BEFORE THE HEARING PANEL IN TIMARU

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of the hearing of submissions in relation to the Proposed Timaru District Plan

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STATEMENT OF PRIMARY EVIDENCE OF JEREMY TREVATHAN (ACOUSTICS) ON BEHALF OF PRIMEPORT TIMARU LIMITED AND TIMARU DISTRICT HOLDINGS LIMITED

HEARING STREAM F

Dated: 9 April 2025

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EXECUTIVE SUMMARY

1. My name is Jeremy William Trevathan. I am the Principal Acoustic Engineer and Director of Acoustic Engineering Services, an acoustic engineering consultancy with offices in Auckland, Wellington and Christchurch.

2. I have prepared this statement of evidence on behalf of PrimePort Timaru Limited (**PrimePort**) and Timaru District Holdings Limited (**TDHL**) in respect of matters arising from PrimePort's and TDHL's submissions and further submissions on the Proposed Timaru District Plan (**Proposed Plan**).

3. The Port Noise Control Boundaries have been developed based on the procedure described in the New Zealand Port Noise Standard NZS 6809:1999 and are representative of a realistic future operational scenario for port activities occurring within Precinct 7. An Inner Control Boundary (65 dB Ldn (5day)) and Outer Control Boundary (57 dB Ldn (5 day)) have been proposed (the **Port NCBs)**. New noise sensitive activities establishing within the Port NCBs must be provided with sound insulation.

4. There are several submissions which query the location of the Port NCBs, or how the noise insulation requirements should be applied. My evidence outlines that these concerns do not have a robust noise basis, and the wording as notified should be retained.

5. There are several submissions which discuss what noise limits should apply for activities outside Precinct 7 but inside the Port Zone. In my opinion it would be logical for the noise limits in Table 24 to apply for such activities, however I acknowledge that it may be difficult for some existing operators to comply with those noise limits, and a more nuanced approach may be needed.

QUALIFICATIONS AND EXPERIENCE

6. My full name is Jeremy William Trevathan. I am the Principal Acoustic Engineer and Director of Acoustic Engineering Services, an acoustic engineering consultancy with offices in Auckland, Wellington and Christchurch.

7. I hold the qualifications of Bachelor of Engineering with Honours and Doctor of Philosophy in Mechanical Engineering (Acoustics) from the University of Canterbury.

8. I am a member of the Acoustical Society of New Zealand.

9. I have over nineteen years' experience in the field of acoustic engineering consultancy and have been involved with a large number of environmental noise assessments on behalf of applicants, submitters and as a peer reviewer for Councils.

10. Acoustic Engineering Services was engaged by PrimePort from 2018 to produce the Port NCBs. That work was primarily undertaken by my colleague Oliver Hutchinson, under my supervision. I am familiar with the site and general area.

11. In preparing this evidence I have read the following documents:

    (a) Submissions on the Proposed Timaru District Plan, from Submitters:

        (i) Property Income Fund No.2 Limited (Submission 56)

        (ii) Fonterra Limited (Submission 165)

        (iii) PrimePort Limited (Submission 175)

        (iv) KiwiRail Holdings Limited (Submission 187)

        (v) Waka Kotahi New Zealand Transport Agency (Submission 143)

        (vi) The Terrace Timaru Limited (Submission 22)

        (vii) Canterbury Regional Council (Environment Canterbury) (Submission 183)

        (viii) Ronney Holdings Limited (Submission 174)

        (ix) G.D.M. Offices Limited (Submission 38)

    (b) The Proposed District Plan Noise Chapter – Response to Technical Noise Issues Raised memorandum prepared by Mr Malcolm Hunt, dated 24 March 2025.

    (c) Section 42A Report: Light and Noise prepared by Liz White dated 24 March 2025.

12. I am authorised to provide this evidence on behalf of PrimePort and TDHL.

CODE OF CONDUCT

13. While this is a Council hearing, I have read the Code of Conduct for Expert Witnesses (contained in the 2023 Practice Note) and agree to comply with it. Except where I state I rely on the evidence of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

SCOPE OF EVIDENCE

14. My statement of evidence addresses the following matters:

    (a) Development of the Port Noise Control Boundaries

    (b) NOISE-R8 - Port noise provisions

    (c) NOISE-S3 - Sound insulation requirements

    (d) NOISE-R9 - Alterations to existing dwellings

15. I address each of these points in my evidence below.

DEVELOPMENT OF THE PORT NOISE CONTROL BOUNDARIES

16. The process of modelling noise from existing and future port noise generation was undertaken during late 2021 and early 2022. The definition of Port NCBs followed the procedure described in NZS 6809:1999 *Acoustics – Port Noise Management and Land Use Planning*. The modelling process and outputs are documents in AES Report AC18314 – 05 – R1 dated 11 February 2022, which is attached as Appendix A to this evidence.[1]

17. NZS 6809 is a well-known and established standard within New Zealand for port noise management and planning. It has been used at many other ports around New Zealand since its publication. Its use has been directed by the National Planning Standards since 2019.

18. NZS 6809 stipulates that areas of land which are deemed exposed to port noise should be demarked by two 'Control Boundaries'. An Inner Control Boundary (**ICB**) is drawn at the 65 dB Ldn (5 day) contour line and an Outer

[1] This document is also referred to in footnote 34 of the Section 42A Report: Light and Noise, and is available to download at https://www.timaru.govt.nz/__data/assets/pdf_file/0005/669866/Primeport-AES-2022-Noise-Report.pdf

Control Boundary (**OCB**) at the 55 dB Ldn (5 day) contour line. Placement of the Port NCBs is required to take into account the full range of port activity types, frequency and intensity of noise generating activities, proposed seasonal variation, foreseeable future expansion and any proposed new operations. My colleagues and I worked closely with PrimePort to develop a realistic scenario for future noise emissions from PrimePort operations.

19. The 57 dB Ldn line was selected for the OCB rather than the 55 dB Ldn line which is the default option in NZS 6809:1999. This decision was made in conjunction with the Council and is appropriate from an acoustic point of view because where noise levels of up to 57 dB Ldn are incident on the external facades of dwellings, appropriate noise levels inside the dwelling are very likely to be achieved, even if the occupants of the dwelling have windows open for ventilation. This ensures that a rule requiring review and possible upgrades of new dwellings is appropriately targeted and does not include sites where an appropriate internal noise level is very likely to be achieved with standard New Zealand residential constructions.

20. A number of submissions have sought to remove the OCB from some properties (at 12, 14 and 22 The Terrace). However, I agree with Mr Malcolm Hunt that:

    (a) there is no reason to suggest that modelling used to predict acoustic screening, or the algorithms used are faulty; and

    (b) there are no justifiable, noise-related reasons for removing the OCB from 12, 14 and 22 The Terrace.

21. Two submissions (38.2 and 202.3) oppose the inclusion of their specific properties within the OCB. These submissions both note that the OCB has been drawn to follow property boundaries, rather than following a noise contour line from noise modelling or measurement. They assert that this suggests the control boundaries were drawn in an ‘ad hoc’ or ‘non-scientific’ manner.

22. As detailed above, the placement of the OCB was based on detailed computational modelling, conducted in accordance with NZS 6809. The modelling process, and detailed description of the basis for the model are documented in Appendix A. This report was made available on the Timaru District Council website during the submission process. The actual noise

contour map (on which the placement of the control boundaries was based) can be seen in Appendix 1.2 of the Appendix A document.

23. The OCB line was set to follow property boundaries nearest to the relevant noise contour lines, rather than the actual noise contour line itself. This is in accordance with the procedures for ICB / OCB placement in NZS 6809 (see figure 1 of NZS 6809). Following property boundaries (rather than the noise contours themselves) reduces the confusion which could eventuate if part of a site (or structure) was affected by a sound insulation rule and another part was not affected.

24. Submission 202.3 implies that screening due to topography and the built environment were not taken into account in the definition of the control boundaries. This is not the case. As detailed in Appendix A, topography was modelled using high definition LiDAR ground survey data, made publicly available by Environment Canterbury. Modelling of structures used data from LINZ. The influence of these elements on the modelling can be clearly seen in the noise contour maps in Appendix 1.2 of the AES report. If the existing built environment and/or topography were to be ignored in the modelling, the noise contours would spread significantly further, and the OCB would cover a much larger area of the city – which is unrealistic.

25. Screening by topography and the built environment heavily influences the shape of the contours, and by extension the OCB. However, sites on The Terrace are at a higher elevation than the Port, overlooking the port area, and therefore do not benefit from terrain screening. Buildings on the north side of The Terrace do provide some screening of sites on the south side of the road, however gaps between the north side buildings means that screening is partial, and direct propagation of port noise can occur in these gaps. Additionally, other factors such as diffraction of sound around and over the top of buildings, and reflections, mean that while sites on the south side of the Terrace may not have line of sight to the Port, they are still expected to receive some noise from Port operations.

26. I therefore consider it appropriate for the location of the OCB to remain as notified.

NOISE-R8 - PORT NOISE PROVISIONS

27. I have reviewed how port-related noise provisions have been implemented into the Proposed Plan noise chapter (s42A version).

28. NOISE-R8 of the Proposed Plan (s42A version) outlines provisions for 'Noise from activities within the Port Zone' for two areas – ' NOISE-R8.1: Port Zone within Precinct 7' and 'NOISE-R8.2: Port Zone outside Precinct 7'. Combined, this set of provisions addresses all potential noise sources within the Port Zone.

29. NOISE-R8.1 Port Zone PER-1, PER-2 and PER-3 are worded as I would expect, based on NZS 6809:1999.

30. NOISE-R8.2 PER-1 is appropriate. NOISE-R8.2 PER 2 states that within the Port Zone but outside Precinct 7 activities are permitted provided they observe compliance with:

> *On any day between 10pm to 7am the following day, noise generated must not exceed 45 dB LAeq (9 hours) when measured at or within any residentially zoned site, provided that any single 15 minute sound measurement level must not exceed 50 dB LAeq and 75 dB LAmax.*

This relatively lenient noise limit is consistent with what submissions from Fonterra and Property Fund Limited No.2 (165.112 and 56.1) have sought. In my opinion it would be logical for activities located within the Port Zone but outside Precinct 7 to be subject to the general environmental noise limits in Table 24 (including day and night time limits). However, I understand that there are some existing operators that are concerned about their ability to meet those noise limits, and so a more nuanced approach may be needed.

31. A submission from Environment Canterbury (183.143) requests that the Proposed Plan Rule NOISE-R8 be amended, where possible, to ensure alignment with Rule 8.21 of the Canterbury Coastal Environment Plan.

32. The Canterbury Coastal Environment Plan outlines noise performance standards for noise generated within the Coastal Marine Area including the 'Operational Area of the Port of Timaru' with reference to outdated versions of NZS 6801 and 6802. The National Planning Standards (2019) requires port noise to be assessed using the Port Noise standard NZS 6809:1999 – and so I consider it is the Canterbury Coastal Environment Plan which should be updated in due course for consistency with the current best practice approach, which is being integrated into the Proposed Plan, and not the other way around.

NOISE-S3 - SOUND INSULATION REQUIREMENTS

33. As outlined in NOISE-S3.2, any new noise sensitive activity establishing within the OCB is required to achieve a minimum external to internal noise reduction performance of 'not less than 30 dB Dtr,2m,nT,w + Ctr' – commonly called a 'façade reduction' requirement.

34. A façade reduction requirement is a blanket requirement for the external building envelope and is technically independent of any properties of the external noise source, such as level and directionality. There are pros and cons of this approach, as follows:

Pros

- A blanket façade reduction approach can streamline the upgrades process, as the upgrades are the same to all part of the building.
- Because the requirement applies to all façades, this can also provide better insulation against noise that may be incident on the dwelling from multiple directions such as noise emanated in commercial / mixed use zones.
- The level of facade reduction required is typically based on the expected upper level of incident noise, meaning that the upgrades are guaranteed to adequately protect the acoustic amenity of the space.
- This is a pragmatic approach in situations where it may be difficult to derive a specific external noise level to use in analysis (for example, city centres where there are multiple noise sources).

Cons

- The upgrades may be over and above what is actually required for the specific circumstances of a building, resulting in overdesign (money spent of building upgrades, which is not actually needed). An example in this case would be a hypothetical new dwelling located just inside the OCB (55 dB Ldn) where the proposed 30 dB Dtr,2m,nT,w + Ctr façade reduction requirement would result in an internal noise level much lower than the recommendation contained within NZS 6809:1999.

35. Relevant to this point, I note that two submissions from Waka Kotahi (143.119) and KiwiRail (187.78) seek to change the sound insulation

requirements for road and rail sources from a façade reduction approach to an internal noise level criterion.

36. A change for these sources would result in some inconsistencies in approach for how different noise sources outlined in NOISE-S3 are addressed, unless the port noise requirements were also changed to an 'internal noise level criterion'.

37. Overall, both the façade reduction and internal noise level assessment methodologies have their own merits, and both could be used to provide adequate protection of new dwellings from port noise.

38. I note that some new dwellings will be required to comply with multiple noise insulation provisions i.e., state highway traffic noise and port noise. Consistency in approach may have some benefits there (i.e., either a façade reduction or internal noise level assessment is used for all sources). However, overlapping requirements which are mismatched in various technical ways are not uncommon, and are routinely worked through by acoustic engineers.

NOISE-R9 - ALTERATIONS TO EXISTING DWELLINGS

39. A submission from Rooney Holdings Limited (174.72) states that the noise insulation provisions outlined in NOISE-R9 (which include Port noise) should only apply to new buildings, and not to alterations to existing buildings.

40. Discussions of this nature are common in other Plan Changes and jurisdictions. I acknowledge that there are practical issues in this area. For example, the potential confusion created by only upgrading the extension to a dwelling, when the rest of the existing dwelling is not acoustically treated. Or how even a small change to a space (i.e., adding a ranch slider) can trigger the Rule to apply for the rest of the external façades of that space.

41. However, if the Rule were changed to remove any requirement relating to additions or alteration, this would undermine the overall goal of protecting permitted noise-generating activities from reverse sensitivity issues created by new noise-sensitive development. Therefore, I recommend that a requirement relating to 'alterations to existing buildings' be retained in the Rule.

42. I note that Mr Malcom Hunt has addressed this submission in his memorandum, proposing a percentage floor area increase threshold (where the floor area of a habitable room is increased by 20% or more) as a way to demarcate between trivial and substantive 'alterations' situations. I agree that this approach would generally ensure money was not spent upgrading building elements, where there may be minimal benefit to occupants.

CONCLUSION

43. The Port NCBs for PrimePort were developed in accordance with the procedure outlined in NZS 6809:1999. I worked closely with PrimePort to determine a future operational scenario, including operational inputs for the modelling. Based on this the ICB (65 dB Ldn(5day)) and OCB (57 dB Ldn(5day)) were developed.

44. The 57 dB Ldn line was selected for the OCB rather than the 55 dB Ldn line which is the default option in NZS 6809:1999. This decision was made in conjunction with Council and is logical since even at the 57 dB Ldn threshold, an appropriate internal noise environment is still achieved, even if windows are open for ventilation.

45. Two submissions seek their sites to be excluded from the OCB, citing factors such as terrain and shielding. The port noise modelling takes into account terrain data and shielding from dwellings, and that there is no robust technical basis for these submissions.

46. A relatively lenient noise limit has been recommended in the s42A report for activities outside of Precinct 7 but within the Port Zone. In my opinion it would be logical to apply the general environmental noise limits outlined in Table 24 for these activities. However, I acknowledge that this may create compliance issues for existing operators, and a more nuanced approach may be needed.

47. NOISE-S3 outlines a 30 dB Dtr,2m,nT,w + Ctr façade reduction requirement for new dwellings or alterations to existing dwellings within the OCB. Relevant to this, Waka Kotahi and KiwiRail submissions propose an 'internal noise level' criterion for traffic and rail noise sources, which otherwise results in some inconsistencies for how different noise sources are mitigated. Both approaches could be used to provide adequate protection of port noise.

48. There is a further submission which states that noise insulation requirements should not apply to alterations of existing buildings. The s42A report has recommended a refinement to the approach on this issue, which is appropriate.

Date: 9 April 2025

Jeremy William Trevathan

APPENDIX A – AES NOISE CONTOUR MODELLING REPORT

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PrimePort Timaru

Port noise contours

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Approver	**Signature**
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1.0 BACKGROUND

Acoustic Engineering Services (AES) was engaged by PrimePort Timaru to develop noise contours in accordance with NZS 6809:1999 *Acoustics – Port Noise Management and Land Use Planning*.

PrimePort Timaru's operations include a variety of domestic and international import and export activities, including containers, steel, cement, bulk products (logs etc.), and fish. The existing layout of the port, with specific areas that are relevant to PrimePort's operations labelled, is shown in figure 1.1 below.

Figure 1.1 – Timaru Port existing layout

2.0 EXISTING ACTIVITY

From our correspondence with PrimePort, and our observations on site, the primary noise generating activities conducted on site, as part of the normal operation of the port are as outlined below:

- Container activity:
    - Container cranes loading and unloading from ships
    - Refrigerated container (reefer) compressors
    - Reach stacker movements
    - Truck movements
- Steel activity:
    - On-ship cranes unloading steel from ships
    - Forklift movements
    - Storage area movements
- Cement activity:
    - Exterior noise from the Holcim vacuum pump room
    - Unloading operation from a Holcim ship
- Bulk products activity:
    - On-ship cranes unloading bulk products from ships
    - Truck movements
- Fishing activity
    - Hiab cranes unloading crates from ships
    - Forklift movements
    - Truck movements
- Shunt trains

Details and assumptions related to each of the above sources given in section 3.1 below.

2.1 Site visits and attended measurements

AES has made a number of visits to the Timaru Port site since 2018 to measure and observe existing sources of operational noise. Some of these visits were part of previous noise monitoring projects.

Two site visits took place in 2021 with the express purpose of observing, measuring, and documenting noise sources, for inclusion in the current noise contour modelling project. Oliver Hutchison of AES visited the site on the 27th of September and 26th of October 2021 during the day time, to observe and measure noise from the existing activity on the site. Measurements were undertaken in general accordance with NZS 6801:2008.

During the time of both our visits, weather was clear, with light winds and mild temperatures (14 – 15°C). Measurements were undertaken using a Brüel & Kjær Type 2250 Class 1 Sound Analyser. The analyser was field calibrated before measurements, and the calibration checked after measurements. No significant change was noted (<0.1 dB).

During our first visit (September 2021), we measured sources associated with steel, container, and bulk products handling, and noise from fishing wharves. During our second site visit (October 2021), we measured sources associated with container handling. Measurements of cement handling were undertaken in 2018 as part of previous noise compliance monitoring.

Some sources were unable to be directly measured due to operational or safety reasons. These include shunt trains, and the rail mounted air pump / vacuum used for cement unloading from a ship. As detailed in section 3.1 below, our assumptions for these sources are based on research we have conducted into similar sources that we have on file.

3.0 PLANNED FUTURE ACTIVITY

In addition to surveying the existing noise generating activities of PrimePort's operation, future planned development over the next 10 years have been taken into account in the final port noise contour modelling. Based on our correspondence with PrimePort, we understand that the following future developments are planned, and these have been accounted for in the Scenario 1.2 modelling in section 5.2 of this report:

- Demolition of the No.3 wharf, and the extension of the North Mole wharf to the south creating an additional berth on the North Mole Wharf for steel and container handling.
- A proposed new wharf at Evans Bay, to be used for bulk product handling.

We understand that future development projects are at various stages of planning, and all are dependent on the materialisation of projected growth in demand for import and export services at Timaru Port. Based on our discussion with PrimePort, we understand that some future development projects are unlikely to occur within the next 10 years, and these projects have not been included in the modelling, as follows:

- Demolition of the existing PrimePort administration building, and the adjacent Transit Shed. Expansion of the North Mole Wharf container storage area to the south (the green area shown in figure 3.1 below).
- Additional Holcim cement storage facility adjacent to the existing facility.

Various future port noise development projects can be seen in figure 3.1 below.

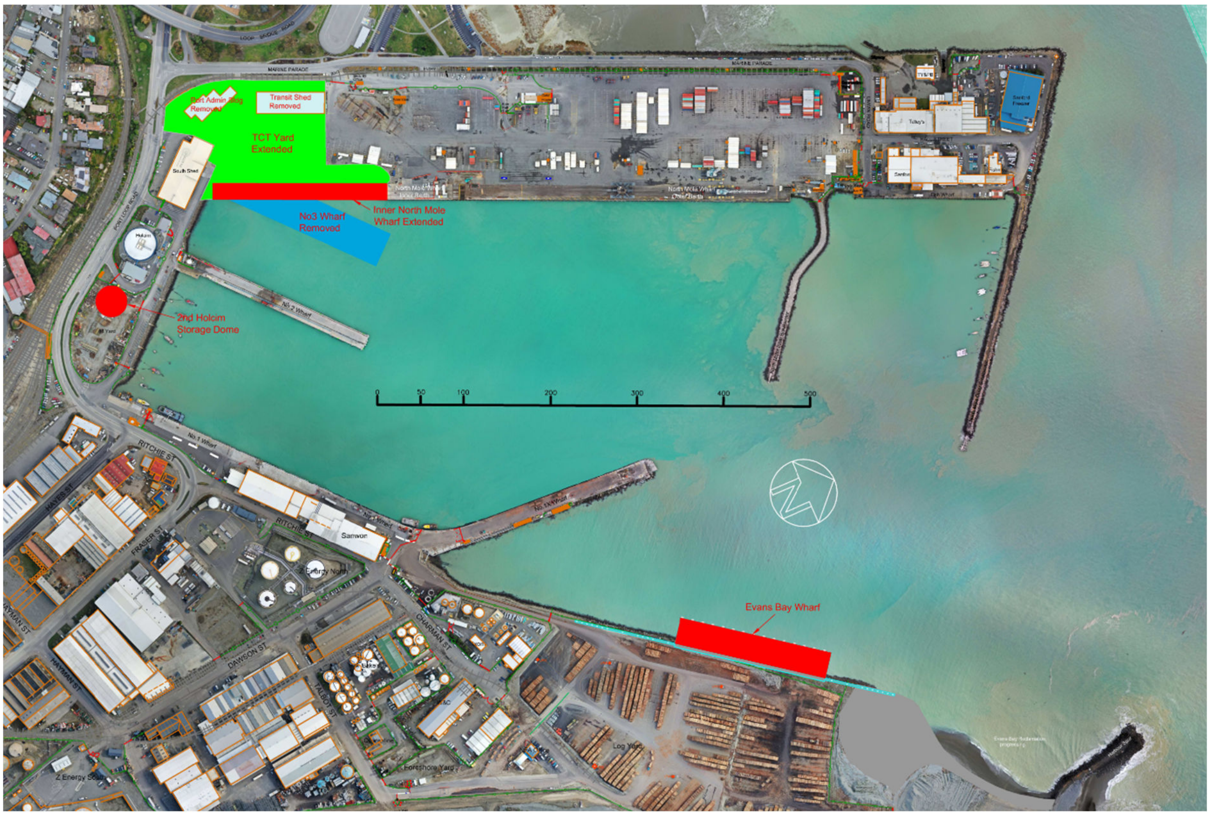


Figure 3.1 – Timaru Port future development projects

4.0 NOISE MODELLING

4.1 Model parameters

SoundPlan computational noise modelling based on ISO 9613 *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation* has been used to calculate the propagation of noise from all major noise sources identified. Modelling has taken into account the topography of the area, built environment, worst-case downwind conditions, and sound power levels of the noise sources. Geospatial data was sourced from various locations to build the noise model, as outlined in table 4.1 below.

Table 4.1 – Sources of geospatial data used

Data type	Source	Dataset
Terrain	Canterbury Maps	NZAM_10027_2010
Property boundaries	LINZ	NZ Property Titles
Aerial imagery	Canterbury Maps	Latest Imagery (ImageServer)
Buildings	LINZ	NZ Building Outlines

Terrain data based on LiDAR survey was used with a 1 m vertical resolution. Ground absorption factor was set at 0.6 for land areas (0 = hard, 1 = soft), and 0 for water. Buildings were set with a typical height of 6 metres. The reflection order was set to 1. The height of the noise contour grid was set to 1.5 metres above the ground level. The grid spacing of the model (distance between calculated nodes) was set to 5 metres.

Noise modelling involved and iterative process, and constant dialogue with PrimePort, to construct realistic operational scenarios for each type of source.

Characteristics of the individual noise sources modelled are given in tables 4.2 through 4.6 below.

4.2 Noise sources

4.2.1 Container activity

Table 4.2 – Container activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Liebherr mobile harbour crane	NMW	109	▪ Sound source located at the centre height of the onboard diesel engine of the crane, approximately 5 m above ground level ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site and reflects the sound level created by a single crane under load during a container lift. Actual emissions would be expected to be lower during times of inactivity	Existing: ▪ 2 cranes are active both servicing a single ship at the North Mole Wharf outer berth, 24 hours, for 2 days Future ▪ An additional single crane is active servicing a single ship at the North Mole Wharf inner berth 24 hours, for 3 days

Table 4.2 (ctd) – Container activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Containers banging on ship during unload or onload	NMW	118	▪ Sound source located on the ship, at a height of 12 m above ground level ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of an empty 40' container hitting another container (metal on metal sound) and reflects the sound level created by a single container (instantaneous impact sound) ▪ Our model has conservatively assumed that the noise from container impacts will be present for 30 seconds in each one hour period. This is consistent with an operational speed of 30 container movements per hour per crane	Existing: ▪ 2 cranes are active both servicing a single ship at the North Mole Wharf outer berth, 24 hours, for 2 days Future ▪ An additional single crane is active servicing a single ship at the North Mole Wharf inner berth 24 hours, for 3 days
Containers banging on the ground during unload or onload	NMW	123	▪ Sound source located at ground level ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of an empty 40' standard container hitting concrete and reflects the sound level created by a single container (instantaneous impact sound) ▪ Our model has conservatively assumed that the noise from container impacts will be present for 30 seconds in each one hour period. This is consistent with an operational speed of 30 container movements per hour per crane	Existing: ▪ 2 cranes are active both servicing a single ship at the North Mole Wharf outer berth, 24 hours, for 2 days Future ▪ An additional single crane is active servicing a single ship at the North Mole Wharf inner berth 24 hours, for 3 days

Table 4.2 (ctd) – Container activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Reefer containers	NMW	89	▪ Sound source located at 1 m and 3.4 m above ground level (double stacked containers) ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single 40' reefer container compressor during its duty cycle ▪ Our model has conservatively assumed that all reefer compressors will be active simultaneously, and all will be active constantly. In reality we would expect the real noise level produced to be lower due to individual compressors powering on and off (duty cycles)	Existing: ▪ 24 hours, 5 days ▪ 15 double-stacked rows of containers (600 containers total) were modelled, spread around the NMW Future: ▪ 24 hours, 5 days ▪ 22 double-stacked rows of containers (880 containers total) were modelled, spread around the NMW
Container trucks	Existing container truck route	102	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a truck engine ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single 40' standard container being loaded onto a truck (instantaneous impact sound)	Existing: ▪ 24 hours, 5 days ▪ 15 trucks per hour visiting the site during all hours of the day Future: ▪ 24 hours, 5 days ▪ 30 trucks per hour visiting the site during all hours of the day
Container banging during load onto a truck	Existing container truck loading zone	118	▪ Sound source located at 1 m above ground level, being the approximate height of a container truck bed ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single container truck	Existing: ▪ 24 hours, 5 days ▪ 15 trucks per hour visiting the site during all hours of the day Future: ▪ 24 hours, 5 days ▪ 30 trucks per hour visiting the site during all hours of the day

Table 4.2 (ctd) – Container activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Container reach stacker	NMW	107	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a container stacker engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as an area source covering the entire area used by container stackers ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single container stacker	Existing and future: ▪ 24 hours, 5 days ▪ 1 reach stacker is active around the site during all hours of the day ▪ 1 reach stacker is active around the site during the day time period only (0700 – 2200)

4.2.2 Steel activity

Table 4.3 – Steel activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
On-ship crane	NMW, inner berth	86	▪ Sound source located at the height of the control box of the on-ship crane ▪ Modelled spectrum based on results measured on site. The sound source is predominantly hydraulic winch motor noise ▪ Sound power level is based on results measured on site and reflects the sound level created by a single crane under load during a steel lift. Actual emissions would be expected to be lower during times of inactivity	Existing and future: ▪ 24 hours, 5 days ▪ 2 cranes are active on a single ship at the North Mole Wharf inner berth (worst-case location)

Table 4.3 (ctd) – Steel activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Steel forklift	NMW, inner berth and existing steel storage area	107	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a steel forklift engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as an area source covering the entire area used by steel forklifts ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of a single steel forklift	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 2 steel forklifts are active around the site during all hours of the day
Steel handling noise	NMW, inner berth and existing steel storage area	125	▪ Sound source located at ground level ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site of the instantaneous impact sound as steel is handled by forklifts ▪ Our model has conservatively assumed that the noise from steel handling will be present for 60 seconds in each one hour period, per forklift. This is consistent with an operational speed of 30 steel movements per hour per forklift	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 2 steel forklifts are active around the site during all hours of the day

4.2.3 Cement activity

Table 4.4 – Cement activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Rail mounted air pump / vacuum	No. 2 wharf	112	▪ Sound sources located on the wharf, adjacent to a vessel ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on research data due to the fact that we have not been able to directly measure this source	Existing and future: ▪ 24 hours, 5 days
Cement pumping plant room, silo compressors	Holcim plant room, south of No. 2 wharf	98	▪ Sound sources located at the height of the louvres on the northwest, northeast, and southeast façades of the cement pumping plant room ▪ Modelled spectrum based on results measured on site ▪ Sound power level is based on results measured on site and reflects the average sound level in the vicinity of the cement plant room during a pumping operation	Existing and future: ▪ 24 hours, 5 days
Cement trucks	Holcim plant area, south of No. 2 wharf	102	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a truck engine ▪ Modelled spectrum based on results of similar trucks measured on site ▪ Sound power level is based on results measured on site of similar trucks measured on site	Existing and future: ▪ 24 hours, 5 days ▪ 5 trucks per hour visiting the cement terminal during all hours of the day

4.2.4 Bulk product activity

Table 4.5 – Bulk product activity, noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
On-ship crane	No. 1 wharf No. 1 Extension wharf Proposed Evans Bay wharf	86	▪ Sound source located at the height of the control box of the on-ship crane ▪ Modelled spectrum based on results measured on site. The sound source is predominantly hydraulic winch motor noise ▪ Sound power level is based on results measured on site and reflects the sound level created by a single crane under load during a lift. Actual emissions would be expected to be lower during times of inactivity	<u>Existing:</u> ▪ 24 hours, 5 days ▪ 2 cranes are active on a single ship at the No. 1 wharf ▪ 2 cranes are active on a single ship at the No. 1 Extension wharf <u>Future:</u> ▪ 24 hours, 5 days ▪ Additional 2 cranes are active on a single ship at the proposed Evans Bay wharf
Log handler	Evans Bay log storage area	107	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a log handler engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as an area source covering the entire area used by log handler ▪ Modelled spectrum based on results of similar equipment measured on site ▪ Sound power level is based on results measured on site of a single log handler	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 1 log handler is active around the site during all hours of the day ▪ 1 log handler is active around the site during the day time period only (0700 – 2200)
Maffi trucks	No. 1 wharf and No 1 Extension wharf to Evans Bay log storage area	102	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a truck engine ▪ Modelled spectrum based on results of similar trucks measured on site ▪ Sound power level is based on results measured on site of similar trucks measured on site	<u>Existing and future:</u> ▪ 24 hours, 5 days ▪ 20 truck movements per hour (10 return trips) between the No. 1 wharf and the log storage yard during all hours of the day ▪ 20 truck movements per hour (10 return trips) between the No. 1 Extension wharf and the log storage yard during all hours of the day

Table 4.5 (ctd) – Bulk product activity, noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Log trucks (deliveries)	Log storage area	102	▪ Sound source located at 1.5 m above ground level, being the approximate centre height of a truck engine ▪ Modelled spectrum based on results of similar trucks measured on site ▪ Sound power level is based on results measured on site of similar trucks measured on site	<u>Existing and future:</u> ▪ 0700-1700 hours, 5 days ▪ 10 trucks per hour visiting the site

4.2.5 Fishing activity

Table 4.6 – Fishing activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Hiab cranes, trucks, forklifts, associated loading and unloading noise	No. 1 wharf inner berth No. 3 wharf NMW fishing wharf	105	▪ Modelled spectrum based on results of measured on site ▪ Sound power level is based on results measured on site in the vicinity of fishing operations	<u>Existing and future:</u> ▪ 24 hours, 5 days

4.2.6 Shunt train activity

Table 4.7 – Shunt train activity noise sources

Source	Location	Sound power level (L_{wA})	Source attributes	Level of activity
NMW container shunt train	From the Kiwirail corridor to the end of the NMW	133	▪ Sound source located at 3 m above ground level, being the approximate centre height of the shunt locomotive engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as a line source covering the shunt siding from the edge of the Kiwirail corridor, to the end of the line at the North Mole Wharf ▪ Spectrum based on an example spectrum for a train held on file ▪ Sound power level is based on research into typical freight train sound power ▪ Our model has assumed that a shunt takes 2 minutes to pass by a given location on the line (travelling at approximately 10 km / h)	Existing: ▪ 1 train daily during the night time period Future: ▪ Additional 1 train daily during the day time period

Table 4.7 (ctd) – Shunt train activity noise sources

Source	Location	Sound power level (L_{WA})	Source attributes	Level of activity
Evans Bay log shunt train	From the Kiwirail corridor to the end of the Evans Bay log storage area	133	▪ Sound source located at 3 m above ground level, being the approximate centre height of the shunt locomotive engine ▪ Due to wide area of possible sound source locations, the sound source is modelled as a line source covering the shunt siding from the edge of the Kiwirail corridor, to the Evans Bay log storage area ▪ Spectrum based on an example spectrum for a train held on file ▪ Sound power level is based on research into typical freight train sound power ▪ Our model has assumed that a shunt takes 2 minutes to pass by a given location on the line (travelling at approximately 10 km / h)	Future: ▪ 1 train weekly during the night time period

5.0 SCENARIOS

5.1 Scenario 1.1 – All sources, existing full port scenario

This scenario considers noise from all sources associated with a 'full port' scenario, under the existing port layout. The types of activity occurring at each wharf can be seen in table 5.1 below. The resulting noise contours can be seen in appendix 1.1.

Table 5.1 – Existing full port scenario, assumed ships in port

NMW, outer berth	NMW, inner berth	No. 1 wharf	No. 1 Extension wharf	No. 2 wharf	No. 3 wharf	TCT wharf extension	Evans Bay wharf
Container	Steel	Fishing, bulk product	Bulk product	Cement	Fishing	-	-

5.2 Scenario 1.2 – All sources, future full port scenario

This scenario considers noise from all sources associated with a 'full port' scenario, under the future port layout. The types of activity occurring at each wharf can be seen in table 5.2 below. The resulting noise contours can be seen in appendix 1.2.

Table 5.2 – Future full port scenario, assumed ships in port

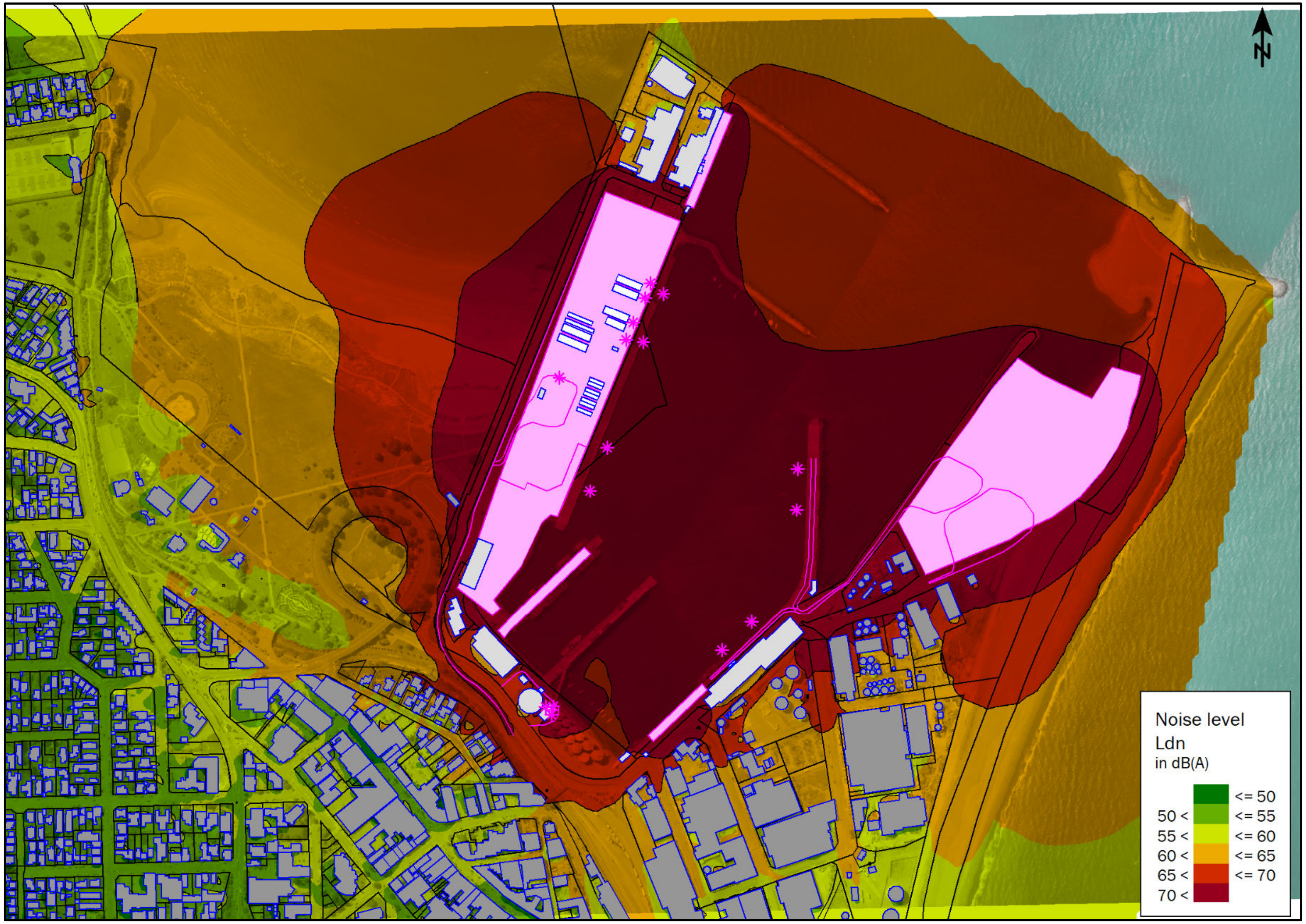
NMW, outer berth	NMW, inner berth	No. 1 wharf	No. 1 Extension wharf	No. 2 wharf	No. 3 wharf	TCT wharf extension	Evans Bay wharf
Container	-	Fishing, bulk product	Bulk product	Cement	(demolished)	Combined container and steel ship	Bulk product

6.0 CONTROL BOUNDARIES

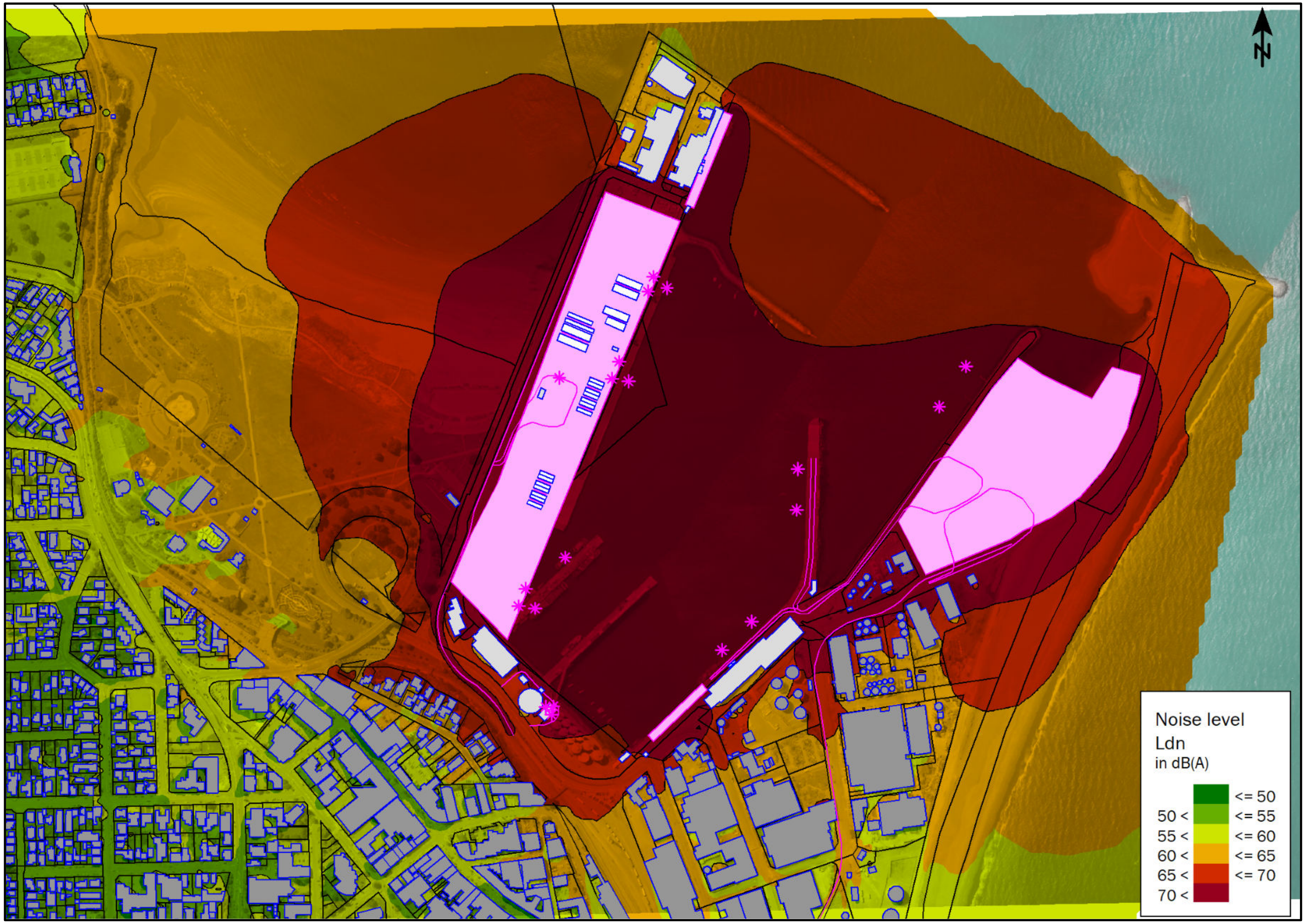
Subsequent to the completion of noise modelling, the Inner and Outer Control Boundaries were drawn in accordance with NZS 6809:1999, and were based on the scenario 1.2 model above, allowing for planned increases in activity over the next five to 10 years.

The Inner Control Boundary was located just beyond the extent of the 65 dB L_{dn} contour line, and was snapped to the boundaries of properties that the noise model showed would likely experience noise levels of 65 dB L_{dn} or higher within the site boundary. The Outer Control Boundary was similarly drawn, located just beyond the extent of the 57 dB L_{dn} contour line. The 57 dB L_{dn} line was selected for the Outer Control Boundary as an appropriate internal port noise level is very likely to be achieved where external port noise levels are 55 to 57 dB L_{dn}, and so this will increase the efficiency of any Rule requiring review and possible upgrade of new dwellings between the Inner and Outer Control Boundaries. As noted previously, property boundary data was sourced from LINZ.

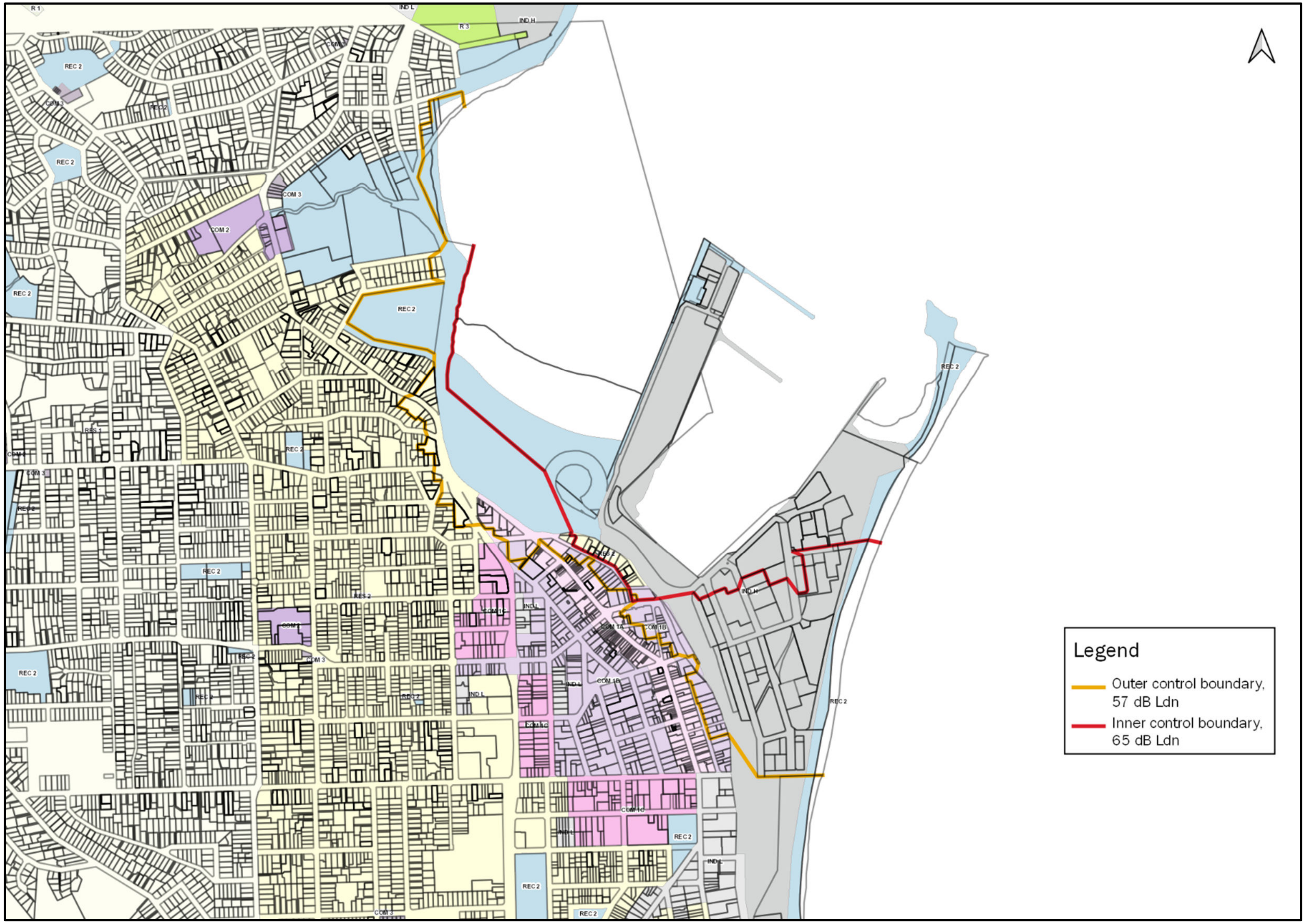
The resulting control boundaries can be seen in appendix 1.3.



Appendix 1.1 – Scenario 1.1 – All sources, existing full port scenario



Appendix 1.2 – Scenario 1.2 – All sources, future full port scenario



Appendix 1.3 – Location of inner and outer control boundaries, with ODP zones