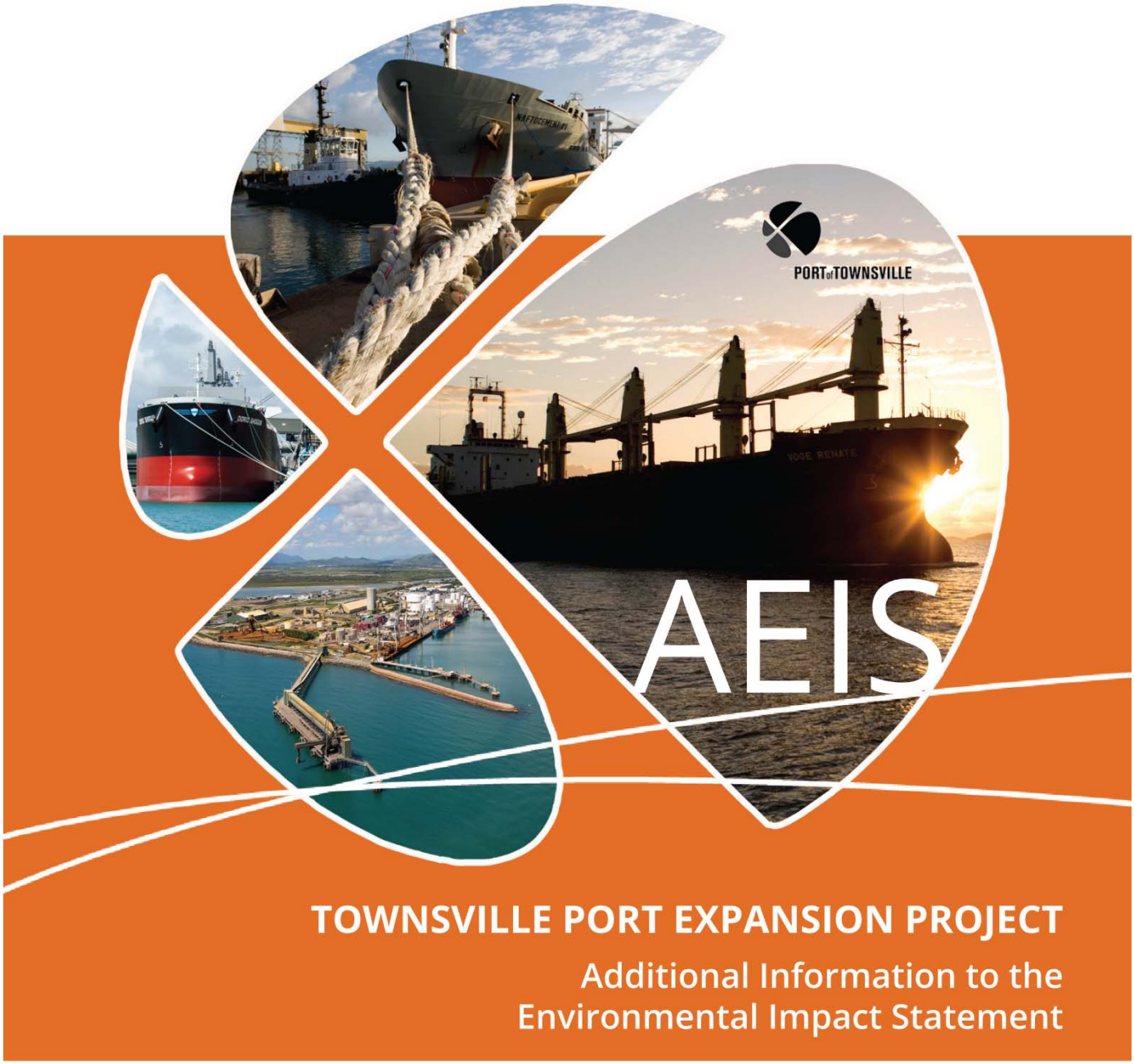

TOWNSVILLE PORT EXPANSION PROJECT

Additional Information to the Environmental Impact Statement

TOWNSVILLE PORT EXPANSION PROJECT

SECTION 12

Noise and Vibration

AECOM BMT WBM

12.0 Noise and Vibration

12.1 Introduction

Noise impacts of the Port Expansion Project (PEP) are described in Chapter B.10 of the PEP Environmental Impact Statement (EIS). The Project area supports existing port facilities with the nearest sensitive receptors identified approximately 1.4 km from the PEP boundary. The existing ambient environment is characterised by traffic and port activity noise.

This chapter provides information to address submissions received in response to the PEP EIS relevant to noise and vibration. More specifically, key issues raised from the submission process include:

- clarification of construction phase noise monitoring and mitigation measures
- land transport noise leading to increased disturbance of sensitive receptors (community)
- noise attenuation through a building façade
- night noise leading to increased disturbance of sensitive receptors
- application of the World Health Organization (WHO) Guidelines
- consistency in the complaints handling process
- land transport noise disrupting terrestrial fauna behaviour and movement patterns (refer to Section 9.0)
- underwater noise disrupting marine fauna behaviour and movement patterns (refer to Section 8.0)
- cumulative impacts associated with increased in maritime activity (refer to Section 25.0).

12.2 Response to Submissions

12.2.1 Clarification of construction phase noise monitoring and mitigation measures

10 submissions queried the proposed approach to noise monitoring and implementation of mitigation measures, with an emphasis on piling activities and fixed noise-emitting plant. An adaptive approach to implementing noise monitoring and management strategies during construction activities is discussed in Sections B.10.5.1.5 and B.10.5.2.4 of the EIS. Noise monitoring will be undertaken in accordance with the relevant standards at sensitive receptors during construction works identified as likely to cause community disturbance (such as piling or where noise-emitting plant is to be fixed in a stationary location for a significant amount of time) and in response to community complaints.

Environmental Management Plans (EMP) outlining monitoring, reporting and corrective action procedures for the construction and operational phases of the proposed development are provided in C.2.2 and C.2.5 of the EIS. In the event of exceedances of construction noise goals, noise-generating activities and equipment will be reviewed and mitigation measures (such as community consultation, timing of equipment use and use of acoustic enclosures) investigated to assess appropriateness to the Project and implemented where practicable. Monitoring activities will continue following all corrective action to assess the adequacy of those actions to mitigate the issue.

Townsville City Council further recommended an appropriate action plan be implemented and disseminated to relevant stakeholders. Stakeholder consultation and complaints management in association with noise is addressed in Sections B.10.5.1.4 and B.10.5.2.2 of the EIS. The Port of Townsville Limited (POTL) will update an established complaints handling procedure to accommodate the PEP and information regarding how to submit a noise enquiry will be provided on the POTL website.

12.2.2 Land transport noise leading to increased disturbance of sensitive receptors

Four submissions requested further information on how impacts of increased rail and site traffic noise on nearby sensitive receptors (community) are addressed. A road traffic noise impact assessment is provided in Section B.10.4.8 of the EIS. In addition to assessing road noise this section provides context for the exclusion of rail infrastructure from the assessment. POTL does not have developmental control or authority over rail servicing current or future port operations and therefore any impact associated with rail infrastructure must be addressed under a separate approval submitted by the relevant proponent.

12.2.3 Noise attenuation through building façades

The Department of Environment and Heritage Protection (DEHP) queried the relevancy of attenuation levels through an open window in Section B.10.4.6.1 of the EIS. The insertion loss through open windows of 10-15 dB previously assumed in the EIS to determine the *Environmental Protection Policy (Noise) 2008* night-time external noise goal has been revised to a more conservative insertion loss of 5-10 dB. The updated table summarising the operational noise goals, reflecting this reduced insertion loss through open windows, is provided in Table 12.1 below.

Table 12.1 Update to EIS Table B.10.12 Summary of external noise goals applicable at nearest noise sensitive receivers

Period	Time	Environmental Protection Policy (Noise) 2008 $L_{Aeq, adj, 1hr}$ dB(A)	Planning for Noise Control $L_{Aeq,1hr}$ dB(A)	World Health Organisation guidelines L_{Aeq} dB(A)	ECOACCESS Low Frequency dB(Lin)
Day	7am – 6pm	50	28 – 48*	40 – 45**	50 dB(Lin) Screening test (indoors)
Evening	6pm – 10pm	50	28 – 46*	40 – 45**	
Night	10pm – 7am	35 – 40**	28 – 44*	35 – 40**	

* These are specific for each noise sensitive receiver. Table B.10.13 (of the EIS) displays the Planning for Noise Control noise goals for each noise sensitive receiver.
** Assuming a 5-10 dB reduction through open windows

12.2.4 Night noise leading to increased disturbance of sensitive receptors

Two submissions were received regarding night-time noise from the PEP exceeding ambient background levels. Predicted noise levels for construction plant and equipment (based on continuous operation in an unmitigated environment) at noise-sensitive receptors (including Breakwater Quays) are tabulated in Tables B.10.6 and B.10.7 of the EIS with a comparison to known pre-construction noise levels at residential areas presented in Section B.10.4.3.1 of the EIS. Construction noise levels at sensitive receptors are predicted to be no higher than the pre-construction noise levels. Environmental Management Plans provided in Appendix B2 and Appendix B3 outline measures to mitigate noise generation and respond to exceedances including the investigation and implementation of alternative methods to construction and operation where practicable.

One submission also requested clarification on the assessment against the sleep disturbance criteria. The impact of night-time construction noise is discussed in Section B.10.4.3.2 of the EIS and is assessed against known pre-construction ambient and background noise levels measured at the nearest sensitive receptors. A comparison of night-time construction noise against a relevant sleep disturbance criterion is discussed in Section 12.3.4.1 of this AEIS. As noise emission from plant and equipment typically used at night during construction works is quasi-steady in nature (as piling works are not planned to occur at night), the night-time construction noise emission has been assessed against the L_{Aeq} noise descriptor, rather than an L_{max} noise descriptor, for consistency.

12.2.5 Application of the WHO Guidelines

DEHP has sought the *Night Noise Guidelines for Europe 2009* (the 2009 WHO Guidelines) to be applied to the assessment rather than the *Guidelines for Community Noise 1999* (the 1999 WHO Guidelines). The 1999 WHO Guidelines were used in the EIS to inform the derivation of noise criteria, primarily the recommendation of a 30 dB(A) L_{Aeq} noise level inside bedrooms. These guidelines are considered the most appropriate for this assessment as:

- The Terms of Reference (ToR) did not require an assessment of the long term average emissions or the 2009 WHO Guidelines although these were available at the time the ToR was issued.
- The 2009 WHO Guidelines are considered complementary to, rather than a replacement of the 1999 WHO Guidelines. The 40 dB descriptor utilised in the 2009 WHO Guidelines refers to a different measure, namely the $L_{night,outside}$, which is a long term average measured over every night of the year. Conversely, the 'typical worst case' noise impact scenario from the PEP has been assessed in the EIS, to which the 1999 WHO Guidelines' L_{Aeq} value of 30 dB inside bedrooms is more applicable.
- The 1999 WHO Guidelines limit of 30 dB(A) L_{Aeq} is consistent with the *Environmental Protection (Noise) Policy 2008* (EPP [Noise]) Acoustic Quality Objective inside dwellings at night-time, which is intended to protect the environmental value of "health and wellbeing in relation to the ability to sleep".
- An assessment of the 2009 WHO Guidelines $L_{night,outside}$ noise descriptor requires a different approach to the EIS noise assessment. This would require an assessment of the long term average emissions, including consideration of changing meteorological conditions and operating conditions over the entire year and is inconsistent with the comparison against the "typical worst case" scenario presented in the EIS

The 1999 WHO Guidelines are considered most appropriate for the PEP EIS assessment and will continue to be utilised to inform the acoustic assessment for this Project.

12.2.6 Consistency in complaints handling process

Townsville City Council recommended a consistent approach between POTL and council to handling noise complaints associated with the PEP. As stated in Section B.10.5.1 of the EIS, POTL has an established complaints handling procedure which will be updated to accommodate the PEP. Information regarding noise issues and enquiries will be made available on the POTL website in accordance with the PEP consultation program. POTL will work closely with Townsville City Council and DEHP to capture and consistently manage any complaints.

12.3 Revised Environmental Impact Assessment

12.3.1 Legislation and policy

The Queensland Department of Transport and Main Roads document *Road Traffic Noise Management Code of Practice 2008* has been superseded with the *Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise 2013*. The calculation methodology, noise goals and applicability are unchanged between the versions used for the EIS, and for the current report.

12.3.2 Design refinement

The project design has been further refined as described in Section 2.0 of the AEIS. The extent of dredging and reclamation works has been updated as a result of the project design refinements. Construction staging has altered from the EIS and accordingly noise impacts associated with construction have been revised.

Broadly, the design refinement has resulted in the following changes to the PEP EIS relevant to the noise and vibration assessment:

- construction noise impact, due to an increase in land reclamation area (Section B.10.4.3.1 Tables B.10.4, B.10.5, B.10.6 and B.10.7)
- operational noise impacts, due to the revised berth arrangement (Sections B.10.4.6.1, B.10.4.6.2 and B.10.4.6.3)
- construction phase traffic volumes and resulting traffic noise impacts (Section B.10.4.8.2
- cumulative impacts, associated with the change in operational noise impacts (Sections B.10.6).

An updated summary of noise and vibration impacts are discussed in Section 12.3.4.1 of this Report.

12.3.3 Supporting studies

The assessment of operational noise emissions from the PEP when it is fully constructed, assumed to be by 2031, was updated to reflect the revised PEP layout and is discussed later in this chapter.

12.3.4 Revised assessment

12.3.4.1 Impact assessment

Construction Phase - Traffic Noise

This section addresses Section B.10.4.8.2 of the EIS, specifically the construction phase traffic noise impact to dwellings on Boundary Street. The traffic assessment of the staged construction of the PEP indicated that Stage 2 (Year 2025) will generate the typical highest traffic volumes and so was considered the critical construction stage in terms of potential impacts on the surrounding road network and traffic noise emissions.

At that time, volumes of approximately 240 cars (during peak times) and 7 heavy vehicles per hour are estimated to access the site during May 2025, based on the updated traffic flows as a result of the design refinement. This forecast traffic flow represents approximately 8-13% of the forecast background traffic volumes on Boundary Street for that year. As such, the contribution to overall peak hour traffic noise levels on Boundary Street from PEP construction traffic is less than 1 dB, and is therefore not considered to represent a significant contribution to the traffic noise environment at that time.

Construction Noise - Daytime Sources

This section addresses Section B.10.4.5.1 of the EIS, specifically the daytime construction phase noise impact to nearby sensitive receptors, based on revised staging and associated traffic generation. Refinements to the Project approach have resulted in a larger reclamation area, with dredgers, dozers, front-end loaders and traxcavators (i.e. tractor-excavators) operating 24 hours per day. The noise impact from these activities was assessed in Table B.10.4 of the EIS.

The staging refinement is also expected to delay certain construction activities, such as piling activities; however, the severity and duration of impact is expected to be similar to that identified in Section B.10.4.5.1 of the EIS.

Construction Noise – Night-time Sources

This section addresses Section B.10.4.5.1 of the EIS, specifically the night time construction phase noise impact to nearby sensitive receptors, based on the changes to staging and associated traffic generation. Most of the construction activities associated with the PEP will be undertaken during normal daytime hours (6:30 am to 6:30 pm), 6 days per week. Several of the processes however are proposed to be carried out over 24 hours, 7 days a week. A summary of these activities and the reason that the night-time works are required is as shown in Table 12.2.

Table 12.2 Update to EIS Table B.10.5 .24 hour Construction Works Plan

Construction Activity	Stage	Duration	Reason for Night-time Works
Dredging	Stage 1	4.5 years	Due to volume of materials removed, 24/7 dredging during construction is time-critical to the completion of the Project. Reduced dredging hours would unreasonably prolong the construction period and increase potential environmental impacts.
	Stage 2	4.3 years	
	Stage 3	2.3 years	
Rock Supply / Placement	Stage 1	11 months	Due to the volume of materials to supply, 24/7 delivery of materials to the site during construction is time-critical to the completion of the Project (pending relevant conditions at individual quarries). Reduced supply hours would unreasonably prolong port construction and therefore the construction period and increase potential environmental impacts. The impact on road traffic can also be reduced by spreading the traffic volumes during the night.
	Stage 2	11 months	
	Stage 3	-	
Wharf construction	Stage 1	11 months	The nature of the wharf construction works over water, with limited access to work fronts, requires 24/7 activities to limit the duration and best utilise marine plant. When concrete is poured in large volumes, it will need to be done as a continuous process to ensure that it sets correctly.
	Stage 2	2.8 years	
	Stage 3	18 months	
Reclamation fill	Stage 1	4.5 years	The source of the reclamation fill will be dredged material, therefore the activities will run concurrently with the dredging operation.
	Stage 2	4.5 years	
	Stage 3	2.3 years	

Activities associated with night-time works, and their predicted unmitigated noise impact to the nearest sensitive receptors, are summarised in Table 12.3. The reference sound pressure levels were sourced from Australian Standard AS 2436-2010 *Guide to noise and vibration control on construction, demolition and maintenance sites,* British Standard BS 5228-1:2009 *Code of practice for noise and vibration on construction and open sites Part 1: Noise* and from AECOMs in house database.

The estimated noise impact has been calculated by assessing noise emission from individual pieces equipment operating at the closest point in the PEP footprint to each relevant receiver. A correction has been made to account for the percentage of time each item of equipment will operate at night (on a typical worst case basis), and it has been assumed that the intervening ground is flat, without allowance for any shielding from terrain or buildings.

Due to the preliminary nature of the construction methodology, a more detailed assessment is not practical and as such the assessment does not consider multiple pieces of equipment operating at different locations simultaneously. However this has been mitigated by applying conservative assumptions in terms of equipment location and intervening topography and on this basis the impacts outlined in Table 12.3 are considered indicative of the likely night-time impacts.

It is noted that the Townsville Marine Precinct is a commercial precinct with daytime occupancy only. As such it is not considered sensitive at night and night time noise levels have not been calculated.

The predicted noise levels at the noise-sensitive receivers are presented as external noise levels as described in Section B.10.4.3.2 of the EIS.

Table 12.3 Update to EIS Table B.10.7 Typical Predicted Noise Levels from Construction Plant and Equipment – Night –time Construction Works. Merges with EIS Table B.10.6.

Plant	Typical Sound Pressure Level at 10 m, dB(A)	% of Night-time Operations	Predicted noise level at nearest noise-sensitive receptors L_{Aeq} dB(A)				
			29 Hubert Street	55 Macrossan Street	5 Breakwater Quays	The Ville Resort-Casino	1 Esplanade
Barge	76	20%	23	24	26	27	10
Work boat	78	20%	25	26	28	29	12
Bulldozer	81	70%	34	34	37	38	21
Concrete truck	80	70%	33	33	36	37	20
Crane	82	80%	35	36	38	39	22
Mechanical Dredge	82	100%	36	37	39	40	23
Excavator/Traxcavator	79	100%	33	34	36	37	20
Front End Loader	82	100%	36	37	39	40	23
Generator (diesel)	71	100%	25	26	28	29	12
Truck (> 20 tonne)	79	75%	32	33	35	36	19
Tug for barge	82	10%	26	27	29	30	13

Based on the measured night-time pre-construction noise levels at residential areas, the typical night-time construction noise levels identified in the above table for individual items of equipment are:

- Below the existing average night-time ambient noise levels of 46 to 49 dB(A) for all activities.
- At or below the existing average night-time background noise levels of 38 to 45 dB(A) for all activities.
- Compliant with the EPP (Noise) night-time acoustic quality objective, and 1999 WHO night-time guideline value of 35- 40 dB(A) L_{Aeq}, for all construction activities. The acoustic quality objective of the EPP (Noise) is intended to protect the environmental value of health and wellbeing, in relation to the ability to sleep. Similarly, the 1999 WHO Guideline value is intended to protect against the critical health effect of sleep disturbance.

Operational Phase

This section addresses Sections B.10.4.6.1, B.10.4.6.2 and B.10.4.6.3 of the EIS, specifically the operational phase noise impact to nearby noise sensitive receivers.

Table 12.4 below presents the results of noise modelling (under the meteorological conditions described in Section B.10.3.5 of the EIS) at 2 metres above local ground level for the residential locations and at the uppermost floor for The Ville Resort – Casino. As the Port will operate 24/7, they can represent either daytime or night-time predicted noise levels. Predicted exceedances of both noise goals (Planning for Noise Control and World Health Organization) are shown in **bold** in Table 12.4. A discussion of the relevant noise guidelines is provided in Appendix A6.

A series of noise contour plots for the predicted external noise levels at 2 metres above local ground level are given in Appendix A6. Noise goals and predicted noise levels for noise-sensitive receivers presented below and in the contours are for noise external to the dwelling/building.

Table 12.4 Update to EIS Table B.10.14 Predicted typical operational external noise levels at nearest noise-sensitive receivers, calendar year 2031

Location	Noise Goal Range, dB(A)		Forecast LA_{eq} Noise Level, dB(A)		
	Planning for Noise Control*	World Health Organization	Neutral, D Class Calm	D Class 3m/s SE wind	D Class 3m/s S wind
29 Hubert Street	41	35 – 40	**43**	41	39
55 Macrossan Street	35	35 – 40	**44**	**42**	40
5 Breakwater Quays	44	35 – 40	**46**	**50**	44
The Ville Resort - Casino	42	35 – 40	**46**	**51**	**45**
1 Esplanade, Picnic Bay, Magnetic Island	28	35 – 40	28	31	30
Townsville Marine Precinct	N/A	70	48	45	43

*Most stringent Planning for Noise Control noise target for each location provided

As the noise guidelines provided by the Planning for Noise Control document are applicable to external noise levels, and the Environmental Protection (Noise) Policy provides an internal guideline noise value for commercial activities, no Specific Noise Level targets are set for the Townsville Marine Precinct.

Comparison against Planning for Noise Control noise goals

The operation of the expanded portion of the Port in calendar year 2031 is expected to produce noise levels of up to 43 dB(A) at 29 Hubert Street, 44 dB(A) at 55 Macrossan Street, 50 dB(A) at Breakwater Quays, 51 dB(A) at The Ville Resort – Casino and 31 dB(A) at 1 Esplanade, Picnic Bay, Magnetic Island. At Hubert Street, the Planning for Noise Control noise goals is forecast to be exceeded by up to 2 dB(A). This is considered borderline compliant as a difference of 1-2 dB is not generally perceptible. It is noteworthy that the Planning for Noise Control noise goal is slightly more lenient than the World Health Organization noise goal at this receptor.

Forecast exceedances at Macrossan Street and Breakwater Quays are more significant. This is discussed further below.

Comparison against World Health Organization guidelines

As the World Health Organization guidelines presented here are in relation to the potential for sleep disturbance, the night time assessment period is the most important and is discussed below.

External noise levels at Hubert Street, Macrossan Street, Breakwater Quays and The Ville Resort – Casino from the operating Port Expansion Project under the identified prevailing wind conditions are predicted to exceed the World Health Organisation guidelines by up to 11 dB(A) (at the Casino). This is examined in subsequent sections.

Table 12.4 shows external noise levels of up to 48 dB(A) are predicted at the Townsville Marine Precinct from the Port Expansion Project. Typical reduction across a standard commercial façade (closed windows and doors, air conditioned) is 20 dB; therefore, the internal guideline level of 45 dB(A) for the commercial properties at the Townsville Marine Precinct is likely to be readily achieved.

The predicted external noise levels at the Magnetic Island location are forecast to be below the lower Wold Health Organization limit under all modelled meteorological conditions.

Operational Phase - Breakwater Quays and 55 Macrossan

This section addresses Section B.10.4.6.1 of the EIS, specifically the operational noise impact to Breakwater Quays dwellings with the reduced insertion loss through an open window as discussed in Section 12.2.3 of this Report. This section also addresses the operational noise impact to 55 Macrossan Street.

At Breakwater Quays, the predicted typical worse case operational noise level is 50 dB(A) L_{Aeq}. This exceeds the WHO 1999 and EPP (Noise) night-time external noise goal of 35-40 dB(A) L_{Aeq} by 10-15 dB(A), assuming windows are open. Similarly at 55 Macrossan Street, the predicted typical worse case operational noise level is 44 dB(A) L_{Aeq}. This exceeds the World Health Organization and EPP (Noise) night-time external noise goal of 35-40 dB(A) L_{Aeq} by 4-9 dB(A), assuming windows are open.

The following points are noted in relation to these receptors.

- The predicted noise impact is based on the assumption that all six PEP berths and associated plant and equipment are operational, including the use of both 30 tonne cranes. However it is noted that the construction, and hence operation, of the six berths associated with the PEP are staged over 10 years, namely:
  - 2021 – Berth 12 is operational
  - 2025 – Berth 12 and 14 are operational
  - 2026 – Berth 12, 14 and 15 are operational
  - 2027 – Berth 12, 14, 15 and 16 are operational
  - 2031 – All six berths are operational.

  As such, the operational PEP noise impact is predicted to be less than that predicted in the EIS until the Year 2031, with a gradual increase in operational noise levels between 2021 and 2031.
- Post 2031, as the predicted noise levels in the EIS are based on the typical worse case operating conditions of the PEP and worst case meteorological conditions, it follows that during most operational situations where there is less port activity (fewer ships berthed) and/or different meteorological conditions, the noise impact will be lower. Indeed, of the three meteorological conditions assessed for 55 Macrossan Street, one condition gave rise to noise levels predicted to comply with the WHO noise goal, and a second gave rise to a marginal 2 dB(A) exceedance of this noise goal.
- Currently the Breakwater Quays development is incomplete, with only three dwellings built at the time of this AEIS. It is however noted that these dwellings are of a contemporary construction, which given the North Queensland climate would typically include openable windows, mechanical ventilation and air-conditioning. Typical reduction across a contemporary dwelling façade with windows closed is predicted to be at least 20 dB(A). The provision of air-conditioning also allows dwelling occupants to keep external doors and windows closed during periods of peak Port operation. Therefore, internal noise levels as a result of peak Port operations inside these dwellings are predicted to achieve the EPP (Noise) night-time acoustic quality objective, and 1999 WHO night-time guideline value, with windows closed.
- As discussed in Section B.10.6 of the EIS, the noise levels at the Breakwater Quays receptor is also predicted to increase in the future, independent of the PEP, and attributable to:
  - noise from an expanded casino operation, resulting in increased mechanical plant noise, car park noise and vehicle movement noise (along Sir Leslie Thiess Drive)
  - noise from the Breakwater Quays development when built out, resulting in increased domestic noise, watercraft noise and mechanical plant noise.

The cumulative effect of all these developments is expected to increase the actual noise environment at the Breakwater Quays development, and hence at the time of its operation, the additional impact of the PEP on the noise environment will correspondingly be less.

On this basis, noise impacts are considered to be manageable through the measures discussed in Section B.10.5.2.1 of the EIS, and no additional noise mitigation is recommended for the Breakwater Quays development and Macrossan Street receptor.

Operational Phase – The Ville Resort – Casino

The predicted external noise level of 51 dB(A) at the hotel building of The Ville Resort – Casino is forecast to exceed the external criteria by up to 16 dB(A). It is noted that all of the hotel rooms are air conditioned, allowing patrons to keep external doors and windows closed, for which an outdoor-to-indoor noise reduction of at least 20 dB(A) is expected. Therefore, internal noise levels as a result of port operations in hotel rooms are predicted to comply with the World Health Organization's indoor sleep and night time guidelines.

Comparison against existing noise levels

Based on the measured daytime noise levels (refer to EIS Section B.10.3.3) and the predicted noise levels presented in Table 12.4 of this Report, these worst-case operational Port noise levels are:

- below the existing daytime average ambient average noise levels of 51 to 57 dB(A) at all receptor locations
- up to 8 dB(A) higher than the existing daytime background "typical quietest" noise levels of 38 to 45 dB(A).

When compared to the measured night time noise levels, these worst-case operational Port noise levels are:

- below the existing night time average ambient average noise levels of 46 to 49 dB(A) at all modelled receptor locations except The Ville Resort – Casino and 55 Macrossan Street, where the predicted worst-case operational Port noise levels is forecast to be 2 dB higher than the existing ambient noise levels at this location
- up to 11 dB(A) higher than the existing night time background "typical quietest" noise levels of 32 to 41 dB(A).

Therefore, the operational noise emitted from the expanded portion of the Port under certain prevailing wind conditions is likely to be audible at the nearest mainland receptors. A discussion of mitigation measures to address the predicted noise emissions in relation to the Planning for Noise Control noise goals is provided in Section B.10.5.2 of the EIS. These mitigations measures are considered to continue to be appropriate, notwithstanding the changed impacts as a result of the design refinement.

Low frequency noise

This section addresses Section B.10.4.6.3 of the EIS. The draft ECOACCESS *Guideline for the Assessment of Low Frequency Noise* provides an initial screening assessment for the audibility of low frequency noise.

The following two requirements are specified as part of this screening test:

- the overall sound pressure level within dwellings does not exceed 50 dB(Lin)
- the overall dB(Lin) level within dwellings does not exceed the dB(A) level by more than 15 dB.

Where these conditions are not met, there is an increased likelihood that low frequency noise may be audible and additional assessment by way of measurement is recommended. It is noted that this initial screening test only identifies the risk of increased audibility as detailed below.

The predicted external noise levels at the identified receptors under the worst-case weather conditions for each receptor are summarised in Table B.10.15 below. The predicted noise levels at the noise-sensitive receivers are external noise levels.

Table 12.5 Update to EIS Table B.10.15 Predicted worst-case external noise levels at sensitive receivers

Location	Overall dB(Lin)	Overall dB(A)	Difference dB
29 Hubert Street, South Townsville	56	43	13
55 Macrossan Street, South Townsville	55	44	12
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville	63	50	12
The Ville Resort - Casino	63	51	12
1 Esplanade, Picnic Bay, Magnetic Island	46	31	15
Townsville Marine Precinct	62	48	14

In order to relate the above external noise predictions to noise levels within the dwelling (where the screening test is applied), a correction is generally applied to the external noise predictions. However this correction is dependent on the building façade material(s), size of the window opening and the internal surfaces of the dwelling. For the purpose of discussion, the internal dB(Lin) noise levels are assumed to be 0-5 dB(Lin) below the external levels, assuming the intrusive noise has significant low frequency content.

Both requirements of the screening test are met outside the receptor at 1 Esplanade, Picnic Bay, Magnetic Island, and as such they are likely to also be met inside this receptor. Accordingly, there is a low probability of significant low frequency noise audibility within these areas.

Whilst the predicted noise levels outside The Ville Resort – Casino and the Townsville Marine Precinct have a significant level of exceedances (up to 13 dB(Lin)), it is noted that hotel rooms and commercial areas within these two receptors are generally air-conditioned, allowing users to keep external doors and windows closed, Accordingly, there is a low probability of significant low frequency noise audibility within these areas.

The predicted external noise levels at the Macrossan Street and Hubert Street receptors exceed the first screening test requirement by 5-6 dB(Lin), whilst the Breakwater Quays development has predicted noise levels which exceed the first screening test requirement by up to 13 dB(Lin). Accordingly, there is a moderate to significant probability of significant low frequency noise audibility within these areas during adverse weather conditions and with windows open.

It is however noted that the 5-6 dB(Lin) exceedance of the first screening test requirement at the Macrossan Street and Hubert Street receptors may be ameliorated by closing the windows during peak port activity. Similarly, the dwellings at Breakwater Quays are of a contemporary construction, which given the North Queensland climate would typically include operable windows, mechanical ventilation air-conditioning; this allows external windows and doors to be closed at during periods of peak port operation.

On this basis, noise impacts are considered to be manageable through the measures discussed in Section B.10.5.2.1 of the EIS, and no additional noise mitigation is recommended for the mainland receptors.

Cumulative Impacts

This section addresses Section B.10.6 of the EIS, specifically EIS Table B.10.20, Table B.10.21 and the discussion thereafter, to reflect the updated 2031 PEP operational noise impact as discussed earlier in this Report.

Table 12.6 Update to EIS Table B.10.20 Cumulative noise levels – day time port operations

Location	Estimated cumulative noise levels L_{Aeq} dB					
	Existing 2011 day-time noise levels	Predicted Townsville Marine Precinct noise levels	Total noise levels (without the Port Expansion Project)	Worst-case predicted Port Expansion Project noise levels	Total noise levels (with the Port Expansion Project)	Estimated increase with the Port Expansion Project
29 Hubert Street, South Townsville	51	36	51	43	52	1
55 Macrossan Street, South Townsville	57	34	57	44	57	0
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville	52	28	52	50	54	2
The Ville Resort - Casino	59	30	59	51	60	1
1 Esplanade, Picnic Bay, Magnetic Island	40*	14	40	31	41	1
Townsville Marine Precinct	59**	59	62	48	62	0

* Estimated from AS 1055.2 (Standards Australia, 1997b)
** Estimated based on measured noise levels at The Ville Resort - Casino; the closest measurement location to the Townsville Marine Precinct

Table 12.7 Update to EIS Table B.10.21 Cumulative noise levels – night time port operations

Location	Estimated cumulative noise levels L_{Aeq} dB					
	Existing 2011 night-time noise levels	Predicted Townsville Marine Precinct noise levels	Total noise levels (without the Port Expansion Project)	Worst-case predicted Port Expansion Project noise levels	Total noise levels (with the Port Expansion Project)	Estimated increase with the Port Expansion Project
29 Hubert Street, South Townsville	46	-	46	43	48	2
55 Macrossan Street, South Townsville	49	-	49	44	50	1
5 Breakwater Quays, Sir Leslie Thiess Drive, Townsville	48	-	48	50	52	4
The Ville Resort - Casino	52	-	52	51	55	3
1 Esplanade, Picnic Bay, Magnetic Island	30*	-	30	31	34	4
Townsville Marine Precinct	52**	-	52	48	53	1

* Estimated from AS 1055.2 (Standards Australia, 1997b)
** Estimated based on measured noise levels at The Ville Resort - Casino

Based on the above estimation of future noise levels, the cumulative daytime operational noise impact of the proposed Port expansion and the known Townsville Marine Precinct is negligible (i.e. up to 2 dB(A)). It is noted that a change in noise levels of 1-2 dB(A) is not generally perceptible.

The night-time cumulative noise levels of the existing and future Port operations (excluding the Townsville Marine Precinct, which is inactive at night) indicates a small but generally not perceptible (i.e. less than 3 dB(A)) change in amenity for the residences at 29 Hubert Street and 55 Macrossan Street. At 5 Breakwater Quays, 1 Esplanade, Picnic Bay, Magnetic Island and The Ville Resort – Casino, the estimated cumulative impact of all known Port-related developments begins to be noticeable at a 3-4 dB increase in combined effect when compared to the developments in the absence of the proposed Port expansion, although it is noted that the resultant cumulative noise to 1 Esplanade, Picnic Bay, Magnetic Island continues to remain below the World Health Organization noise goal for sleep disturbance, as discussed earlier in this section.

In reality, however, the noise levels at these receivers from sources other than the proposed Port expansion are also expected to increase, such that the noise contribution from the Port expansion alone becomes less significant. Other future sources, which at this stage cannot be quantified, include:

- noise from an expanded casino operation (e.g. building services noise, car park and vehicle noise from Sir Leslie Thiess Drive)
- noise from the Breakwater Quays development (as yet incompletely developed) (e.g. building services noise, car park and vehicle noise from Sir Leslie Thiess Drive)
- noise from general growth and development of the city centre and Flinders Street East
- noise from vehicles on the Townsville Port Access Road
- noise from upgraded rail operations within both the Port area and the Eastern Access Corridor.

The cumulative effect of all these developments is expected to increase the actual noise environment in the vicinity of the Port, and hence at the time of its operation, the additional impact of the Port expansion on the noise environment at that time will correspondingly be less. These factors and contributions can be more meaningfully assessed in the future at stages when applications by port tenants are undertaken.

12.3.4.2 Mitigation measures

The predicted impacts of the PEP with the design refinement have been reviewed and are predicted to be similar to those reported in the EIS. Accordingly, the mitigation measures summarised in the EIS are still considered to be appropriate and adequate to manage noise emissions generated by the PEP, in consideration of the design refinement.

12.3.5 Summary

The following table provides a summary of the mitigation measures proposed to reduce impacts of noise and vibration emissions generated by the Project. Mitigation measures will be outlined and implemented through the Construction and Operational Environmental Management Plans.

Table 12.8 Summary of Noise & Vibration Impacts and Mitigation Measures

Element	Primary Impacting Process	Updated Risk Rating			Mitigation Measures	Mitigated Risk Rating
		Magnitude	Likelihood of impact	Risk Rating		
Increased noise leading to degradation of acoustic amenity to local sensitive receptors.	Construction	Medium	Almost Certain	High	Equipment to be in good working condition. General good site working practices to be implemented. Construction activities that may potentially cause noise impact prior to each stage and appropriate controls to be identified and implemented. Early identification of potential impacted areas and community concerns with timely communication to stakeholders of planned construction activities. Noise to be monitored and corrective actions taken if complaints received.	High
Increased noise leading to degradation of acoustic amenity to regional sensitive receptors.	Construction	Minor	Almost Certain	Medium		Medium
Increased vibration leading to degradation of acoustic amenity to local sensitive receptors.	Construction	Negligible	Unlikely	Negligible	Equipment to be in good working condition. General good site working practices to be implemented.	Negligible
Increased noise leading to degradation of acoustic amenity to local sensitive receptors.	Operational	Medium	Almost Certain	High	Mitigation measures such as barriers, enclosures etc. are largely impractical and are not recommended. Equipment to be in good working condition. Noise to be monitored and corrective actions taken if complaints received. Individual port tenants to consider noise as part of the Integrated Development Assessment System (IDAS) process	High
Increased noise leading to degradation of acoustic amenity of regional sensitive receptors.	Operational	Minor	Almost Certain	Medium		Medium
Increased vibration leading to degradation of acoustic amenity of local sensitive receptors.	Operational	Negligible	Almost Certain	Low	Equipment to be in good working condition. General good site working practices to be implemented	Low

12.4 Conclusion

The changes made as part of the design refinement are not envisaged to substantially alter the outcome of the Noise and Vibration assessment in the EIS. The PEP is predicted to generate impacts of up to moderate significance (risk magnitude) to local sensitive receptors. As these impacts are classified as 'almost certain' this results in a high residual risk rating at the local level. Noise impacts on a regional scale are of lesser magnitude (minor) and therefore the residual risk rating is lower (medium). The implementation of mitigation measures outlined in the EIS are considered appropriate to manage noise impacts to nearby noise sensitive receivers, but would not change the overall risk level.