



**APPENDIX K**

**NAPIER PORT WHARF  
NO. 6 FUTURE PORT  
NOISE MAPS**

**NAPIER**  
**PORT**



VEROS

MARSHALL DAY  
Acoustics 

PORT OF NAPIER  
WHARF 6 FUTURE PORT NOISE MAPS (2026)  
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Project: **FUTURE PORT NOISE MAPS (2026)**

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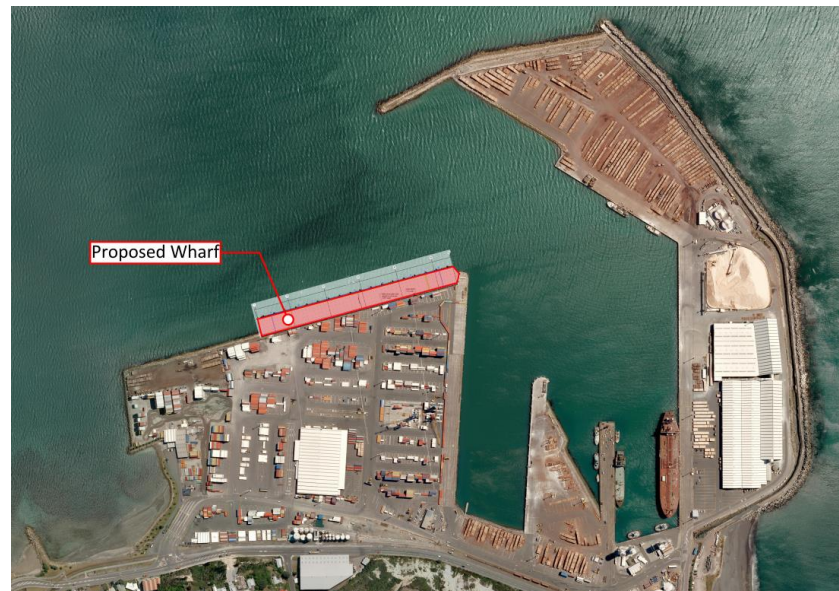
**1.0 INTRODUCTION**

Marshall Day Acoustics Limited (MDA) first prepared a noise model for Port of Napier in 1994. The noise model has regularly been reviewed to establish the operative City of Napier District Plan Port Noise Control Boundaries, evaluate future development options and reflect changes in current operations.

Port of Napier Ltd is seeking consent to build a new wharf ('Wharf 6') on the north side of the existing container terminal (refer Figure 1 below). Wharf 6 is proposed to be 350m long and 34m wide.

Port of Napier has engaged Marshall Day Acoustics Limited (MDA) to review forecast future operations to assess ongoing compliance with the District Plan noise rules. This report presents future noise contours for the peak period in 10 years (2026) incorporating the revised port layout (i.e. with Wharf 6) and forecast growth in operations.

**Figure 1: Aerial Map showing proposed location of Wharf 6**



Note:

- This report relates to port operations noise only. A separate acoustic report has been prepared to address temporary noise associated with the construction of Wharf 6 (refer MDA report Rp 001 2016446A).
- A glossary of technical terms is included in Appendix A.

**2.0 PORT NOISE STANDARD (NZS 6809: 1999)**

**2.1 Overview**

Noise from Port Napier is experienced primarily on the landward side of the mean high water springs, and is managed in terms of the Napier City District Plan. The District Plan's provisions have been developed in terms of New Zealand's Port Noise Standard.

The objective of NZS 6809 is to ensure the long-term compatibility of ports and their neighbours by the application of appropriate land use planning techniques. The Standard recognises the need for ports to operate in an effective manner and provides guidelines to ensure that the adjacent residential communities can co-exist with ports and their associated activities.

The Standard uses the concept of *Inner and Outer Control Boundaries* which it recommends be incorporated onto planning maps in the District Plan. Each boundary has an associated range of permitted and conditional activities. Furthermore, port companies and port users should implement management plans to manage and monitor noise from their operations, with the aim of progressively reducing noise levels wherever practicable.

The *Inner and Outer Control Boundaries* are based around an acoustic parameter called the *Day/Night Level* or  $L_{dn}$  and measured in dBA. This parameter is essentially the energy average sound level calculated over a 24-hour period. Night-time noise is adjusted by adding 10 dBA in order to reflect the greater sensitivity to noise at night. For NZS6809, the *Inner and Outer Control Boundaries* equate to a predicted noise level over a 5 day period of 65 dBA  $L_{dn}$  and 55 dBA  $L_{dn}$  respectively.

**2.2 Port Noise Boundaries**

The control boundaries are derived from the noise contours for the predicted peak operations period in the lifetime of the District Plan, which is typically 10 years in the future. The control boundaries are inclusive, following cadastral boundaries.

For existing ports, NZS 6809: 1999 recommends the noise limits in Table 1 below.

**Table 1: Noise Limits for existing ports**

| Location  | Day-night (Long term)                             | Night-time (Short term)  |
|---|---|--|
| At any point on land at, or beyond, the inner control boundary (i.e. beyond Area A) | 65 dB $L_{dn}$ (5 days)<br>68 dB $L_{dn}$ (1 day) | 60 dB $L_{Aeq}$ (9 hrs)<br>65 dB $L_{Aeq}$ (15 min)<br>85 dB $L_{AFmax}$ |

Note: Daytime is defined as 0700 – 2200 on any day  
Night time is defined as 2200 – 0700 the following day

These limits have been applied to Port Napier's projected activities over the past two decades, and the inner and outer control boundaries have been incorporated in the District Plan, along with

relevant rules. Port noise level must stay within these boundaries in order to comply with the District Plan.

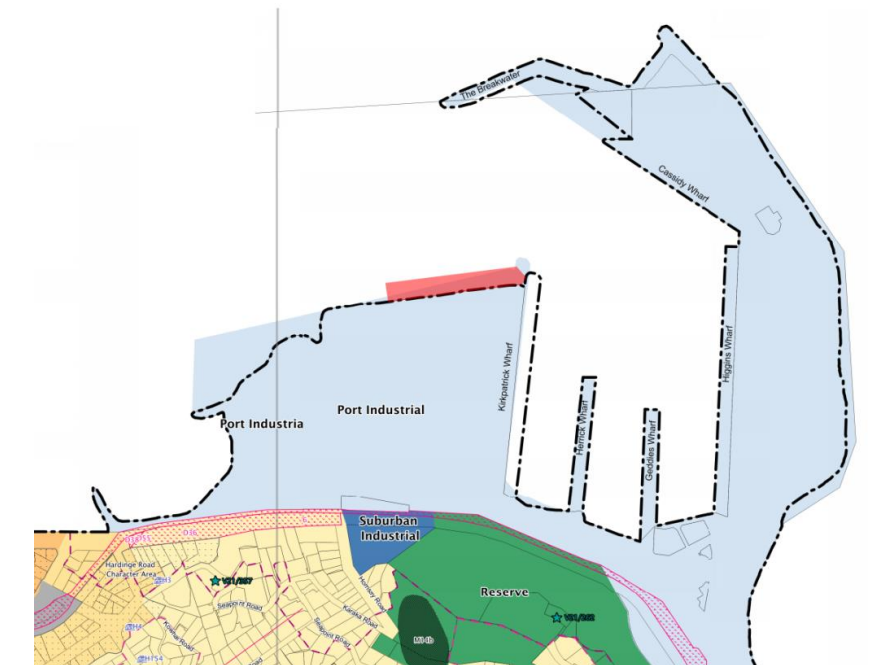
The operative Port Noise Boundaries extend into the Harginge Road Residential and Northern Residential areas at the east end of Ahuriri, and Napier Character Hill Residential on the north side of Napier Hill (refer planning maps F7 and F8). The rules that apply to port noise are set out in Appendix B.

Port of Napier has also implemented a Noise Management Plan (NMP) in accordance with the requirements of NZS 6803: 1999 and District Plan rule 28.15.1 (b). Information on port noise, including the current version of the NMP is available on the Port of Napier website: <http://www.napierport.co.nz/community/sustainability/>.

**2.3 Hawke's Bay Regional Coastal Environment Plan (RCEP)**

With reference to Figure 2 and Figure 3 (overleaf), Wharf 6 is located in the Port Management Area of the Coastal Marine Area (CMA). The Hawke's Bay Regional Coastal Environment Plan including Policies in Chapter 25 and Rule 177, align with equivalent controls in the Napier District Plan provisions discussed in Section Section 2.2 above. This is a normal way to manage such cross-boundary effects.

**Figure 2: City of Napier District Plan (Proposed Wharf 6 in Red)**



**Figure 3: Hawke's Bay Regional Coastal Plan (Proposed Wharf 6 in Orange)**



## 2.4 Current Port Noise Maps (2016)

MDA has undertaken attended noise monitoring to verify the shape of the modelled noise contours, and annually reviews noise monitoring data from the Bluff Hill Noise Monitoring Terminal (NMT) to calibrate the port noise model. The Bluff Hill NMT is located within the Port Inner Noise Boundary (i.e. closer to the Port). Therefore conservatively, compliance is achieved if the noise limits are not exceeded at the Bluff Hill NMT.

The current operational scenario was recently updated in July 2016 (refer MDA report Rp 002 r01 2015784A). In summary, the noise contours remain compliant with District Plan rule 28.15.1 part (a).

## 2.5 Future Port Noise Maps (2026)

The objective of this report is to prepare a comparable future noise model for forecast peak period operations in 10 years (2026). The results enable evaluation of the predicted change in port noise emissions and its ability to continue to comply with District Plan rule 28.15.1 part (a).

## 3.0 MODELLING METHODOLOGY

### 3.1 Overview

A computer-based noise model is used to predict the ‘average’ noise emissions from the Port over a peak five-day operating period. The model consists of the following parts that must be accurate in order for the noise contours to be reliable:

- **Noise sources**  
The equipment reference noise levels are representative. Measurements have been made of representative Port machinery to determine the sound power levels in the model.
- **Operational scenario**  
The operational assumptions are representative, including the location of sources and their operational duration. This has been developed and reviewed with the Port on a regular basis.
- **Modelling methodology**  
The software takes into account attenuation due to distance, shielding, ground absorption, topography, air absorption and assigns the night weighting of the  $L_{dn}$  index. It enables both individual and cumulative assessment of noise emissions.
- **Calibration**  
The model relies on short-term and long-term monitoring to verify shape of the overall level of the contours and calibrate the model.

### 3.2 Noise Sources

The noise source data for the model was prepared from measurements carried out on Port of Napier machinery. In some cases, equipment information was supplemented with representative data measured at other Ports (e.g. ships) in order to make it more complete.

In every case, the octave band spectrum of the noise source was measured at a known distance while the equipment undertook several cycles of operation. From this data, the sound power level of the equipment was calculated. The calculated sound powers were cross checked against data for similar equipment. Table 2 summarises the sources used in the 2016 and 2026 noise models.

**Table 2: Noise sources used in the operational noise models**

| Noise Sources used in Model*                  | Sound Power Level (dB $L_{wA}$ ) |
|---|----------------------------------|
| Cranes  | 110 – 115                        |
| Ships   | 105 – 115                        |
| Reach stackers / large forklifts / excavators | 105 – 110                        |
| Log Loaders / Large Trucks                    | 100 – 110                        |
| Small fork-lifts                              | 90 – 95                          |
| Reefer units                                  | 85 – 110                         |

\* Trains and vehicles on public roads are excluded from port noise contours

### 3.3 Operational Scenarios

City of Napier District Plan Rule 28.15.1 parts (b-f) relate to noise monitoring, mitigation, management and liaison with respect to the ‘Current Port Noise Maps’. The Current Port Noise Maps are produced from the ‘busy 5-day’ operational scenario model, which is updated annually. The Port operational input assumptions are essential to ensure the model reflects the peak 5-day period of maximum cargo throughput or activity.

The modelling assumptions include a description, the number of, and an equivalent ‘on-time’ description for each noise source. The ‘on-time’ operational profile is explained by way of the following four examples from Figure 2 of the Current Port Noise Maps (2016) included in Appendix C:

- **Item A1: ‘Logging trucks (east gate – log yard)’**  
This represents truck movements between the east gate and log yard on Wharf 1, where two movements are required for one return trip. The average ‘5-day movements’ for the noise source is split into day (0700-2200) and night (2200-0700) periods to enable application of the night weighting in the  $L_{dn}$  index. The sound power level of one truck is modelled travelling along the line shown in Figure 4 at an average speed of 15km/hr. The number of movements is input as 364 trucks movements per day and 28 movements per night over the 5-day period (i.e. 1820 day and 140 night movements over the modelled 5 day period).
- **Item A2: ‘Log Loaders (truck unloading)’**  
This represents log loaders operating on Wharf 1. The sound power level of each unit is included at various representative locations identified in Figure 4. The daytime ‘on-time’ summary description ‘75% 13h 5d’ indicates that the equipment is typically utilised 75% of an activity period spanning 13 hours on all 5 days. There are three of these sources included in the model, as denoted in the ‘No.’ column.
- **Item E1: ‘Reefers (24 chiller units stack 6wx4h)’**  
This represents a stack of 24 reefer units, arranged 6 units wide by 4 units high. The cumulative sound power level for 24 units is evenly distributed over one end of the stack, facing the tower that provides electricity to the units. The location of the stacks is shown in Figure 4. The ‘on-time’ takes into account typical duty cycle times.
- **Item E5: ‘R&D / Depot Reach Stacker (10 units)’**  
This represents ten reach stackers operating in the container terminal. The cumulative sound power level is for ten units evenly distributed over its region of operation shown in Figure 4.

### 3.4 Modelling Methodology

The noise model has been prepared using SoundPLAN, an internationally recognised computer noise modelling programme. SoundPLAN uses a digital topographical terrain map of the area as its base. Each noise source is located at an appropriate height above the digital map and the software then calculates noise propagation in multiple directions, allowing for buildings, topography, shielding, reflections and meteorological conditions.

The SoundPLAN model uses the calculation algorithms of ISO 9613-2: 1996 'Acoustics – Attenuation of noise during propagation outdoors – Part 2: General method of calculation'. Its accuracy has been established by a number of field trials, including comparisons in New Zealand between predictions and measurements.

The model relies on the following geo referenced base data sourced from Napier City Council (May 2015):

- Topographical contours at 1m intervals
- Cadastral boundaries
- Building footprints and heights

The noise contours are obtained by computer interpolation between calculated grid points at 10m intervals.

### 3.5 Calibration

The 2016 annual monitoring review (to 30 June 2016) is summarised in Marshall Day Acoustics report Rp 002 r01 2015784A (6 July 2016).

The annual review is based on the measured ambient noise levels at the Bluff Hill Noise Monitoring Terminal (NMT), located near 3 Karaka Road. The Bluff Hill NMT is considered to provide a good point of reference for port noise levels received in the community. The NMT captures audio recordings of loud noise events to enable identification of the source and ensure validity of the measured data. It also enables identification of high noise sources for management purposes.

In summary, the review found that the port continues to comply with the 65 dB  $L_{dn(5\text{ day})}$  and 68 dB  $L_{dn(1\text{ day})}$  noise limits in rule 28.15.1 (a). It determined that the highest port noise controlled period measured 63.4 dB  $L_{dn(5\text{ day})}$  at the NMT for the period 15 to 20 March 2016. Note noise levels are normally reported to the nearest whole number, however to aid transparency, the calibration level is presented to one decimal place.

Environmental noise sources unrelated to the Port (such as wind, rain, cicadas, crickets and bird song) are often seasonal, easily identified and excluded through the annual review process. However, sporadic noise sources (such as public road, rail and air movements) are often difficult to identify, separate and exclude. It is estimated that on a normal day, noise sources unrelated to the Port contribute approximately 56 dB  $L_{dn}$ , elevating the measured noise level at the NMT by approximately 1 decibel during the peak operations period.

Therefore, the Current Port Noise Maps (2016) are calibrated to 62.4 dB  $L_{dn(5\text{ day})}$  at the NMT (i.e. 63.4 dB  $L_{dn(5\text{ day})}$  minus 1 decibel).

The results of an attended noise survey in 2012 have been used to verify the shape of the modelled noise contours at multiple locations. The agreement between predicted and measured contours is excellent ( $\pm 1$  dBA) at receiver positions with line of sight to the operations. Note that  $\pm 2$  dBA accuracy would normally be expected and is considered acceptable for environmental noise predictions.

The future noise model (2026) leverages from the current noise model (2016) with the same noise sources, operational assumptions (adjusted for forecast growth), modelling parameters and calibration adjustment. In summary, the future (2026) noise contours are predicted to be generally the same shape as the current (2016) noise contours, but 2 decibels louder (1.7 decibels at the NMT).

### 4.0 PORT NOISE MAPS

The Current Port Noise Maps (2016) are included in Appendix C and the Future Port Noise Maps (2026) are included in Appendix D.

For each set of noise maps, the Figures are summarised as follows:

- Figures 1 and 1A: The noise contours at 1.5m above ground level enable comparison with noise survey measurements undertaken in accordance with New Zealand Standard NZS 6801:2008 "Acoustics – Measurement of environmental sound", which is the revision of the 1999 version referred to in rule 28.15.1 (f).
- Figure 2: Presents the modelling inputs and assumptions.

It is considered that the calibrated current noise model (2016) provides an accurate representation of the existing peak operations period. Likewise, the calibrated future noise model (2026) provides an accurate representation of the potential peak operations period.

In summary, the future peak period operations in 2026 are predicted to remain compliant with District Plan rule 28.15.1 part (a).

### 5.0 CONCLUSIONS

MDA has updated the Port of Napier noise model to represent both current (2016) and future (2026) operations with Wharf 6 and forecast growth. It is considered that the noise model provides an accurate representation of current and future port noise emissions during peak operating periods.

In summary:

- The future (2026) noise contours are predicted to be generally the same shape as the current (2016) noise contours, but 2 decibels louder
- Port of Napier future operations are predicted to remain compliant with Napier District Plan noise rule 28.15.1 part (a)

**APPENDIX A GLOSSARY OF TERMINOLOGY**

|                                |  |
|--------------------------------|--|
| <b>NZS 6809:1999</b>           | New Zealand Standard NZS 6809:1999 “Acoustics – Port Noise Management and Land Use Planning”   |
| <b>dB</b>                      | Decibel. The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$  |
| <b>dba</b>                     | 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.   |
| <b>A-weighting</b>             | The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.   |
| <b><math>L_{Aeq}(t)</math></b> | The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.<br><br>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. |
| <b><math>L_{A90}(t)</math></b> | The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level.   |
| <b><math>L_{Amax}</math></b>   | The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.  |
| <b><math>L_{dn}</math></b>     | The day night noise level which is calculated from the 24 hour $L_{Aeq}$ with a 10 dB penalty applied to the night-time (2200-0700 hours) $L_{Aeq}$ .  |
| <b>Frequency</b>               | The number of pressure fluctuation cycles per second of a sound wave. Measured in units of Hertz (Hz).   |
| <b>Hertz (Hz)</b>              | Hertz is the unit of frequency. One hertz is one cycle per second. One thousand hertz is a kilohertz (kHz).  |
| <b>Noise</b>                   | A sound that is unwanted by, or distracting to, the receiver.  |
| <b>Ambient</b>                 | 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.   |

**APPENDIX B NAPIER DISTRICT PLAN, PORT INDUSTRIAL ZONE, RULE 28.15**

**28.15 Noise**

1. The following noise conditions shall apply to all land uses, other than those exempted in Rule 57.5 and container repair, and maintenance activities (See Rule 28.15.2 below):
  - a) All land uses within the zone must be conducted so as to ensure the following noise limits are not exceeded at any point beyond the Port Inner Noise Boundary shown on the planning maps:
 

|  |                        |
|--|------------------------|
| Over any 5 consecutive day period          | $L_{dn}$ 65 dBA        |
| On any day                                 | $L_{dn}$ 68 dBA        |
| 2200 hours to 0700 hours the following day | $L_{eq(9hour)}$ 60 dBA |
|  | $L_{eq(15min)}$ 65 dBA |
| 2200 hours to 0700 hours the following day | $L_{max}$ 85dBA        |

NOTE: To demonstrate non-compliance it shall only be necessary to show non-compliance with any one noise limit.
  - b) The Port Operator shall include in a Port Noise Management Plan minimum monitoring and reporting requirements for noise management as set out in Appendix 33A.
  - c) Where any noise sensitive activity is partly or wholly contained within the area seaward of a noise contour line that is 65 dBA  $L_{dn}$  (5 day average) as shown on the current Port Noise Contour Map attached to the Port Noise Management Plan; or
 

Where sound level monitoring indicates that port noise equals or exceeds 65 dBA  $L_{eq}$  (15 minutes 10pm-7am) on more than three occasions (more than 24 hours apart) during any rolling 12 month period within the boundary of a noise sensitive activity:

The Port Operator shall comply with the matters set out in Appendix 33B(1).
  - d) Where any noise sensitive activity is partly or wholly contained within the area seaward of a noise contour line that is 68 dBA  $L_{dn}$  (5 day average) as shown on the current Port Noise Contour Map attached to the Port Noise Management Plan; or
 

Where sound level monitoring indicates that port noise equals or exceeds 68 dBA  $L_{eq}$  (15 minutes 10pm-7am) on more than three occasions (more than 24 hours apart) during any rolling 12 month period within the boundary of a noise sensitive activity:

The Port Operator shall comply with the matters set out in Appendix 33B(2).
  - e) The Port Operator shall establish, maintain and participate in a Port Noise Liaison Committee which shall operate in accordance with the requirements set out in Appendix 33C.
  - f) Noise must be measured in accordance with the provisions of New Zealand Standard NZS6801:1999 “Acoustics: Measurement of Environmental Sound” and New Zealand Standard NZS6809:1999 “Acoustics: Port Noise Management and Land Use Planning”.



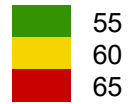
**APPENDIX C CURRENT PORT NOISE MAPS (2016)**

- Figure 1 Noise Contours 1.5m above ground (5 decibel intervals)
- Figure 2 Model 5-day Operational Scenario

**APPENDIX D FUTURE PORT NOISE MAPS (2026)**

- Figure 1 Noise Contours 1.5m above ground (5 decibel intervals)
- Figure 2 Model 5-day Operational Scenario

Noise level  
(dBA L<sub>dn</sub> 5-day)



Port Noise Boundaries

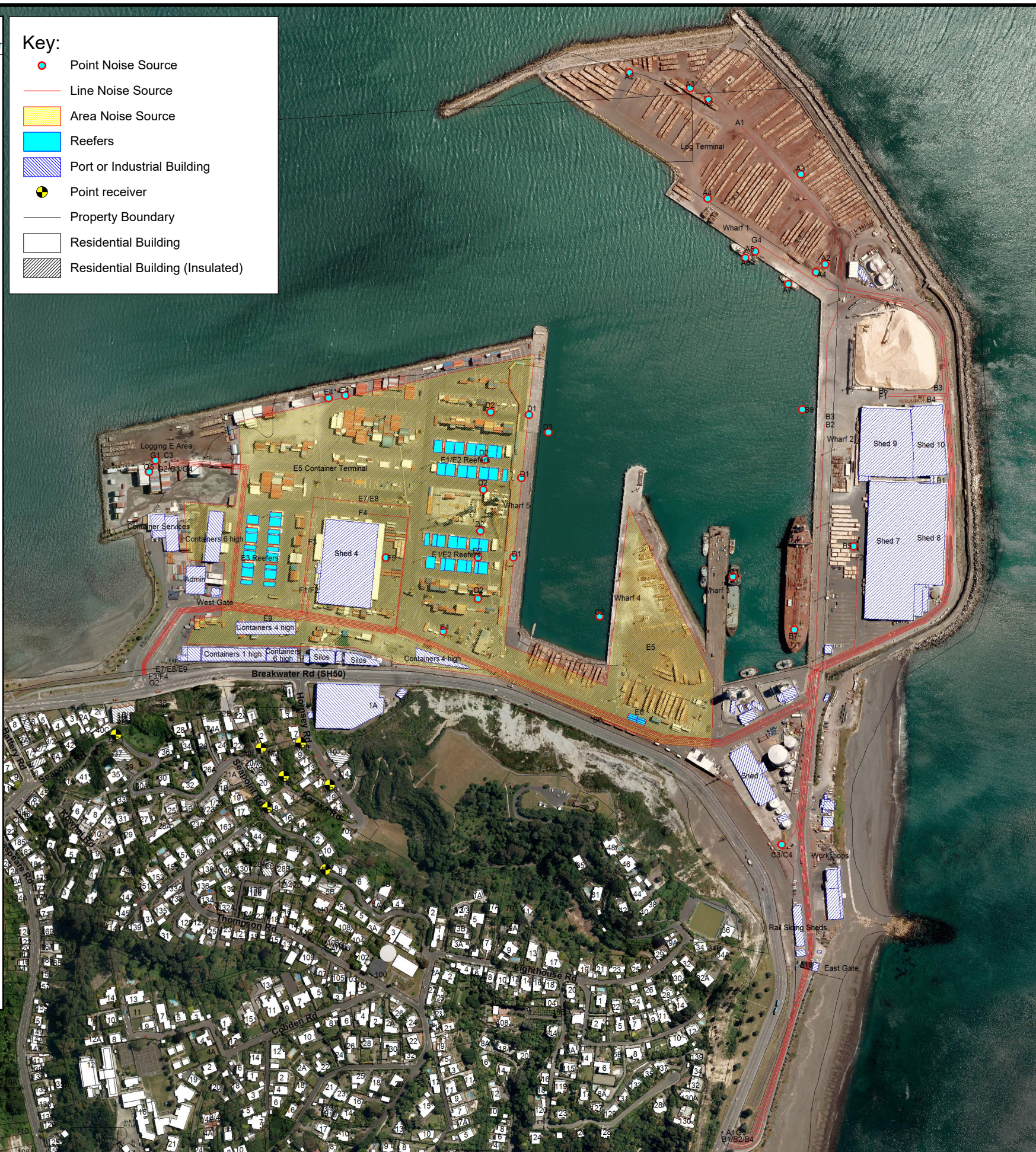
- Operative Inner Port Noise Boundary
- Operative Outer Port Noise Boundary



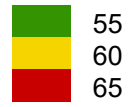
| Item  | Model Source Description                    | No. | Location<br>dgm + Z (m) X, Y | Site activities 'on-time' |               | Vehicle movements to/from site |               | km/hr |
|---|---|-----|------------------------------|---------------------------|---------------|--------------------------------|---------------|-------|
|   |   |     |                              | Day (07-22)               | Night (22-07) | Day (07-22)                    | Night (22-07) |       |
| <b>A "Sources A - Wharf 1.geo"</b>            |   |     |                              |                           |               |                                |               |       |
| A1  | Log Trucks (East gate - log yard)           | 1   | 2                            | -                         | -             | 364/d                          | 28/n          | 15    |
| A2  | Log Loaders (truck unloading)               | 3   | 3                            | 75% 13h 5d                | 75% 1h 5n     | -                              | -             | -     |
| A3  | Log High Stacker (log yard)                 | 2   | 2                            | 75% 13h 5d                | 75% 1h 5n     | -                              | -             | -     |
| A4  | Log Loaders (ship loading)                  | 2   | 3                            | 75% 15h 5d                | 75% 9h 5n     | -                              | -             | -     |
| A5  | Log Butting Tractor (log ship loading)      | 1   | 2                            | 75% 15h 5d                | 75% 9h 5n     | -                              | -             | -     |
| A6  | Log Excavators (4 units log ship stacking)  | 1   | 8                            | 100% 15h 5d               | 100% 9h 5n    | -                              | -             | -     |
| A7  | Log Ship (~179m, bow out)                   | 1   | 15                           | 60% 15h 5d                | 60% 9h 5n     | -                              | -             | -     |
| <b>B "Sources B - Wharf 2.geo"</b>            |   |     |                              |                           |               |                                |               |       |
| B1  | Fertiliser Trucks (East gate - Shed 8)      | 1   | 2                            | -                         | -             | 50/d                           | -             | 15    |
| B2  | Fertiliser Trucks (East gate - Wharf 2)     | 1   | 2                            | -                         | -             | 68/d                           | 4/n           | 15    |
| B3  | Fertiliser Trucks (Ship to Shed 10)         | 1   | 2                            | 20% 15h 5d                | 20% 9h 5n     | -                              | -             | -     |
| B4  | Fertiliser Trucks (East gate - Shed 10)     | 1   | 2                            | -                         | -             | 66/d                           | 22/n          | 15    |
| B5  | Diesel Forklift (Shed 7)                    | 1   | 1.5                          | 40% 15h 5d                | 40% 1h 5n     | -                              | -             | -     |
| B6  | WPI Truck (Rail siding - Shed 9)            | 1   | 2                            | -                         | -             | 9/d                            | 43/n          | 15    |
| B7  | Ship (~185m, bow out)                       | 1   | 15                           | 51% 15h 5d                | 51% 9h 5n     | -                              | -             | -     |
| B8  | Log Ship (~179m, bow out)                   | 1   | 15                           | 20% 15h 5d                | 20% 9h 5n     | -                              | -             | -     |
| <b>C "Sources C - Wharf 3 and 4.geo"</b>      |   |     |                              |                           |               |                                |               |       |
| C1  | Ship (~80m, bow in)                         | 1   | 10                           | 35% 15h 5d                | 35% 9h 5n     | -                              | -             | -     |
| C2  | Ship (~170m, bow in)                        | 1   | 15                           | 46% 15h 5d                | 46% 9h 5n     | -                              | -             | -     |
| C3  | Log Trucks (Rail siding - E Area)           | 1   | 2                            | -                         | -             | 10/d                           | -             | 10    |
| C4  | Log High Stacker (Rail siding)              | 1   | 2                            | 25% 13h 5d                | 25% 1h 5n     | -                              | -             | -     |
| <b>D "Sources D - Wharf 5.geo"</b>            |   |     |                              |                           |               |                                |               |       |
| D1  | Container Cranes                            | 3   | 10                           | 60% 15h 5d                | 60% 9h 5n     | -                              | -             | -     |
| D2  | Reach Stackers                              | 6   | 2                            | 60% 15h 5d                | 60% 9h 5n     | -                              | -             | -     |
| D3  | Container Ship (~269m, bow in)              | 1   | 20                           | 65% 15h 5d                | 65% 9h 5n     | -                              | -             | -     |
| <b>E "Sources E - Container Terminal.geo"</b> |   |     |                              |                           |               |                                |               |       |
| E1  | Reefers (24 chiller units stack 6wx4h)      | 14  | 0-10                         | 50% 15h 5d                | 50% 9h 5n     | -                              | -             | -     |
| E2  | Reefers (24 freezer units stack 6w x 4h)    | 14  | 0-10                         | 33% 15h 5d                | 33% 9h 5n     | -                              | -             | -     |
| E3  | Reefers Testing (6 unit rows 6w x 1h)       | 17  | 1.5                          | 25% 15h 5d                | 25% 9h 5n     | -                              | -             | -     |
| E4  | Generator (for overflow reefers)            | 3   | 2                            | 100% 15h 5d               | 100% 9h 5n    | -                              | -             | -     |
| E5  | R&D / Depot Reach Stacker (10 units)        | 1   | 2                            | 100% 15h 5d               | 20% 2h 5d     | -                              | -             | -     |
| E6  | Halls Reefers                               | 6   | 2                            | 33% 15h 5d                | 33% 9h 5n     | -                              | -             | -     |
| E7  | Container Trucks In (West gate to Wharf 5)  | 1   | 2                            | -                         | -             | 436/d                          | -             | 10    |
| E8  | Container Trucks Out (Wharf 5 to West gate) | 1   | 2                            | -                         | -             | 436/d                          | -             | 10    |
| E9  | Thames St Trucks                            | 1   | 2                            | -                         | -             | 139/d                          | 16/n          | 10    |
| <b>F "Sources F - Shed 4.geo"</b>             |   |     |                              |                           |               |                                |               |       |
| F1  | Pulp Truck (Shed 9 to Shed 4)               | 1   | 2                            | -                         | -             | 34/d                           | 2/n           | 15    |
| F2  | Pulp Truck (Shed 7 to Shed 4)               | 1   | 2                            | -                         | -             | 27/d                           | 2/n           | 15    |
| F3  | Pan Pac Trucks In (West gate to Shed 4)     | 1   | 2                            | -                         | -             | 30/d                           | 3/n           | 10    |
| F4  | Pan Pac Trucks Out (Shed 4 to West gate)    | 1   | 2                            | -                         | -             | 30/d                           | 3/n           | 10    |
| F5  | Diesel Forklift (Shed 4)                    | 1   | 1.5                          | 75% 15h 5d                | 75% 1.5 5n    | -                              | -             | -     |
| <b>G "Sources G - Logging E Area.geo"</b>     |   |     |                              |                           |               |                                |               |       |
| G1  | Log Loaders (truck loading/unloading)       | 1   | 3                            | 75% 13h 5d                | 75% 1h 5n     | -                              | -             | -     |
| G2  | Log Trucks (West gate - E Area)             | 1   | 2                            | -                         | -             | 74/d                           | -             | 10    |
| G3  | Log Trucks (East gate - E Area)             | 1   | 2                            | -                         | -             | -                              | 6/n           | 10    |
| G4  | Log Trucks (E Area - Logging Ship)          | 1   | 2                            | -                         | -             | 50/d                           | 30/n          | 15    |
| G5  | Log High Stacker (E Area)                   | 1   | 2                            | 60% 13h 5d                | 60% 1h 5n     | -                              | -             | -     |

**Key:**

- Point Noise Source
- Line Noise Source
- Area Noise Source
- Reefers
- Port or Industrial Building
- Point receiver
- Property Boundary
- Residential Building
- Residential Building (Insulated)

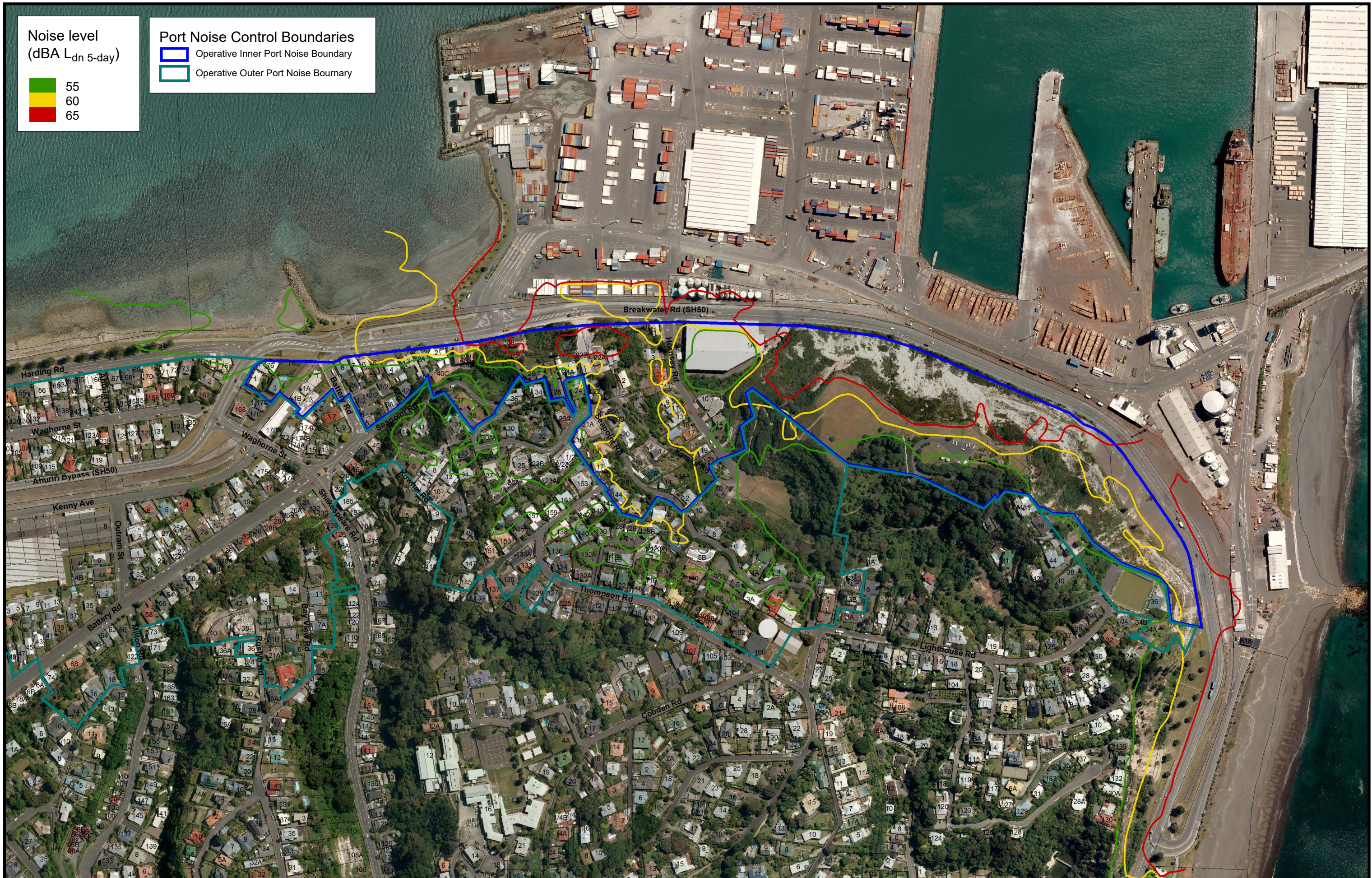


Noise level  
(dBA L<sub>dn</sub> 5-day)



Port Noise Control Boundaries

- Operative Inner Port Noise Boundary
- Operative Outer Port Noise Boundary



| Item  | Model Source Description                    | No. | Location<br>dgm + Z (m) X, Y | Site activities 'on-time' |               | Vehicle movements to/from site |               |       |
|---|---|-----|------------------------------|---------------------------|---------------|--------------------------------|---------------|-------|
|   |   |     |                              | Day (07-22)               | Night (22-07) | Day (07-22)                    | Night (22-07) | km/hr |
| <b>A "Sources A - Wharf 1.geo"</b>            |   |     |                              |                           |               |                                |               |       |
| A1  | Log Trucks (East gate - log yard)           | 1   | 2                            | -                         | -             | 950/d                          | 62/n          | 15    |
| A2  | Log Loaders (truck unloading)               | 5   | 3                            | 75% 13h 5d                | 75% 1h 5n     | -                              | -             | -     |
| A3  | Log High Stacker (log yard)                 | 3   | 2                            | 75% 15h 5d                | 75% 9h 5n     | -                              | -             | -     |
| A4  | Log Loaders (ship loading)                  | 3   | 3                            | 75% 15h 5d                | 75% 9h 5n     | -                              | -             | -     |
| A5  | Log Butting Tractor (log ship loading)      | 1   | 2                            | 75% 15h 5d                | 75% 9h 5n     | -                              | -             | -     |
| A6  | Log Excavators (4 units log ship stacking)  | 1   | 8                            | 100% 15h 5d               | 100% 9h 5d    | -                              | -             | -     |
| A7  | Log Ship (~179m, bow out)                   | 1   | 15                           | 100% 15h 5d               | 100% 9h 5n    | -                              | -             | -     |
| <b>B "Sources B - Wharf 2.geo"</b>            |   |     |                              |                           |               |                                |               |       |
| B1  | Fertiliser Trucks (East gate - Shed 8)      | 1   | 2                            | -                         | -             | 50/d                           | -             | 15    |
| B2  | Fertiliser Trucks (East gate - Wharf 2)     | 1   | 2                            | -                         | -             | 68/d                           | 4/n           | 15    |
| B3  | Fertiliser Trucks (Ship to Shed 10)         | 1   | 2                            | 25% 15h 5d                | 25% 9h 5n     | -                              | -             | -     |
| B4  | Fertiliser Trucks (East gate - Shed 10)     | 1   | 2                            | -                         | -             | 66/d                           | 22/n          | 15    |
| B5  | Diesel Forklift (Shed 7)                    | 1   | 1.5                          | 70% 15h 5d                | 70% 1h 5n     | -                              | -             | -     |
| B6  | WPI Truck (Rail siding - Shed 9)            | 1   | 2                            | -                         | -             | 9/d                            | 43/n          | 15    |
| B7  | Ship (~185m, bow out)                       | 1   | 15                           | 51% 15h 5d                | 51% 9h 5n     | -                              | -             | -     |
| B8  | Log Ship (~179m, bow out)                   | 1   | 15                           | 20% 15h 5d                | 20% 9h 5n     | -                              | -             | -     |
| B9  | Log Loaders (truck unloading)               | 1   | 3                            | 75% 13h 5d                | 75% 1h 5n     | -                              | -             | -     |
| B10   | Log High Stacker (log yard)                 | 1   | 2                            | 75% 15h 5d                | 75% 9h 5n     | -                              | -             | -     |
| <b>C "Sources C - Wharf 3 and 4.geo"</b>      |   |     |                              |                           |               |                                |               |       |
| C1  | Wharf 3 Ship (~80m, bow in)                 | 1   | 10                           | 35% 15h 5d                | 35% 9h 5n     | -                              | -             | -     |
| C2  | Wharf 4 Ship (~170m, bow in)                | 1   | 15                           | 46% 15h 5d                | 46% 9h 5n     | -                              | -             | -     |
| C3  | Log Trucks (Rail siding - E Area)           | 1   | 2                            | -                         | -             | 22/d                           | -             | 15    |
| C4  | Log High Stacker (Rail siding)              | 1   | 2                            | 56% 13h 5d                | 56% 1h 5n     | -                              | -             | -     |
| C5  | Log Trucks (East gate - log yard)           | 1   | 2                            | -                         | -             | 20/d                           | -             | 15    |
| C6  | Log Loaders (truck unloading)               | 1   | 3                            | 15% 15h 5d                | -             | -                              | -             | -     |
| C7  | Log High Stacker (log yard)                 | 1   | 2                            | 15% 15h 5d                | -             | -                              | -             | -     |
| <b>D "Sources D - Wharf 5 and 6.geo"</b>      |   |     |                              |                           |               |                                |               |       |
| D1  | Wharf 5 Container Cranes (mobile)           | 2   | 10                           | 15% 15h 5d                | 15% 9h 5n     | -                              | -             | -     |
| D2  | Wharf 5 Reach Stackers                      | 4   | 2                            | 15% 15h 5d                | 15% 9h 5n     | -                              | -             | -     |
| D3  | Wharf 5 Container Ship (~269m, bow in)      | 1   | 20                           | 20% 15h 5d                | 20% 9h 5n     | -                              | -             | -     |
| D4  | Wharf 6 Container Cranes (mobile)           | 3   | 10                           | 60% 15h 5d                | 60% 9h 5n     | -                              | -             | -     |
| D5  | Wharf 6 Reach Stackers                      | 6   | 2                            | 60% 15h 5d                | 60% 9h 5n     | -                              | -             | -     |
| D6  | Wharf 6 Container Ship (~290m centred)      | 1   | 20                           | 65% 15h 5d                | 65% 9h 5n     | -                              | -             | -     |
| <b>E "Sources E - Container Terminal.geo"</b> |   |     |                              |                           |               |                                |               |       |
| E1  | Reefers (24 chiller units stack 6wx4h)      | 28  | 0 - 10                       | 50% 15h 5d                | 50% 9h 5n     | -                              | -             | -     |
| E2  | Reefers (24 freezer units stack 6w x 4h)    | 28  | 0 - 10                       | 33% 15h 5d                | 33% 9h 5n     | -                              | -             | -     |
| E4  | Generator (for overflow reefers)            | 1   | 2                            | 100% 15h 5d               | 100% 9h 5n    | -                              | -             | -     |
| E5  | R&D / Depot Reach Stacker (15 units)        | 1   | 2                            | 100% 15h 5d               | 27% 9h 5n     | -                              | -             | -     |
| E6  | Halls Reefers                               | 6   | 2                            | 33% 15h 5d                | 33% 9h 5n     | -                              | -             | -     |
| E7  | Container Trucks In (West gate to Wharf 5)  | 1   | 2                            | -                         | -             | 1159/d                         | -             | 10    |
| E8  | Container Trucks Out (Wharf 5 to West gate) | 1   | 2                            | -                         | -             | 1159/d                         | -             | 10    |
| <b>F "Sources F - Shed 4.geo"</b>             |   |     |                              |                           |               |                                |               |       |
| F1  | Pulp Truck (Shed 9 to Shed 4)               | 1   | 2                            | -                         | -             | 60/d                           | 4/n           | 15    |
| F2  | Pulp Truck (Shed 7 to Shed 4)               | 1   | 2                            | -                         | -             | 47/d                           | 3/n           | 15    |
| F3  | Pan Pac Trucks In (West gate to Shed 4)     | 1   | 2                            | -                         | -             | 30/d                           | 3/n           | 10    |
| F4  | Pan Pac Trucks Out (Shed 4 to West gate)    | 1   | 2                            | -                         | -             | 30/d                           | 3/n           | 10    |
| F5  | Diesel Forklift (Shed 4)                    | 1   | 1.5                          | 100% 15h 5d               | 100% 1.5h 5n  | -                              | -             | -     |

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