MARSHALL DAY Acoustics

188 BEAUMONT STREET
ACOUSTIC ASSESSMENT OF EFFECTS

Rp 001 20251034 | 26 February 2026

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Project: **188 BEAUMONT STREET**

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1.0 EXPERIENCE OF THE AUTHORS

The contributing authors, in their capacity as authors of this report, have read and agree to comply with the Environment Court of New Zealand's Code of Conduct for Expert Witnesses as specified in the Environment Court Practice Note 2023. Where this report relies on information provided by other experts, this is outlined within the report.

My name is Micky Suen Wen Yang, and I am the lead author of this report. I am a senior acoustic engineering consultant with 9 years' experience at Marshall Day Acoustics. I hold a Bachelor of Engineering and Commerce Conjoint degree from the University of Auckland. I am a Member of the Acoustical Society of New Zealand. I have worked on a wide range of resource consent projects from large infrastructure to small events across the country. Of particular relevance to this project is 65 Upper Queen Street (BUN60375684) which is a nine-story build to rent apartment complex. I was the lead consultant and prepared the acoustic assessment report and provided post lodgement assistant by responding to s92 requests and reviewing conditions.

My name is Shaun James King, and I am the reviewer of this report. I am a Principal Acoustic Consultant and Shareholder at Marshall Day Acoustics. I have 17 years of experience working as an acoustic consultant. I have the qualification of Bachelor of Mechanical Engineering with Honours from the University of Auckland. I am a full member of the Acoustical Society of New Zealand and a member of Engineering New Zealand. My experience relevant to this project includes Resource Consents for Aotea Symphony Centre, University of Auckland Recreation and Wellness Centre, Auckland City Mission – Mission Homeground, Downtown Carpark & the Takapuna Gasometer Build to Rent site.

2.0 SUMMARY

Marshall Day Acoustics has been engaged by Westhaven Residential Limited Partnership to prepare an assessment of effects report to in relation to a substantive application for a referred project under the Fast-track Approvals Act 2024 (FTAA) in respect of the 188 Beaumont Street project (the 'Project').

The Project is an urban development project in Auckland's city centre involving a residential-led mixed use building comprising approximately 210 residential apartments, ground floor retail, and ancillary car parking. The Project is located at 188 Beaumont Street, Auckland Central.

This report presents:

- A description of the site
- The applicable construction noise and vibration performance standards
- An assessment of construction noise and vibration
- The applicable operational noise performance standards
- An assessment of operational noise
- The applicable façade noise performance standards
- Recommended façade controls
- Recommended conditions of consent

To summarise our findings:

- Construction noise and vibration can comply at all receivers except at Orams Marine – located south of the Project site at 164 Beaumont Street. Orams Marine as occupier and Auckland Council as landowner of 164 Beaumont Street have provided their written approval to the project.
- Operational noise emission can be designed to comply with the relevant standards.
- Building envelope and internal sound insulation for the apartments will be designed to comply with appropriate criteria.

Appendix A presents a glossary of terminology used in this report.

Appendix B provides some suggested wording for any acoustic conditions of consent.

3.0 PROJECT DESCRIPTION

3.1 Site and Surrounds

188 Beaumont Street (the Site) is currently a carpark. It is located on the corner of Jellicoe Street and Beaumont Street and is directly north of Orams Marine (Orams) – a specialist superyacht refitter and general boat maintenance facility.

The site is zoned *Business – City Centre Zone* in the Auckland Unitary Plan (AUP) and is located in *sub-precincts C* and *E of the Wynyard Precinct*. Operational noise rules, related to external noise and internal noise levels, within the precinct provisions take precedence over those within zone or Auckland-wide rules. However, the construction noise and vibration performance standards in the Auckland-wide rules still apply.

All adjoining properties are also zoned the same but are in either *Wynyard sub-precinct C, E, or F*.

The site is also within Noise Area 1 in the Wynyard Precinct Plan 9 – see Figure 4. The Wynyard Precinct provisions include specific noise standards to minimise reverse sensitivity effects on existing industrial and maritime land uses by providing a minimum level of internal acoustic amenity for occupants of buildings from external noise sources generated by activities in the Wynyard Precinct and a maximum level of noise that activities other than accommodation may generate.

Figure 1 shows an aerial of the existing site with the current zoning and Precinct areas in the AUP.

Figure 1: Site zoning and aerial

The majority of neighbours are undeveloped as shown in Figure 1. To the north is Silo 6 and to the east is another carpark. The western boundary borders the *Coastal – General Coastal Marine Zone*. Orams is located south of the Site at 164 Beaumont Street.

There is a structure within the Historic Heritage overlay approximately 85m to the east of the site which means more stringent construction vibration limits apply on this structure from construction work at the subject Site.

AUP Activity Table I214.4.1 states that any new buildings within *sub-precinct C* and *sub-precinct E* requires Restricted Discretionary Activity consent. We understand that none of the neighbouring undeveloped sites (Silo 6 to the north and the carpark to the east) hold any consents to construct a

building. Therefore, there are no potential future buildings that would form part of the existing environment for our assessment[1].

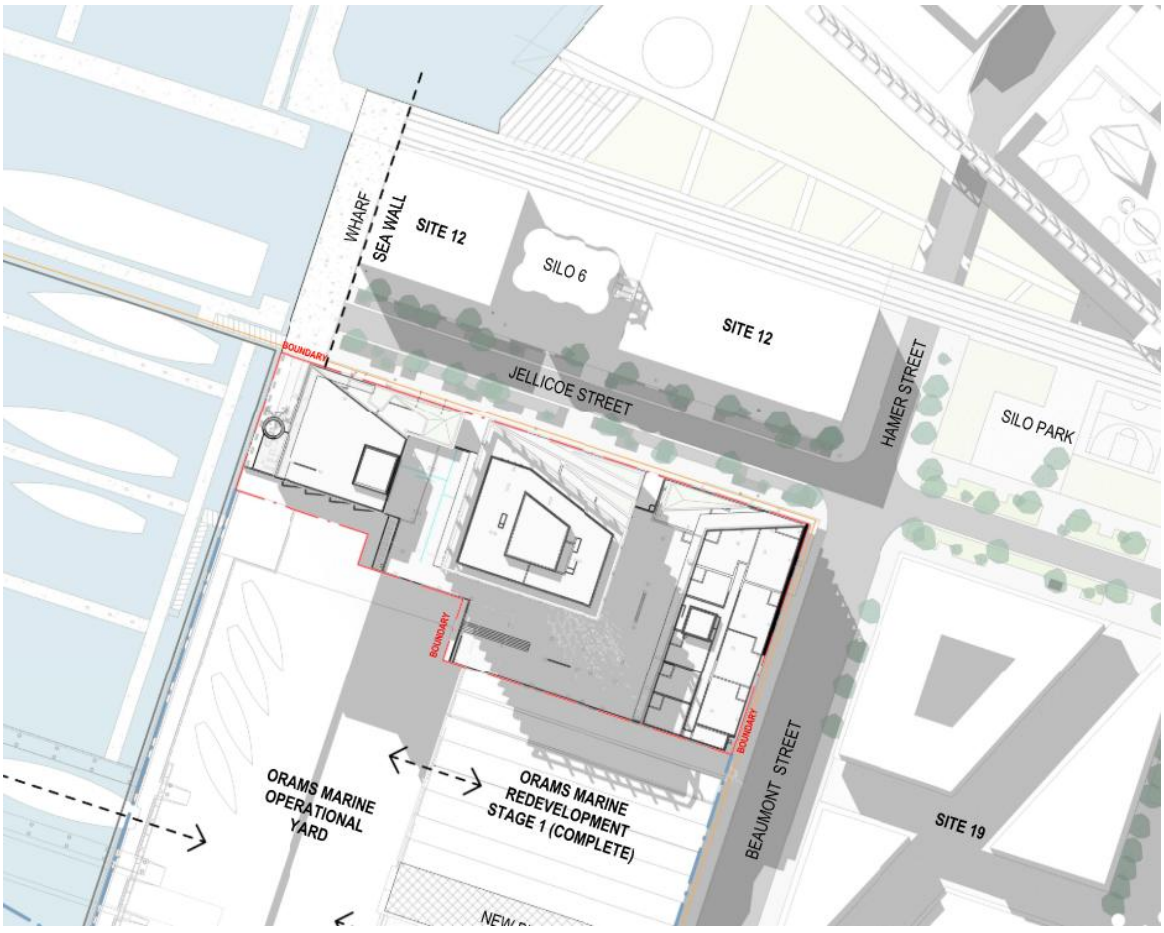
The only receivers of note are therefore Orams (occupier) and Auckland Council (as landowner) of 164 Beaumont Street who have provided their written approval to the proposal. All other occupied buildings are sufficiently far from the Site such that compliance with permitted noise limits for the zone/precinct and the relevant construction noise and vibration performance standards (Section 4.2.1 and Section 4.3.1 respectively) would readily be achieved. Silo 6 and the structure within the Historic Heritage overlay (shown on Figure 1 above) are relevant for the assessment of construction vibration – although we note the risk of non-compliance with the construction vibration limit at these structures is negligible given the distance from the Site.

3.2 Proposed Development

The proposed development will have three towers with a shared carpark podium. Four levels of carparking are proposed with the three towers being 7, 20, and 10 storeys high providing approximately 210 residential apartments and ground flood retail. There is no basement proposed.

Figure 2 below shows the proposed site plan.

Figure 2: Proposed site plan



[1] In accordance with the Auckland Unitary Plan Practice and Guidance Note Measuring and Assessing Noise RC 3.2.23 (V2) dated August 2021

4.0 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

4.1 Construction Methodology

We understand[2] that the construction methodology will entail:

- Sheet piling to construct a cut-off wall for the lift pit and core
- Reinforced bored concrete piles, socketed into East Coast Bays Formation siltstone and sandstone rock for the building foundations. This may require vibrated steel casings
- Approximately 6-8 months of piling (including establishment of piling plant, installation of approximately 150 bored piles, installation of pile caps and ground beams)
- Approximately 9-11 months of civil and podium works (including the installation of ground floor services, site level establishment, ground floor construction and construction of the shared podium)
- Approximately 20-24 months for the construction of the tower (including the construction of all three buildings).
- Standard construction methods for all other activities to construct the buildings. These include minor earthworks, concreting, compaction, building construction.
- Approximately 2.5-3 years total construction duration

The construction hours will be 0700 – 1800 Monday to Saturday.

Based on the above, we consider that piling will generate the highest construction noise and vibration levels.

4.2 Construction Noise Assessment

4.2.1 Construction Noise Performance Standards

AUP Standard E25.6.28 provides the applicable construction noise performance standards that apply within the *Business – City Centre* zone. The noise criteria apply at 1 metre from the façade of a building that is occupied during the works. Table 1 shows the applicable construction noise limits.

E25.6.1 (3) states that construction noise is to be measured and assessed in accordance with New Zealand Standard NZS 6803: 1999 *Acoustics - Construction Noise*.

Table 1: Long-term AUP construction noise limits at occupied buildings sensitive to noise and other buildings

Time	Noise limit (dB)	
	Average ($L_{Aeq(30min)}$)	Maximum (L_{AFmax})
Monday to Friday 0630 – 2230	75	90
Saturday 0700 – 2300	80	90
Sunday 0900 – 0700	65	85
All other times	60	75
All other times in the *City Centre Residential Precinct* and the *Learning Precinct*	55	75

[2] Based on an email from AECOM dated 4 November 2025 and Initia report P-002883 Rev 0 dated November 2025no time

4.2.2 Indicative Construction Noise Levels

Table 2 provides representative sound power levels for activities based on the construction methodology. Note that these are conservative and assume no shielding from terrain, buildings, or duration adjustments.

Table 2: Indicative sound power levels and predicted noise levels at distances for assumed equipment

Equipment	Sound Power	Barrier	Façade Noise Level (dB L_{Aeq})			Limit Setback (m) to achieve noise level (L_{Aeq})		
	(dB L_{wA})	(dB)	5m	25m	100m	75 dB	60 dB	55 dB
No barrier								
Vibrated casing / sheet piling	116	0	97	91	68	52	209	331
Large bored piling rig	111	0	92	86	63	33	132	209
Excavator (20T)	103	0	84	78	55	14	63	100
Vibratory roller	103	0	84	78	55	14	63	100
Mobile Crane (35T) operating	98	0	79	73	50	8	40	63
Hydraulic power pack	97	0	78	72	49	7	36	58
Generator (150kVA)	93	0	74	68	45	4	25	40
Compressor	93	0	74	68	45	4	25	40
With barrier								
Large bored piling rig	111	10	82	76	53	11	52	83
Excavator (20T)	103	10	74	68	45	4	25	40
Vibratory roller	103	10	74	68	45	4	25	40
Mobile Crane (35T) operating	98	10	69	63	40	3	14	25
Hydraulic power pack	97	10	68	62	39	2	13	22
Generator (150kVA)	93	10	64	58	35	1	8	14
Compressor	93	10	64	58	35	1	8	14

4.2.3 Construction Noise Assessment

Orams Marine (at 164 Beaumont Street) is the closest receiver to the Site. Any other receiver is more than 70m away from the closest Site boundary.

We predict infringements of 75 dB L_{Aeq} at Orams Marine during daytime (0730 – 1800 hrs) construction – see Table 3. There will be no night-time construction. Further, Orams has provided their written approval for the project, including the construction noise infringements.

We predict compliance with 75 dB L_{Aeq} can be achieved at all other occupied buildings within the Wynyard Precinct and beyond, due to them being more than 70m away from the Site.

Table 3: Predicted construction noise levels at Orams with no noise barriers

Activity	Predicted noise level (dB L_{Aeq})	Estimated Duration of infringement
Vibrated casing / sheet piling	95 – 100	4.5 – 5 months
Bored piling	85 – 90	4.5 – 5 months
Earthworks	75 – 80	3 months
All other work	<75	2.5 years

We predict noise levels at Orams Marine that would infringe the 75 dB L_{Aeq} construction noise limit by up to 25 dB during the loudest activity (vibrated casing). Noise level infringements reduce as the works progress away from piling. Note, the above estimated infringement duration would have some overlap with each other as some activities would happen in the same period, but not at the same time (i.e. some earthworks might happen followed by piling followed by some more earthworks). The total expected duration of infringements will depend on the work sequencing which is not known at this stage of the project.

4.3 Construction Vibration Assessment

4.3.1 Construction Vibration Performance Standards

4.3.2 Building Protection

AUP rule E25.6.30 (1)(a) requires construction vibration to be measured and assessed in accordance with German Standard DIN 4150-3:1999 "*Structural vibration – Part 3: Effects of vibration on structures*".

Figure 3 overleaf shows the short-term (transient)[3] vibration limits applying at building foundations in any axis. Table 4 summarises the vibration limits in all other cases.

The criteria relate to the avoidance of cosmetic building damage, such as cracking in paint or plasterwork. Cosmetic building damage effects are deemed 'minor damage' in the Standard and can generally be easily repaired. The cosmetic building damage thresholds are much lower than those that would result in structural damage. The Standard states:

"Experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur."

We consider this standard appropriate for assessment of cosmetic building damage and note that it has been used successfully in Auckland since adoption of the AUP.

[3] Short-term (transient) vibration is "*vibration which does not occur often enough to cause structural fatigue and which does not produce resonance in the structure being evaluated*".

Figure 3: Short-term (transient)[1] vibration at building foundations (DIN 4150-3 1999: Figure 1)

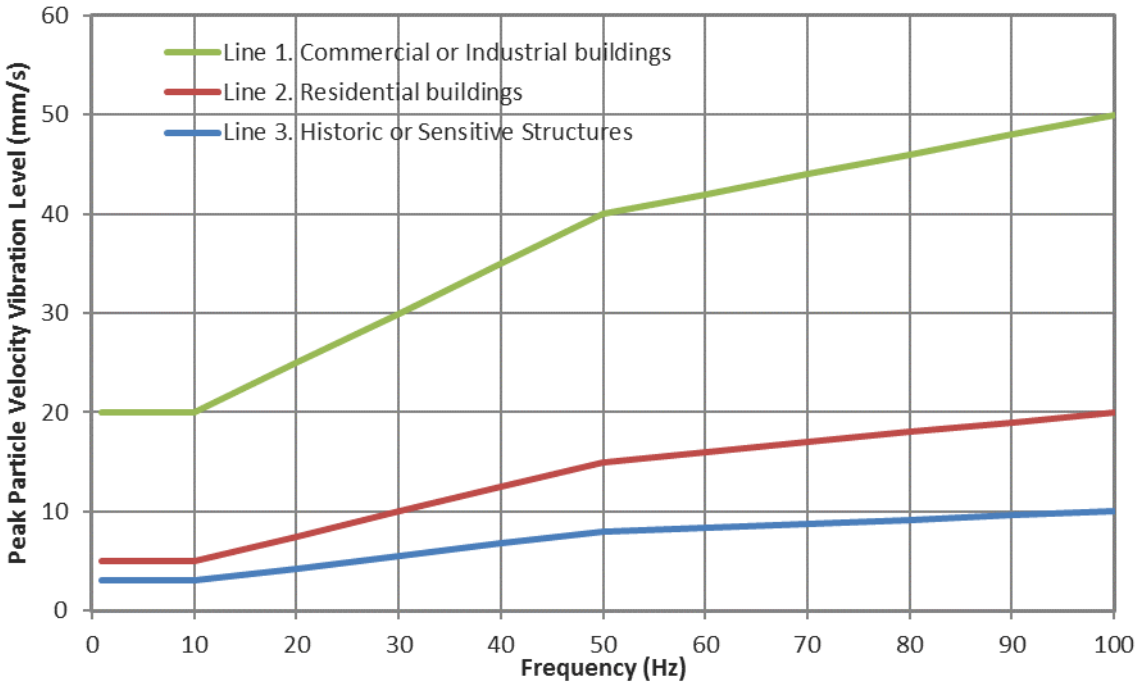


Table 4: Vibration at horizontal plane of highest floor (DIN 4150-3 1999: Tables 1 and 3)

Structure Type	Peak Particle Velocity Vibration Level (mm/s)	
	Short-term (transient)[1]	Long-term (continuous)[4, 5]
Line 1. Commercial or Industrial buildings	40	10
Line 2. Residential buildings	15	5
Line 3. Vibration Sensitive Structures	8	2.5

4.3.3 Vibration Amenity

The main vibration concern of building owners and occupants is usually building damage as they can feel vibration at levels much lower than those that would cause damage.

AUP rule E25.6.30 (1)(b) requires construction vibration in any axis on the floor of interest to comply with the levels in Table 5.

Table 5: AUP Amenity Vibration Limits

Receiver	Period	Peak Particle Velocity
Occupied activity sensitive to noise	2200 – 0700 hrs 0700 – 2200 hrs	0.3 mm/s 2.0 mm/s
Other occupied buildings	At all times	2.0 mm/s

[4] Long-term (continuous) vibration is types not covered by the short-term vibration definition.

[5] The long-term (continuous) criteria can apply at all floor levels, but levels are normally highest at the top floor.

4.3.4 Indicative Construction Vibration Setback Distances

Table 6 summarises the expected setback distances from buildings for high vibration equipment to achieve compliance with the AUP rules.

The building protection limit includes a 100% safety factor to inform risk while the amenity limits do not show vibration levels typically expected on site[6].

Our predictions also include a factor to account for energy loss into a large masonry building on spread footing (the same type of building as Orams Marine).

Table 6: Indicative setback distances for vibration levels (in PPV) at building foundations

Equipment	Vibration setback distance (m)				
	Vibration Amenity		Building Protection[1]		
	BS 5228	AUP	Heritage	Residential	Commercial
	1 mm/s	2 mm/s	2.5 mm/s	5 mm/s	10 mm/s
Vibrated pile casing	4	1	3	1	0
Sheet piling	5	2	4	1	0
Drum roller (6 - 8t)	6	3	5	2	1
Plate compactor (450 kg)	4	2	3	2	1

[1] Includes 100% safety factor

4.3.5 Construction Vibration Assessment

Orams Marine is the closest building to the Site as their building is directly on the boundary of the Site. We predict compliance, at Orams Marine and all other buildings, with the building protection vibration limits from any construction activity.

With respect to vibration amenity, we predict that construction activities have the potential to infringe the amenity vibration limit of 2mm/s PPV, at Orams only, depending on where construction is occurring. We consider that vibration levels could occasionally be perceptible for workers within the building. We consider these levels are acceptable, because Orams Marine is an industrial receiver who would be more tolerant of high vibration. Further, Orams Marine has provided written approval to the project.

We predict no risk of infringing the building protection vibration limit at the Historic Heritage structure because it is more than 30m away (the structure is approximately 85m away). Vibration at all other receivers within the Wynyard Precinct and beyond is predicted to comply with both the cosmetic building protection and amenity limits.

[6] The amenity vibration levels are based on regression analysis of all our measured data points for a given construction activity/equipment. Based on this regression curve, we can predict the typically expected vibration levels at a given distance. However, our data set does not cover all possible measurement distances and does not differentiate between different ground conditions. Therefore a 100% safety factor is included for the building protection setback distance. This takes the typical setback distances predicted and increases it two-fold to make the setback distance larger for conservatism.

4.4 Construction Noise and Vibration Management Plan

We recommend that a Construction Noise and Vibration Management Plan (CNVMP) be implemented for this Project and included as a condition of consent. We recommend it includes:

- Identification of potentially affected receivers
- Noise and vibration limits
- Identification of the duration, frequency, and timing of works to manage disruption
- Identification of the likely noise and vibration levels and duration of exposure for activities during the Project works
- Processes for engaging with potentially affected receivers
- Measures for controlling noise and vibration, including training requirements
- A complaints procedure
- Methods and frequency for construction noise and vibration monitoring, and reporting of monitoring results and outcomes

5.0 OPERATIONAL NOISE ASSESSMENT

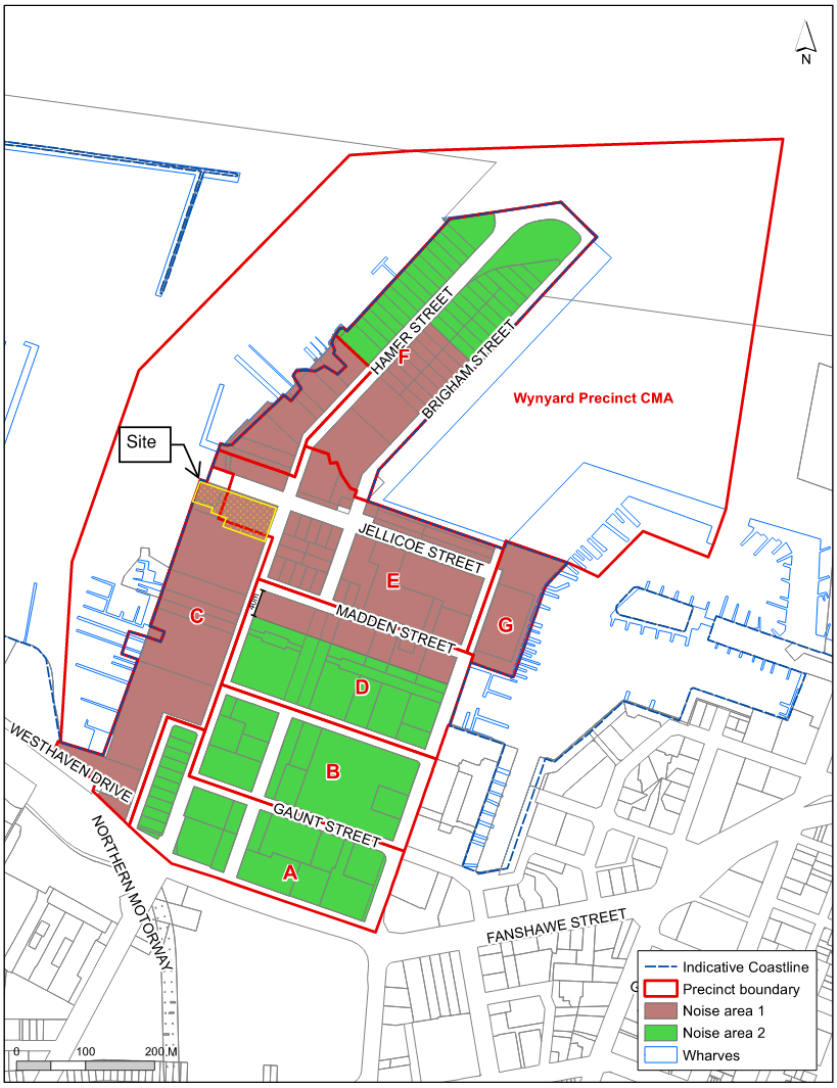
5.1 Operational Noise Performance Standards

Standard I214.6.4 (2) in the Wynyard Precinct specifies the maximum external noise levels that activities in specified noise areas (refer Figure 4) are permitted to emit, based on the noise receiver location (the Site and all surrounding receivers are in Noise Area 1). The noise limits apply at 1m from the façade of any building containing habitable spaces. They are:

Table 7: Operational noise limits (AUP I214.6.4 (2))

Noise source location	Noise limit (dB)		Noise receiver location
	0700 – 2300 hrs	2300 – 0700 hrs	
Noise Areas 1, 2	60 L_{A10}	55 $L_{Aeq\ (15min)}$ 66 $L_{eq\ (15min)}$ @ 63 Hz 62 $L_{eq\ (15min)}$ @ 125 Hz 90 L_{AFmax}	Noise Area 2
Noise Areas 1, 2	70 L_{A10}	70 $L_{Aeq\ (15min)}$ 76 $L_{eq\ (15min)}$ @ 63 Hz 73 $L_{eq\ (15min)}$ @ 125 Hz 90 L_{AFmax}	Noise Area 1

Figure 4: AUP Wynyard Precinct Plan 9 – Noise Areas



We note that the AUP Standard (Table 7) uses two metrics (L_{A10} and L_{Aeq}). In our opinion, there is no compelling rationale to use two metrics in this environment and anticipate that is likely a roll-over error when the Wynyard Precinct provisions were adopted into the AUP. We consider the L_{eq} metric would be more appropriate because:

- The L_{eq} metric is more readily able to be accurately assessed, modelled and measured
- All other noise provisions in the AUP use L_{Aeq} rather than L_{A10}
- The L_{eq} metric is the currently accepted standard noise metric as per New Zealand Standard NZS 6801:2008 *Acoustics – Measurement of environmental sound* and New Zealand Standard NZS 6802:2008 *Acoustics - Environmental Noise.*
- Changing to the L_{Aeq} metric would have little impact. For many noise sources the measured L_{A10} level is 1 to 3 dB higher than the measured L_{Aeq} level. For the surrounding receivers this will be a negligible impact

We propose the Project standardises the noise metrics for consistency (i.e. use L_{Aeq} rather than L_{A10}). This should be included in the conditions of consent.

5.2 Operational Noise Assessment

5.2.1 Mechanical Services Plant

A large mechanical services plant is proposed on the ground floor. The apartments will be served by split mechanical systems with outdoor units located on levels 1, 2, 3, and on the roof of the tower. Preliminary equipment selections show that they can achieve compliance with the operational noise rules in the AUP.

5.2.2 Retail and Food & Beverage

The ground floor is proposed to include retail and food & beverage tenancies that face out of the Site. We anticipate that these tenancies would be able to readily comply with the noise limits at Orams and all other receivers within the Wynyard Precinct and beyond. The operators may need to moderate the level of music noise at night to ensure compliance.

6.0 SOUND INSULATION

6.1 Internal Noise Level Performance Standards

6.1.1 External Sound Insulation

Standard I214.6.4 (1) (a) of the Wynyard Precinct provides the internal noise level criteria of sound insulation required for accommodation buildings. It is:

- 35 dB L_{A10} in every bedroom
- 45 dB L_{A10} in all other habitable spaces

These levels provide an appropriate level of internal amenity for an apartment.

We also recommend that all L_{A10} metrics are converted to L_{Aeq} for this project, while keeping the numerical limit the same (e.g. 35 dB L_{A10} becomes 35 dB L_{Aeq}). 35 dB L_{Aeq} is referred to in C8.6.2 of NZS 6802 when discussing the acceptable internal noise level to protect sleep.

The above criteria are based on:

1. AUP I214.6.4 (1) (a) (i): An external traffic noise level of 65 dB L_{A10} (Note, 65 dB L_{A10} is approximately equal to 62 dB L_{Aeq} for traffic noise) at the boundary of any road between 2300 and 0700 hrs, **AND**
2. AUP I214.6.4 (1) (a) (ii): The external noise levels permitted in Noise Area 1 – see Table 7

AUP I214.6.4 (1) (b) also requires all bedrooms and other habitable rooms to be adequately ventilated in accordance with clause G4 of the New Zealand Building Code. We provide further commentary about this in Section 6.2.2.

Based on the two criteria above (traffic noise level and the permitted external noise levels in Noise Area 1), our design level (discussed further in Section 6.2.1) is 71 dB L_{Aeq} (=70 dB L_{Aeq} + 62 dB L_{Aeq}).

We have used the spectrum in Table 8 for our assessment. This is based on a combination of traffic noise and the low frequency controls in AUP I214.6.4 (1) (a) (ii). We recommend that this spectrum be included in the conditions of consent.

Table 8: Incident external noise level spectrum used for calculation

Octave Band Centre Frequency (Hz)							dBA
63	125	250	500	1000	2000	4000	
77	74	66	65	65	65	64	71

6.1.2 Internal Noise Sound Insulation Between Adjacent Tenancies

Standard I214.6.4 (3) of the Wynyard Precinct also provides internal noise criteria for an activity (e.g. retail tenancy) that shares a common building element (such as a floor or wall) with a separate tenancy. The internal noise criteria are:

Table 9: Internal noise levels (AUP I214.6.4 (3))

Time	Noise limit (dB)
0700 – 2300 hrs	45 L_{A10}
2300 – 0700 hrs	40 L_{A10} 55 L_{10} @ 63 Hz 50 L_{10} @ 125 Hz

6.2 Sound Insulation Assessment

6.2.1 Recommended Façade Constructions To Control External Noise

At this stage, the façade design is still in preliminary design. However, in our experience, the façade of the apartments can be designed (at the detailed design stage) to provide sufficient sound insulation to enable compliance with AUP Standard I214.6.4 (1) (a). Design compliance should be demonstrated during the building consent stage and conditions of consent are recommended to ensure this.

Table 10 summarises an indicative building envelope construction arrangement that will enable compliance. They are based on the spectrum provided in Table 8.

Table 10: Indicative/example building envelope construction

Building Element	Construction
Roof	Concrete roof/balcony structure Minimum 300 mm deep ceiling cavity and absorptive cavity blanket 1 x 13 mm plasterboard on suspended metal ceiling batten system
Glazing (DGU)	12.76 mm acoustic laminate / 12 mm airgap/ 8.38 mm acoustic laminate ($R_w + C_{tr}$ 38 dB)
Brick wall	70mm brick 20mm+ drainage cavity 13 mm plasterboard RAB 140mm timber studs or 150mm steel studs with absorptive cavity blanket 13 mm plasterboard internal lining
Concrete wall	Concrete panel (min 100mm thick) 45 mm timber studs with absorptive cavity blanket 13 mm plasterboard internal lining
Other solid walls	Steel/Aluminium/GRC cladding panels 20mm + cavity batten 2 x 13 mm plasterboard RAB or 2 x 9mm fibre cement panel RAB 140mm timber studs or 150mm steel studs with absorptive cavity blanket 2 x 13 mm high density plasterboard internal lining
Roof	Concrete roof/balcony structure Minimum 300 mm deep ceiling cavity and absorptive cavity blanket 1 x 13 mm plasterboard on suspended metal ceiling batten system

6.2.2 Mechanical Service Plant – Indoor Units

We note that the internal noise levels can only be achieved with windows closed. This means that mechanical ventilation will be required. The proposed design includes a mixture of ducted and highwall air conditioning units.

The ducted units can be designed to comply with the internal noise limits.

For highwalls, it is important to select quiet units as mitigation is not possible. To ensure compliance with the internal noise limits we recommend that all high wall units be specified to achieve the following:

- Apartment Highwall Units 24 dB(A) at 1.4m (as read off manufacture data sheets)

The noise level needs to be achieved at the lowest speed setting to cool the room to 25°C based on external design conditions of dry bulb 25.1°C and wet bulb 20.1°C (as per Rule E25.6.10(3)(c)). Higher noise levels are acceptable at speeds that achieve temperatures less than 25°C.

6.2.3 Internal Noise Between Tenancies

We consider the criteria discussed in Section 6.1.2 is intended to control noise from retail or food & beverage establishments to an apartment.

We consider the criteria can be achieved because the common elements will be designed to enable compliance with the New Zealand Building Code clause G6 and that limitations can be put on the operator, if required.

7.0 CONCLUSION

With our recommendation that a CNVMP be prepared and implemented throughout the construction of the Project, and the conditions of consent relevant to acoustics proposed by the Applicant, construction noise effects are predicted to be reasonable.

Operational noise emission is predicted to comply with the relevant criteria at all times.

Compliance can be readily achieved with the façade sound insulation rules in the AUP.

APPENDIX A GLOSSARY OF TERMINOLOGY

A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 μPa i.e. dB = 20 x log(P/Pr)
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A- weighted) so as to more closely approximate the frequency bias of the human ear.
$L_{Aeq\ (t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_{A10}	The A-weighted sound level exceeded for 10% of the measurement period, measured in dB. Commonly referred to as the average maximum noise level.
Noise	A sound that is unwanted by, or distracting to, the receiver.
PPV	Peak Particle Velocity For Peak Particle Velocity (PPV) is the measure of the vibration aptitude, zero to maximum. Used for building structural damage assessment.
SPL or L_P	Sound Pressure Level. A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μPa RMS) and expressed in decibels.
SWL or L_W	Sound Power Level A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
Vibration	When an object vibrates, it moves rapidly up and down or from side to side. The magnitude of the sensation when feeling a vibrating object is related to the vibration velocity. Vibration can occur in any direction. When vibration velocities are described, it can be either the total vibration velocity, which includes all directions, or it can be separated into the vertical direction (up and down vibration), the horizontal transverse direction (side to side), and the horizontal longitudinal direction (front to back).

APPENDIX B SUGGESTED ACOUSTIC CONDITIONS OF CONSENT WORDING

We recommend that the following conditions are implemented for any consent granted. We have recommended a change in noise metric for consistency and to align with New Zealand Standard NZS 6801:2008 *Acoustics – Measurement of environmental sound* and New Zealand Standard NZS 6802:2008 *Acoustics - Environmental Noise.*

Construction Noise & Vibration

1. Construction noise shall, except at Orams Marine (164 Beaumont Street, Lot 2 DP 541270), comply with Auckland Unitary Plan (AUP) Standard E25.6.28, as far as practicable.
2. Construction vibration shall, except at Orams Marine (164 Beaumont Street, Lot 2 DP 541270), comply with AUP Standard E25.6.30 as far as practicable.
3. A final Construction Noise and Vibration Management Plan (CNVMP) must be prepared by a suitably qualified person and submitted to Auckland Council for certification 10 working days prior to the commencement of the construction works. At a minimum, the final CNVMP must address the relevant measures in Annex E of NZS 6803:1999 "Acoustics - Construction Noise" and Appendix B of DIN 4150-3:1999 "Structural vibration - Part 3 Effects of vibration on structures". The CNVMP must be implemented throughout the Project, and a copy must be maintained on site.

   The purpose of the CNVMP is to identify and adopt the Best Practicable Option (BPO) for the management of construction noise and vibration to avoid, mitigate or remedy adverse effects.

Internal Sound Levels

4. The building envelope must be designed to achieve the following internal noise levels:
   - 35 dB L_{Aeq} in every bedroom
   - 45 dB L_{Aeq} in all other habitable spaces
5. The above internal noise levels shall be achieved based on the following façade incident noise level:

Octave Band Centre Frequency (Hz)							
63	125	250	500	1000	2000	4000	dB L_{Aeq}
77	74	66	65	65	65	64	71

6. Mechanical ventilation and/or cooling systems shall be installed in apartments to achieve an internal noise level not exceeding 35 dB L_{Aeq} in bedrooms and 40 dB L_{Aeq} in living areas when measured at least 1m from any diffuser at the minimum airflows required to achieve the design temperatures and airflows in Standard E25.6.10 (3) (b) (i) and (ii)

   Advice note: For highwall units, the internal noise limits in condition 6 can be achieved by selecting a unit with a manufacturer stated noise level of 24 dBA @ 1.4m, or similar. Selection should be reviewed by a suitably qualified acoustic engineer for confirmation.

7. Internal noise levels from other tenancies sharing a common building element (e.g. floor or wall) to another tenancy within the same building on the subject site shall comply with the following internal noise levels:

Time	Noise limit (dB)
0700 – 2300 hrs	45 L_{Aeq}
2300 – 0700 hrs	40 L_{Aeq} 55 L_{eq} @ 63 Hz 50 L_{eq} @ 125 Hz

Operational noise

8. Noise emitted from activities on the site as authorised under this resource consent to other sites in the Wynyard Precinct shall comply with the following noise limits. The limits apply at 1m from the façade of any building containing habitable spaces

Noise limit (dB)		Noise receiver location
0700 – 2300 hrs	2300 – 0700 hrs	
60 L_{Aeq}	55 $L_{Aeq\ (15min)}$ 66 $L_{eq\ (15min)}$ @ 63 Hz 62 $L_{eq\ (15min)}$ @ 125 Hz 90 L_{AFmax}	Noise Area 2
70 L_{Aeq}	70 $L_{Aeq\ (15min)}$ 76 $L_{eq\ (15min)}$ @ 63 Hz 73 $L_{eq\ (15min)}$ @ 125 Hz 90 L_{AFmax}	Noise Area 1