MARSHALL DAY Acoustics

SOUTHERN LINK INLAND PORT NOISE ASSESSMENT

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Project: **SOUTHERN LINK INLAND PORT**

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1.0 SUMMARY

We have assessed the potential noise effects from the construction and operation of the proposed Southern Link Inland Port Project (**Project**) at 270-292 Dukes Road North, Mosgiel (**Site**) under the provisions of the Fast-track Approvals Act 2024 (**FTAA**). Anticipated noise emissions from the proposed project include:

- General temporary construction activities
- Rail movements on and off the Site
- Road truck movements on and off the Site
- Container moving and stacking (reach stackers, straddle carriers)
- Warehouse loading/unloading (forklifts)
- Container wash and repair

Our assessment has considered the activities proposed to be undertaken, the existing noise environment, and the mitigation that can practicably be implemented.

Based on the mitigation measures included in the Site design and a selection of further recommended mitigation measures, we predict that noise from the construction and operational stages of the development can achieve reasonable noise levels at all nearby receivers.

Any actual or potential noise effects associated with additional vehicle movements to and from the Site on the surrounding road and rail networks will be predominantly within the scale of existing noise produced from these networks. However, there will be some increase in noise level experienced by a small number of nearby receivers.

The noise rules in Dunedin City Council Second Generation District Plan (**District Plan**) provide an indication of what is considered reasonable for the area. There are some details of the rules that we consider are not necessary or appropriate for a project of this scale. We have recommended noise criteria for the Project to address this. Overall, our assessment indicates that noise levels can comply with the District Plan noise limits and our recommended noise criteria at the relevant noise sensitive receivers.

We consider that the overall noise effects associated with the Project are reasonable.

A glossary of acoustical terminology used in this report is included in Appendix A.

2.0 QUALIFICATIONS AND EXPERTISE

My name is Brendon Shanks, and I am an Associate at Marshall Day Acoustics Ltd (**MDA**). MDA is a specialist acoustics consultancy of about 100 professional acoustics consultants, founded in 1981, with offices in New Zealand, Australia, Hong Kong/China, and France.

I hold the qualifications of degrees of Bachelor of Science (Physics) and Bachelor of Music from the University of Otago. I am a member of the Acoustical Society of New Zealand and the Institute of Acoustics (UK). I have 18 years' experience as an acoustics consultant.

My experience relevant to this application includes:

- I have prepared a noise management plan and reviewed noise monitoring for the CityDepot container hub (Lyttleton Port Company). This included assessing different activities and developing best practice management measures to reduce noise effects. Many of the activities undertaken on the CityDepot site are similar to those proposed in the Project.
- I provide independent advice to the Port Otago Port Noise Liaison Committee. This includes preparation and revision of a noise model of the Port Chalmers port operation, analysis of noise monitoring data from the fixed monitors in the community, and attendance at regular

Committee meetings to present updates on noise issues and to answer technical questions from Committee members. The noise sources associated with the Project are largely the same as those at the Port Chalmers site.

- I have undertaken acoustic assessments for mine and quarries that include periods of site preparation and vehicle movements on the site and on local roads. I have appeared as an expert witness at Council hearings and in the Environment Court.

3.0 EXPERT WITNESS CODE OF CONDUCT

Although this Project is not being considered before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses as contained in section 9 of the Environment Court Practice Note 2023. I agree to comply with that Code. I am satisfied that the matters which I address in this Noise Assessment Report are within my area of expertise, except where I state that I am relying on information provided by another person or expert. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

4.0 PROPOSED DEVELOPMENT

The proposed Southern Link Inland Port Project is located at 270-292 Dukes Road North, Mosgiel. The Project is a joint venture between Port Otago and Dynes Transport that is known as the Southern Link Property Limited (**SLPL**).

With a lack of space at Port Chalmers and the Dunedin central business district logistics hubs, the applicant considers the Mosgiel location is a suitable option for bulk storage and use as a logistics hub as a staging site for shipping, rail, and truck transport.

The Site covers approximately 40 hectares and is proposed to house large, roofed warehouses and sealed yard space.

4.1 There will be various noise sources associated with the development

The development will include several activities that will generate noise. These are detailed further in Section 8.0, however in summary these will include:

- General temporary construction activities
- Rail movements on and off the Site
- Road truck movements on and off the Site
- Container moving and stacking (reach stackers, straddle carriers)
- Warehouse loading/unloading (forklifts)
- Container wash and repair (welding, hand tools, water blasters)

4.2 The development will progress in stages

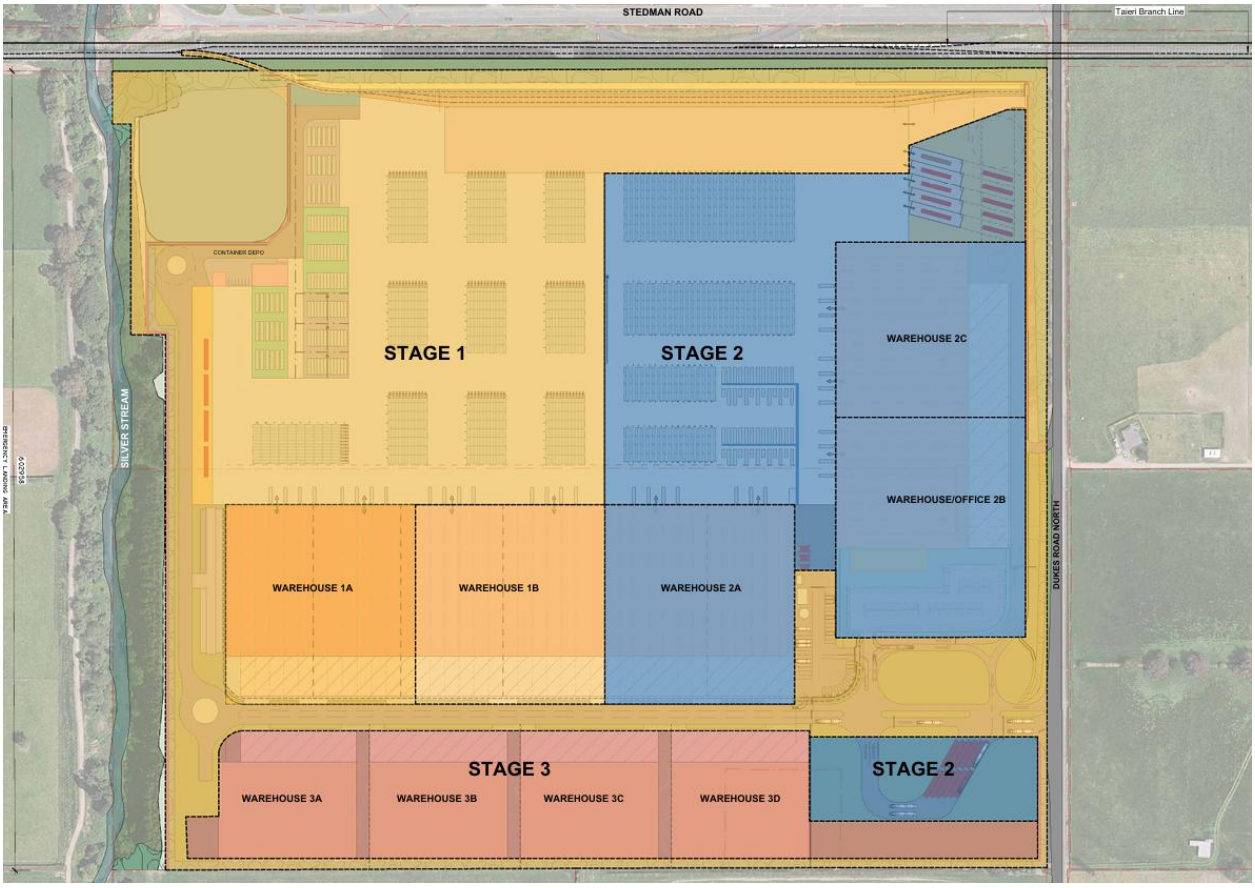
The development is proposed to be progressed in three stages. Stage 1 includes the establishment and utilisation of container stacking areas and an onsite rail siding, with road and rail movements occurring to the Site, and the establishment and utilisation of some warehouse buildings. Stages 2 and 3 include progressively more warehousing, establishment and utilisation of additional container stacking areas, and a moderate increase in vehicle movements to the Site.

Some construction activity will be included in each stage. However, most of the construction activity with potential to generate noise will occur during Stage 1 construction.

Details of the proposed operational activities for each stage are given in Appendix B.

The Site staging plan is shown in Figure 1.

Figure 1: Staging plan



4.3 Nearby receivers are a mix of rural and industrial

The Site is zoned Taieri Plain Rural in the District Plan and is located at the eastern edge of an existing industrial area which includes a relatively small scale container storage area, the Fonterra Mosgiel site, a timber mill operation, and the eastern end of the Taieri Aerodrome, Otago Aero Club and Heli Otago.

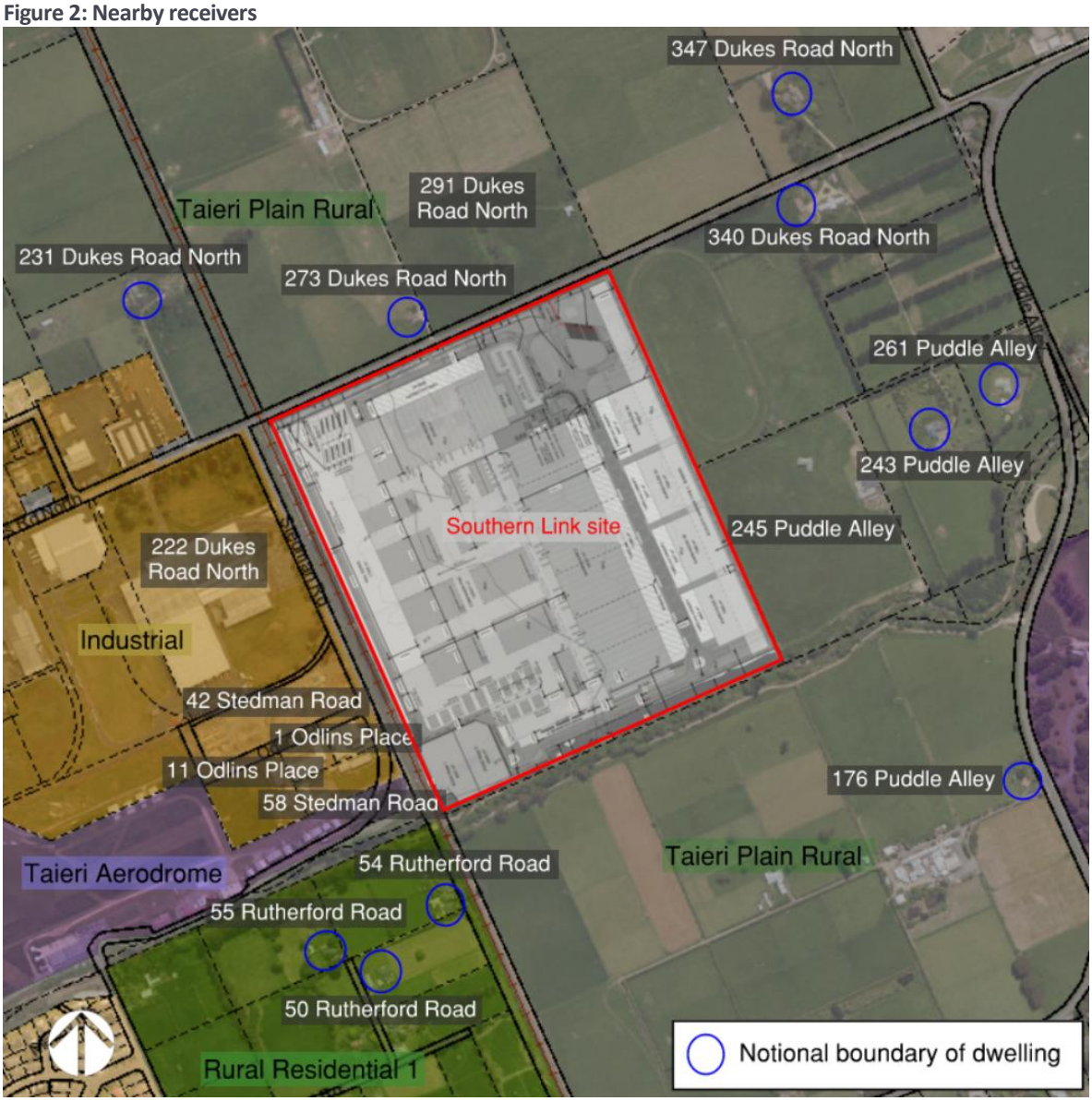
The sites to the north, east, and south of the proposed Site are zoned rural, generally consisting of farmland and a few dwellings. The closest dwellings and the distance from Site are presented in Table 1. The dwelling at 245 Puddle Alley is owned by SLPL and therefore noise effects have not been assessed at this location.

The Site and surrounds are shown in Figure 2.

Table 1: Distance to nearby dwellings

Dwelling	Distance from the Site to dwelling (m)
50 Rutherford Road	300
54 Rutherford Road	180
55 Rutherford Road	305
176 Puddle Alley (Duncan South Limited)	465
243 Puddle Alley	365
231 Dukes Road North	275
273 Dukes Road North	55
340 Dukes Road North	325

Figure 2: Nearby receivers



4.4 Mitigation measures have been built into the design

The Project has been designed with noise mitigation measures in place to reduce noise effects as far as practicable. This includes the following features:

- Site layout – warehouse buildings constructed near boundaries (northern and eastern boundaries) to provide screening between outdoor container stacking activities and sensitive receivers
- Enclosed loading areas ("tunnels") within warehouse buildings
- Noise barriers on site boundaries where practicable – noting that in some locations, solid barriers are not appropriate operationally due to rail access and water flow. These openings face towards the less noise sensitive industrial sites

These design features have been included in the design to reduce noise emission from the Site, and they represent the best practicable option to ensure that noise associated with the Project received at nearby sites is reasonable.

4.4.1 Noise mitigation is included in all Stages

These noise mitigation design features are shown in Figures 3, 4, and 5.

Figure 3: Noise mitigation design – Stage 1

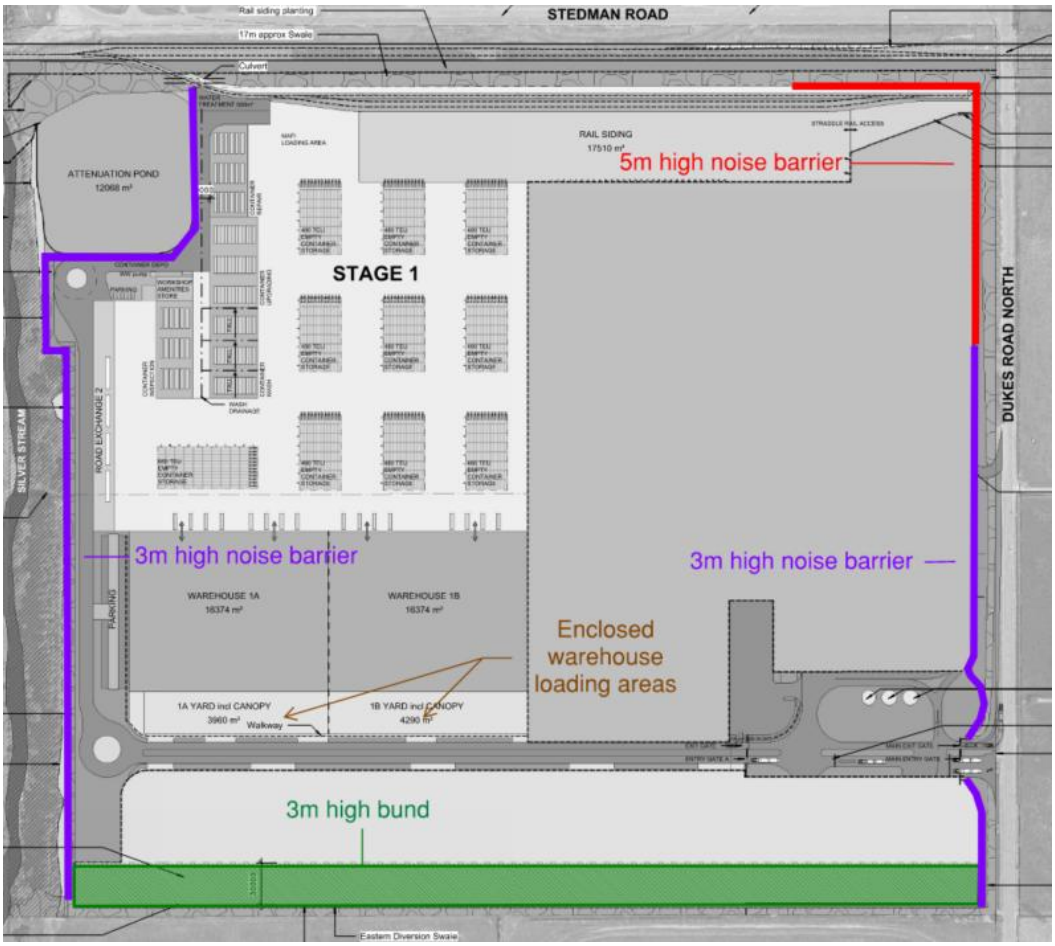


Figure 4: Noise mitigation design – Stage 2

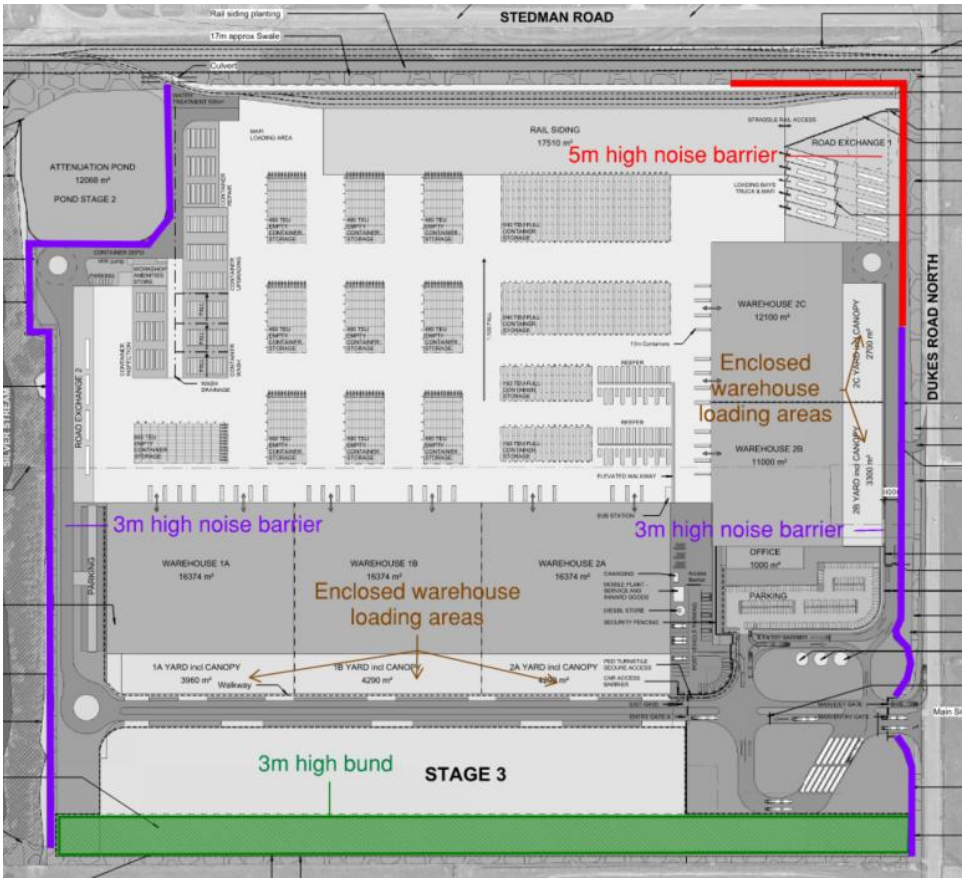
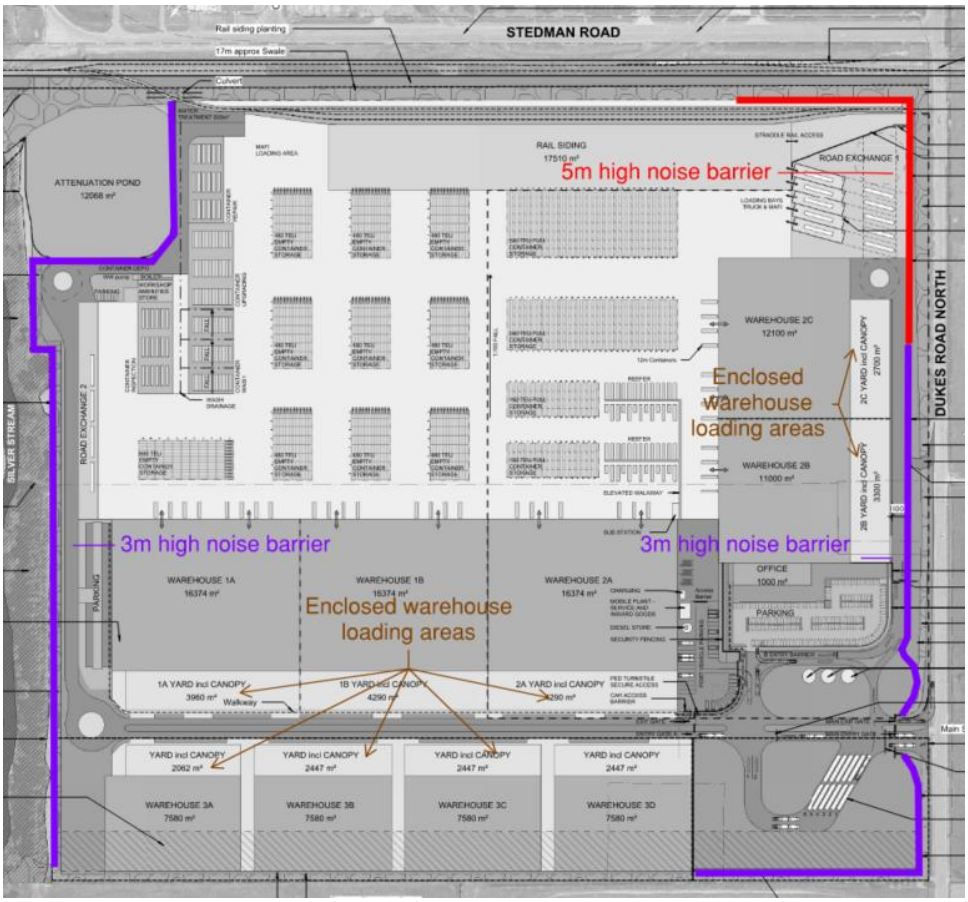


Figure 5: Noise mitigation design – Stage 3



4.4.2 Noise barriers reduce noise emission from the Site

The purpose of the noise barriers is to reduce noise emission from activity on the site to the nearby sensitive receivers. By blocking line of sight between a source and a receiver, a reduction of around 10 decibels is achieved.

The height of the barriers have been designed to ensure that adequate noise reduction is achieved. This has resulted in two barrier types – Type A (5m high) and Type B (3m high), as well as a 3m bund during Stages 1 and 2.

To provide effective noise mitigation, the noise barriers will be constructed with no gaps (excluding water flow flaps as discussed below) and using materials with a surface mass of 12 kg/m^2 or greater. In the north-eastern corner of the Site, the barrier will include gaps that will allow water flow under the barrier during surface water flooding events. "Flaps" have been designed so that the gaps are covered over when there is no water flowing. The flaps should be designed with a surface mass of 10 kg/m^2 or greater. An indicative detail of these flaps is shown in Appendix C.

5.0 EXISTING NOISE ENVIRONMENT

We have conducted noise monitoring within the site and in the surrounding area to understand the existing ambient noise environment. Noise monitors were located at positions representing the nearby dwellings, as shown in Figure 6.

MP1 represents dwellings near the rail corridor, such as 54 Rutherford Road. This position is a similar distance from the rail corridor and industrial area at Stedman Road.

MP2 represents dwellings located further to the east of the Site on Puddle Alley.

MP3 represents the closest dwellings to the north of the Site.

A summary of the measured noise levels at the monitoring positions is included in Table 2. Full details of monitoring data are included in Appendix D.

Figure 6: Noise monitoring positions

Table 2: Measured ambient noise levels

Measurement position	Measured noise level (dB)			
	Daytime		Night-time	
	L_{Aeq} [1]	L_{A90}	L_{Aeq} [1]	L_{A90}
MP1	53	39	44	31
MP2	52	40	41	30
MP3	50	38	43	28

[1] Arithmetic average of the daily L_{Aeq} levels, daily L_{Aeq} values are logarithmic average of periods during each day.

We have excluded periods of rain and where wind in the area may have been greater than 5m/s.

During site visits and through analysis of the noise monitoring data we have identified several noise sources that characterise the area. These include:

- Light aircraft flights to/from the aerodrome - including flight training involving repeated take-off and landing
- Helicopter movements from the aerodrome – including night flights from the rescue helicopter
- Rail movements to/from the Fonterra Mosgiel site
- Plant noise from the industrial area (Timber Mill site)
- Existing container stacking activity at the site adjacent to the aerodrome
- Traffic movements on Dukes Road North

The aircraft and train activity generates intermittent high noise events, with periods of lower noise level in between.

Other noise sources that influenced the noise monitoring are typical to the rural environment, such as distant farm machinery, light wind in vegetation, birds and insects.

6.0 ACOUSTIC PERFORMANCE STANDARDS REVIEW

We have reviewed the District Plan noise performance standards and relevant guidelines and identified what are considered to be reasonable noise performance standards for the Project.

6.1 2GP noise limits at nearby dwellings are for a rural environment

The nearby dwellings are located in the 'Rural' or 'Rural Residential' zones. The District Plan noise rules for these zones include noise limits that apply at the site boundary (9.3.6 1. d) and lower limits that apply at the notional boundary of a dwelling (9.3.6 1. b). This acknowledges that the land immediately surrounding dwellings is more sensitive to noise than typical rural land. Higher noise limits apply at the 'Industrial' and 'Taieri Aerodrome' zones to the west of the site (9.3.6 1. f).

The District Plan noise rules include separate limits for dwellings in parts of the rural zones that are within 350m of an Industrial Zone (9.3.6 1. c). For these areas the night-time noise limit is 5 decibels higher than other rural areas. The purpose of this increased night-time limit is to avoid overly restricting industrial activity during the night-time period. Figure 7 shows the area that is within 350m of the existing Industrial Zone and indicates the dwellings that are within that area.

The noise limits from rule 9.3.6 of the District Plan for the different surrounding receiving zones are summarised in Table 3.

Figure 7: 350m from Industrial Zone

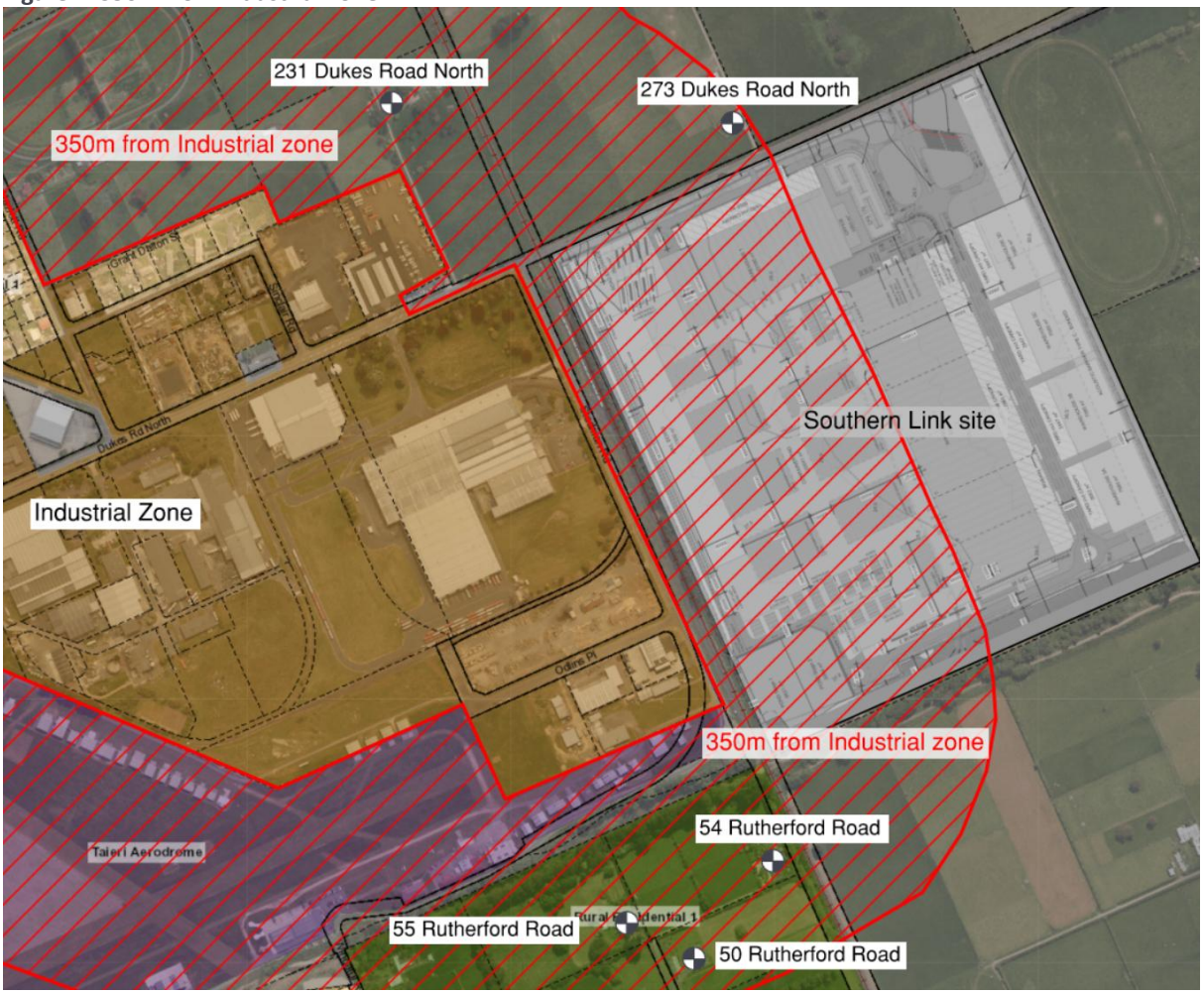


Table 3: 2GP noise limits (9.3.6 1.)

Zone of receiving property		Noise level measured boundary (or notional boundary in rural zones) of receiving property		
		Day 7:00am – 7:00pm	**Evening 7:00pm – 10:00pm**	**Night 10:00pm – 7:00am**
b.	Rural and Rural Residential Zone (at notional boundary of noise sensitive activities); except in those parts of rural zones that are within 350m of the Industrial Zone	55 dB L_{Aeq}	50 dB L_{Aeq}	40 dB L_{Aeq} 70 dB L_{Amax}
c.	Those parts of a Rural Zone that are within 350m of the Industrial Zone	55 dB L_{Aeq}	50 dB L_{Aeq}	45 dB L_{Aeq} 75 dB L_{Amax}
d.	Rural and Rural Residential Zone (at property boundaries, where there are no noise sensitive activities within 20m of boundary)	60 dB L_{Aeq}	60 dB L_{Aeq}	60 dB L_{Aeq} 85 dB L_{Amax}
f.	Industrial, Taieri Aerodrome	65 dB L_{Aeq}	60 dB L_{Aeq}	60 dB L_{Aeq} 85 dB L_{Amax}

6.2 Noise from road and rail sources outside the Site is not assessed against noise limits

The proposed development will include rail movements to the Site and increased heavy vehicle movements on sections of the local roading network.

The District Plan noise rule includes exemptions for noise from vehicles on public roads (9.3.6 3. h.) and from rail movements – including on sidings (9.3.6 3. q.). However, in order to be comprehensive, we have predicted noise from these sources as part of the assessment of effects in Section 10.

Noise from vehicle movements on the Site would be required to comply with the Site operational noise limits.

6.3 District Plan construction noise criteria are based on NZS 6803:1999

Rule 4.5.4.1 of the District Plan requires that construction noise must be measured and assessed according to New Zealand Standard NZS 6803:1999 "Acoustics – Construction Noise". The noise criteria apply at 1m outside the façades of buildings, and only while they are occupied.

The District Plan also includes a table on noise limits that is based on the recommended construction noise levels in NZS 6803:1999. These include noise limits of 70 dB L_{Aeq} and 85 dB L_{AFmax} during the daytime works period. Text from District Plan Rule 4.5.4.1 is included in Appendix E.

6.4 The District Plan construction vibration rule considers amenity and building protection

The District Plan includes construction vibration criteria that address effects on amenity and protection from potential building damage (Rule 4.5.4.X). The amenity criteria (Rule 4.5.4.X a.) apply only to occupied buildings. The daytime criterion is 2mm/s PPV and a night-time criterion of 0.3 mm/s PPV at a building housing a noise sensitive activity.

The building protection criteria (Rule 4.5.4.X b.) are based on the guidance values contained in the German Standard DIN 4150-3:2016 "Vibration in buildings – Part 3: Effects on Structures" **(DIN 4150-3)**.

A full version of Rule 4.5.4.X is included in Appendix F.

6.5 Noise levels will be assessed in accordance with NZS 6802:2008

The District Plan noise rules (9.3.6 4.) require that noise is assessed in accordance with the New Zealand environmental noise assessment standard NZS 6802:2008 "Acoustics - Environmental Noise" (**NZS 6802**). We consider that it is appropriate for the consent conditions to require assessment of compliance with the noise limits in accordance with this standard.

NZS 6802 includes adjustments to the measured noise level to achieve a "rating level" used to assess compliance with noise limits. This rating level accounts for:

- Adjustments for any special audible characteristics (e.g. tonality or impulsiveness); and
- Adjustments for duration (except for activities occurring at night).

6.5.1 Noise levels are assessed for a 15 minute period

NZS 6802 requires that noise levels are assessed for a 15 minute period (unless otherwise specified). This is known as the "Reference time interval".

6.5.2 Duration adjustments can be applied:

Where noise only occurs for part of the day, NZS 6802 provides that a maximum duration adjustment of 5 decibels can be applied. Duration adjustments cannot be applied during the night-time period.

6.5.3 An adjustment is applied for special audible characteristics

Noise containing a "special audible characteristic" (**SAC**), such as clear tonality, is considered to be more annoying. NZS 6802 requires that a +5 decibel adjustment is applied to such noise sources. Tonal reversing alarms from trucks may attract an SAC adjustment.

6.6 Further direction on appropriate noise limits is found in other standards/guidance

In addition to the rules in the District Plan, the standards and guidance detailed in this section provide direction for appropriate noise criteria to protect against unreasonable noise effects.

6.6.1 NZS 6802:2008 includes recommended upper noise limits

NZS 6802 sets out the following guidance with regard to acceptable upper noise limits on sites utilised for residential / noise sensitive activities:

- Daytime: 55 dB $L_{Aeq\,(15\,min)}$
- Night-time: 45 dB $L_{Aeq\,(15\,min)}$ and 75 dB L_{AFmax}

The standard states that these guideline noise limits offer reasonable protection of health and amenity to occupants. The night-time noise limit in this standard (45 dB L_{Aeq}) is 5 decibels higher than the District Plan limits that apply at the notional boundary of dwellings in the Rural Zones (9.3.6 1. b.). However, the standard also notes that local authorities may choose to set more stringent noise limits to afford greater protection to noise sensitive activities.

The limits should generally not be exceeded at any point within the boundary of a residential site. However, NZS 6802 also states that *"where activities to be protected are in a rural area, the appropriate measurement location will generally be at any point within the notional boundary of any rural dwelling…"*. This confirms that it is not typical to set these limits at a site boundary, where there are no noise sensitive receivers. NZS 6802 does not include recommended noise limits at the boundary of a rural site (where there is no noise sensitive activity within 20m).

6.6.2 World Health Organisation provides guidance for the potential onset of health effects

World Health Organization (**WHO**) Guideline Values for Community Noise (Berglund and Lindvall, 1999) give guidelines for environmental noise exposure. For community or environmental noise, the critical health effects (those effects which occur at the lowest exposure levels) are sleep disturbance, annoyance (slight, moderate, high), and speech interference/communication disturbance.

The WHO Guideline Values for these three critical health effects for community or environmental noise are presented in Table 4. These guideline values are the exposure levels that represent the onset of the effect for the general population. That is, at these noise levels, critical health effects only begin to appear in a small number of vulnerable or sensitive groups.

Table 4: WHO guideline values for the critical health effects of community or environmental noise

Specific Environment	Critical health effect(s)	dB L_{Aeq}	Time base (hours)	dB L_{AFmax}
Outdoor living area	Serious annoyance, daytime & evening	55	16	-
	Moderate annoyance, daytime & evening	50	16	-
Dwellings, indoors Inside bedrooms	Speech Intelligibility and moderate annoyance, daytime & evening	35	16	-
	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values) night-time	45	8	60

7.0 RECOMMENDED NOISE AND VIBRATION CRITERIA

The noise rules in the District Plan form the basis of the noise assessment (as for normal consents). We predict that noise from the site would comply with the District Plan noise limits at the relevant noise sensitive receivers.

However, we consider that some elements of the District Plan noise limits for the rural zone are not appropriate for the proposed activity. We recommend the following noise limits are applied to the Project. The recommended limits are based on the District Plan limits and other relevant standards and guidance, and we consider these would result in reasonable noise effects whilst offering greater flexibility to the operation of the site.

7.1 Night-time noise limits can be simplified

The District Plan rules result in a night-time noise limit of 45 dB L_{Aeq} for some dwellings (those within 350m of an industrial zone) and 40 dB L_{Aeq} at others. We consider that the noise limits for the Project should be simplified to **45 dB L_{Aeq} night-time** (10pm – 7am) **at the notional boundary of any existing noise sensitive receiver** (dwelling).

This is consistent with guidance presented in Section 6.6 and is similar to the noise limits that apply to noise within 350m of the industrial zone and also the nearby 'Fonterra noise control mapped area'.

7.2 Noise limits should not apply at the immediate site boundary

The District Plan includes a noise limit of 60 dB L_{Aeq} at the site boundary of rural land where there are no sensitive receivers within 20m (9.3.6 1. d.). We consider that this noise limit is unnecessary as it applies overly restrictive limits at the immediate site boundary, in an environment that is absent of noise sensitive receivers. Therefore, this rule imposes limits that do not address any real effects on sensitive receivers. We consider that localised noise levels greater than 60 dB L_{Aeq} at an area of rural land that is not near a dwelling would not be an unreasonable emission of noise.

Applying appropriate noise limits at the notional boundary of a noise sensitive receiver is a better way to ensure suitable protection of land that is used for noise sensitive activities. This is consistent with guidance provided in NZS 6802 and the WHO guidelines.

7.3 Lower night-time/evening noise limits are not necessary at industrial sites

The District Plan noise limits for the Industrial zone include a daytime limit of 65 dB L_{Aeq} and evening/night-time limit of 60 dB L_{Aeq}. Based on the lack of sensitivity of the adjacent industrial land, we consider that a limit of **65 dB L_{Aeq}** would be reasonable **at any industrial boundary** during day and night periods. Noting that lower night-time limits are typically applied to protect against sleep disturbance, which is not an issue in the adjacent industrial land.

As discussed in Section 6.2 these limits do not apply to rail movements on or off the site or to vehicles on the public road.

7.4 Construction noise and vibration

We consider that the construction noise and vibration criteria contained in the District Plan are suitable for the site.

8.0 CONSTRUCTION NOISE AND VIBRATION EFFECTS

We have assessed the likely noise and vibration from construction activity on the site. We anticipate that typical construction activities can comfortably comply with the District Plan noise and vibration standards and therefore, the temporary effects on any residents in the vicinity will be reasonable.

8.1 A construction methodology has been developed

A preliminary construction program and methodology have been prepared. This includes periods of construction activity during each of the stages of development of the Site. During these stages, the type of construction activity is similar, but would occur at different parts of the Site.

The methodology does not include specific equipment. However, based on the description of the activities, the anticipated construction works are summarised in Table 5.

We understand that higher noise generating activities will typically be undertaken during daytime hours (from 7am – 7pm, Monday to Friday, and 7:30am – 6pm on Saturdays).

Table 5: Summary of anticipated construction activities

Activity	Equipment
Site earthworks	Excavators, scraper, truck movements, bulldozer operating across the site
Pavement construction	Vibratory roller, plate compactor, concrete pours at building platforms, rail pad and container pad
Noise wall construction	TBC – Pending detailed design of the noise wall
Building construction	Mobile crane, truck deliveries, hand tools operating at building platform area

8.2 Construction activity can comply with daytime limits at 40m from a dwelling

Table 6 provides indicative construction noise levels for typical activities anticipated on the Site. They are considered representative of the activities proposed. However, in practice, construction noise levels are inherently variable due to factors such as equipment selection, methodology and operator skill/care.

Based on the anticipated noise sources on site and the site layout, we predict that construction activities can comply with the daytime construction noise criteria at a distance of 40m or greater (without a noise barrier in place). Therefore, we predict that daytime construction activity can comply at all nearby noise sensitive receivers.

High noise emitting night-time construction activity is not proposed.

Table 6: Sound power levels at compliance setback distances at 1m from a building façade[1]

Equipment	Sound power level	Setback to achieve compliance[2]	
	(dB L_{wA})	70 dB L_{Aeq} (daytime)	45 dB L_{Aeq} (night-time)
Excavator (40T)	105	28m	>200m
Vibratory roller	103	25m	160m
Plate compactor	108	40m	>200m
Bulldozer (41T)	108	40m	>200m
Hand tools	103	25m	160m
Mobile Crane (100T) operating	99	16m	110m
Truck and trailer unit delivery[3]	98	14m	100m

[1] In accordance with the requirements of NZS 6803: 1999, inclusive of 3 decibels façade reflection

[2] Based on weekday noise limits, without barrier shielding

[3] Includes 5 decibels of averaging allowing for the time component of deliveries.

8.3 Noise levels will be significantly lower than 70 dB most of the time

Due to the setbacks/distance to nearby receivers we predict that construction activity will comply with the daytime noise limit of 70 dB L_{Aeq} at all nearby dwellings. Furthermore, we anticipate that noise levels would be significantly lower than 70 dB for most of the time. This is due to the setback distances typically being greater than those indicated in Table 6 and much of the construction activity occurring behind the perimeter noise walls, which will be established during the initial construction phase.

8.4 A management plan will be developed if night works are required

If construction activity is required at night – for example, for extended concrete pours – a construction noise management plan should be developed to ensure that the best practicable option is adopted to reduce noise.

8.5 We predict that construction vibration will be insignificant

We predict that vibration from construction activity can comply with the requirements of 2GP Rule 4.5.4.X.

British Standard BS 5228-2:2009 "Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration" provides guidance on the amenity effects of vibration. The descriptions are reproduced below, and are supplemented with descriptions for 2mm/s and 5mm/s (to bridge the gap between 1 and 10 mm/s in the Standard):

- 0.14mm/s PPV Just perceptible in the particularly sensitive environments
- 0.3 mm/s PPV Just perceptible in normal residential environments
- 1 mm/s PPV Typically acceptable with prior notification
- 2 mm/s PPV Clearly perceptible but typically acceptable during daytime in dwellings and workplaces if it occurs intermittently, and with prior notification.
- 5mm/s PPV Highly unsettling in dwellings and workplaces. If prolonged, some occupants may want to leave the building. Computer screens will shake, and items could fall off shelves if they are not level.
- 10 mm/s PPV Likely to be intolerable for any more than a very brief period

We predict that vibration from the proposed construction activities may be just perceptible (less than 1 mm/s PPV) at the closest receiver (273 Dukes Road North) for the highest vibration sources.

Predicted levels from all activity would comfortably comply with building damage criteria contained in DIN 4150-3.

9.0 PREDICTED OPERATIONAL NOISE LEVELS

We have predicted the noise levels from the proposed activities at the nearby receivers. We anticipate that the construction and operation of the site can comply with the District Plan noise limits (refer Section 6.1) and the recommended noise limits (refer Section 7.0) at all noise sensitive receivers.

9.1 Prediction Methodology

We have used the noise modelling package SoundPLAN to predict noise levels. Calculations in SoundPLAN are based on ISO 9613-2:2024 "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation" (**ISO 9613**). This method has the scope to consider a range of factors affecting the sound propagation including:

- The magnitude of the noise source in terms of sound power
- The distance between source and receiver, and associated distance attenuation

- The presence of obstacles such as screens or barriers in the propagation path
- The presence of reflecting surfaces
- The hardness of the ground between the source and receiver
- Attenuation due to atmospheric absorption, and
- Meteorological effects such as wind gradient, temperature gradient and humidity.

In ISO 9613, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level. The Standard adopts the conservative approach of assuming that wind is always blowing from the noise sources to the receiver locations. The equations and calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

Noise source data from measurements of port activity has been used for the noise modelling. A table of the noise data used in the assessment is included in Appendix G.

9.2 We have modelled two stages of the proposed development

It is intended that the Site will be developed over three stages. We have modelled noise from the operational activity on the Site for Stage 1 and Stage 3 (the final stage). During Stage 1 there will be fewer buildings on the Site to provide shielding to the east. Stage 3 represents the completed development, with all warehouse buildings in place.

The intermediate Stage 2 will progressively include more shielding from the additional warehouse buildings (Warehouse 2A, 2B, and 2C shown in Figure 1) and is expected to generate noise levels between the range predicted for Stage 1 and Stage 3.

The noise modelling scenarios are summarised in Table 7. We have modelled the anticipated peak hour truck movements on the Site and the expected operating on-time of the container stacking activity. The model scenarios include mitigation from noise barriers at the site boundary.

Noise from rail movements is addressed separately in Section 9.7.

Table 7: Activity scenarios – Stage 1 and Stage 3

Activity	Stage 1		Stage 3	
	Daytime (7am-10pm)	Night-time (10pm-7am)	Daytime (7am-10pm)	Night-time (10pm-7am)
Trucks – Exchange 1 (peak hour)	14	0	14	4
Trucks - Exchange 2 (peak hour)	12	0	12	0
Trucks - Warehouse (peak hour)	1.7	0	3.8	1.6
Side loaders	2 units operating 50% of the time	0	4 units operating 50% of the time	2 units operating 50% of the time
Straddle carriers	2 units operating 50% of the time	0	3 units operating 50% of the time	2 units operating 50% of the time
Electric forklifts (in warehouse loading areas)	13	0	41	41
Outdoor workshop	100% operating	-	100% operating	100% operating
Container wash	100% operating	-	100% operating	100% operating

9.3 Predicted noise levels comply with the 2GP limits at all noise sensitive receivers

We have predicted the daytime and night-time noise levels at the notional boundary of the nearby receivers and at the nearby industrial sites. The predicted noise levels are shown in Table 8 (Stage 1) and Table 9 (Stage 3).

Table 8: Predicted noise levels – Stage 1 (excluding construction)

Receiver	Stage 1 [1] - Daytime (7am-7pm)/Evening (7pm-10pm)	
	Predicted noise level (dB L_{Aeq})	2GP noise limit
Dwellings (notional boundary)		
50 Rutherford Road	43	55 / 50
54 Rutherford Road	46	55 / 50
55 Rutherford Road	43	55 / 50
183 Puddle Alley (Duncan South Limited)	38	55 / 50
202 Puddle Alley	34	55 / 50
231 Dukes Road North	44	55 / 50
273 Dukes Road North	48	55 / 50
340 Dukes Road North	43	55 / 50
Industrial sites		
222 Stedman Road (Fonterra – Southeast boundary)	53	65
222 Stedman Road (Fonterra – Northeast boundary)	49	65
1 Odlins Place	45	65

[1] No night-time activity during Stage 1

Table 9: Predicted noise levels – Stage 3

Receiver	Stage 3 - Daytime (7am-7pm) / Evening (7pm-10pm)		Stage 3 - Night-time (10pm-7am)	
	Predicted noise level	2GP noise limit	Predicted noise level	2GP noise limit
Dwellings (notional boundary)				
50 Rutherford Road	45	55 / 50	43	45
54 Rutherford Road	48	55 / 50	45	45
55 Rutherford Road	44	55 / 50	42	45
183 Puddle Alley (Duncan South Limited)	39	55 / 50	37	40
202 Puddle Alley	32	55 / 50	30	40

Receiver	Stage 3 - Daytime (7am-7pm) / Evening (7pm-10pm)		Stage 3 - Night-time (10pm-7am)	
	Predicted noise level	2GP noise limit	Predicted noise level	2GP noise limit
231 Dukes Road North	45	55 / 50	43	45
273 Dukes Road North	48	55 / 50	43	45
340 Dukes Road North	43	55 / 50	40	40
Industrial sites				
222 Stedman Road (Fonterra – Southeast boundary)	55	65	53	60
222 Stedman Road (Fonterra – Northeast boundary)	51	65	48	60
1 Odlins Place	47	65	44	60

[1] Property owned by SLPL

Noise contour plots for the modelled scenarios are included in Appendix H.

9.4 Tonal reversing alarms will attract a 5 decibel SAC adjustment

We understand that all the motorised vehicle equipment utilised on the site will be fitted with broadband "squawker" reversing alarms. These do not contain tonality and therefore would not attract a special audible characteristic (SAC) adjustment.

If road trucks with tonal reversing alarms are required to reverse into the exchange areas, this would attract an SAC adjustment. Our assessment has assumed that tonal reversing alarms are included, and we have added the SAC adjustment to this noise source.

9.5 L_{Amax} noise levels are best controlled through management measures

Based on measurements of similar activity on other sites, we anticipate that container stacking activity can comply with a night-time noise criterion of 75 dB L_{Amax} at the nearby receivers, provided skilled operators are used.

However, L_{Amax} events are highly variable and are typically caused by accidental impacts as a result of poor driver technique. Based on this, it is not possible to definitively state what the L_{Amax} noise levels at the closest dwellings will be. It is possible that occasional impact events from poor stacking technique would result in noise levels above 75 dB L_{Amax} at the closest dwellings. We consider that this potential noise effect is best addressed with appropriate management measures. These may include:

- Driver training on high stacking
- Active noise monitoring to capture high noise events and allow follow up with repeat offenders
- Minimising high stacking near the site boundary at night (where practicable)

9.6 The predicted change in road traffic noise on the public road would be just perceptible

We have predicted the change in noise level from vehicles on Dukes Road North, based on the anticipated increases in traffic volume. The increase in road traffic will primarily affect the two dwellings to the north of the site (273 and 231 Dukes Road North). We have predicted the noise level

at these properties with and without the development in place, based on the existing road traffic on the section of roads closest to each dwelling[4].

The traffic data used in this assessment is presented in Table 10.

Table 10: Road traffic data

Receiver	Section of road	Existing		With development	
		AADT [1]	% heavy vehicles	AADT [1]	% heavy vehicles
273 Dukes Road North	Dukes Road North – east of Stedman Road	1432	1.9	2036	8.2
231Dukes Road North	Dukes Road North – west of Stedman Road	2224	6.6	2828	10.1

[1] Annual Average Daily Traffic

Based on the anticipated increase in traffic, we predict that road traffic noise levels would increase by:

- 4 decibels at 273 Dukes Road North
- 2 decibels at 231 Dukes Road North

Subjectively, a change in noise level of 3-4 decibels is considered to be "just perceptible", while a change of 1-2 decibels is considered to be "imperceptible". We therefore consider that there are limited effects on neighbouring dwellings from road traffic on Dukes Road North, particularly as the character of the noise source (i.e. traffic) will remain unchanged.

9.7 We have predicted noise levels from a train pass

While noise from trains is not required to comply with any noise limits, in order to provide a comprehensive assessment of potential noise effects we have predicted the likely noise level. This includes noise from the rail movements on the Site and in the rail corridor (off the Site).

The closest receiver to the rail corridor is 54 Rutherford Road (approximately 40m from the rail corridor). Other dwellings in the immediate area are more than 100m from the corridor. We have predicted the noise level at various distances from the rail corridor to indicate the likely noise effects for dwellings that are close to the rail corridor but are further away from the site.

The predicted L_{Aeq} levels shown in Table 11 are the noise level during a 3-minute period as the train passes. The L_{Amax} is the estimated maximum noise level based on measurements at another site. The L_{Amax} is highly variable and is generally controlled by features such as particular engine type, imperfections in the rail lines, and wheel interaction at junctions. We discuss the effects from the noise levels Table 11 in Section 10.4.

Table 11: Predicted noise from rail movements

Distance to receiver	Predicted noise level (dB)	
	L_{Aeq}	L_{Amax}
20m	69	85
40m	66	79
60m	63	76
100m	61	71

[4] MobileRoad.org, June 2025

10.0 OPERATIONAL NOISE EFFECTS

We have assessed the relevant noise rules, standards and guidance, along with the existing noise environment in the area. Based on these factors, we consider that operational noise criteria of 55 dB L_{Aeq} during the daytime (7am – 7pm), 50 dB L_{Aeq} during the evening (7pm-10pm), and 45 dB L_{Aeq} at night (10pm – 7am) at the notional boundary of existing dwellings, and 65 dB L_{Aeq} at all times at the boundary of any industrial site, are reasonable (refer Section 7.0).

We predict that activity on the site can comfortably be undertaken within the daytime criterion at all noise sensitive receivers. Predicted noise levels for the night-time activity during the fully operational development (Stage 3) can be undertaken within the night-time criterion. Noise levels at the industrial boundaries will be within the recommended 65 dB L_{Aeq}.

10.1 We predict that daytime activity noise will be lower than existing noise levels in the area

Based on the existing noise environment and the predicted noise levels, daytime activity noise levels would typically be lower than the existing noise levels. The average daytime L_{Aeq} levels measured at the monitoring locations ranged from 46 to 59 dB $L_{Aeq\ (daytime)}$. The highest predicted daytime level at a notional boundary is 48 dB L_{Aeq} at 54 Rutherford Road. However, the background sound levels in the area can be relatively low, so noise from the site is likely to be audible at times.

The character of the noise will be similar to some activity already present in the area, including rail movements to the Fonterra site, farm machinery, and existing container stacking activity adjacent to the aerodrome. However, the scale of activity will result in a change to the ambient noise environment by increasing how often this noise is present.

10.2 Night-time activity is likely to be audible at a reasonable level

Night-time activity is not proposed during Stage 1. We have assessed the potential for night-time activity in the future, including night-time truck deliveries. The predicted night-time noise levels are up to 45 dB L_{Aeq} at the closest receivers, with all mitigation measures in place.

The existing night-time noise levels ranged from 32 to 53 dB $L_{Aeq\ (night)}$ at the three monitoring locations, with the average levels at each position between 41 and 44 dB $L_{Aeq\ (night)}$. This shows that, while there is some variability in the existing night-time noise levels, the predicted noise levels at the closest receivers are similar to the existing average levels.

There are times when existing background noise levels are very low, so night-time activity is likely to be audible at times, albeit at a reasonable level. With appropriate management of L_{Amax} events, we do not anticipate that the noise levels would cause sleep disturbance at any noise sensitive receivers.

10.3 Trucks with tonal reversing alarms should be avoided if possible

We understand that road trucks will be required to reverse into position in the exchange areas. This may include some trucks with tonal reversing alarms. We have assessed the likely noise from these alarms at nearby receivers (including a +5 decibel adjustment for SAC).

While the noise levels can comfortably comply with reasonable noise levels during daytime and night-time, it is possible that this noise would be audible during periods of low background sound.

We recommend that, where practicable, the site operator insist on broadband reversing alarms for trucks entering the site during the night-time.

10.4 Rail movements will be similar to existing activity in the area

We have predicted the noise level at various distances from the rail corridor. The results indicate that there will be brief periods of high noise from rail movements at dwellings that are closest to the rail corridor.

However, these receivers already experience noise from rail movements. Rail movements on and off the Site will generate similar noise levels to existing activity for the Fonterra site.

Based on information provided by KiwiRail, we understand that the existing train movements (projected for January 2026) along this section of the rail corridor include four trains (8 movements) on weekdays and two trains (4 movements) on weekend days. Two of these movements are scheduled to occur during the night-time period (early morning, before 7am).

These trains are servicing the Fonterra Mosgiel site. We understand that these movements reduce during the winter months based on the Fonterra seasonal requirements.

The proposed operation of the Site currently includes 4 movements per day (none during the night-time period) with potential for future growth. This scale of activity is less than the existing usage during peak times and cumulatively would increase the number of rail movements from 8 to 12 during the peak period, with no additional night-time movements. Furthermore, there will be no noticeable difference in the noise level or character for receivers near the rail corridor.

10.5 Rail is protected in the 2GP

Noise from the rail corridor is expected and rules are in place to protect the rail corridor against reverse sensitivity. Rule 9.3.1 of the 2GP requires dwellings within 70m of a rail corridor to provide a certain standard of sound insulation to the building envelope.

This puts the onus on property owners to mitigate against noise effects from the existing rail network. This type of rule is designed to protect against reverse sensitivity on critical infrastructure, such as rail. With the sound insulation in place, existing houses are already protected from rail noise, irrespective of the number of trains passing in the corridor.

10.6 Noise effects will be reasonable and have been mitigated as far as practicable

Due to the scale of the development and the type of activity, we anticipate that the predicted noise levels will be audible at times and will result in a change in the ambient noise environment in the rural areas immediately adjacent to the Site. However, based on guidance from the 2GP, NZ Standards, and WHO guidelines, we consider that the noise levels are reasonable for the area.

Furthermore, we consider that the mitigation measures that have been included in the design of the site demonstrate that the best practicable option to reduce noise has been adopted.

10.7 Vibration from site operation will be negligible

We have considered the potential for vibration effects from the operations on the site. Based on the distance to the nearby receivers, we predict that vibration from all activities proposed on the site would be below 0.3mm/s PPV[5] which is the level that is considered just perceptible in normal residential environments and therefore will have no adverse effect on any residents in the vicinity.

11.0 CONCLUSION

We have assessed the potential noise and vibration effects from the construction and operation of the proposed Project.

We predict that construction activities can be completed within the noise and vibration criteria contained in the District Plan.

[5] British Standard BS 5228-2:2009 *"Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration"*

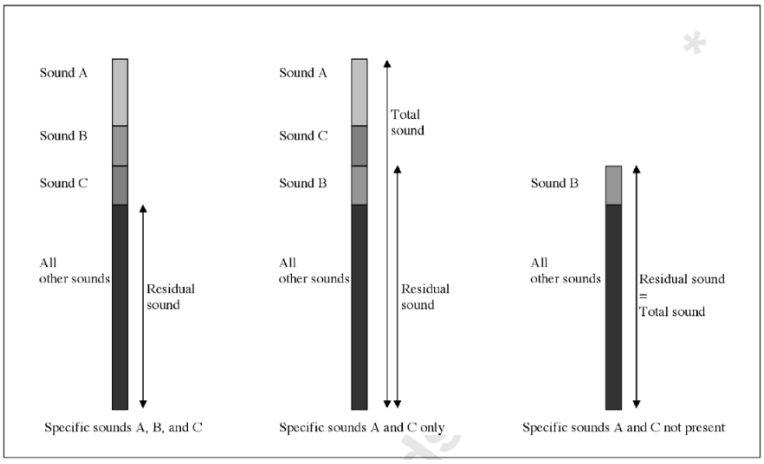
Mitigation measures have been integrated into the Site design. This includes noise barriers/bunds at Site boundaries, use of the Site layout to utilise shielding from warehouse buildings, and enclosed loading areas on the warehouses.

We have recommended appropriate noise limits for the operation of the site, based on District Plan standards and other relevant standards/guidance. We predict that the operation of the Site can comply with the District Plan limits and the recommended limits at the notional boundaries of the relevant existing dwellings.

The Project will include some additional road traffic on the surrounding public roads and rail movements on the existing rail corridor and new siding. While noise from these sources is not required to comply with noise limits, we have assessed the potential effects and consider that these are reasonable in the context of the existing noise environment.

The scale of the proposed Project will result in some change to the ambient noise environment in the area immediately surrounding the Site. However, we consider that best practicable option noise mitigation measures have been included in the design of the Site to ensure that noise at all noise sensitive receivers is reasonable.

APPENDIX A GLOSSARY OF TERMINOLOGY

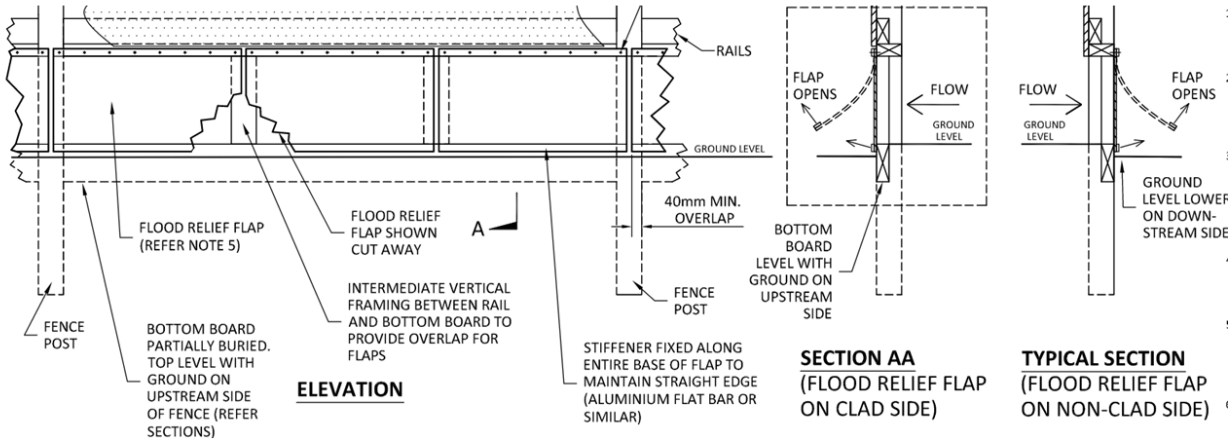
A-weighting	A set of frequency-dependent sound level adjustments that are used to better represent how humans hear sounds. Humans are less sensitive to low and very high frequency sounds. Sound levels using an "A" frequency weighting are expressed as dB L_A. Alternative ways of expressing A-weighted decibels are dBA or dB(A).
Background sound	The sound that is continuously present in a room our outdoor location. Often expressed as the A-weighted sound level exceeded for 90 % of a given time period i.e. L_{A90}.
dB	Decibel. The unit of sound level.
L_{A90}	The A-weighted sound level exceeded for 90 % of the measurement period, measured in dB. Commonly referred to as the background noise level.
L_{Aeq}	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB.
L_{Amax}	The A-weighted maximum sound level. The highest sound level which occurs during the measurement period. Usually measured with a fast time–weighting i.e. L_{AFmax}
L_w	Sound Power Level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L_{WA}.
Noise	A subjective term used to describe sound that is unwanted by, or distracting to, the receiver.
Notional boundary	A line 20 metres from any side of a dwelling, or the legal boundary where this is closer to the dwelling. This definition is from NZS 6802:2008.
PPV	Peak Particle Velocity. The measure of the vibration aptitude, zero to maximum. Used for building structural damage assessment.
Special audible characteristics	Distinctive characteristics of a sound that make it more likely to cause annoyance or disturbance. A penalty of up to 5 decibels can be applied when assessing sounds with SAC Examples are tonality – a hum or a whine) and impulsiveness – bangs or thumps.
Total sound **Or** **Ambient sound**	The totally encompassing sound in a given situation at a given time, from all sources near and far, including the Specific Sound. See also Residual Sound.  This definition is from NZS 6802:2008.

APPENDIX B PROPOSED OPERATIONAL ACTIVITY

Table 12: Activity scenarios

Activity	Stage 1		Stage 2		Stage 3	
	Daytime (7am-10pm)	Night-time (10pm-7am)	Daytime (7am-10pm)	Night-time (10pm-7am)	Daytime (7am-10pm)	Night-time (10pm-7am)
Trucks – Exchange 1 (peak hour)	0	0	14	4	14	4
Trucks - Exchange 2 (peak hour)	26	0	12		12	0
Trucks - Warehouse (peak hour)	2.3	0	3.5	1.5	5	2.2
Side loaders	2 units operating 50% of the time	0	3 units operating 50% of the time	2 units operating 50% of the time	4 units operating 50% of the time	2 units operating 50% of the time
Straddle carriers	2 units operating 50% of the time	0	3 units operating 50% of the time	2 units operating 50% of the time	3 units operating 50% of the time	2 units operating 50% of the time
Electric forklifts (in warehouse loading areas)	13	0	29	29	41	41
Outdoor workshop	100% operating	-	100% operating	100% operating	100% operating	100% operating
Container wash	100% operating	-	100% operating	100% operating	100% operating	100% operating

APPENDIX C NOISE BARRIER – WATER FLOW FLAP



APPENDIX D NOISE MONITORING DATA

Measurement Position 1 (MP1)

Date: 25 June – 8 July, 2024

Coordinates: -45.854905
170.378505

Weather: Periods of wind > 5 m/s and rain excluded from data

Weather data sourced from nearby weather station

Instrumentation: 01 dB Cube, serial 11190
Larson Davis Type CAL200 calibrator, serial 19792

Calibration: Field calibration of the equipment was carried out before measurements, and the calibration checked after measurements. Observed change less than 1 dB

Table 13: MP1 Noise monitoring results

Date	Measured noise level (dB)			
	Day		Night	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
25/06/2024 [1]	50	35	37	28
26/06/2024	48	39	39	28
27/06/2024	54	42	43	35
28/06/2024	52	37	48	27
29/06/2024	51	38	36	28
30/06/2024	50	38	35	27
1/07/2024	52	40	43	27
2/07/2024	53	44	45	37
3/07/2024	56	40	50	32
4/07/2024	59	39	45	32
5/07/2024	59	40	50	31
6/07/2024	55	39	38	32
7/07/2024	53	39	50	37
8/07/2024 [1]	50	42	51	34

[1] Partial day

Figure 8: MP1 Diurnal noise

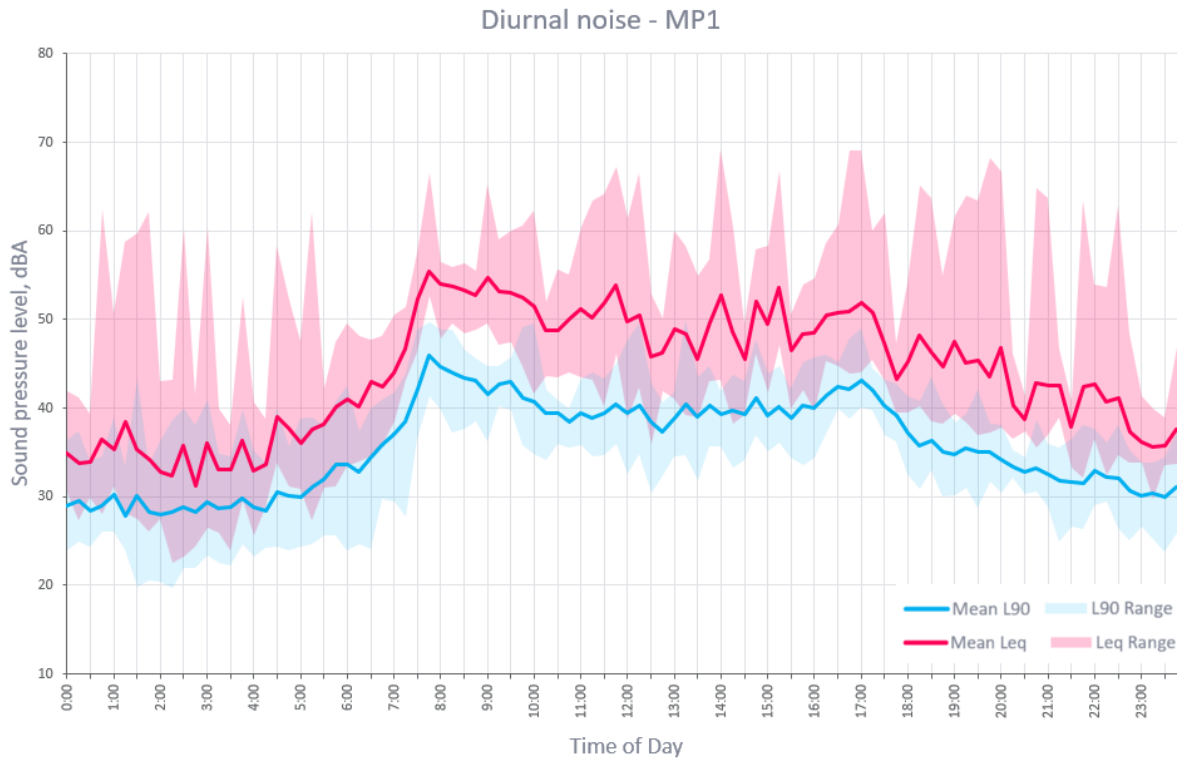
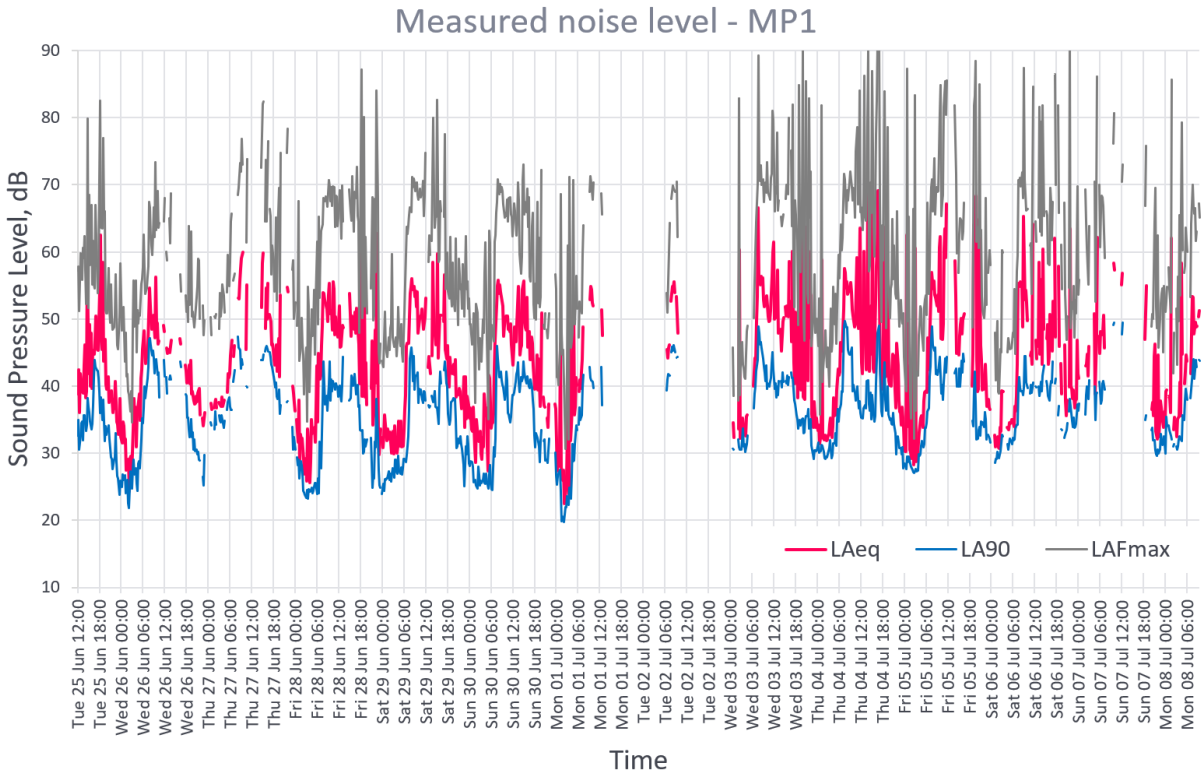


Figure 9: MP1 Full noise data



Measurement Position 2 (MP2)

Date: 19 June – 25 June, 2024

Coordinates: -45.858722
170.374061

Weather: Periods of wind > 5 m/s and rain excluded from data

Weather data sourced from Invercargill airport weather station

Instrumentation: 01 dB Cube, serial 11190
Larson Davis Type CAL200 calibrator, serial 19792

Calibration: Field calibration of the equipment was carried out before measurements, and the calibration checked after measurements. Observed change less than 1 dB

Table 14: MP2 noise monitoring results

Date	Measured noise level (dB)			
	Day		Night	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
19/06/2024 [1]	53	40	50	34
20/06/2024	55	45	44	35
21/06/2024	53	44	45	31
22/06/2024	55	36	41	32
23/06/2024	49	36	34	27
24/06/2024	49	37	32	24
25/06/2024 [1]	46	42	39	29

[1] Partial day

Figure 10: MP2 Diurnal noise

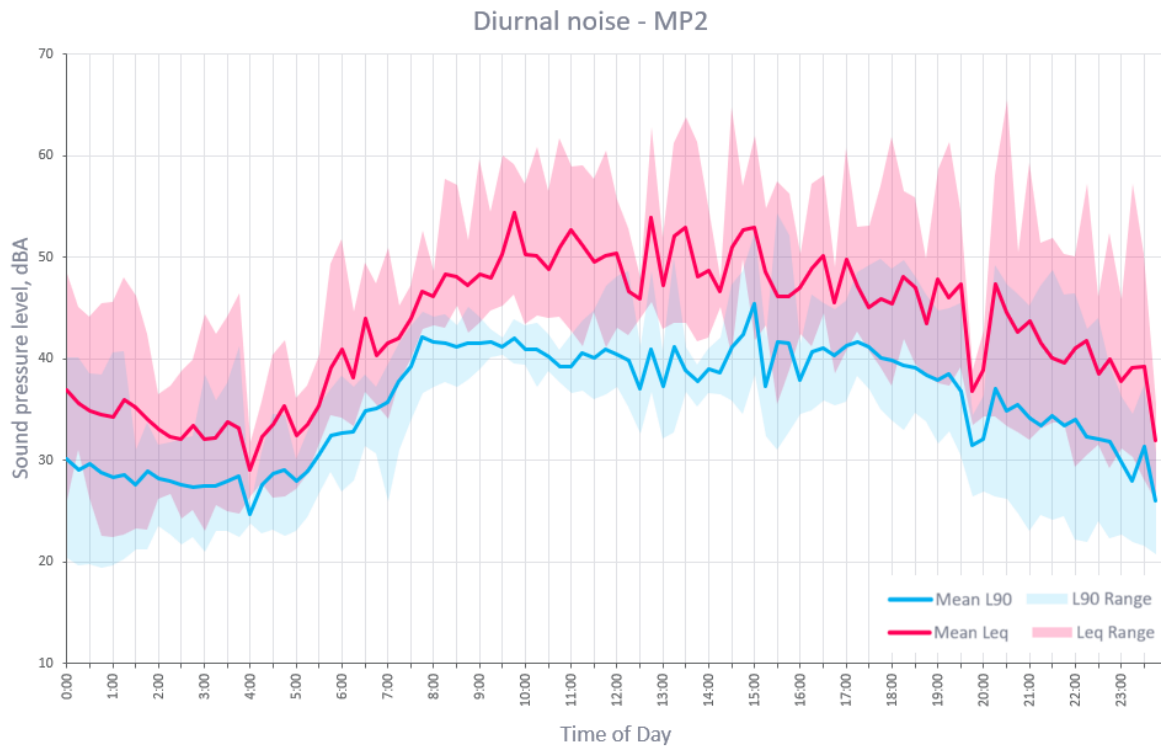
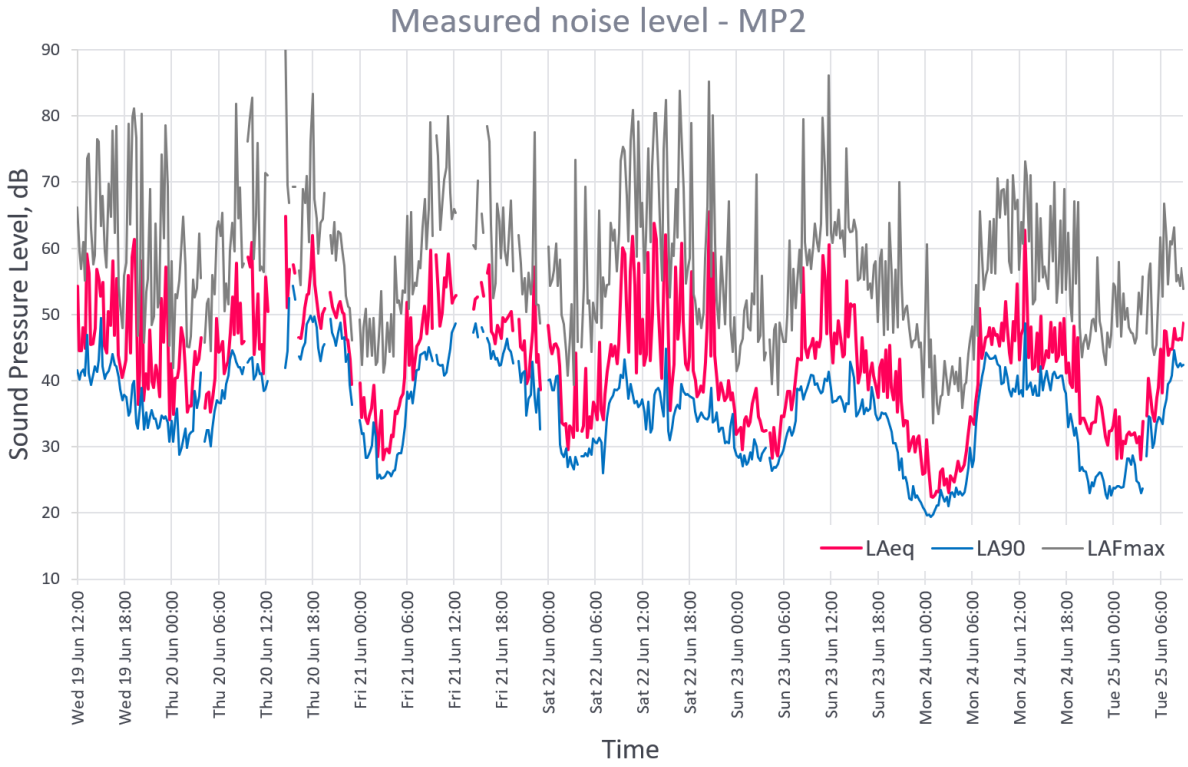


Figure 11: MP2 Full noise data



Measurement Position 3 (MP3)

Date: 11 July – 22 July, 2024

Coordinates: -45.8518056
170.3729639

Weather: Periods of wind > 5 m/s and rain excluded from data

Weather data sourced from Invercargill airport weather station

Instrumentation: 01 dB Cube, serial 11190
Larson Davis Type CAL200 calibrator, serial 19792

Calibration: Field calibration of the equipment was carried out before measurements, and the calibration checked after measurements. Observed change less than 1 dB

Table 15: Noise monitoring results

Date	Measured noise level (dB)			
	Day		Night	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
11/07/2024 [1]	51	36	44	29
12/07/2024	52	42	46	31
13/07/2024	49	39	53	41
14/07/2024	48	35	42	27
15/07/2024	51	37	44	26
16/07/2024	49	36	40	21
17/07/2024	49	36	37	22
18/07/2024	51	38	41	22
19/07/2024	50	42	44	34
20/07/2024	52	37	42	30
21/07/2024	50	35	41	25
22/07/2024 [1]	52	43	40	30

[1] Partial day

Figure 12: MP3 Diurnal noise

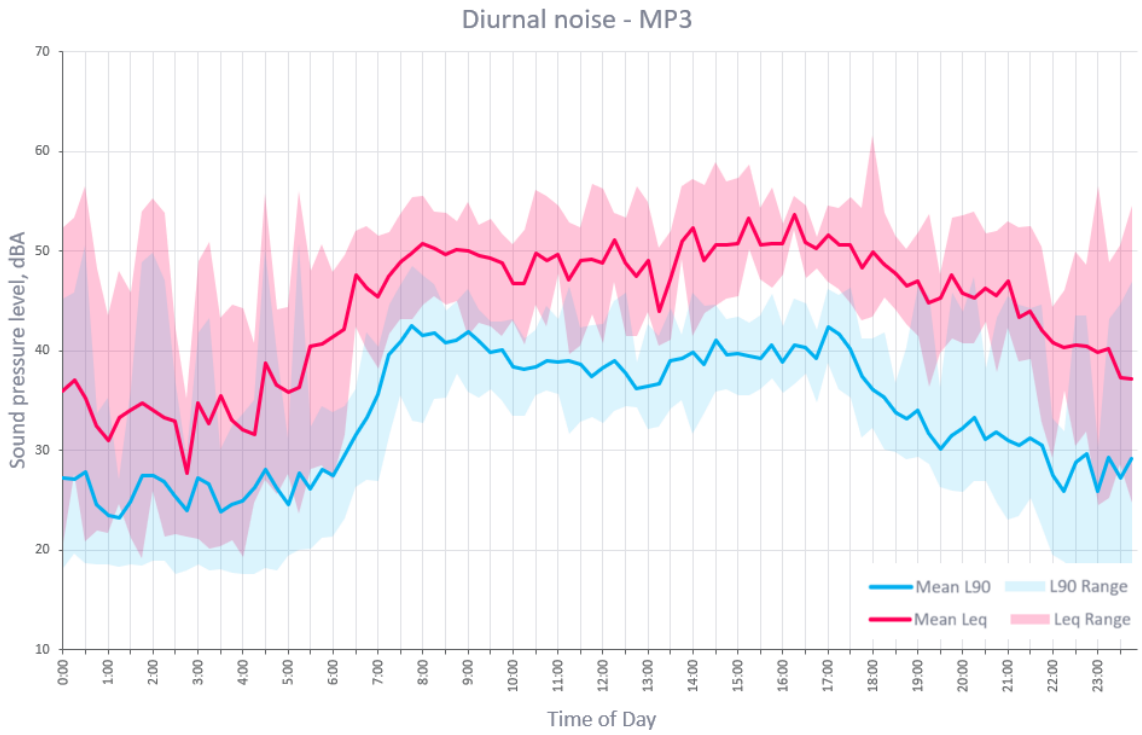
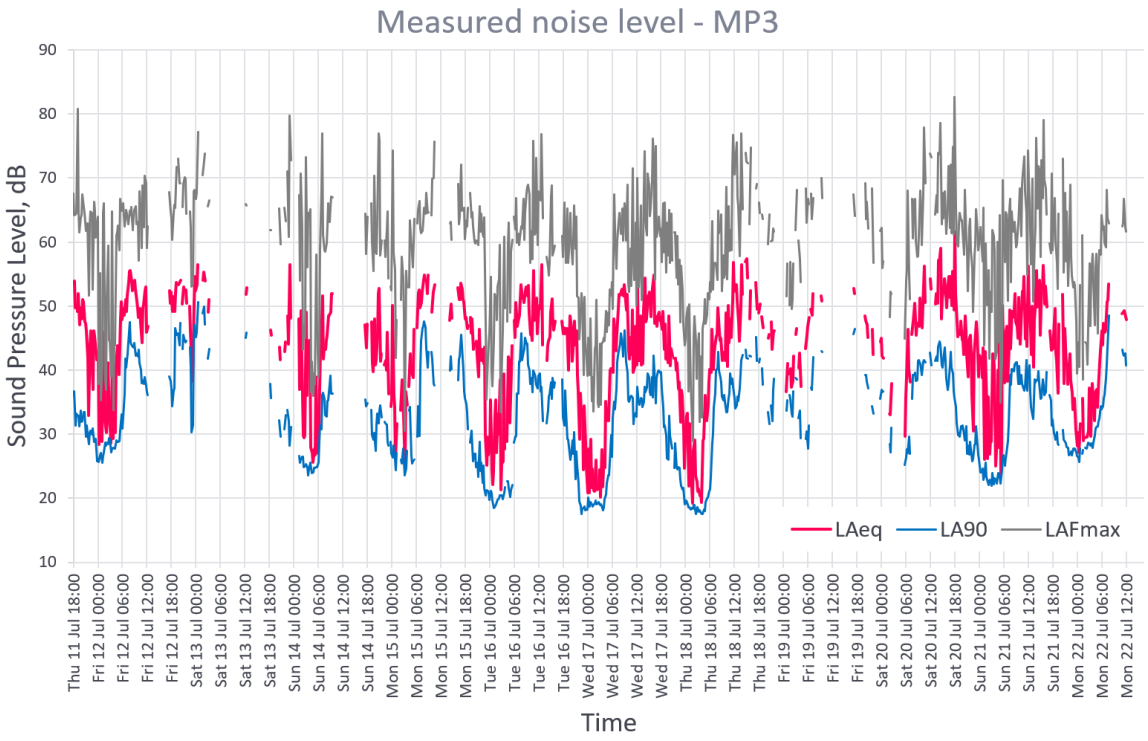


Figure 13: MP3 Full noise data



APPENDIX E 2GP CONSTRUCTION NOISE (RULE 4.5.4.1)

4.5.4.1 Construction and site investigation noise

a. Construction and site investigation must not exceed the relevant noise limits in Rule 4.5.4.1.a.i, Rule 4.5.4.1.a.ii and Rule 4.5.4.1.a.iii at any building that is occupied during the construction and site investigation works. Noise must be measured and assessed in accordance with NZS6803:1999 Acoustics Construction Noise:

i. Construction and site investigation noise received at any building that is occupied during the construction works in the following locations must not exceed the noise limits in the following table, except where Rule 4.5.4.1.X applies:

1. residential zones;
2. dwellings in rural and rural residential zones; and
3. buildings housing noise sensitive activities in the Recreation Zone, centres zones, SSYP, and major facility zones other than Port Zone:

Time of week	Time period	Duration of work					
		1. Typical duration (dBA)		2. Short-term duration (dBA)		3. Long-term duration (dBA)	
		LAeq	Lmax	LAeq	Lmax	LAeq	Lmax
Weekdays	1. 6.30am - 7.30am	60	75	65	75	55	75
	2. 7.30am - 6.00pm	75	90	80	95	70	85
	3. 6.00pm - 8.00pm	70	85	75	90	65	80
	4. 8.00pm - 6.30am	45	75	45	75	45	75
Saturdays	5. 7.30am - 6.00pm	75	90	80	95	70	85
	6. 6.00pm - 7.30am	45	75	45	75	45	75
Sundays and Public Holidays	7. 7.30am - 6.00pm	55	85	55	85	55	85
	8. 6.00pm - 7.30am	45	75	45	75	45	75

ii. Construction and site investigation noise received at any building that is occupied during the construction and site investigation works in the Industrial, Industrial Port and Port zones at buildings that do not house a noise sensitive activity must not exceed the noise limits in the following table, except where Rule 4.5.4.1.X applies:

Time period	Duration of work		
	1. Typical and long-term duration	2. Short-term duration	3. NA
	LAeq (dBA)	LAeq (dBA)	NA
1. 7.30am - 6.00pm	75	80	NA
2. 6.00pm - 7.30am	80	85	NA

b. NA

c. Activities that contravene this performance standard in any of the following ways are discretionary activities:

i. activities that contravene Rule 4.5.4.1.a by less than 5dBA;

ii. activities that contravene Rule 4.5.4.1.a by 5dBA or more, in the commercial and mixed use zones between 7.00am and 10.00pm;

iii. activities that contravene Rule 4.5.4.1.X.i, iii or iv in the commercial and mixed use zones;

iv. activities that contravene Rule 4.5.4.1.a by 5dBA or more in the Port, Industrial Port and Industrial zones; or

v. activities that contravene Rule 4.5.4.1.X in Port, Industrial Port and Industrial zones.

d. Activities that contravene this performance standard other than provided for in 4.5.4.1.c are non-complying activities.

e. For the purposes of Rule 4.5.4.1 "short-term duration" means construction and site investigation work at any one location for up to 14 calendar days per project; "typical duration" means construction and site investigation work at any one location for more than 14 calendar days but less than 20 weeks per project; and "long-term duration" means construction and site investigation work at any one location with a duration exceeding 20 weeks per project.

APPENDIX F 2GP CONSTRUCTION VIBRATION (RULE 4.5.4.X)

4.5.4.X Construction and site investigation vibration

a. Construction and site investigation vibration received at occupied buildings in any zone must not exceed the following amenity vibration limits:

Location	Time Period	Vibration Limit (mm/s PPV)	Assessment Locations
A building housing a noise sensitive activity	7.00am to 10.00pm	2 mm/s PPV	In the corner of the floor of the storey of interest for any occupied multi-storey building, or within 500mm of ground level at the foundation of any occupied single storey building.
	10.00pm to 7.00am	0.3 mm/s PPV	
All other buildings	At all times	2 mm/s PPV	

i. Except that this standard does not apply to:

1. Vibration received at a building on the same site as the construction and site investigation activity where the building and land on which the construction and site investigation activity is undertaken are in the same ownership; or

2. Vibration from construction and site investigation activity undertaken within a road where:
   1. the works cannot practicably comply with the vibration limits specified in standard 4.5.4.X.a;
   2. the number of days on which vibration is predicted to exceed the limits in standard 4.5.4.X.a at any building is three or less;
   3. the works in the road can be undertaken independently from any work on private land that is part of the same project; and
   4. occupants of all buildings where vibration is predicted to exceed the limits are advised in writing no less than three days before the vibration generating construction and site investigation works begin. The written notice must include the location and duration of the works, and a contact name and phone number for enquiries, questions or complaints. This requirement to provide written notice does not apply to emergency works.

3. Vibration that complies with a limit of 5 mm/s PPV unless a lower limit for avoiding building damage in rule 4.5.4.X.b applies, in which case the lower limit must be complied with; and
   1. Vibration occurs on a total of no more than three days at any one building per construction project and only between the hours of 7.00am and 6.00pm; and
   2. The occupants of all buildings where vibration is predicted to exceed 2 mm/s PPV are advised in writing no less than three days before the vibration-generating construction and site investigation works begin. The written advice must include the location and duration of the works, and a contact name and phone number for questions or complaints.

3. Vibration that complies with a limit of 5 mm/s PPV unless a lower limit for avoiding building damage in rule 4.5.4.X.b applies, in which case the lower limit must be complied with; and
   1. Vibration occurs on a total of no more than three days at any one building per construction project and only between the hours of 7.00am and 6.00pm; and
   2. The occupants of all buildings where vibration is predicted to exceed 2 mm/s PPV are advised in writing no less than three days before the vibration-generating construction and site investigation works begin. The written advice must include the location and duration of the works, and a contact name and phone number for questions or complaints.

b. Construction and site investigation vibration received at any buildings in any zone must not exceed the following building damage vibration limits:

Location	Time Period	Vibration Limit (mm/s PPV)	Measurement Location
Any building	At all times	The guideline vibration velocity values (PPV) set out in the German Standard DIN 4150-3:2016 *Vibration in buildings - Part 3: Effects on Structures*	In accordance with the requirements of DIN 4150-3:2016

i. Except that this standard does not apply to vibration received at a building on the same site as the construction and site investigation activity, and the building and land on which the construction and site investigation activity is undertaken are in the same ownership, provided that:
   1. where the building or structure is a scheduled heritage building or scheduled heritage structure, a suitably qualified person certifies that the works can be undertaken without causing structural damage to the scheduled heritage building or structure.

ii. Vibration generated by construction and site investigation must be assessed using peak particle velocity (PPV). This is consistent with the metrics used in ISO 4866:2010 Mechanical vibration and shock.

iii. Scheduled heritage buildings and scheduled heritage structures are always considered to be 'structures that are particularly sensitive to vibration and are of great intrinsic value' in terms of assessment under DIN 4150–3:2016.

c. Activities that contravene this performance standard are discretionary activities.

Vibration Performance Standards - Cosmetic Building Damage

Construction vibration to be measured and assessed in accordance with German Standard DIN 4150-3:2016 "*Vibrations in buildings – Part 3: Effects of vibration on structures*".

The short-term (transient)[6] vibration limits in Table 16 apply at building foundations in any axis.

The long-term (continuous)[7] vibration limits in Table 16 apply at all floor levels, but levels are normally highest in horizontal axes on the top floor.

DIN 4150-3 limits are for avoiding 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 Standard states: "*Experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur*." Much higher vibration levels (i.e. an order of magnitude higher) would be needed for potential structural damage.

[6] 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*"

[7] Long-term (continuous) vibration includes types not covered by the short-term vibration definition

Figure 14: Short-term (transient)[1] vibration at building foundations (DIN 4150-3 2016: Figure 1)

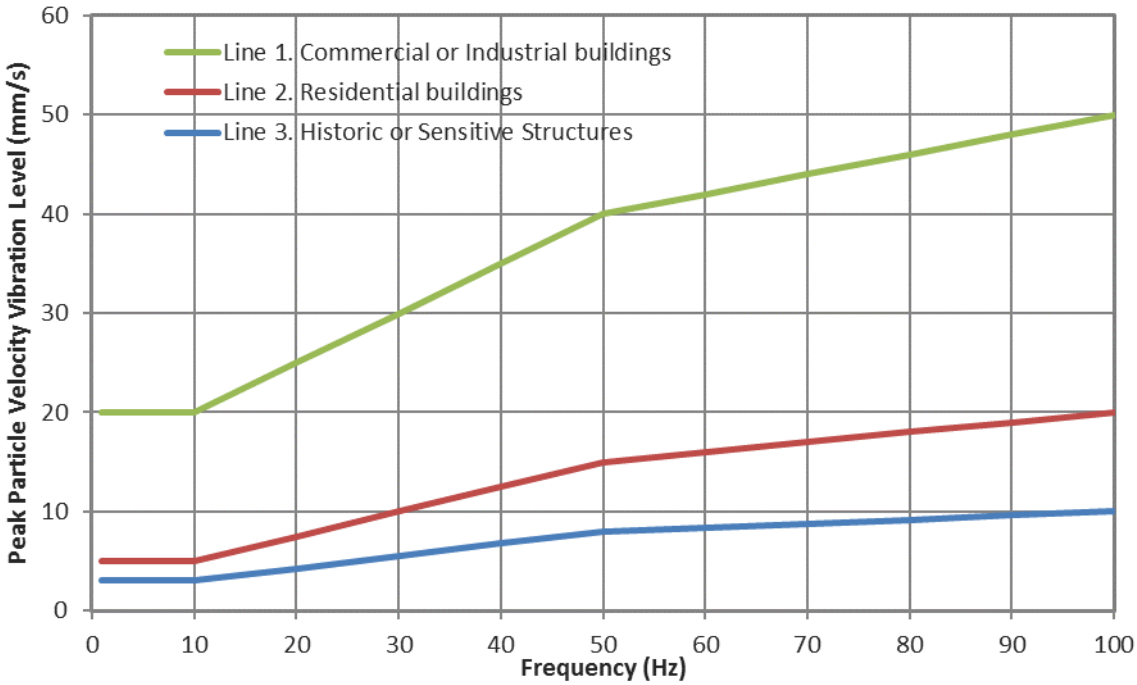


Table 16: Vibration at horizontal plane of highest floor (DIN 4150-3 2016: Tables 1 and 4)

Building Type	Peak Particle Velocity Vibration Level (mm/s)	
	Short-term (transient)	Long-term (continuous)
Line 1. Commercial or Industrial	40	10
Line 2. Residential	15	5
Line 3. Vibration sensitive	8	2.5

DIN 4150-3 states that Line 3 should be used for buildings "*that, because of their particular sensitivity to vibration, cannot be classified under Lines 1 and 2* ***and*** *are of great intrinsic value (e.g. listed building)*".

APPENDIX G NOISE SOURCE DATA

Table 17: Sound power levels of proposed equipment

Item	Plant and equipment	Sound power (dB L_w)
1	Straddle carriers (Hybrid)	104
2	Reach stackers	111
3	Side lifters	111
4	Fork lift	95
5	Container wash	101
6	Workshop activity	103

APPENDIX H NOISE CONTOUR PLOTS

231 Dukes North Road

273 Dukes North Road

340 Dukes North Road

222 Stedman Road (North)

245 Puddle Alley

222 Stedman Road (Centre)

222 Stedman Road (South)

183 Puddle Alley

54 Rutherford Road

55 Rutherford Road

50 Rutherford Road

Sound level
dB $L_{Aeq(15\ min)}$

= 30
= 35
= 40
= 45
= 50
= 55
= 60

Legend

- Point source
- Line source
- Area source
- Main building
- Noise control wall
- Point receiver
- Noise protection berm

The noise contours in this figure were obtained by computer interpolation between calculated grid points. There is an interpolation accuracy of approximately ± 1.5 dB. For precise noise levels at specific locations, refer to point receiver calculations (if applicable)

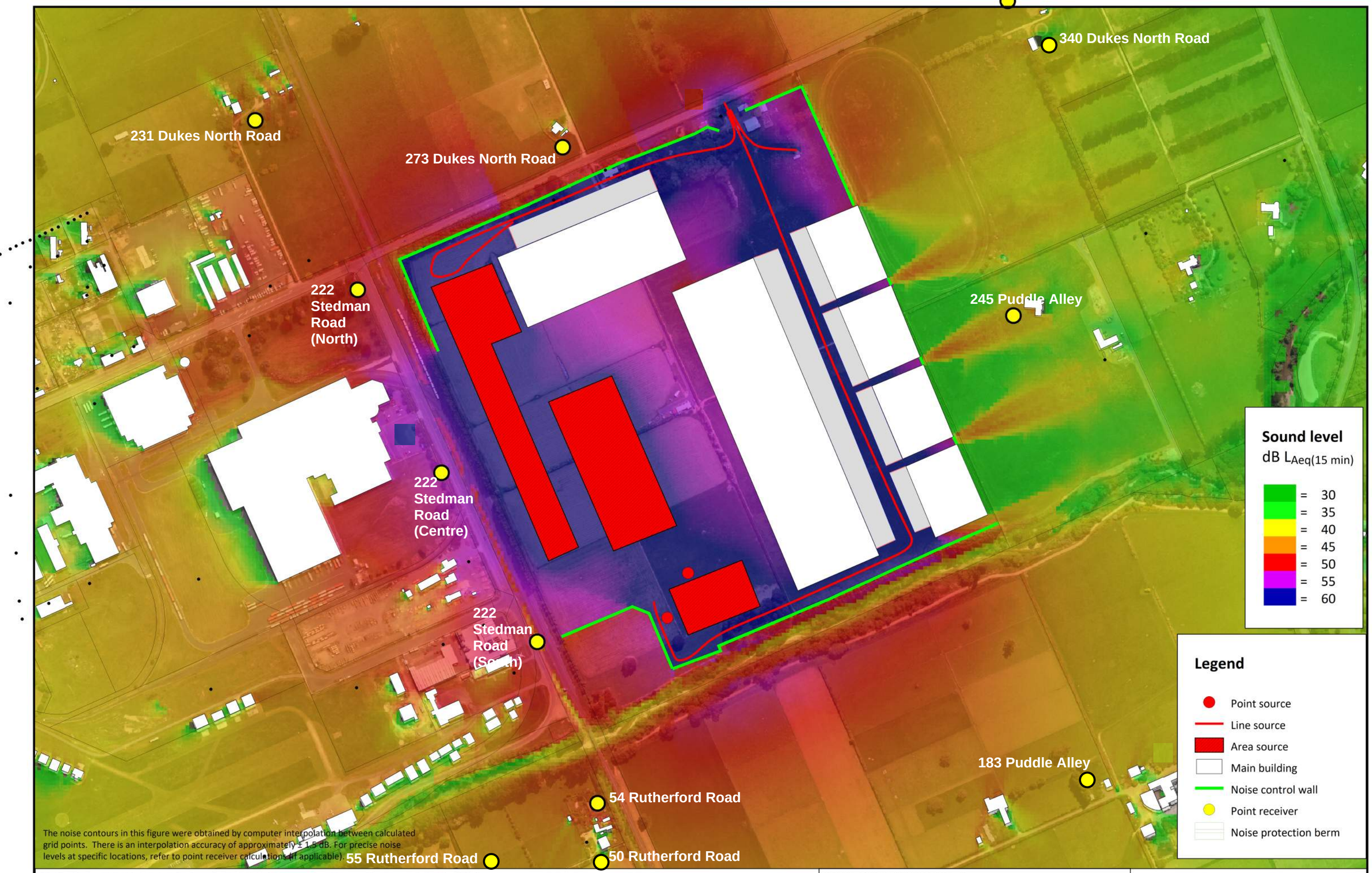
MARSHALL DAY Acoustics

Southern Hub Edge
Stage 1 Daytime Operation

Project: Southern Edge Hub Mosgiel
Project no: 20240460 Run no: 44
Filename: Sn 016 Daytime Stage 1 Jan 2026 Layout
Prepared by: JG Date: 26/02/2026

0 20 40 80 120 160 m

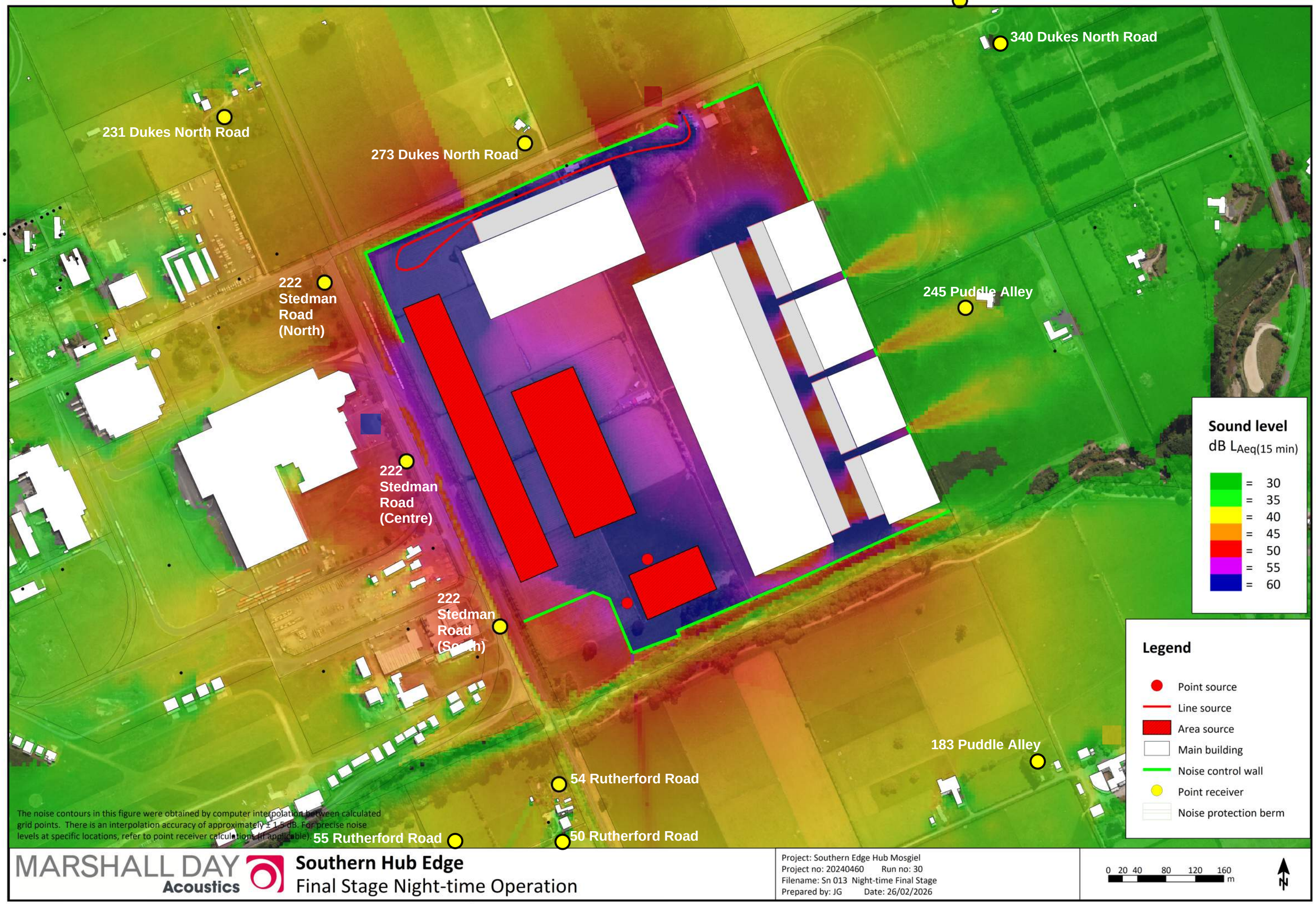
N



MARSHALL DAY Acoustics

Southern Hub Edge
Final Stage Daytime Operation

Project: Southern Edge Hub Mosgiel
Project no: 20240460 Run no: 41
Filename: Sn 012 Daytime Final Stage
Prepared by: JG Date: 26/02/2026


231 Dukes North Road
273 Dukes North Road
340 Dukes North Road
222 Stedman Road (North)
245 Puddle Alley
222 Stedman Road (Centre)
222 Stedman Road (South)
183 Puddle Alley
54 Rutherford Road
55 Rutherford Road
50 Rutherford Road
Sound level
dB $L_{Aeq(15\ min)}$
= 30
= 35
= 40
= 45
= 50
= 55
= 60
Legend
Point source
Line source
Area source
Main building
Noise control wall
Point receiver
Noise protection berm
The noise contours in this figure were obtained by computer interpolation between calculated grid points. There is an interpolation accuracy of approximately ± 1.5 dB. For precise noise levels at specific locations, refer to point receiver calculations (if applicable)
MARSHALL DAY Acoustics
Southern Hub Edge
Final Stage Night-time Operation
Project: Southern Edge Hub Mosgiel
Project no: 20240460 Run no: 30
Filename: Sn 013 Night-time Final Stage
Prepared by: JG Date: 26/02/2026
0 20 40 80 120 160 m
N

BRENDON SHANKS

Acoustic Consultant

Brendon Shanks is an associate in the Dunedin office, with experience in both environmental noise and building acoustics. Brendon's interest in acoustics stems from a passion for choral music and a background in physics.

Brendon started with Marshall Day in 2007, leaving in 2011 to live in London for a five year period. During his time in the UK he worked as a Consultant at Jacobs SKM, and a Senior Acoustic Engineer at Sandy Brown Associates.

Brendon has worked extensively in port noise projects, including Port of Auckland, Lyttleton Port, and Port Otago, providing planning support, technical guidance, management of noise, and analysis of noise monitoring. In addition to this, he has provided planning support for projects in the mining and power sectors and has presented evidence as an expert witness at Council hearings and in the Environment Court.

His project experience is supplemented by his use of acoustic calculation software for environmental noise propagation.

QUALIFICATIONS

- Bachelor of Science - Physics
- Bachelor of Music
- Member of the Acoustical Society of New Zealand
- Member of the Institute of Acoustics (UK)

RELEVANT PROJECT EXPERIENCE

CityDepot | Lyttleton Port Company

The CityDepot container hub (Lyttleton Port Company) is a container storage facility with residential receivers nearby. Many of the activities undertaken on the CityDepot site are similar to those proposed at the Southern Link site. The project included preparing an updated noise management plan for the site. This included assessing different activities and developing best practice management measures to reduce noise effects. In addition to this, biannual noise monitoring is conducted around the site to determine compliance with the relevant noise criteria.

Port Otago Noise Assessment | Port Otago Ltd

This project involves several elements of noise assessment and technical guidance. It includes providing independent advice to the Port Otago Port Noise Liaison Committee. This involves preparing and revising a noise model of the Port Chalmers port operation, analysing noise monitoring data from the fixed monitors in the community, and attending regular Committee meetings to present updates on noise issues and to answer technical questions from Committee members. The noise sources associated with the Southern Link project are largely the same as those at the Port Chalmers site.