



Project: **WELLINGTON FERRY INFRASTRUCTURE PROJECT**

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1.0 INTRODUCTION

Marshall Day Acoustics (MDA) has been engaged by Centreport Ltd (CPL) to prepare a Construction Noise and Vibration Management Plan (CNVMP) for the CSIF Piling works (the 'Project').

This CNVMP will be used to ensure compliance with the relevant noise rules under the Natural Resources Plan (the 'NRP') of the Greater Wellington Regional Council, and that Project noise and vibration emissions are no more than necessary. It identifies the performance standards for the Project and sets out best practicable options (BPO) for airborne noise, underwater noise, and vibration management.

This CNVMP will be implemented throughout the construction period. It should be considered a 'living document' that will be expanded and updated as the Project progresses. It is the primary tool for managing the Project's construction noise and vibration effects.

A glossary of terminology is included in Appendix A.

2.0 PROJECT DESCRIPTION

2.1 Overview

The works involve impact piling and associated enabling activities over water within the Commercial Port Area, nearby the Interislander ferry terminal building and Kaiwharawhara Point to the north. This includes construction of both permanent structures (excluding at Kaiwharawhara Point), and temporary structures such as work platforms (referred to as 'staging'). The works are part of the construction and upgrade of structures to receive new Interislander ferries.

Site maps showing the subject site, piling plan, and surrounding environment are attached in Appendix B. These will be updated as further project details are finalised.

The works are scheduled for approximately 30 months, between July 2026 and December 2028. This means that the long-duration construction noise limits apply (Section 3.0).

Works on site may be carried out at any time, but impact piling activities will be limited to occur between 0730 – 1800 hrs, Monday to Saturday.

2.2 Construction Methodology

A summary of the methodologies and proposed equipment for the piling works is as follows. Only the activities expected to generate appreciable levels of noise and/or vibration have been included:

- Permanent Piles Methodology
 - For each pile:
 - Install bubble curtain
 - Drive the initial 24-metre or 32-metre casing section using a vibro-hammer. In the event of refusal, the pile driving will be continued with impact hammer
 - Drill within the casing using a drilling rig mounted to a crawler crane or pile top drill
 - Splice the next 12 to 17-metre casing section to the drilled-out casing
 - Drive the pile further using impact piling. An estimated average strike rate is 1000 strikes per pile. We understand two piles will be installed per day
 - Drill within the casing using a drilling rig mounted to a crawler crane or pile top drill to pile toe level
 - Perform the Pile PDA testing using impact piling

- Install the reinforcement cage and concrete the pile
 - Permanent piles will be completed in groups around the wharf area. The current groupings and timeline are shown in Appendix B2
- Temporary Staging Piles Methodology
 - Same as for permanent piles, but drilling will not be required
 - Piles and work platforms will be removed following completion of the Project
 - Equipment used will differ to permanent piles installation, as detailed below
- Piling Equipment
 - Permanent piles:
 - Soilmec RT3 drilling rig
 - IQIP – Impact hammer IQIP S-350
 - IQIP – Noise shroud Ø2.2m
 - IQIP – Vibro-hammer IQIP Z5
 - Junttan HHx350 Hydraulic impact hammer (with custom noise shroud)
 - Junttan Vibro-hammer VH50VM
 - Temporary staging piles:
 - PTC60 Vibro Hammer
 - Junttan 9A Hydraulic impact hammer
 - Junttan – HHk 18A Hydraulic impact hammer

2.3 Contact Details

Contact details for the relevant personnel are listed in Table 1. The Project Manager is responsible for implementing this CNVMP.

Table 1: Contacts

Role	Name	Organisation	Phone	Email
Project Director	David McGoeys	BPC	TBC	TBC
Communications and Engagement Manager	Andree Kai Fong	CentrePort Ltd	021 824 579	kaifan@centreport.co.nz
HSE Manager	Adam Hunt	BPC	TBC	TBC
Acoustic Specialist	Steve Arden	MDA	027 872 2432	steve.arden@marshallday.co.nz

2.4 The NRP and the RMA

In respect of construction activities, the NRP only includes Permitted Activity provisions related to airborne noise – there are no rules or conditions related to vibration or underwater noise. However, it does include an objective (Objective O50) and policy (Policy P158) for the minimisation of underwater noise effects on marine fauna.

Regardless of compliance with any noise or vibration limits, the overarching requirement for the construction activities is to satisfy Section (s16) of the Resource Management Act 1991 (RMA).

s16 states “Every occupier of land (including any premises and any coastal marine area), and every person carrying out an activity in, on, or under a water body or the coastal marine area, shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level.”

3.0 AIRBORNE NOISE

3.1 Airborne Noise Performance Standards

The NRP specifies coastal management general conditions for activities within the Commercial Port Area. In relation to construction noise, the following applies:

5.6.2 Coastal Management General Conditions

[...]

(p) Noise from port-related activities located within the Commercial Port Area shown on Map 51, Map 52 and Map 53 and the Lambton Harbour Area (Northern Zone) shown on Map 51 shall comply with the following noise standards:

[...]

(vii) noise generated by construction which shall meet the standards specified in Table 1 of NZS 6803:1999 Acoustics – Construction [...]

Table 1 of NZS 6803:1999 “Acoustics – Construction Noise” (‘NZS 6803:1999’) does not include noise standards. The general condition of the NRP likely refers to Table 2 and/or Table 3 of NZS 6803:1999, which provide recommended upper limits for construction noise received in residential and commercial zones.

Further details on the guidelines noise limits of NZS 6803:1999 and the noise limits for Monday to Saturday for long-term duration works¹ are included as Appendix C.

During the impact piling hours (0730 – 1800 hrs, Monday to Saturday), the construction noise limit from NZS 6803:1999 is 70 dB L_{Aeq}. An additional limit of 85 dB L_{AFmax} applies to occupied dwellings. The noise limits apply at one metre outside the façades of buildings, and only while they are occupied.

3.2 Predicted Airborne Noise Levels

Table 2 predicts levels for high-noise construction activities without effective noise barriers. It identifies the activities/equipment that require mitigation and/or management, and the source-receiver distances where the risk begins. It will be kept up to date by the Acoustic Specialist when new information becomes available, e.g. through noise monitoring (Section 8.0).

The setback distances do not consider any screening or reflection effects from existing structures or natural features.

Table 2: Indicative noise levels at 1m from a building façade²

Equipment	Sound Power Level (dB L _{Aeq})	Noise Level (dB L _{Aeq})			Setback (m)
		10 m	20 m	50 m	70 dB L _{Aeq}
Impact piling (mitigated)* – permanent piles	126	101	95	87	209
Impact piling (mitigated)* – staging piles	124	99	93	85	174
Vibratory piling	114	89	83	74	69
Pile drilling rig	111	86	80	71	52
Trucks moving	106	81	75	66	33

¹ Construction work at any one location with a duration exceeding 20 weeks

² In accordance with the requirements of NZS 6803: 1999 (Section 3.0), inclusive of 3 decibels façade reflection

Equipment	Sound Power Level (dB L _{Aeq})	Noise Level (dB L _{Aeq})			Setback (m)
		10 m	20 m	50 m	70 dB L _{Aeq}
Mobile crane (35t) operating	98	73	67	58	14
Generator	93	68	62	53	8
Pumps and Compressors	93	68	62	53	8

*Mitigated with a noise shroud and/or a dolly. Impact piling will not be carried out without any mitigation measures applied

3.2.1 Non-Commercial Port Area Receivers

Based on an acoustic model of the site and surroundings, we have predicted compliance with the Project noise limits during impact piling hours (70 dB L_{Aeq} at all receivers and 85 dB L_{AFmax} at occupied dwellings) at all non-Commercial Port Area receivers. These are the receivers beyond the port area bounded by railway track to the north and Aotea Quay to the west (the 'CentrePort Area').

This is supported by noise monitoring we have carried at the nearest residential receivers. Where required, further noise monitoring during the works will be carried out to verify that noise emissions are being adequately managed (refer Section 8.0).

The closest and most exposed receivers to construction noise have been identified as being to the northwest of the site. This includes commercial activities along Hutt Road, and residential activities along and beyond Sar Street. At these receivers, it is expected that while piling operations will be audible, noise mitigation and management measures will be in place during all works to ensure construction noise is no louder than necessary.

The most recent noise monitoring, when assessed in accordance with NZS 6803:1999, resulted in the following noise levels:

- 52 – 56 Sar Steet 68 dB L_{Aeq}
- Corner of Sar Street and Barnard Street 65 dB L_{Aeq}

Both monitoring locations had direct line of sight to piling activities.

3.2.2 Commercial Port Area Receivers

We have predicted that at times, receiver buildings within the CentrePort Area may receive construction noise levels in excess of the Project noise limits.

Potential noise effects that may arise among staff occupying these buildings will be managed internally by CentrePort.

The existing Interislander terminal building has been identified as a receiver building that would be frequently occupied by members of the public waiting to board ferries (the 'terminal patrons') and thus measures must be adopted to mitigate risk of potential noise effects.

As overarching concerns are health and hearing protection for terminal occupants, we have referred to the WorkSafe New Zealand noise limits. These are 85 dB L_{Aeq(8hrs)}³ and 140 dB L_{Cpeak}. While terminal patrons would not be working, the WorkSafe noise limits provide a suitable baseline for assessing repeated noise exposure.

We have predicted that for all stages of impact piling, the WorkSafe noise limits would be complied with for terminal occupants and those in the canopied outdoor area to the building's south.

Mitigation and management measures to ensure this are included in Section 6.7.

³ The noise level averaged over an 8-hour day

The subsequent priority following hearing protection would be acoustic comfort for terminal patrons. All impact piling is likely to be audible at and within the terminal building, with the level of noise being dependent on the distance to the piling.

A temporary terminal building will be constructed nearby and north of the existing terminal. We have predicted that piling noise levels received within this temporary terminal would be lower than at the existing terminal, with lower likelihoods for annoyance or disturbance to occupants compared to the existing terminal. Use of the temporary terminal in place of the existing terminal by the commencement of the SS Span 2 stage will be targeted.

With all measures in place (refer Section 6.6), we predict noise levels will be at a level that will not significantly disturb terminal occupants or interrupt any activities.

4.0 UNDERWATER NOISE

4.1 Species of Interest and Marine Mammal Criteria

Table 3 shows the species of interest for the project. The thresholds have been taken from the *Technical Guidance for Assessing the Effects on Anthropogenic Sound on Marine Mammal Hearing* from the US Department of Commerce National Oceanic and Atmospheric Administration (NOAA). This document is used as standard practice for underwater noise assessments in New Zealand. This document is referred to as the 'NOAA 2024 Guidelines' throughout this management plan.

The NOAA 2024 Guidelines provide auditory impact thresholds (temporary threshold shift (TTS) and auditory injury (AUD INJ)) and auditory weighting curves for all marine mammals relevant to this project.

Table 3: Summary of NOAA TTS and AUD INJ thresholds⁴

NOAA species group	Threshold for impulsive sources (i.e. impact piling)	
	TTS	AUD INJ
Very-high-frequency cetaceans (hectors dolphin)	144 dB SEL _{cum(vhf)} 196 dB L _{peak}	159 dB SEL _{cum(vhf)} 202 dB L _{peak}
High-frequency cetaceans (orca, bottlenose dolphin, common dolphin, dusky dolphin)	178 dB SEL _{cum(hf)} 224 dB L _{peak}	193 dB SEL _{cum(hf)} 230 dB L _{peak}
Low-frequency cetaceans (whales)	168 dB SEL _{cum(lf)} 216 dB L _{peak}	183 dB SEL _{cum(lf)} 222 dB L _{peak}
Otariid pinnipeds (fur seals)	170 dB SEL _{cum(ow)} 224 dB L _{peak}	185 dB SEL _{cum(ow)} 230 dB L _{peak}
Kororā		

4.2 Predicted Underwater Noise Levels

4.2.1 Noise source Level

Table 4 overleaf shows the assumed underwater piling source level. There is significant variation in noise emitted from piling works underwater. It is important to note that the piling works may be significantly quieter than our predictions in Table 4. Therefore, this CNVMP requires underwater

⁴ SEL thresholds have a reference of 1 $\mu\text{Pa}^2\text{s}$ and L_{peak} thresholds have a reference of 1 μPa

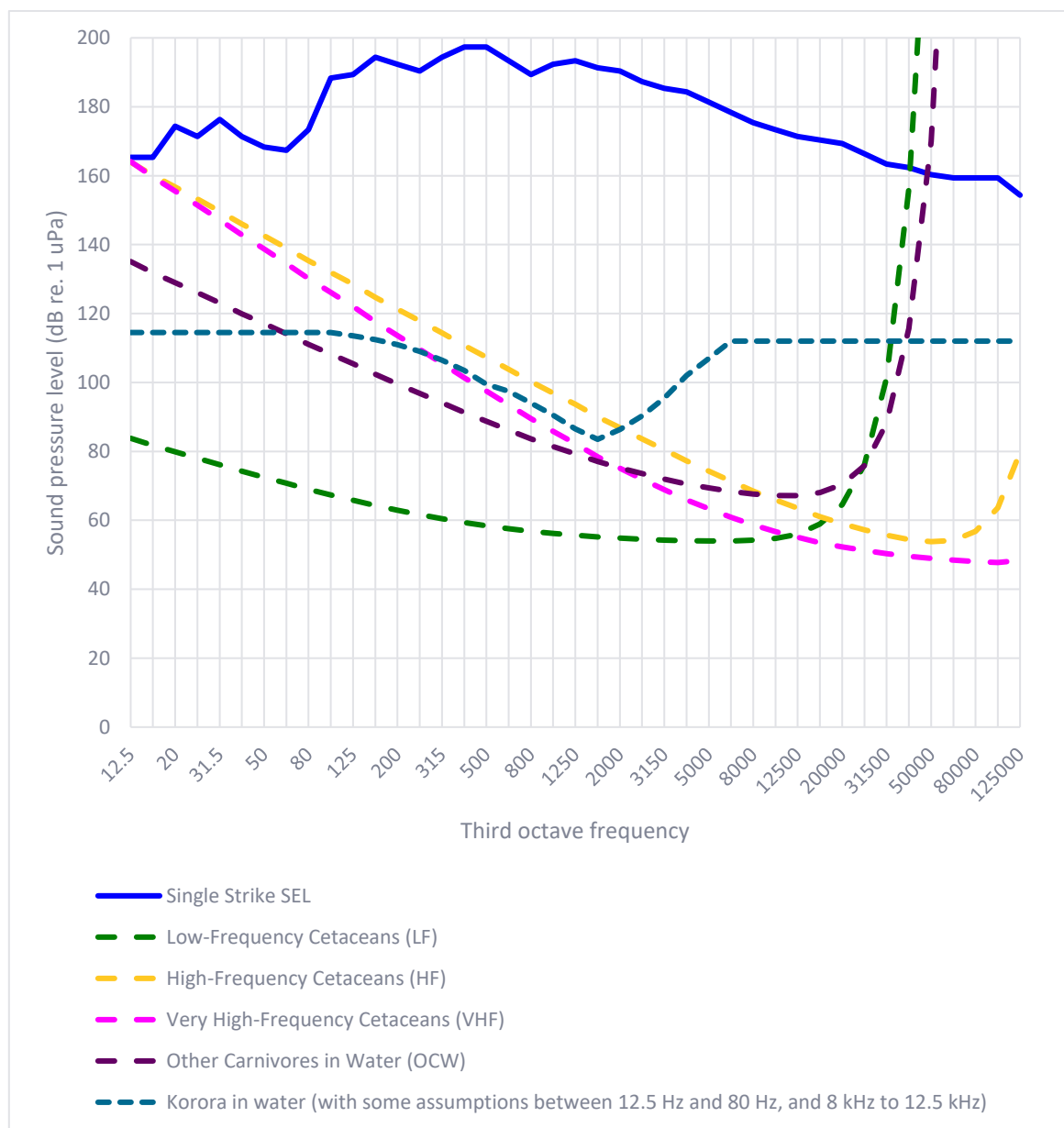
noise measurements to be carried out at the first instance of the key piling works to verify these source level assumptions and confirm the management zones (Section 8.3.)

Figure 1 shows the source spectrum plotted against the hearing thresholds of the species of interest.

Table 4: Summary of piling source data using worst-case scenario

Pile method	Piling type	Unweighted source levels at 1m (dB)			Data source
		Peak	RMS	SEL _{ss}	
Impact	1800mm circular steel	230	215	205	RMS based on CALTRANS ⁵ cata, spectrum based on measurements at Eastland Port of a 1200mm pile

Figure 1: Source spectrum and hearing thresholds



⁵ Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish November 2015

4.2.2 Flee response

Noise exposure modelling is typically undertaken in one of two ways, and both are presented in this CNVMP:

- **Stationary noise exposure:** This traditional simplified approach identifies the minimum distance at which a stationary animal is predicted to receive a daily noise exposure at or above the criteria (e.g. TTS in Table 3). It assumes the animal does not flee in response to the impact piling noise, so is very conservative. This approach has been typically used for all underwater assessments in the past.
- **Flee response noise exposure:** Flee modelling assumes that a marine mammal swims away from the noise source as soon as piling begins. This modern approach is more realistic and is now commonly adopted for European offshore windfarm impact pile driving assessments⁶.

Section 1.4.2 of the RPS example report notes: *“The most likely response of a marine mammal to noise levels that could induce TTS is to flee from the ensonified area (Southall et al., 2019) and subsequently the onset of TTS can be referred to as the fleeing response”*. It goes on in Section 1.7.1: *“Simplified exposure modelling could assume that the mammal either being static and at a fixed distance away from the noise source... This, however, would give an unrealistic level of exposure, as the animals are highly unlikely to remain stationary when exposed to loud noise, and is therefore expected to swim away from the source.”*

We present the findings using this approach as well.

Table 5 lists the conservative flee response swim speeds (i.e. not the fastest).

Table 5: Flee response swim speeds

Species hearing group	Flee response swim speed (m/s)
Very-high frequency cetaceans	1.4
High frequency cetaceans	1.5
Low frequency cetaceans	2.1
Otariid pinnipeds	2.0

⁶ European examples of flee response noise exposure modelling for offshore windfarm impact pile driving:

- RPS report for the Oriel Windfarm off the coast of Ireland (March 2024)
- Subacoustics report for the Muir Mhòr windfarm off the coast of Scotland (Nov 2024)
- SMRU report for the Seagreen Wind Farm off the coast of Scotland (April 2020)

4.2.3 Predicted marine mammal observation zones (MMOZ)

Both stationary and flee response MMOZ are presented.

Table 6 shows the project's TTS/AUD INJ zones predicted for each hearing group, rounded to the nearest 50m, assuming a stationary mammal. These zones are applied by the MMO as the MMOZ.

Table 6: The project MMOZ assuming stationary mammal

Piling type	Species hearing group	Impact pile driving	
		TTS	AUD INJ
1800mm circular steel	Very-high frequency cetaceans	2,000m	300m
	High frequency cetaceans	400m	150m
	Low-frequency cetacean	3,100m	1,400m
	Otariid pinnipeds	850m	150m

Table 7 shows the MMOZ for the predicted TTS onset distance from the pile being driven, assuming marine mammals flee when pile driving commences while conservatively ignoring the mitigation benefits of the soft-start protocol.

Table 7: The project MMOZ assuming a flee response

Piling type	Species hearing group	Impact pile driving
1800mm circular steel	Very-high frequency cetaceans	400m
	High frequency cetaceans	<50m
	Low-frequency cetacean	1100m
	Otariid pinnipeds	100m

Appendix D shows the calculated MMOZ for the stationary and flee response.

The single strike TTS and AUD INJ zones for all hearing groups are negligible (i.e. <50m), except for the low frequency cetacean with the following single strike peak impact zones:

- Peak noise causing TTS 185m
- Peak noise causing AUD INJ 75m

As an initial position, CPL will adopt an MMOZ based on the flee response approach. This is based on the low likelihood of very high frequency cetaceans (hectors dolphins) and low frequency cetaceans (whales) being in Wellington Harbour⁷ and the practicality and safety of MMOs to observe an MMOZ beyond 500m from land. This initial position will be reviewed by CPL based on measured noise levels and observed presence of marine mammals in the MMOZ

4.3 Measured Underwater Noise Levels

Underwater noise measurements were made during the first instance of piling works carried out on 17 July 2026. The results of those measurements verified that the noise source level from impact piling and calculated MMOZ extents specified in Section 4.0 of this report are valid.

⁷ Based on a previous project at Centreport. Section 3.1.1 of the certified Marine Mammal Management Plan for Centreport Seaview Wharf Renewal Works dated September 2021

5.0 VIBRATION

5.1 Vibration Performance Standards

5.1.1 Cosmetic Building Damage

There are no requirements in the NRP in respect of vibration, but under the RMA, vibration is included in the definition of noise and must be managed accordingly to avoid excessive emissions. In New Zealand, construction vibration is generally measured and assessed in accordance with German Standard DIN 4150-3:2016 *"Vibrations in buildings – Part 3: Effects of vibration on structures"* ('DIN 4150-3:2016').

DIN 4150-3:2016 limits are for avoiding cosmetic building damage, such as cracking in paint or plasterwork. The Standard states: *"Experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur."* Further information relating to the Standard can be found in Appendix E1.

For the Project, we have applied the long-term vibration limits as a conservative approach. These are shown below.

Building Type	Peak Particle Velocity Vibration Level (mm/s)
Commercial or Industrial	10
Residential	5
Vibration sensitive and Heritage	2.5

We are not aware of any vibration sensitive or heritage-listed buildings within the vicinity of the site.

5.1.2 Amenity

The main vibration concern of building owners and occupants is usually building damage, but the threshold levels of vibration perception and annoyance are much lower than what would cause damage.

Further discussion on the standards we have referred to for guidance on vibration perception, and typical responses to different levels of vibration are included in Appendix E4.

We propose 1 mm/s PPV to be the vibration trigger level at which engagement related to vibration effects will be prioritised for the potentially affected receivers.

5.2 Predicted Vibration Levels

For this Project, given the works required and the distance between these works and buildings, we do not expect any significant risks in respect of construction vibration.

There are no buildings within cosmetic building damage setbacks, and construction vibration is not predicted to exceed the amenity trigger level in occupied buildings. This is supported by vibration monitoring we have carried out within the existing Interislander terminal building, which is the closest building to the works.

Vibration from impact piling may be perceptible within the existing terminal during the closest set of piles (starting in mid-2027, refer Appendix B2).

Communication channels will be provided for in the terminal if any concerns related to this arise (refer Section 7.1).

6.0 MITIGATION AND MANAGEMENT

Regardless of compliance with noise and vibration limits BPO must be adopted. The BPO measures detailed in this section will be adopted throughout the works to ensure noise and vibration emissions are no greater than necessary.

Engagement with receivers in the surrounding environment will be maintained throughout the works (refer Section 7.1) and any complaints will be addressed in accordance with the complaints response procedure detailed in Section 7.2.

6.1 Training

All staff will participate in an induction training session before starting work on the construction, with attention given to the following matters:

- Activities with the potential to generate high levels noise and/or vibration
- Mitigation and management measures (Section 6.0)
- Sensitive receivers and any agreements made through engagement (Section 7.0)
- Monitoring requirements (Section 8.0)

As the construction progresses, any updates of noise and vibration matters will be addressed during regular site meetings and/or 'toolbox' training sessions.

6.2 Equipment Selection

When selecting construction equipment:

- Use electric motors rather than diesel engines where practicable
- Use rubber tracked equipment rather than steel tracked equipment where practicable
- Use equipment that is suitably sized for the task (i.e. oversized equipment tends to generate more noise compared to smaller equipment that can complete the same works)
- Maintain equipment well to minimise rattles, squeaks, etc
- Fit engines with exhaust silencers and engine covers where practicable
- Avoid tonal reversing or warning alarms (beepers). Alternatives include broadband alarms (squawkers/quackers), flashing lights, proximity sensors, reversing cameras and spotters

6.3 Scheduling

Piling is currently scheduled to prioritise a shorter overall programme, whereby piling will continue each day within the impact piling hours. This is to minimise the total number of months where construction activities will be impacting nearby receivers.

There shall also be coordination with the ecologist's recommendations to avoid pile driving during sensitive seasonal periods, and driving in daylight hours only to aid marine mammal observers.

Any significant updates to programming will be provided as part of the Project's communication measures (refer Section 7.1).

Impact piling activities will be limited to occur between 0730 – 1800 hrs, Monday to Saturday.

6.4 General Measures

Complaints can arise even if the noise and vibration levels comply with the Project limits. To minimise complaints, the following common mitigation measures are recommended:

- Avoid unnecessary noise. This means managing the site to ensure:
 - o No shouting

- o No unnecessary use of horns
- o No site radios
- o No rough handling of material and equipment
- o No banging or shaking excavator buckets
- o No unnecessary steel on steel contact (e.g. during the loading of scaffolding on trucks)
- o No high engine revs. This includes choosing the right sized equipment and turning engines off when idle.
- Avoid unnecessary vibration. This means managing the site to ensure:
 - o No unnecessary dropping of heavy objects
 - o No potholes, bumps or corrugations in site accessways
 - o Excavator operators are skilled and use their machine considerately
- Mitigate track squeal from tracked equipment, such as excavators. This may include tensioning and watering or lubricating the tracks regularly
- Locate stationary equipment (e.g. generators) away from noise sensitive receivers and/or screen them behind site buildings and material stores
- Utilise specific measures for the following activities:
 - o Excavators (Section 6.5)
 - o Piling (Section 6.6)
- Engagement is complete (Section 7.0) prior to commencing high-noise and vibration activities
- Undertake monitoring (Section 8.0)

6.5 Excavators

All excavators can generate high noise and vibration levels. The actual level they generate depends very much on the experience and temperament of the operator.

- Use the right sized excavator for the job
- Operate the bucket and arm with smooth movements (avoid jerking)
- Tip material from the bucket rather than shaking it clean where practicable
- Avoid hitting the bucket on the ground or dropping heavy objects
- Control the weight shift of the excavator to avoid the tracks lifting and thudding on the ground

6.6 Piling

- For pre-drilling (if used), avoid shaking the auger to remove spoil where practicable. Shaking the kelly bit connection creates very loud banging that often results in noise complaints. If spoil does not fall off the auger easily, use tools to scrape the auger clean if necessary. If shaking is required due to Health and Safety constraints, ensure bushes are well maintained to minimise steel on steel contact.
- For vibratory piling, wait for the hammer/driver vibration to stabilise before pressing or extracting piles
- All impact piling will include noise mitigation at the source throughout the duration of the activity
 - o Airborne noise will be mitigated through use of a hammer shroud which provides acoustic screening and/or a dolly

- Underwater noise will be mitigated through use of bubble curtains (refer Section 7.3.3 for further detail)

6.7 Existing Interislander Terminal Building

- Target full operation and utilisation of the temporary terminal building to be constructed in place of the existing terminal by commencement of SS Span 2 piling works at the latest
- The outdoor canopied area will be managed such that during the closest piling stages (SS Span 2 Works and Shore Span Temporary Staging), it will only be accessible when necessary, such as when the terminal is approaching maximum capacity
- During the Shore Span Temporary Staging works (the closest piling stage to the existing terminal), noise barriers to the perimeter of the canopied outdoor area will be installed. Installed noise barriers will:
 - Block line-of-sight to piling activities
 - Have minimum surface mass of 6.5 kg/m², e.g. 12mm plywood or most proprietary 'noise curtain' products
 - Be abutted, battened, or overlapped to provide a continuous screen without gaps at the bottom or between panels
 - Be installed for SS Span 2 Works as well if the temporary terminal is not in operation by this stage
- Hearing protection (earplugs) will be openly available to terminal occupants
- The terminal will include signage and resources to advise terminal patrons of the potential for audible construction noise, and to receive relevant project information (refer Section 7.1).

7.0 ENGAGEMENT

7.1 Communication

7.1.1 Before construction

Written communication via residents' networks will be provided to nearby communities (currently Wadestown and Thorndon), and made publicly available via social media, and updates on online project sub-site one week prior to commencement of new sets or stages of piling. It will include:

- Details of the overall works, its timing and duration
- Contact details and names of personnel whose job is to receive complaints and enquiries (should also match a person identified in Section 2.3)
- Acknowledge that some activities (listed in this document) are predicted to generate high noise levels and may result in disturbance for short periods
- Descriptions of what activities they may hear and their character (e.g. impact piling noise – impulsive thuds at distance)

7.1.2 During construction

Once construction has begun, ongoing communication is important. Regular communication during the works will include:

- Public site signage that includes contact details (via online portal)
- Details of upcoming activities that may result in disturbance

Any changes to scheduled timing and duration of activities. The Project Manager or Communications and Engagement Manager (refer Section 2.3) will be contactable during work hours and will address any concerns and complaints in accordance with Section 7.2.

7.2 Complaints Response

Complaints will be acknowledged immediately where practicable and responded to within three days. If a more detailed response is needed, it will be provided within a timeframe agreed with the complainant.

All construction noise and vibration complaints will be recorded in a complaints file that is available to affected parties on request. For each complaint, an investigation will be undertaken as soon as practicable using the following steps:

- Acknowledge receipt of the concern or complaint and record:
 - o The name, address and contact details of the complainant (unless they elect not to provide)
 - o Time and date the complaint was received and who received it
 - o Time and date of the activity that caused the complaint (estimated where not known)
 - o The complainant's description of the activity and its resulting effects
 - o Any relief sought by the complainant (e.g. scheduling of the activity)
- Identify the relevant activity and review the activity log to verify the complaint (or otherwise)
- Review data from monitoring (if available) to identify the time in question and, if possible, verify exceedance
- Review the predicted noise and/or vibration levels to determine if the activity was identified. Consider attended monitoring to verify the underlying reference level assumptions
- Review the mitigation and management measures in place to ensure the BPO has been applied (Section 6.0). Review the relief sought by the complainant. Adopt further mitigation and management measures as appropriate.
- Report the findings and recommendations to the Project Manager, implement changes and update this CNVMP as appropriate
- Report the outcomes of the investigation to the complainant, identifying where the relief sought by the complainant has been adopted or the reason(s) otherwise.

Any ongoing complaints may trigger a consultation process (i.e. 2-way communications) between the complainant, the Project Manager, and the Communications and Engagement Manager. The purpose of consultation is to address concerns about noise and vibration on a case-by-case basis.

A copy of all correspondence will be made available to affected parties upon request, and all consultation outcomes/agreements will be documented in this CNVMP. As part of the consultation process, the following may be implemented by the Project Manager (or nominated person):

- Review the construction methodology, mitigation measures and management strategies to ensure they represent the BPO. The BPO considers:
 - o Practicability
 - o Predicted noise/vibration benefits
 - o The interests of affected parties
 - o Implications for Project timing and duration
 - o Cost

- Consultation with affected parties to understand their sensitivities, including times they are home. The objective is to establish a collaborative approach to managing adverse noise and vibration effects
- Implement any measures agreed with the affected party in good faith
- Monitor the activity to verify the extent of any adverse effects (Section 8.0) and need for any further mitigation

7.3 Underwater construction noise mitigation

7.3.1 Overview

Implement the following best practice measures to manage and mitigate underwater noise on marine mammals^{8 9}:

1. Reducing the noise at source by selecting pile driving equipment and methodologies that generate lower noise emissions. This could be done by:
 - i. prioritising vibro-piling to minimise underwater noise emissions. This would then be followed by impact piling (at a reduced strike volume) to socket the pile,
 - ii. using a hammer cushion or dolly during impact piling to avoid steel on steel contact
2. Scheduling high noise works in consultation with an ecologist's recommendations to avoid pile driving during sensitive seasonal periods, and driving in daylight hours to aid marine mammal observers
3. Mitigating noise from the piling using single bubble curtains (Section 7.3.3) or similar systems to reduce noise propagating into the water column
4. Stopping/postponing works when marine fauna is present using marine mammal observers (MMO - Section 7.3.2), and/or use of acoustic detectors and similar technologies to identify marine mammals in the marine mammal observation zone
5. Validating the underwater noise levels and mitigation: carrying out underwater noise measurements (Section 8.3) to validate the size of the predicted zones and review the effectiveness of mitigation and management measures.

7.3.2 Marine Mammal Observer (MMO)

As per standard practice, an MMO manages the Marine Mammal Observation Zones (MMOZ – Section 4.2.3) during impact pile driving. The MMO protocol is summarised below:

- **MMO:** The MMO is typically on continuous watch from an elevated position near the pile-driving rig or nearby headland. The aim is to identify marine mammals in or entering the MMOZ. The MMO will be familiar with these standard operating procedures, keep a record of all sightings, and enforce shutdowns due to the presence of marine mammals in the MMOZ.
- **Pre-start procedure:** the MMOZ is typically visually monitored by the MMO for at least 30 minutes before the commencement of vibro and impact pile driving. Pile driving may commence if no marine mammals have been sighted within the MMOZ or they have left the MMOZ.
- **Soft start procedure:** Impact pile driving must start with low energy impacts over the first 10-minute interval to alert marine mammals and invoke a flee response if nearby.

⁸ https://link.springer.com/rwe/10.1007/978-3-031-10417-6_13-1

⁹ https://link.springer.com/referenceworkentry/10.1007/978-3-031-10417-6_182-1

- **Shut-down procedure:** Pile driving activity must stop immediately if a marine mammal is sighted within or about to enter the MMOZ.

7.3.3 Bubble Curtain

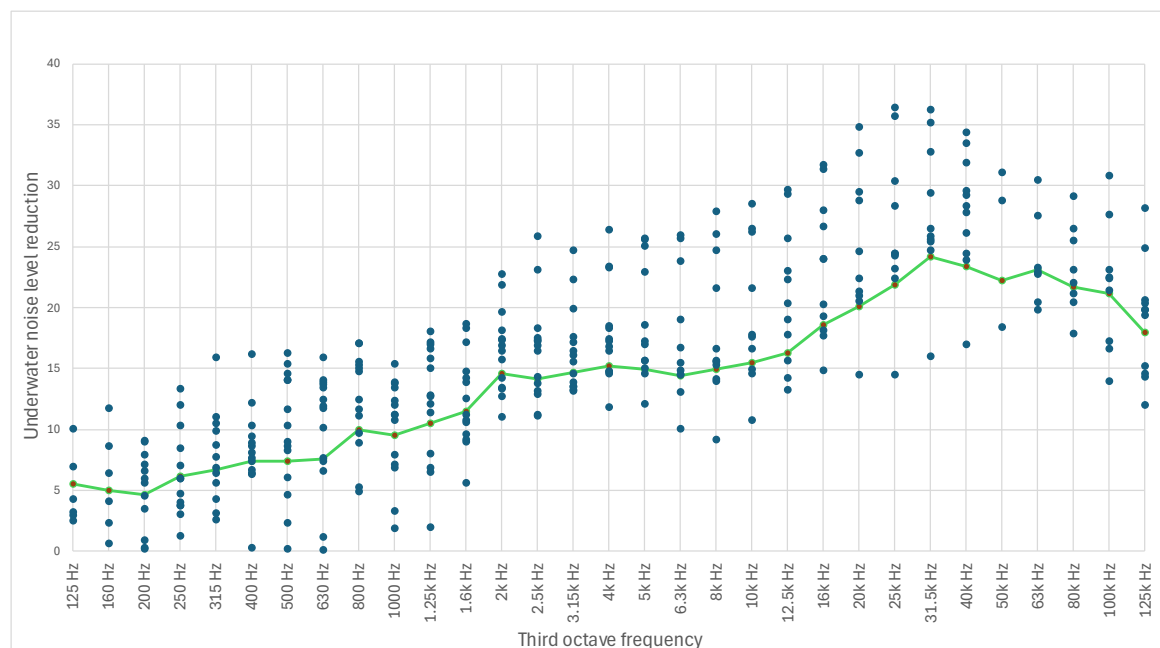
A bubble curtain will be used for all impact piling.

The performance of the bubble curtain is highly dependent on an effective installation. The following shall be confirmed prior to the commencement of impact piling:

- The bubble curtain is weighted down to the seabed (not floating) and not obstructed
- The bubbles are consistent across the length of the tubing. Note that higher pressures may be required if the tubing is on sloped ground (more pressure is required to produce bubbles in deeper water compared with shallow water)
- A method is available to purge water from the tubing
- The tubing creates a consistent barrier between the piling and harbour (typically a ring or horse-shoe shape near land)

The bubble curtain performance shall be verified through underwater noise monitoring, and the results compared to the data in Figure 3 to determine its effectiveness.

Figure 2: Single bubble curtain measurement results



8.0 NOISE MONITORING

8.1 Attended noise monitoring

This is where a suitably qualified acoustic engineer visits the site and measures levels in real time. This enables us to :

- Review the implementation of this CNVMP, including the mitigation and management measures in Section 6.0 and engagement in Section 7.0
- Verify the predicted levels are representative and the response protocols are appropriate for the resulting effects
- Determine compliance

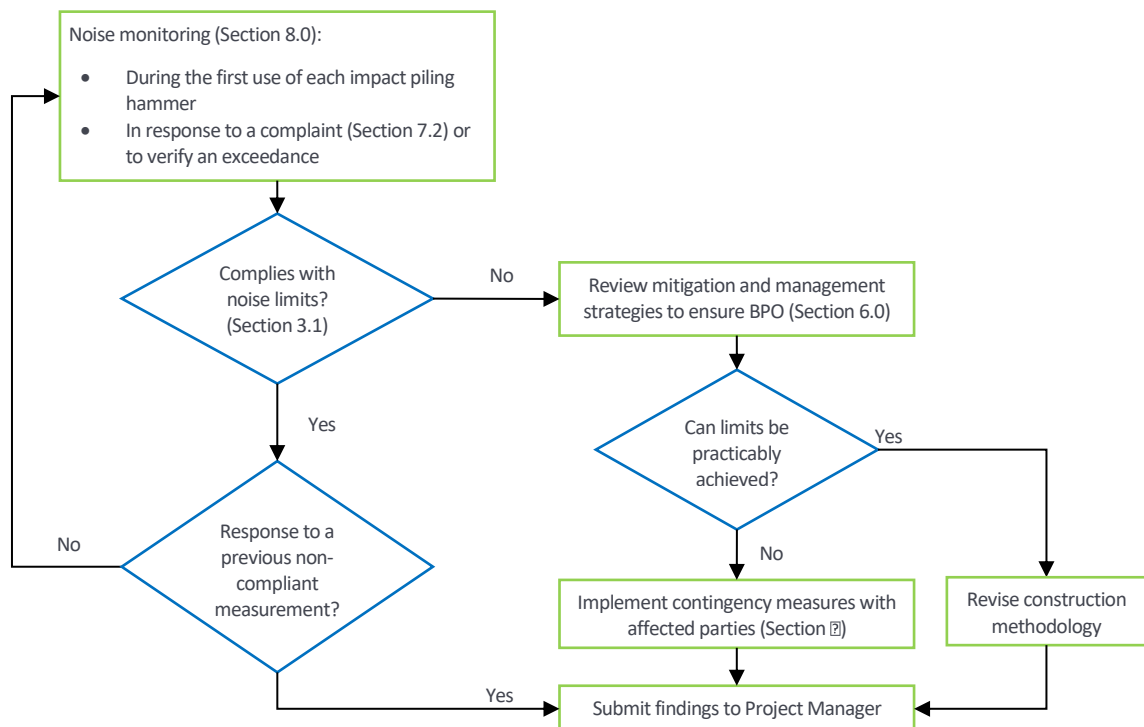
8.2 Noise Monitoring Methodology

Construction noise will be monitored:

- The first time impact piling is used on site. Two hammer sizes will be used, and noise monitoring will be carried out the first time each one is used. This will allow for verification of the predicted noise level for this activity (Section 3.2).
- In response to a reasonable noise complaint (Section 7.2)
- At 1m from the building façade facing the construction site, or a proxy position adjusted for distance
- By a suitably qualified and experienced specialist (e.g. Member of the Acoustical Society of New Zealand) in accordance with the requirements of New Zealand Standard NZS 6803: 1999 “Acoustics - Construction Noise”
- For an appropriate duration, reported with the measured level (e.g. 65 dB L_{Aeq} (30min))
- The results will be used to update Section 3.2 if appropriate

A noise monitoring flowchart is presented in Figure 3.

Figure 3: Noise Monitoring Flow Chart



8.3 Underwater noise monitoring

Underwater construction noise levels shall be measured:

- During impact driving steel piles for each piling rig, to verify the assumed noise levels and to confirm the bubble curtain performance
- By the Acoustic Specialist (Table 1)
- For a representative duration

APPENDIX A GLOSSARY OF TERMINOLOGY

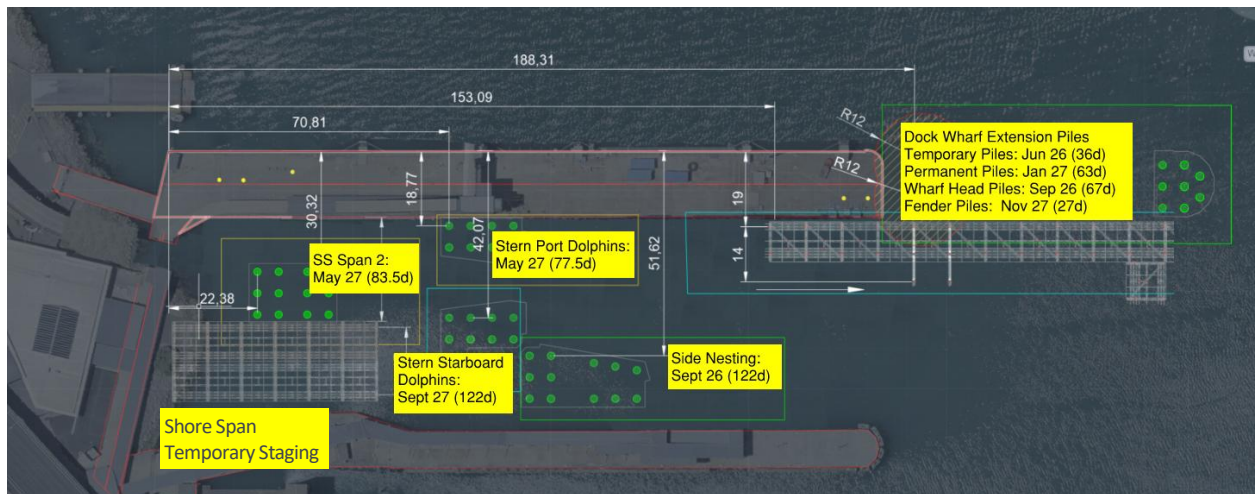
Noise	A sound that is unwanted by, or distracting to, the receiver.
dB	Decibel (dB) is the unit of sound level. Expressed as a logarithmic ratio of sound pressure (P) relative to a reference pressure (Pr), where $dB = 20 \times \log(P/Pr)$.
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) to more closely approximate the frequency bias of the human ear. A-weighting is used in airborne acoustics.
L_{Aeq} (t)	The equivalent continuous (time-averaged) A-weighted sound level commonly referred to as the average level. The suffix (t) represents the period, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{AFmax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_w	Sound Power Level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L _{WA} .
NZS 6803:1999	New Zealand Standard NZS 6803: 1999 <i>"Acoustics – Construction Noise"</i>
Vibration	When an object vibrates, it moves rapidly up and down or from side to side. The magnitude of the sensation when feeling a vibrating object is related to the vibration velocity. Vibration can occur in any direction. When vibration velocities are described, it can be either the total vibration velocity, which includes all directions, or it can be separated into vertical (up and down vibration), horizontal transverse (side to side) and horizontal longitudinal direction (front to back) components.
PPV	Peak Particle Velocity (PPV) is the measure of the vibration amplitude, zero to maximum, measured in mm/s.
BS 5228:2009	British Standard BS 5228:2009 <i>"Code of practice for noise and vibration control on construction and open sites, Part 1: Noise, Part 2: Vibration"</i>
DIN 4150-3:2016	German Standard DIN 4150-3:2016 <i>"Vibrations in buildings – Part 3: Effects of vibration on structures"</i>

APPENDIX B SITE

B1 Piling Locations in context of the NRP [Base image: GWRC NRP]



B2 Piling plan [Base image supplied by BPC]



B3 Indicative location of Kaiwharawhara Point temporary staging [Image supplied by CentrePort]



B4 Site and surrounding environment [Base image: Land Information New Zealand]



APPENDIX C CONSTRUCTION NOISE LIMITS

The applicable noise limits of NZS 6803:1999 depend on the duration of construction works. Construction projects which are of a shorter duration have higher allowable noise limits than those of a longer duration. The long-term duration limits apply for this project.

The noise limit from NZS 6803:1999 for long-term durations are shown in Tables C1 and C2, excluding Sundays and public holidays. They apply at one metre outside the façades of buildings and only while they are occupied.

C1 Construction noise limits for activities sensitive to noise (e.g. occupied dwellings)

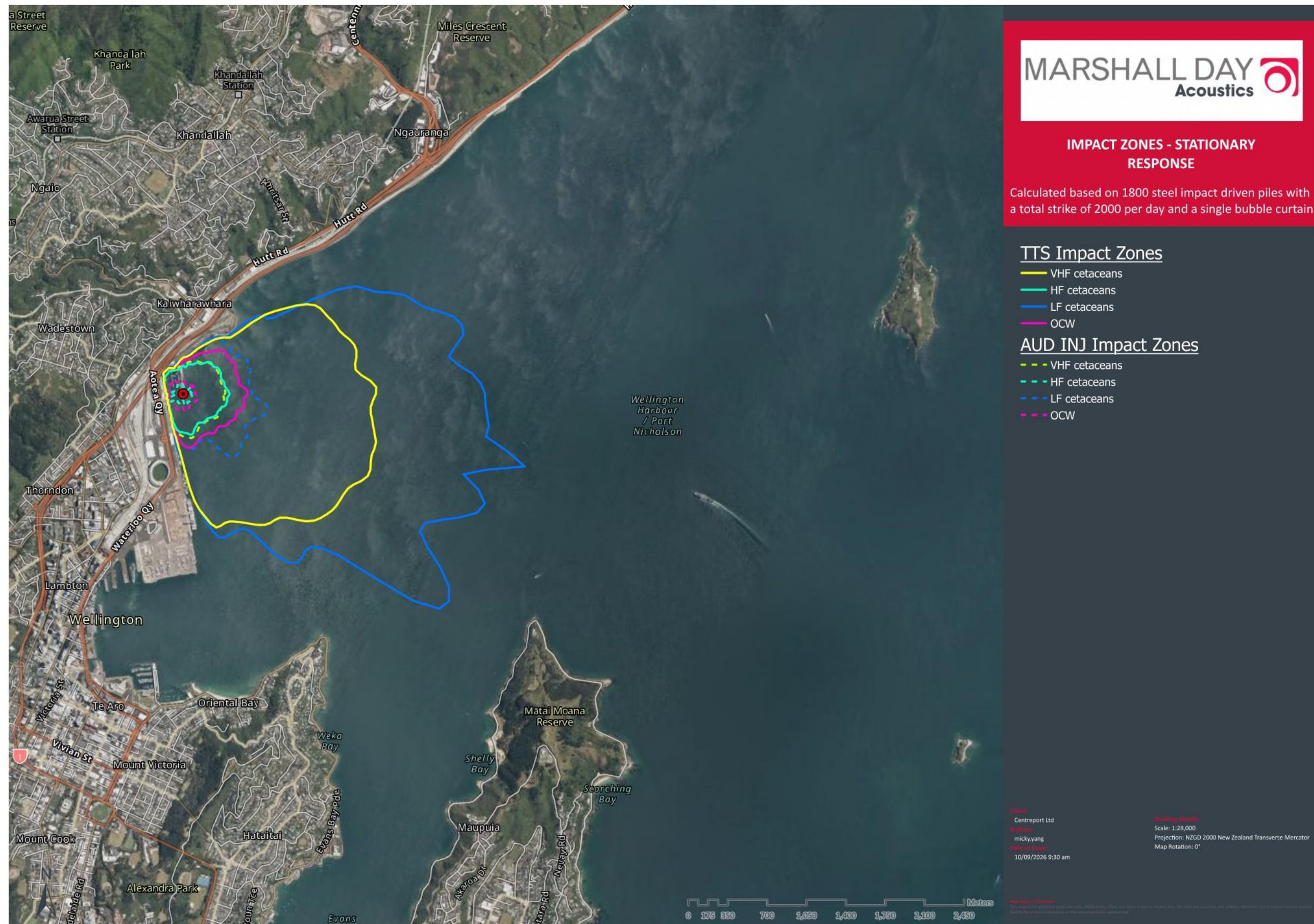
Time of week	Time period	Long-term duration ¹⁰ construction noise limit	
		dB L _{Aeq}	dB L _{AFmax}
Weekdays	0630 – 0730	55	75
	0730 – 1800	70	85
	1800 – 2000	65	80
	2000 – 0630	45	75
Saturdays	0730 – 1800	70	85
	1800 – 0730	45	75

C2 Construction noise limits for noise affecting any other activity (e.g. occupied commercial building)

Time of week	Time period	Long-term duration construction noise limit
		dB L _{Aeq}
All days	0730 – 1800	70
	1800 – 0730	75

¹⁰ Construction work at any one location with a duration exceeding 20 weeks

APPENDIX D PREDICTED UNDERWATER NOISE IMPACT ZONES





MARSHALL DAY
Acoustics

IMPACT ZONES - ASSUMING A FLEE RESPONSE

Calculated based on 1800 steel impact driven piles at a rate of 1 strike/3 seconds and a single bubble curtain

TTS Impact Zones

- VHF assuming flee response with single bubble curtain
- LF assuming flee response with single bubble curtain
- OCW assuming flee response with single bubble curtain

Client:
Centreport Ltd
Author:
micky yang
Date of Issue:
13/04/2026 5:07 pm

Drawing Details:
Scale: 1:7,340
Projection: NZGD 2000 New Zealand Transverse Mercator
Map Rotation: 0°

Disclaimer / Warnings:
This map is for general purposes only. While every effort has been made to ensure that the data are accurate and reliable, Marshall Day Acoustics cannot assume liability for errors or omissions in the data graphically represented.

APPENDIX E CONSTRUCTION VIBRATION LIMITS

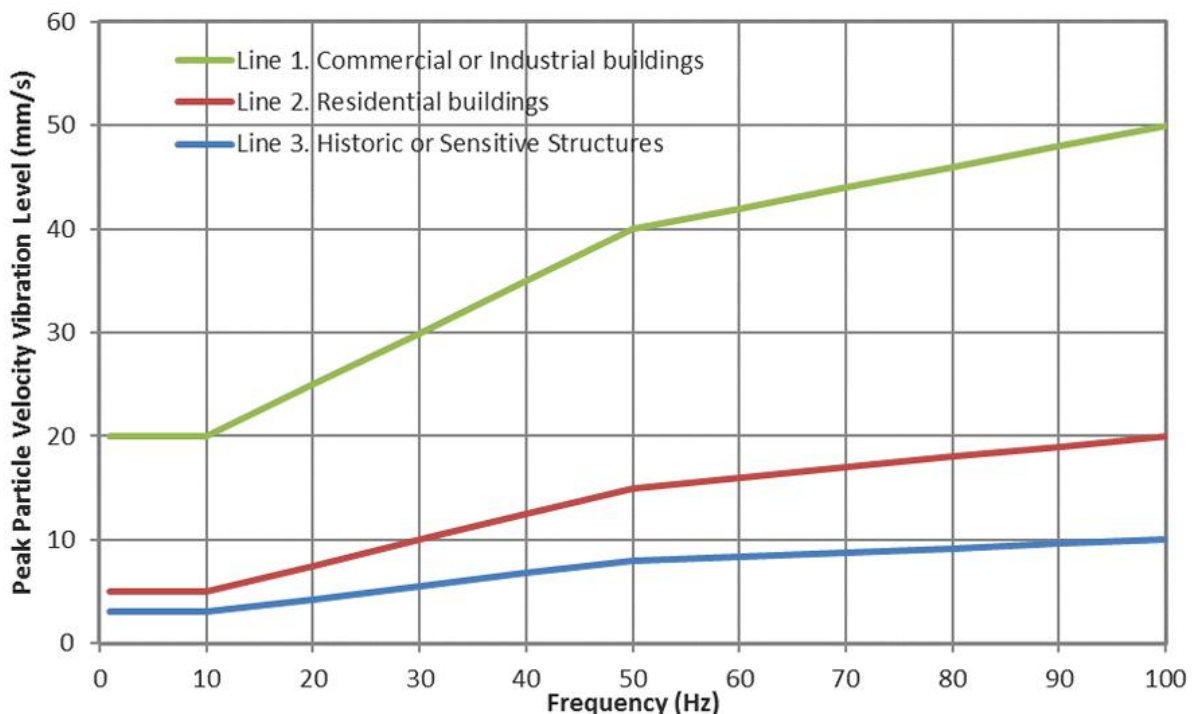
E1 Cosmetic Building Damage

DIN 4150-3:2016 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.

The short-term (transient)¹¹ vibration limits from DIN 4150-3:2016 are shown in Figure E2 and apply at building foundations in any axis.

The long-term (continuous)¹² vibration limits from DIN 4150-3:2016 are shown in Figure E3 and apply at all floor levels, but levels are normally highest in horizontal axes on the top floor.

E2 Short-term (transient) vibration limits at building foundations (DIN 4150-3:2016 Figure 1)



E3 Vibration limits in 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 4150-3:2016 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)"*.

¹¹ 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"*

¹² Long-term (continuous) vibration includes types not covered by the short-term vibration definition

E4 Vibration Amenity

The main vibration concern of building owners and occupants is usually building damage, but the threshold levels of vibration perception and annoyance are much lower than what would cause damage. While certain vibration events may be comfortably below structurally significant levels, they may be intense enough to cause concern or distress among building occupants.

We propose that the amenity effects of construction vibration are assessed in accordance with British Standard BS 5228-2:2009 *“Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration”*. The Standard provides guidance on the amenity effects of vibration and is widely used in New Zealand. The descriptions are reproduced below, and are supplemented with our own 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 only) in dwellings and workplaces if it occurs intermittently, and with effective prior engagement
- 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