential Receiver, $L_{Aeq,30min}$ dB	EPR Evening Criteria, L_{Aeq} dB	Complies?
17 Taylor Street	50	53	Yes

4.1.2.1. Loading Bay Ceiling Treatment

To reduce the reverberant noise level within the loading bay, and therefore the noise emission to adjacent residential dwellings, it is recommended that an acoustically absorptive ceiling is installed. The absorptive material is to have a Noise Reduction Coefficient of NRC ≥ 0.9. Suitable products may include 50mm thick glasswool with a density not less than 32kg/m^3 (such as Bradford Supertel) faced with an acoustically transparent moisture rated lining (such as CSR Ultraphon) and, where necessary, covered with perforated metal which has an open area of not less than 20%.

4.1.2.2. Loading Bay Door Noise & Vibration

Noise impacts associated with the operation of the doors for the loading bay will be minimised and expected to be acceptable through the implementation of the following:

- An impervious roller door should be installed to the loading bay entrance which is constructed using non-perforated materials (such as steel or aluminium).

- The garage door motor should be installed using vibration isolation mounts equivalent to Embelton NRD. Where under axial load, these mounts shall be selected to achieve minimum static deflection of 8mm when installed.
- The subcontractor responsible for the installation of the garage door shall ensure that noise from the garage door shall not exceed 60dB L_{Amax} at 2m from the door.

5. Conclusion

Octave Acoustics have conducted an acoustic assessment of potential mechanical plant and waste collection noise emissions associated with the proposed commercial development to be constructed at 360-372 South Road, Moorabbin.

At this early stage of the proposed development, there are only preliminary spatial services drawings available, as detailed mechanical drawings or specifications have not yet been developed. Therefore, Octave Acoustics has carried out a preliminary assessment of noise emissions using sound power levels for typical mechanical plant used on similar previous projects. The results of this assessment indicate that plant noise associated with the development is expected to comply with EPR 2021 noise limits using standard equipment types and building methods, such as duct lining or plant screening. Nevertheless, it is recommended that rooftop condensers are set to operate on "quiet mode" during the night period.

In accordance with EPA Publication 1254.2, it is recommended that deliveries and waste collections only occur during the periods specified in Section 3.2. It is calculated that compliance can be achieved with EPR 2021 noise limits for deliveries and waste collection if the recommendations in Section 4.1.2 are followed. This includes the installation of a solid (non-perforated) roller door to the loading bay, which is closed when there is a vehicle in the loading bay. In addition, it is recommended that an acoustically absorptive ceiling treatment is installed within the loading bay to reduce the reverberant noise level.

Appendix A: Glossary of Terms

'A' Frequency Weighting

The 'A' frequency weighting roughly approximates to the Fletcher-Munson 40 phon equal loudness contour. The human loudness perception at various frequencies and sound pressure levels is equated to the level of 40 dB at 1 kHz. The human ear is less sensitive to low frequency sound and very high frequency sound than midrange frequency sound (i.e. 500 Hz to 6 kHz). Humans are most sensitive to midrange frequency sounds, such as a child's scream. Sound level meters have inbuilt frequency weighting networks that very roughly approximates the human loudness response at low sound levels. It should be noted that the human loudness response is not the same as the human annoyance response to sound. Here low frequency sounds can be more annoying than midrange frequency sounds even at very low loudness levels. The 'A' weighting is the most commonly used frequency weighting for occupational and environmental noise assessments. However, for environmental noise assessments, adjustments for the character of the sound will often be required.

AMBIENT NOISE

The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. Usually assessed as an energy average over a set time period 'T' (LAeq,T).

AUDIBLE

Audible refers to a sound that can be heard. There are a range of audibility grades, varying from "barely audible", "just audible" to "clearly audible" and "prominent".

BACKGROUND NOISE LEVEL

Total silence does not exist in the natural or built environments, only varying degrees of noise. The Background Noise Level is the minimum repeatable level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. It is quantified by the noise level that is exceeded for 90 % of the measurement period 'T' (LA90,T). Background Noise Levels are often determined for the day, evening and night time periods where relevant. This is done by statistically analysing the range of time period (typically 15 minute) measurements over multiple days (often 7 days). For a 15-minute measurement period the Background Noise Level is set at the quietest level that occurs at 1.5 minutes.

'C' FREQUENCY WEIGHTING

The 'C' frequency weighting approximates the 100 phon equal loudness contour. The human ear frequency response is more linear at high sound levels and the 100 phon equal loudness contour attempts to represent this at various frequencies at sound levels of approximately 100 dB.

DECIBEL

The decibel (dB) is a logarithmic scale that allows a wide range of values to be compressed into a more comprehensible range, typically 0 dB to 120 dB. The decibel is ten times the logarithm of the ratio of any two quantities that relate to the flow of energy (i.e. power). When used in acoustics it is the ratio of the square of the sound pressure level to a reference sound pressure level, the ratio of the sound power level to a reference sound power level, or the ratio of the sound intensity level to a reference sound intensity level. See also Sound Pressure Level and Sound Power Level. Noise levels in decibels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dB, and another similar machine is placed beside it, the level will increase to 53 dB (from 10 $\log_{10}(10^{(50/10)} + 10^{(50/10)})$ and not 100 dB. In theory, ten similar machines placed side by side will increase the sound level by 10 dB, and one hundred machines increase the sound level by 20 dB. The human ear has a vast sound-sensitivity range of over a thousand billion to one, so the logarithmic decibel scale is useful for acoustical assessments.

dBA – See 'A' frequency weighting

dBC – See 'C' frequency weighting

EQUIVALENT CONTINUOUS SOUND LEVEL, LAeq

Many sounds, such as road traffic noise or construction noise, vary repeatedly in level over a period of time. More sophisticated sound level meters have an integrating/averaging electronic device inbuilt, which will display the energy time-average (equivalent continuous sound level - LAeq) of the 'A' frequency weighted sound pressure level. Because the decibel scale is a logarithmic ratio, the higher noise levels have far more sound energy, and therefore the LAeq level tends to indicate an average which is strongly influenced by short-term, high level noise events. Many studies show that

human reaction to level-varying sounds tends to relate closer to the LAeq noise level than any other descriptor.

'F' (FAST) TIME WEIGHTING

Sound level meter design-goal time constant which is 0.125 seconds.

FREE FIELD

In acoustics a free field is a measurement area not subject to significant reflection of acoustical energy. A free field measurement is typically not closer than 3.5 metres to any large flat object (other than the ground) such as a fence or wall or inside an anechoic chamber.

FREQUENCY

The number of oscillations or cycles of a wave motion per unit time, the SI unit is the hertz (Hz). 1 Hz is equivalent to one cycle per second. 1000 Hz is 1 kHz.

LOUDNESS

The volume to which a sound is audible to a listener is a subjective term referred to as loudness. Humans generally perceive an approximate doubling of loudness when the sound level increases by about 10 dB and an approximate halving of loudness when the sound level decreases by about 10 dB.

MAXIMUM NOISE LEVEL, LAFmax

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'F' (Fast) time weighting. Often used for noise assessments other than aircraft.

MAXIMUM NOISE LEVEL, LASmax

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'S' (Slow) time weighting. Often used for aircraft noise assessments.

NOISE

Noise is unwanted, harmful or inharmonious (discordant) sound. Sound is wave motion within matter, be it gaseous, liquid or solid. Noise usually includes vibration as well as sound.

OFFENSIVE NOISE

Reference: Dictionary of the NSW Protection of the Environment Operations Act 1997).

"Offensive Noise means noise:

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."

'S' (SLOW) TIME WEIGHTING

Sound level meter design-goal time constant which is 1 second.

SOUND ATTENUATION

A reduction of sound due to distance, enclosure or some other devise. If an enclosure is placed around a machine, or an attenuator (muffler or silencer) is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 20 dB reduces the sound energy by one hundred times.

SOUND EXPOSURE LEVEL (LAE)

Integration (summation) rather than an average of the sound energy over a set time period. Use to assess single noise events such as truck or train pass by or aircraft flyovers. The sound exposure level is related to the energy average (LAeq,T) by the formula $LAeq,T = LAE - 10 \log_{10} T$. The abbreviation (SEL) is sometimes inconsistently used in place of the symbol (LAE).

SOUND PRESSURE

The rms sound pressure measured in pascals (Pa). A pascal is a unit equivalent to a newton per square metre (N/m^2).

SOUND PRESSURE LEVEL, Lp

The level of sound measured on a sound level meter and expressed in decibels (dB). Where $LP = 10 \log_{10}(Pa/Po)^2$ dB (or $20 \log_{10}$ (Pa/ Po) dB) where Pa is the rms sound pressure in Pascal and Po is a reference sound pressure conventionally chosen is 20 µPa (20×10^{-6} Pa) for airborne sound. Lp varies with distance from a noise source.

SOUND POWER

The rms sound power measured in watts (W). The watt is a unit defined as one joule per second. A

measures the rate of energy flow, conversion or transfer.

SOUND POWER LEVEL, Lw

The sound power level of a noise source is the inherent noise of the device. Therefore, sound power level does not vary with distance from the noise source or with a different acoustic environment. Lw = Lp + 10 $\log_{10}$ 'a' dB,

re: 1pW, (10^{-12} watts) where 'a' is the measurement noise-emission area (m2) in a free field.

SOUND TRANSMISSION LOSS

The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 - 2002.

STATISTICAL NOISE LEVELS, Ln

Noise which varies in level over a specific period of time 'T' (standard measurement times are often 15-minute periods) may be quantified in terms of various statistical descriptors with some common examples:

The noise level, in decibels, exceeded for 1% of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as LAF1,T. This may be used for describing short-term noise levels such as could cause sleep arousal during the night.

The noise level, in decibels, exceeded for 10% of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as LAF10,T. In most countries the LAF10,T is measured over periods of 15 minutes, and is used to describe the average maximum noise level.

The noise level, in decibels, exceeded for 90% of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as LAF90,T. In most countries the LAF90,T is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

WEIGHTED SOUND REDUCTION INDEX, Rw

This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 Hz to 3.150 kHz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999). Internal partition wall Rw+C ratings are frequency weighted to simulate insulation from human voice noise. The Rw+C is similar in value to the STC rating value. External walls, doors and windows may be Rw+Ctr rated to simulate insulation from road traffic noise. The spectrum adaptation term Ctr adjustment factor takes account of low frequency noise. The weighted sound reduction index is normally similar or slightly lower number than the STC rating value.

'Z' FREQUENCY WEIGHTING

The 'Z' (Zero) frequency weighting is 0 dB within the nominal 1/3 octave band frequency range centred on 10 Hz to 20 kHz. This is within the tolerance limits given in AS IEC 61672.1-2004: 'Electroacoustics - Sound level meters – Specifications'.