Eden Breakwater Wharf Extension

Modification Request to Infrastructure Approval SSI 7734

2 July 2018

Level 17, 141 Walker St
North Sydney NSW 2060
Australia

301311-13734-EN-REP-0031

www.**advisian**.com

Advisian
WorleyParsons Group

Synopsis

This report provides supporting information for a request by the NSW Department of Industry to modify Operation conditions of the Infrastructure Approval SSI 7734 (Modification Request) concerning air quality and noise amenity.

The Modification Request is made in accordance with Section 5.25(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Disclaimer

Project No: 301311-13734-EN-REP-0031 – Eden Breakwater Wharf Extension: Modification Request to Infrastructure Approval SSI 7734

Rev	Description	Author	Review	Approval	Date
C	Re-issued for client review	C Jones	S Wakefield	NA	27 Jun 18
0	Issued for use	C Jones	S Wakefield	S Wakefield	2 Jul 18

Table of Contents

Acronyms and Terms iv

1 Introduction 1

1.1 Project Background 1

1.2 Report Purpose 1

1.3 Report Structure 1

2 Consultation 2

3 Proposed Modifications and Assessment 3

3.1 Noise and Vibration 3

3.1.1 Justification 3

3.2 Air Quality 6

3.2.1 Justification 7

4 Proposed Mitigation Measures 10

5 Conclusion 11

6 References 12

Tables

Table 1: Predicted noise levels and public announcement contribution 4

Table 2: Predicted maximum SO_2 concentrations (µg/m^3) – incremental and (cumulative) – Typical Operations 8

Table 3: Predicted maximum SO_2 concentrations (µg/m^3) – incremental and (cumulative) – Expanded Operations 8

Appendices

Appendix A: Consultation Information

Appendix B: Eden Breakwater Wharf Extension Project- Cruise Ship Noise Impacts, Ship Public Address Systems

Appendix C: Eden Breakwater Wharf Extension Project – Refined SO_2 Emission Modelling

Acronyms and Terms

Acronym/Term	Definition
AMSA	Australian Maritime Safety Authority
CCC	Community Consultative Committee
Construction	Includes all physical work required to construct the SSI, other than the following low impact work: (a) survey works including carrying out general alignment survey, installing survey controls (including installation of global positioning system (GPS)), installing repeater stations, carrying out survey of existing and future utilities and building and road dilapidation surveys and hydrographic survey; (b) background and/or baseline monitoring works; (c) investigations including investigative drilling and excavation; (d) establishment of ancillary facilities in approved locations or in locations meeting the criteria identified in Condition A9 and Condition A11 of the Infrastructure Approval including constructing ancillary facility access roads and providing utilities to the facility; (e) operation of ancillary facilities if the ER has determined the operational activities will have minimal impact on the environment and community (f) minor clearing and relocation of native vegetation, as identified in the EIS/RTS; (g) installation of mitigation measures including erosion and sediment controls, temporary exclusion fencing for sensitive areas and acoustic treatments; (h) relocation and connection of utilities where the relocation or connection does not present a significant risk to the environment as determined by the ER; (i) archaeological testing under the *Code of practice for archaeological investigation of Aboriginal objects in NSW (DECCW, 2010)* or archaeological monitoring undertaken in association with (a)-(i) above to ensure that there is no impact on heritage items; (j) other activities determined by the ER to have minimal environmental impact which may include construction of minor access roads, temporary relocation of pedestrian and cycle paths and the provision of property access; and (k) maintenance of existing buildings and structures required to facilitate the carrying out of the SSI. However, where heritage items, or threatened species, populations or ecological communities (within the meaning of the EP&A Act) are affected or potentially affected by any low impact work, that work is construction, unless otherwise determined by the Secretary in

Acronym/Term	Definition
	consultation with OEH or DPI Fisheries (in the case of impact upon fish, aquatic invertebrates or marine vegetation).
The Department	NSW Department of Industry
DP&E	Department of Planning and Environment
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
ERM	ERM Australia Pacific Pty Ltd
IMO	International Maritime Organization
Infrastructure Approval	Infrastructure Approval (SSI 7734) issued by the Executive Director, Priority Projects Assessment (as delegate of the Minister for Planning) DP&E under Section 115ZB of the *Environmental Planning and Assessment Act* 1979, dated 5 July 2017)
LAeq	Equivalent Continuous Sound Pressure Level
Modification Request	A request for a modification of the Infrastructure Approval SSI 7734 made in accordance with Section 5.25(2) of the EP&A Act.
NCA	Noise catchment area
NSW	New South Wales
OEMP	Operational Environmental Management Plan
Operation	The operation of the SSI (whether in full or in part) for its intended purpose, excluding the following activities carried out during construction: • commissioning trials of equipment; • temporary use of any part of the SSI; and • maintenance works
PEL	Pacific Environment Limited
Project	Eden Breakwater Wharf Extension
Proponent	NSW Department of Industry
Proposed Mitigation Measures	As detailed in the Summary of Proposed Mitigation Measures contained in Response to Submissions Report Eden Breakwater Wharf Extension, dated 24 February 2017
Secretary	Secretary of the NSW Department of Planning and Environment
Sensitive Receiver	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals) religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation areas (including parks and sports grounds), commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, retail spaces and industrial premises), and others as identified by the Secretary
SO_2	Sulfur dioxide
SSI	State Significant Infrastructure

1 Introduction

Advisian has been commissioned by the NSW Department of Industry (the Department) to prepare a request for a modification of the Infrastructure Approval SSI 7734 (Modification Request), dated 5 July 2017 for the Eden Breakwater Wharf Extension (the Project) at Eden, New South Wales (NSW). The Department is the Proponent for the Modification Request.

This report supports the Modification Request made in accordance with Section 5.25(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Project Background

Construction of the Project comprises the extension of the existing Eden Breakwater Wharf and dredging of the approach channel and berth pocket with offshore disposal, to accommodate the berthing of cruise ships of up to 325m in length during Operation. Construction of Stage 1 (Dredging Contract) of the Project commenced on 4 September 2017 and was completed on 21 February 2018. Stage 2 (Marine Structures Contract) commenced on 27 March 2018 and is forecasted to be completed in the first quarter of 2019. Operation of the Project will benefit the local economy by enabling a range of cruise ships to access the region and raise the profile of Eden and surrounds.

The Infrastructure Approval provides conditioning for the Construction and Operation of the Project. The Department has identified Operation conditions within the Infrastructure Approval through consultation with key stakeholders that should be varied in order to optimise the benefits of the Project, in particular the potential benefits to the local economy from maximised cruise ship visitation. The conditions of concern are E17, E18, E20, and E22 and relate to environmental management of noise and vibration and air quality, and the complaint handling process.

1.2 Report Purpose

The purpose of this report is to provide supporting information for the Modification Request to vary conditions E17, E18, E20, and E22. The supporting information includes details of consultation undertaken, an impact assessment relating to air quality and noise amenity, proposed monitoring and additional mitigation, as required.

1.3 Report Structure

This report is structured as follows:

- Section 1 provides an introduction, background and a discussion of the consultation
- Section 2 provides a summary of the proposed modification for consideration including the impact assessment
- Section 3 provides any proposed mitigation measures to manage any potential impacts of the modification
- Section 4 provides a conclusion.

Technical input was provided by ERM Australia Pacific Pty Ltd (ERM) formally Pacific Environment Limited (PEL) during the preparation of this report.

2 Consultation

Consultation with key stakeholders and the community regarding this Modification Request has been undertaken primarily through the Community Consultative Committee (CCC) for the Project. The CCC meetings held on 2 May 2018 and 30 May 2018 have enabled the CCC to be informed of the proposed Modification Request, to discuss the proposed variations to the conditions at the meetings and also provide written comments for the Proponent to consider. The meeting scheduled for the 27 June 2018 will also have an agenda item pertaining to the Operation conditions.

Consultation at the CCC meeting on 2 May 2018 included a detailed discussion from the Proponent regarding the proposed variations to Operation noise conditions (deck announcements, ship equipment maintenance and complaint handling) and air conditions (sulphur content in fuels, ship equipment maintenance and complaint handling). In addition, the Eden Breakwater Wharf Extension Project – Operational Conditions information memorandum (dated 16 May 2018) was prepared and distributed to the CCC (prior to the 30 May 2018 CCC meeting). This memorandum provided further information regarding the potential operational issues with the conditions, including a justification for the proposed variations to the conditions, and current and future policy framework.

Consultation at the CCC meeting on the 30 May 2018 focused on an information update and a general discussion regarding the proposed variations to the conditions. Most CCC members were supportive of the proposed variations and it was noted that if the conditions were not varied, this may impact the incentive for cruise ships to utilise the Port of Eden (and the Breakwater Wharf Extension Project) as a destination port. However, two committee members were concerned about noise and air quality impacts at nearby residences as a result of the proposed variations to the conditions. It was noted that air quality modelling and a noise assessment was being undertaken to quantify any potential impacts and the assessments would be included in any Modification Request.

The minutes of the CCC meetings and memorandum are provided at Appendix A.

The Proponent received five written submissions from CCC members regarding the proposed variations to the conditions. From the submissions received, three were positive and supportive of the proposed Modification Request, and two were concerned and rejected the proposed variations.

Consultation has also occurred with the Department of Environment and Planning (DP&E), the Proponent and a potential Project operator. Meetings have been held on the 12 February and 17 April 2018 to discuss the proposed modification, air quality modelling and noise assessment that the proponent would undertake to support the modification and generally DP&E's comments.

3 Proposed Modifications and Assessment

3.1 Noise and Vibration

Condition

E17(a) *"no deck announcements and music from open decks while berthed at the SSI in the Port of Eden or transit, with the exception of safety announcements;"*

E17(b) *"ship generators/engines/exhausts must be maintained, upgraded and operated efficiently to reduce noise emissions while in the Port of Eden;"*

E18 *"In the event of complaints from Sensitive Receivers in relation to a specific cruise ship, the source of the offensive noise must be identified and action taken to reduce noise levels with details submitted to the Secretary. The ship must not be permitted to berth at the SSI in the future, unless it can be demonstrated that or measures have been taken to reduce noise levels".*

Proposed Varied Condition

E17(a) *"no deck announcements and music from open decks while berthed at the SSI in the Port of Eden ~~or in transit~~, with the exception of safety announcements;"*

E17(b) *"ship generators/engines/exhausts must be maintained, ~~upgraded~~ and operated efficiently to reduce noise emissions while in the Port of Eden;"*

E18 *"Where a complaint is received from a Sensitive Receiver in relation to a specific cruise ship at the SSI in the Port of Eden, the source and nature of the noise shall be investigated and corrective actions implemented. If there are further complaints or the investigation indicates ongoing exceedance of the predicted noise levels, measures to reduce noise levels shall be investigated and implemented".*

3.1.1 Justification

Condition E17(a)

An assessment titled the Eden Breakwater Wharf Extension Project – Cruise Ship Noise Impacts, Ship Public Address Systems (ERM, 2018a) has been prepared by ERM. The assessment addressed the noise contribution from public announcements and music noise emissions while cruise ships are in transit and at berth to determine the likely noise levels from cruise ship public announcements and music (refer to Appendix B).

A Noise, Vibration and Air Quality Assessment (PEL, 2016) was prepared by PEL (now ERM) for the EIS for the Project (Advisian, 2016). Noise modelling was completed as part of this assessment and was reviewed to provide a comparison of ship mechanical noise contribution with the ship public announcement systems contribution. The results of noise modelling indicated that public announcement system noise impacts would not be likely to result in additional noise levels above the predicted noise levels from ships in transit to/from the Breakwater Wharf or while at berth.

The noise assessment (PEL 2016) presented a single number LAeq noise level assessment for each Sensitive Receiver location across two noise catchment areas (NCA) within the Eden township:

- NCA 1 – representative of receivers in the main township
- NCA 2 – representative of receivers on the Eden peninsular.

Three scenarios were reviewed in the assessment. Scenario 1 represented cruise ships in transit to the berth, Scenario 2 assessed noise impacts from quieter (2a) and louder (2b) cruise ships in terms of power generation and ventilation plant noise sources.

The summary of impacts is presented in Table 1.

Table 1: Predicted noise levels and public announcement contribution

	Predicted Noise levels dB(A)				
	Scenario 1 (L_{Aeq} 15min)	Scenario 2a (L_{Aeq} 15min)	Scenario 2b (L_{Aeq} 15min)	Announcements noise contribution (L_{Aeq} 15min)	Announcements noise contribution instantaneous (L_{Aeq})
NCA1	49	40	51	17	32
NCA2	49	41	52	20	35

Notes: Results presented for the highest impacted receiver in each NCA

Based on the predicted Sensitive Receiver noise levels for cruise ships in transit to the berth (Scenario 1) in comparison with expected contribution from public announcement noise sources when at the nearest point (at berth) the ship ventilation plant and exhaust systems are expected be the dominant noise source.

A review of the source contributions over a 15-minute assessment period did not show a significant contribution from the public announcement noise sources in either noise catchment area, when cruise ships are at berth (Scenario 2). These sources are not expected to increase the LAeq 15-minute noise impact compared with the contribution from all other noise sources.

During public announcements, the instantaneous noise level from these sources is expected to be between 5 to 8dB below the ship mechanical noise sources when at berth. Although public announcements and music are not expected to result in additional noise levels when compared with the noise emissions from ship engines and ventilation systems, due to the frequency and characteristic of announcements and the short-term noise level, it is expected that public announcements and music may be audible at both NCA 1 and NCA 2.

Noise impacts from public announcements and music are expected to be less noticeable when the cruise ship is in transit, as noise emission from mechanical noise sources are expected to be louder than when at berth.

Where announcements are assessed against the NSW Industrial Noise Policy (EPA 2000) (which applied at the time of the Infrastructure Approval) no additional "annoying characteristics" penalties would be expected to apply.

Therefore, it is proposed to vary Condition E17(b) of the Infrastructure Approval to address the cruise ships while at berth at the Port of Eden only and remove the requirement while in transit which is expected to be more difficult to enforce compliance. It should be noted, any complaint received would be the subject of notification, investigation and close out processes in accordance with Noise Management Operational Environmental Management Plan (OEMP) Sub-plan that will be prepared and submitted to the Secretary for approval prior to Operation in accordance with the Infrastructure Approval.

Condition E17(b)

With regard to Condition E17(b), it is considered the requirement for cruise ship equipment to be maintained and operated efficiently to be appropriate conditioning for the operation of cruise ships. However, it is considered that the requirement to upgrade should not be necessary unless it was identified that there was a fault or a noise concern. It would be particularly onerous to require that all ship engines be upgraded, and further, it is unclear what sort of upgrade would be required.

Therefore, it is proposed to vary Condition E17(b) of the Infrastructure Approval to address the maintenance and efficient operation of cruise ships only.

Condition E18

The Project will operate within an existing operating port which currently operates 24 hours, seven days a week. Noise emissions associated with the Project will primarily be associated with cruise ships arriving and departing from the Port of Eden and while at berth as identified by PEL (2016). Future shipping schedules indicate that cruise ships would arrive between 7am and 10am and mainly depart between 3pm and 6pm. It was anticipated by PEL (2016) that noise impacts associated with ships arriving and departing would be limited to the half hour prior arrival and post departure. As such, berthing activity would be at the start and end of the day time noise period.

As a result of the potential noise amenity impacts, all reasonable and feasible land-based noise mitigation options have been investigated during the EIS.

A Noise Management OEMP Sub-plan will be developed and implemented to the satisfaction of the Secretary to minimise and manage noise at the facility in accordance with the Infrastructure Approval.

Consultation with key stakeholders, including the Port Authority of NSW who operate similar cruise ship facilities in NSW, found that the noise levels on-board cruise ships are difficult to control, and it is possible that a noise compliant may be received while a ship is at berth or in transit. Any complaint received would be the subject of notification, investigation and close out processes in accordance with Noise Management OEMP Sub-plan that will be developed. It is proposed that complaints will be managed in a manner consistent with the Community Communication Strategy (Revision 3, 24 November 2017) Appendix 3 Community Contact Procedure.

The current condition that if a complaint is received (whether valid or not), and demonstrable measures to reduce noise levels are not satisfactory to the Secretary, than the ship is not permitted to berth at the Port of Eden. This condition would potentially reduce the number of ships to the Project and may require the ship to anchor at a buoy to avoid the Infrastructure Approval condition. This opposes the purpose of the Project, with a potential impact to the local economy.

It is proposed that Condition E18 be varied as outlined above to provide a process for the investigation of any complaints received and implementation of appropriate corrective actions without the restriction of the ship being prevented from berthing at the Breakwater Wharf.

3.2 Air Quality

Condition

E20 *"The Air Quality Management OEMP Sub-plan must include the following measures to reduce emissions from cruise ships:*

(a) *use of low sulphur fuels at berth. Sulphur content is not to exceed 0.1% m/m (mass/mass) unless alternative methods to meet sulphur emission restrictions are utilised such as exhaust gas cleaning systems or scrubbers which act to remove the SO_X directly from the ship exhaust. The use of an alternative method needs to be at least as effective, in terms of emission reduction, as the fuel oil requirements outlined above. Where low sulphur fuel is the proposed mitigation measure, ship fuel bunker notes must be provided and included in the Operation Compliance Reports;*
(b) *use of low sulphur fuels for the duration of transit. Sulphur content is not to exceed 0.1% m/m (mass/mass) unless alternative methods to meet sulphur emission restrictions are utilised such as exhaust gas cleaning systems or scrubbers which act to remove the SO_X directly from the ship exhaust. The use of an alternative method needs to be at least as effective, in terms of emission reduction, as the fuel oil requirements outlined above. Where low sulphur fuel is the proposed mitigation measure, ship fuel bunker notes must be provided and included in the Operation Compliance Reports;*
(c) *ship generators/engines/exhaust must be maintained, upgraded and operated efficiently to reduce air emissions while in the Port of Eden."*

E22 *"In the event of dark smoke emissions, offensive odours and/complaints from residential receivers in relation to a specific cruise ship, additional details are to be provided to the relevant Maritime Authority on the ship's exhaust management. Upon the return of the vessel, monitoring as per Condition 7 and testing of ship stack emissions and fuel used in transit and berth must be undertaken by a suitably qualified specialist with results submitted to the Secretary. Should further community complaints be received, and monitoring indicates emissions levels in excess of that typically recorded for other cruise ships as part of the Operation Monitoring Program required under Condition D7, in the future the ship must not be permitted to berth at the SSI, unless it can be demonstrated that measures have been taken to reduce emission levels."*

Proposed Varied Condition

E20 "*The Air Quality Management OEMP Sub-plan must include the following measures to reduce emissions from cruise ships:*

(a) *The Proponent shall Operate the SSI with the objective that emissions from cruise ships berthed at the SSI at the Port of Eden do not result in an exceedance of the predicted concentrations;*
(b) *Ship generators/engines/exhaust must be maintained, ~~upgraded~~ and operated efficiently to reduce air emissions while at the SSI at the Port of Eden."*

E22 *"Where it is identified that the predicted air quality concentrations have been exceeded or a complaint is received from a Sensitive Receiver in relation to a specific cruise ship about dark smoke emissions or odours, the source and nature of the exceedance will be investigated. If the investigation indicates an ongoing exceedance of the predicted concentrations, measures shall be investigated and implemented."*

3.2.1 Justification

Condition E20(a) and E20(b)

Low sulfur fuel requirements within nominated port areas such as Sydney Harbour are monitored by the Australian Maritime Safety Authority (AMSA) in accordance with Directions issued by AMSA under subsection 246(1)(b) of the *Navigation Act 2012*. Currently, the Port of Eden is excluded from AMSA requirements with respect to the use low sulfur fuel by cruise ships at berth and in transit.

Further, the International Maritime Organization (IMO), under the Annex VI of the *International Convention for the Prevention of Pollution from Ships* (MARPOL Convention), has set a global limit for the sulfur content in fuel used on-board ships to 0.5wt% from 1 January 2020. It should be noted the Project will be in operation for approximately nine months up to 1 January 2020 and for this timeframe a maximum of eight cruise ships have been scheduled to arrive at the Port of Eden (as at June 2018).

A Noise, Vibration and Air Quality Assessment (PEL, 2016) was prepared by PEL (now ERM) for the EIS for the Project (Advisian, 2016). An additional assessment titled Eden Breakwater Wharf Extension Project – Refined SO_2 Emission Modelling (ERM, 2018b) has been undertaken by ERM to provide a refined understanding of the potential ambient air quality impacts of sulfur dioxide (SO_2) emissions from cruise ship operations at the Port of Eden, NSW (refer to Appendix C). The refined analysis considers the assessment sensitivity of the fuel grade (sulphur content) and frequency of port operations. It has been undertaken with a focus on operations that may occur in the period prior to 1 January 2020, after which the use of 0.5wt% sulfur content fuel is mandated under the MARPOL Convention.

Refined dispersion modelling (ERM, 2018b) has been undertaken to reflect the frequency and scale of Port of Eden operations. This reflects a refinement beyond the EIS modelling (PEL, 2016) which assumed that ships would visit on every day of the modelled 2013 meteorological dataset. The current schedule anticipates ship visits of 15 in 2019 and 13 in 2020, whilst it is predicted that the Project may accommodate 40 to 60 ships per year at full scale operation.

Modelling was undertaken for the following scenarios:

- Typical operations: 20 ships per annum, achieved by collation of 2019 and 2020 operations into a single year. This is assumed to reflect a conservative intensity of operations up to 1 January 2020, with contingency for an increase in scheduled visits over this timeframe.
- Expanded operations: 60 ships per annum as reflective of future full scale operation.

The expanded operations have been prepared by overlaying the typical operations schedule in triplicate, with 6-day lag and 4-day lead on the typical operations schedule in to avoid overlapping days. Hoteling demand has also been refined. The EIS modelling (PEL, 2016) assumed a 25% of the

total installed generation capacity, where the refined modelling (ERM 2018b) has more detailed power requirements on a ship by ship basis.

The NSW Environment Protection Authority (EPA) provides SO_2 assessment criteria for 10-minute, 1-hour, 24-hour and annual averaging times. An empirical relationship (VEPA, 1986) was used to predict the maximum 10-minute SO_2 concentrations from the models predicted 1-hour average SO_2 concentrations.

The predicted maximum 1-hour average SO_2 concentrations at the most affected Sensitive Receivers are presented in Table 2 (typical operations) and Table 3 (expanded operations). Predicted exceedances of the 1-hour average SO_2 criterion are shown in bold.

Table 2: Predicted maximum SO_2 concentrations (µg/m^3) – incremental and (cumulative) – Typical Operations

Averaging period	Assessment Criterion	Background concentration	Maximum concentration at most affected sensitive receptor		
			Residual oil	Marine distillate	Low sulfur fuel
10-min	712	149	340 (489)	59 (208)	11 (160)
1-hour	570	104	237 (341)	42 (146)	8 (112)
24-hour	228	24	86 (110)	15 (39)	3 (27)
Annual	60	3	0.24 (3)	0.04 (3)	0.01 (3)

Note: Residual oil = 2.7wt% sulfur fuel.
Marine distillate = 0.5wt% sulfur fuel.
Low sulfur fuel = 0.1wt% sulfur fuel.

Table 3: Predicted maximum SO_2 concentrations (µg/m^3) – incremental and (cumulative) – Expanded Operations

Averaging period	Assessment Criterion	Background concentration	Maximum concentration at most affected sensitive receptor		
			Residual oil	Marine distillate	Low sulfur fuel
10-min	712	149	707 (**856**)	124 (273)	23 (172)
1-hour	570	104	494 (**598**)	86 (190)	16 (120)
24-hour	228	24	94 (118)	16 (40)	3 (27)
Annual	60	3	0.65 (4)	0.11 (3)	0.02 (3)

Note: Residual oil = 2.7wt% sulfur fuel. Greyed out because the results are not relevant for expanded operations due to the MARPOL Convention limit from 1 January 2020.
Marine distaillate = 0.5wt% sulfur fuel.
Low sulfur fuel = 0.1wt% sulfur fuel.

For cruise ships using residual oil (2.7wt% sulfur), marine distillate (0.5wt% sulfur) and low sulfur (0.1wt% sulfur) fuels there is not predicted to be any exceedances of the SO_2 criteria under typical operations (i.e. 20 ships per annum, refer Table 2). For cruise ships using marine distillate (0.5wt% sulfur) and low sulfur (0.1wt% sulfur) fuels there is not predicted to be any exceedances of the SO_2 criteria under typical and expanded operations (i.e. 60 ships per annum, refer Table 3).

The timeframes where residual oil (2.7wt% sulfur) is proposed to be used by cruise ships (up to 1 January 2020) would relate to typical operations (refer Table 2) and for timeframes after 1 January 2020, it is proposed that cruise ships use marine distillate (0.5wt% sulfur) in alignment MARPOL Convention limit of 0.5wt% sulfur content.

Therefore, based on the refined modelling and the MARPOL Convention limit of 0.5wt% sulfur content, it is proposed that cruise ships using the Port of Eden during Operation up to 1 January 2020 continue using residual oil (2.7wt% sulfur) or better while in transit and at berth and after 1 January 2020 cruise ships must use marine distillate (0.5wt% sulfur) or better in accordance with the MARPOL Convention Limit. Given the impending limit change of the MARPOL Convention, it is proposed to remove Conditions 20(a) and 20(b) from the Infrastructure Approval relating to sulfur content in fuels.

It is also proposed to include a new Condition 20(a) for cruise ship operators to manage the emissions from cruise ships in accordance with the relevant guidelines and predicted emissions to provide additional safeguards.

Condition E20(c)

It is proposed to remove the requirement for the cruise ship equipment to be upgraded from this Condition. Refer to comments under the justification for Condition E17(b).

Condition E22

An Air Quality Management OEMP Sub-plan will be developed to the satisfaction of the Secretary prior to Operation and be implemented in accordance with the Infrastructure Approval. This coupled with an Air Quality Operation Monitoring Program (also in accordance with the Infrastructure Approval) to quantify and manage air quality impacts from ships.

Consultation with key stakeholders, including the Port Authority of NSW who operate similar cruise ship facilities in NSW, found that emissions from ships are difficult to control, and it is possible that an air quality compliant may be received while a ship is at berth or in transit. However, based on the Noise, Vibration and Air Quality Assessment (PEL, 2016) and the refined modelling (ERM, 2018b), it shows that an exceedance of air quality criteria is not predicted and unlike considering the conservativism built into the updated modelling.

However, any complaint received will be recorded, investigated and closed out in accordance with Air Quality Management OEMP Sub-plan that will be developed. It is proposed that complaints will be managed in a manner consistent with the Community Communication Strategy (Revision 3, 24 November 2017) Appendix 3 Community Contact Procedure.

The current Condition that if a complaint is received (whether valid or not) and demonstrable measures to reduce noise levels are not satisfactory to the Secretary than the ship is not permitted to berth at the Port of Eden. This condition would potentially reduce the number of ships to the Project and may require the ship to anchor at a buoy to avoid the Infrastructure Approval condition. This opposes the purpose of the Project, with a potential impact to the local economy.

It is proposed that Condition E22 of the Infrastructure Approval be varied, as outlined, to provide a process for the investigation of any complaints received and implementation of corrective measures without the restriction of the ship being prevented from berthing at the Breakwater Wharf.

4 Proposed Mitigation Measures

No changes to the Proposed Mitigation Measures as detailed in the Summary of Proposed Mitigation Measures in the Response to Submission Report Eden Breakwater Wharf Extension Report (Advisian, 2017) are proposed in this Modification Request.

5 Conclusion

The Infrastructure Approval provides conditioning for the Construction and Operation of the Project. The Department has identified Operation conditions within the Infrastructure Approval through consultation with key stakeholders that should be varied in order to optimise the benefits of the Project, in particular the potential benefits to the local economy from maximised cruise ship visitation. The conditions of concern are E17, E18, E20, and E22 and relate to environmental management of noise and vibration and air quality, and complaint handling processes.

Based on the information presented in the EIS (Advisian, 2016), Eden Port Redevelopment – Noise, Vibration and Air Quality Assessment (PEL, 2016), Eden Breakwater Wharf Extension Project – Cruise Ship Noise Impacts, Ship Public Address Systems (ERM, 2018a) and Eden Breakwater Wharf Extension Project – Refined SO_2 Emission Modelling (ERM, 2018b), there are no foreseeable noise amenity or air quality impacts as a result of the Modification Request. In this regard, no changes to the Proposed Mitigation Measures as detailed in the Summary of Proposed Mitigation Measures in the Response to Submission Report Eden Breakwater Wharf Extension Report (Advisian, 2017) are proposed in this Modification Request.

Therefore, it is recommended to vary Conditions E17, E18, E20, and E22 of the Infrastructure Approval in accordance with the proposed variations outlined in and submitted with justification statements within this report. If the Modification Request is not accepted the incentive for cruise ships to utilise the Port of Eden (and the Project) as a destination port will be compromised, it is considered by the Department that the Project is likely to be adversely impacted from restrictive conditions which in turn impact on the local and regional economy.

6 References

Advisian (2016), *Eden Breakwater Wharf Extension State Significant Infrastructure – Environmental Impact Statement*.

Advisian (2017), *Response to Submission Report Eden Breakwater Wharf Extension Report*.

ERM (2018a), *Eden Breakwater Wharf Extension Project - Cruise Ship Noise Impacts, Ship Public Address Systems*.

ERM (2018b), *Eden Breakwater Wharf Extension Project – Refined SO_2 Emission Modelling*.

International Maritime Organization (2018), 'Sulphur oxides (SO_x) and Particulate Matter (PM) – Regulation 14'. Available at: http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Sulphur-oxides-(SOx)-%E2%80%93-Regulation-14.aspx.

NSW Environmental Protection Authority (2000), *Industrial Noise Policy (INP)*.

NSW Environmental Protection Authority (2008), *Industrial Noise Policy Application Notes*.

Pacific Environment Limited (2016). *Eden Port Redevelopment – Noise, Vibration and Air Quality Assessment*.

VEPA (1986). *The Ausplume Gaussian Plume Dispersion Model*. Environment Protection Authority, Olderfleet Buildings, 477 Collins Street, Melbourne Victoria 3000, Publication Number 264.

Appendix A: Consultation Information

Minutes

MEETING	Community Consultative Committee (CCC) - Eden Breakwater Wharf Extension Project		
MEETING NO.	29	DATE	Wednesday, 30 May 2018
LOCATION	The Captain's Table – Eden Fishermen's Club	TIME	6.00pm
ATTENDEES	Jenny Robb, Debbie Meers, Rob Bain, Richard Lamacraft, Robin Arthur, Mike Skitt, Dr Denis Lawrence (via phone), Natalie Godward, Andrew Dooley, Chantel Steele, Greg Thomson, Isaac Smith, Mike Crandell, Simon Wakefield, Peter Mazey, Tony Matthews, Rob Davis, Tomas Rooney, Coral Reynolds		
APOLOGIES	Paul Webster, John Aveyard, Gail Ward, Megan Cleary, Leanne Scott, Graham Stubbs, Kell Dillon, Glenn Vardy		
PREPARED BY	Coral Reynolds		

1. Acknowledgement to Country, welcome and apologies

Simon thanked attendees for coming to the meeting, noted apologies, acknowledged the traditional custodians and peoples of the Country, both land and sea, and paid his respects to Elders past and present.

It was acknowledged that Denis was participating in the meeting via telephone.

2. Actions from previous meeting

Greg to provide a memo to the CCC by 16 May 2018 re Operating Conditions which will include relevant EPA and other information. It was acknowledged that this information had been provided to the CCC.

3. Post approval update

Simon provided a post approval update as follows:

- The monthly Environmental Representative Report continues to be submitted to the Department of Planning and Environment (DP&E).
- The next ER report is due on 7 June 2018.
- EPBC Referral – The effectiveness of the implementation of mitigation measures have been reported to DoEE with no issues identified and no further action.
- No non-conformances have been reported.

Both the ER and Construction Compliance Reports are available on the project website (https://www.industry.nsw.gov.au/lands/major-projects/infrastructure/eden/approvals-and-documents).

4. Operational conditions review

Greg discussed the following with attendees:

- A review of problematic Infrastructure Approval Conditions relating to the operation of cruise ships in the Port of Eden and initial consultation with DP&E has commenced.
- An air quality and noise assessment has commenced to review assumptions and remodel air quality and assess potential noise amenity issues relating to the problematic conditions. Compared to what was done in the Environmental Impact Statement (EIS).

- The CCC has been requested to review these conditions and provide comment or any suggested changes. CCC Comments were required by 29 May 2018. Comments will then be submitted to DP&E for their consideration in June 2018.
- In accordance with the recommendation of the additional assessments and consultation with the CCC, a modification to the Infrastructure Approval may be submitted to DP&E to amend the conditions.
- If submitted, public exhibition of the amendments will be required.

Greg thanked the CCC for the submissions received to date. Jenny stated that she agreed with Cruise Eden's submission but didn't have time to prepare a formal submission.

The meeting discussed the following:

- Noise conditions:
    - Deck announcements and music during transit
    - Upgraded generators/engines/exhausts

Mike S stated that the amendments weren't onerous and noted the content of the submissions that were received on 29 May. Mike S noted his objection was related to music being able to be played on deck and that "music from open decks" should be deleted from any amendments. Mike S felt it was unreasonable to compare Eden to White Bay as White Bay has numerous cruises and would operate under different conditions i.e. departures/sail aways are very noisy. Mike S stated that cruise ships should be able to have music playing if they wanted to for example during the lunchtime period and that the onus is on individual companies to not create any angst in the port communities they visit as it is a multibillion dollar industry. Mike S noted that other activities in the port of Eden are just as noisy.

Denis stated the he was in disagreement with the previous comments and that whilst the majority of cruise ships do adhere to port user requirements and regulations there are some operators who do not. Denis advised that constant trivial announcements are very disruptive. Denis noted that some of the houses adjacent to the port predate the current Breakwater Wharf and when some people bought their houses it was a fishing port that wasn't busy and that these are fairly quiet operations. Denis believed that Eden could be compared to White Bay and that in his experience some companies are good corporate citizens whilst there are others who are serial offenders and sanctions would be required for these operators to adhere to port Operating Conditions. Denis advised that he supports the current Operating Conditions and that modifying these conditions will impact on the quality of life for sensitive receivers.

Robin stated that from his experience that fewer deck announcements are more effective and that it is important to keep these to a minimum, however, some announcements will still be necessary.

Natalie noted that cruise ships currently make announcements as they enter Twofold Bay and as Eden is a transitionary port there are fewer deck announcements made compared to other ports, however, some announcements will still be required. Denis noted that sometimes there are ships visiting Eden that make numerous announcements. Mike S stated that tankers had previously come into Eden and had made more deck announcements than cruise ships would.

Greg asked the CCC to submit their recommendations on what is considered "in transit".

- Complaints handling:
    - Process of receiving a complaint, investigating the source, corrective action, reporting and disciplinary action

Greg noted that the current conditions are poorly worded and doesn't allow for a proper investigation into the complaint received. Greg asked the CCC what they thought would be the best method to manage complaints and that there would be more consultation with the CCC before submission to the DP&E.

- Air quality conditions:
    - Low sulphur fuels 0.1% or 0.5% or 2.7% for the 10 month period prior to 1 Jan 2020
    - Low sulphur fuels 0.1% or 0.5% from 1 Jan 2020 onwards.

Greg discussed the requirements for the 10 month period from operation and prior to 1 January 2020 and after 1 January 2020 when the global limit commences. Greg noted that there are issues to be worked out with the Operator. For example if cruise ships have to use 0.5% fuel they will need to bunker this fuel in addition to 2.7% and 0.1% as it is not currently being used at any other port or whilst in transit, this will be very restrictive and could deter ships from visiting Eden. Greg advised that a lot of information will become available from the additional air quality modelling that is currently being undertaken and Natalie advised that in the 10 month period (from operation until 1 January 2020) there will be nine ships that will visit Eden.

Greg noted the submissions that were received discussed noise and air quality conditions. Natalie stated that Sydney is the only place where 0.1% is being used and that there are no ships carrying 0.5% and the best case scenario is to allow bunker fuel (2.7%) to be used until 2020. For a cruise ship this will be a minimum of $25K in additional costs per visit and that no cruise ship operators would come to Eden. Debbie stated that she had been at Cruise Eden since 2005 and that in some seasons the port had no cruise ship visits and it had been difficult to rebuild the number of cruise ships coming to Eden and any unnecessary restrictions will undo all the hard work. Natalie stated that when cruise ships were in White Bay and burning fuel no air quality levels were exceeded.

Robin stated that some of the statistics regarding fuel emissions were horrific (ie 1 cruise ship = 1 million cars), stakeholder concerns shouldn't be disregarded and the port shouldn't succumb to any threats from the cruise industry to withdraw ships coming to Eden. Robin noted there had been worldwide pressure to reduce emissions and that Eden should anticipate this and speak with other ports. Natalie confirmed that she is in contact with other ports and that Cruise Eden is a member of the Australian Cruise Association, of which every port in Australia is a member of.

Simon and Mike C noted that additional modelling of the assumptions made in the EIS is currently being undertaken which will quantify emission levels. Natalie advised that air quality would be monitored and that the Port Authority would be installing air monitoring equipment. Robin noted that this will address his concerns. Jenny noted that there are a lot of different variables in White Bay which impact air quality levels such as heavy vehicles and the high number of shipping movements. Greg discussed the change in legislation from the NSW EPA to the Commonwealth.

Simon asked CCC members to submit any of their comments to Coral. Andrew advised that this step is just the beginning of consultation with the CCC.

Mike S believed that there should be an economic, environmental and social balance and that some of the submissions weren't considering any economic factors.

5. Marine structures update – May 2018

Greg provided an update of Stage 2 marine structures as follows:

- Offsite works related to the fabrication of the dolphin topside is ongoing
- The Bhagwan Challenge arrived on site on 7 May and piling commenced for the onshore bollards
- Pile installation is continuing with 18 piles completed to date
- Piles are being stored at the Navy Wharf and brought over to the project site.
- 47 of 252 deck planks have been poured.
- Forecast contract completion date remains as February 2019.

6. Environmental monitoring update – May 2018

Greg provided an update of environmental monitoring as follows:

- Water quality:
    - No complaints or adverse water quality observations were received regarding water quality levels in Snug Cove.
- Noise levels:
    - No noise complaints were received.
- Marine mammals:
    - No incidents involving marine mammals.
    - Whales were sighted within the piling observation area on Friday 25 May .
    - Piling was delayed until the whales had cleared the area – this wasn't a requirement but was undertaken.
- Noise and Vibration Monitoring:
    - Monitoring was ongoing throughout the month of May. No issues were recorded with either noise or vibration levels.
    - Vibration monitoring has now ceased, having captured levels for the closest piling works. The report should be received shortly.
    - Noise monitoring will remain in place for the duration of the project.
    - Noise levels are checked by the site team daily to ensure compliance with approvals.

Denis stated that for members of the CCC who don't reside in Snug Cove they are unable to hear the piling and that it was like hitting a steel fence pile with a sledgehammer within a house. Denis advised that while no noise complaints had been received or issues registered in May, piling is imposing a significant impact and loss of amenity for residents. Denis noted that this was not a criticism directed at Waterway Constructions. Mike S noted that whilst the noise levels have been significant the work undertaken to date has been very intermittent.

7. Community complaints – May 2018

Attendees were advised that no community complaints were received during the month.

8. Community feedback

Simon asked the CCC if they had any feedback to provide the project team. Jenny thanked Waterway Constructions for sponsoring the Chamber of Commerce Business Awards.

The meeting closed at 6.51pm.

Minutes

MEETING	Community Consultative Committee (CCC) - Eden Breakwater Wharf Extension Project		
MEETING NO.	28	DATE	Wednesday, 2 May 2018
LOCATION	The Auditorium – Eden Fishermen's Club	TIME	6.00pm
ATTENDEES	Gail Ward, Graham Stubbs, Megan Cleary, Jenny Robb, Debbie Meers, Leanne Scott, Rob Bain, Richard Lamacraft, Robin Arthur, Chantel Steele, Greg Thomson Isaac Smith, Glenn Vardy, Mike Crandell, Simon Wakefield, Rob Davis, Tony Matthews, Tomas Rooney, Tony Knight, Pat McCallum, Coral Reynolds		
APOLOGIES	Kell Dillon, Dr Denis Lawrence, Paul Webster, Nat Godward, John Aveyard		
PREPARED BY	Coral Reynolds		

1. Acknowledgement to Country, welcome and apologies

Simon thanked attendees for coming to the meeting, noted apologies, acknowledged the traditional custodians and peoples of the Country, both land and sea, and paid his respects to Elders past and present.

Simon introduced Tony Knight, the new HSE Advisor for Waterway Constructions, and Pat McCallum, Project Director for Advisian.

2. Actions from previous meeting

There were nil actions.

3. Post approval update

Simon provided a post approval update as follows:

- The monthly Environmental Representative Report continues to be submitted to the Department of Planning and Environment (DP&E).
- The next ER report is due on 7 May 2018.
- The biannual Construction Compliance Report was submitted to DP&E on 6 March 2018. The report details the projects compliance against the SSI conditions of approval.
- No non-conformances have been reported.

Both the ER and Construction Compliance Reports are available on the project website (https://www.industry.nsw.gov.au/lands/major-projects/infrastructure/eden/approvals-and-documents).

4. Operational conditions review

Greg discussed the following with attendees:

- The Infrastructure Approval contains conditions relating to the operation of cruise ships in the Port of Eden and initial consultation has commenced with DP&E to modify some conditions.
- The CCC has been requested by DP&E to review these conditions and provide comment or any suggested changes. CCC comments are required to be submitted before the next CCC meeting. Comments will then be considered for any modification application to DP&E for their consideration around June 2018.
- Monitoring will be recommended for the early stages of operation to validate the modelling undertaken.

- An Operational Environmental Management Plan will be developed for the operational phase of the project that will detail the operational requirements including complaint management and non-conformance management. When the Plan is required, the CCC will be consulted in the development of the Plan.
- If it is considered that any conditions need to be amended a modification application will be submitted to DP&E in accordance with the recommendation of the air and noise assessments and consultation. The modification application will be placed on public exhibition and comments will be received and responded to.
- Noise conditions:
    - E17(a) No deck announcements and music from open decks while berthed at the SSI in the Port of Eden or transit, with the exception of safety announcement
    - (b) Ship generators/engines/exhausts must be maintained, upgraded and operated efficiently to reduce noise emissions while in the Port of Eden.

Potential modification includes removal of "or transit" from E17(a) and "upgraded" from E17(b).

The CCC discussed the practice of having music playing on deck on cruise ships whilst berthed at the new wharf extensions. Gail asked what happens in other ports. Greg advised each port may be different. Debbie queried why music and deck announcements aren't time prescribed. Greg noted that some of these conditions are from White Bay, Sydney, and may be difficult to be implemented in Eden. Leanne noted that the wider community will be impacted including the businesses down at the Wharf. Jenny asked if decibel levels can be prescribed. Greg noted that this may be difficult to enforce. Leanne noted that on other ships they adhere to each individual port's rules. Richard advised "upgraded" from E17(b) should be removed.

- Complaint handling (noise):
    - E18 In the event of complaints from Sensitive Receivers in relation to a specific cruise ship, the source of the offensive noise must be identified and action taken to reduce noise levels with details submitted to the Secretary. The ship must not be permitted to berth at the SSI in the future, unless it can be demonstrated that measures have been taken to reduce noise levels.

Potential modification includes removal of "The ship must not be permitted to berth at the SSI in the future" and revised wording would be provided about the investigation of incidents. Greg discussed having a complaint process that is workable and proactive versus banning cruise ships from coming into port if they are not compliant. Greg noted that if there are complaints and issues they will need to be addressed and can't be ignored.

Leanne asked how this would be managed and what the process would be. Greg stated this is likely to be managed by the operator. Greg noted that there will be reporting undertaken during this phase as per the Infrastructure Approval conditions.

- Air quality conditions:
    - E20 (a) Use of low sulphur fuels at berth. Sulphur content is not to exceed 0.1% m/m (mass/mass) unless alternative methods to meet sulphur emission restrictions are utilised such as exhaust gas cleaning systems or scrubbers which act to remove the SOX directly from the ship exhaust The use of an alternative method needs to be at least as effective, in terms of emission reduction, as the fuel oil requirements outlined above. Where low sulphur fuel is the proposed mitigation measure, ship fuel bunker notes must be provided and included in the Operation Compliance Reports.
    - E20 (b) Use of low sulphur fuels for the duration of transit. Sulphur content is not to exceed 0.1% m/m (mass/mass) unless alternative methods to meet sulphur emission restrictions are utilised such as exhaust gas cleaning systems or scrubbers which act to remove the SOX directly from the ship exhaust The use of an alternative method needs to be at least as effective, in terms of emission reduction, as the fuel oil requirements outlined above. Where low sulphur fuel is the proposed mitigation measure, ship fuel bunker notes must be provided and included in the Operation Compliance Reports.

E20 (c) Ship generators/engines/exhaust must be maintained, upgraded and operated efficiently to reduce air emissions while in the Port of Eden.

Greg noted that this condition has arisen from White Bay, Sydney. In 2015 the NSW EPA introduced limits of sulphur content in fuels of cruise ships which was then ruled inoperative by the Commonwealth Government. Greg discussed the MARPOL limit of 0.5% sulphur content which is to be introduced after 1 January 2020. At the moment the current sulphur content limit is 3.5%. Jenny asked what the conditions were at Newcastle as a comparable port. (Note Greg has checked with the Port Authority of NSW and there are currently no limits in Newcastle Port. However the limit will be 0.5% when the global limit is introduced on 1 January 2020). Greg noted the importance of balancing residents, community, key stakeholder and the operators requirements. Leanne stated she thought the sulphur content level 0.5% was previously agreed by the group at the December 2015 CCC Meeting.

Richard asked if anyone understood the implication of having a high sulphur level fuel ie the smell and health implications. Richard asked if it was possible to make the requirements more stringent over time. Simon noted that the EIS modelling looked at three types of fuels (2.7%, 0.5% and 0.1%) and at 2.7% smell and particulate matter is noticeable. Richard asked what percentage is currently used by cruise ships. Simon advised it is 2.7% sulphur content in fuel.

Leanne discussed a presentation made by an EPA representative in December 2015. It was noted that Greg will follow up the EPA and provide the presentation and relevant information to the CCC.

Robin believed this is a complicated issue and might not be fully understood in just one CCC meeting and wanted time to digest this information. Greg noted the CCC has two weeks to provide back comments and that there will also be exhibition and comment time periods in place for public feedback. Mike noted that if responses were due by 16 May 2018 there may not be enough time to respond and may require a summary narrative. **It was decided that Greg and Simon are to provide a memo/summary narrative for the CCC by 16 May 2018 which will include relevant EPA information and other literature to help the CCC make an informed decision. Gail asked if comparisons to other ports can be included. This information can then be reviewed at the next CCC meeting on 30 May**. Graham Stubbs stated that he previously worked with an environmental manager within Council and may be able to provide information to the CCC at the next meeting.

- Complaint handling (air quality)
    - E22: In the event of dark smoke emissions, offensive odours and/complaints from residential receivers in relation to a specific cruise ship, additional details are to be provided to the relevant Maritime Authority on the ship's exhaust management. Upon the return of the vessel, monitoring as par Condition 7 and testing of ship stack emissions and fuel used in transit and berth must be undertaken by a suitably qualified specialist with results submitted to the Secretary. Should further community complaints be received, and monitoring indicates emissions levels in excess of that typically recorded for other cruise ships as part of the Operation Monitoring Program required under Condition D7, in the future the ship must not be permitted to berth at the SSI, unless it can be demonstrated that measures have been taken to reduce (air) emission levels.

Greg noted this section will be reworded, to include the investigation of incidents. Robin noted the difficulty in having experts come to Eden and what will happen if complaints arise. Greg discussed having a complaint process that is workable and proactive versus banning cruise ships from coming into port if they are not compliant. Greg noted that if there are complaints and issues they will need to be addressed and can't be ignored.

5. Marine structures update

Greg provided an update of Stage 2 marine structures as follows:

- Offsite works related to the procurement and fabrication of the dolphin topside is ongoing.
- Shipment of piles arrived in Eden and have been stored in the log yard at the Navy Wharf.
- Fabrication of dolphins commencing 7 May and installation is currently scheduled to be undertaken from mid to late September.
- Divers have been cutting out sections of the scour protection at the identified pile locations to allow the piles to penetrate into the seabed.
- Pile installation commenced on the 28 April with three piles installed to date.
- The Bhagwan Challenge is due on site on 7 May which is another barge similar to the Casilis.
- Forecast contract completion date remains as February 2019.

6. Building condition surveys

Greg advised the meeting that the building condition surveys had been completed and reports provided to property owners and lease holders.

7. Environmental monitoring update – April 2018

Greg provided an update of environmental monitoring as follows:

- Water quality:
    - No complaints or adverse water quality observations were received regarding water quality levels in Snug Cove.
- Noise levels:
    - No noise complaints were received.
    - Issue raised on 19 April 2018 about use of tonal reversing alarm (beeper) on plant on site. The plant was then converted to broadband reversing alarm (quacker).
    - Unattended noise monitoring is being undertaken at By Street and Victoria Terrace.
    - Attended noise monitoring is being undertaken for a 2 week period.
- Marine mammals:
    - There have been no incidents involving marine mammals however some marine mammals have been observed outside the stop work zone.
    - The marine mammal observation has commenced.

Leanne thanked the team for the quick resolution of the tonal reversing alarm issue.

Simon noted that vibration monitoring is also being undertaken and will monitor vibration impacts for a two week period during piling.

8. Community complaints - April 2018

Attendees were advised that no community complaints have been received during the month. The noise issue previously mentioned has been entered into the Project Issues Register.

9. Community feedback

Greg asked the CCC if they had any feedback to provide the project team. Jenny noted that Eden Gas and Gear and other businesses are pleased with the patronage from the project.

Megan asked if there were any accommodation issues. Rob advised Waterways had been looking for furnished accommodation and it was becoming slightly more difficult.

Leanne queried the intermittent nature of the piling undertaken on 30 April. Rob advised that there had been marine mammals observed near the work zone and they were following the stop work requirements as part of the EPBC referral. Leanne also noted that she had met the marine

mammal observers at By Street. Glenn noted that there had been conjecture regarding the marker buoys and that these were pertaining to the marine mammal observation zones.

10. Other agenda items

These were discussed in the CLG meeting.

The meeting closed at 6.53pm.

NSW GOVERNMENT Department of Industry

Memorandum

TO	Eden Breakwater Wharf Extension Project - Community Consultative Committee
FROM	NSW Department of Industry
DATE	16 May 2018
SUBJECT	**Eden Breakwater Wharf Extension Project - Operational Conditions**

Introduction

At the Community Consultative Committee (CCC) held 2 May 2018, discussions commenced regarding the State Significant Infrastructure (SSI) operational conditions for the Eden Breakwater Wharf Extension Project that may be problematic and proposed modification of the conditions the Department of Industry (the proponent) may be seeking.

During the meeting, it was discussed that the proponent would provide the CCC with a memorandum containing additional information in relation to the proposed amendments and that the CCC would be provided with an opportunity to provide comment on the problematic operational conditions and identify any other potential modifications.

The purpose of this memorandum is to provide the CCC with additional information regarding the proposed modifications. The operational conditions under review are E17, E18, E20, and E22 and relate to environmental management of noise and vibration and air quality.

After reviewing this memorandum, please send any comments (supportive or unsupportive) to eden.wharf@industry.nsw.gov.au by 4:00 PM 29 May 2018. All comments will be discussed at the CCC meeting scheduled for 30 May 2018, as well as any additional comments/concerns raised at the CCC meeting.

All comments received will be taken into consideration when preparing the application to modify the SSI operational conditions and therefore may differ from the information provided in this memorandum. Should the request to modify the conditions be submitted, the CCC will have the opportunity to review and or provide any further comments through a public exhibition period.

Noise and vibration

Condition

E17(a) *"no deck announcements and music from open decks while berthed at the SSI in the Port of Eden or transit, with the exception of safety announcements;"*

E17(b) *"ship generators/engines/exhausts must be maintained, upgraded and operated efficiently to reduce noise emissions while in the Port of Eden;"*

Proposed change to Condition

E17(a) *"no deck announcements and music from open decks while berthed at the SSI in the Port of Eden, with the exception of safety announcements;"*

E17(b) *"ship generators/engines/exhausts must be maintained and operated efficiently to reduce noise emissions while in the Port of Eden;"*

Justification

With regard to Condition E17(a) enforcing compliance of ships while they are in transit or in the wider-port area may be problematic. Therefore it is proposed to modify the condition to address the ships while at berth at the SSI in the Port of Eden. It should be noted, any complaint received would be the subject of notification, investigation and close out processes in accordance with Noise Management OEMP Sub-plan.

With regard to Condition E17(b) the requirement to upgrade should not be necessary unless it was identified that there was a fault or a noise concern. It would be difficult to require that all ship engines be upgraded, and further, it is unclear what sort of upgrade would be required. Therefore it is proposed to modify the condition to address the efficient maintenance and operation of the ship.

Condition

E18 *"In the event of complaints from Sensitive Receivers in relation to a specific cruise ship, the source of the offensive noise must be identified and action taken to reduce noise levels with details submitted to the Secretary. The ship must not be permitted to berth at the SSI in the future, unless it can be demonstrated that measures have been taken to reduce noise levels".*

Proposed change to Condition E18

E18 *"Where a complaint is received from a Sensitive Receiver in relation to a specific cruise ship at the SSI in the Port of Eden, the source and nature of the noise will be investigated. If there are further complaints or the investigation indicates ongoing exceedance of the predicted noise levels, reasonable and feasible measures shall be investigated and implemented where reasonable and feasible".*

Justification

The current condition outlines that if a complaint is received (whether valid or not) and demonstrable measures to reduce noise levels are not satisfactory to the Secretary then the ship is not permitted to berth at the Port of Eden. This condition would potentially reduce the number of ships to the Project and may require the ship to anchor at a buoy to avoid this condition. This opposes the purpose of the Project to accept more cruise ships to visit, with a potential impact on the local economy.

The noise levels on-board a ship are difficult to quantify and control, and it is possible that a noise complaint may be received while a ship is at berth. Any complaint received would be the subject of notification, investigation and close out processes in accordance with Noise Management OEMP Sub-plan.

It should be noted, that a Noise Management OEMP Sub-plan will be developed and implemented to the satisfaction of the Secretary to minimise and manage noise at the facility, including a 24-hour complaints handling mechanism.

Air quality

Condition

E20 *"The Air Quality Management OEMP Sub-plan must include the following measures to reduce emissions from cruise ships:*

(a) *use of low sulphur fuels at berth. Sulphur content is not to exceed 0.1% m/m (mass/mass) unless alternative methods to meet sulphur emission restrictions are utilised such as exhaust gas cleaning systems or scrubbers which act to remove the SO_X directly from the ship exhaust The use of an alternative method needs to be at least as effective, in terms of emission reduction, as the fuel oil requirements outlined above. Where low sulphur fuel is the proposed mitigation measure, ship fuel bunker notes must be provided and included in the Operation Compliance Reports;*

(b) *use of low sulphur fuels for the duration of transit. Sulphur content is not to exceed 0.1% m/m (mass/mass) unless alternative methods to meet sulphur emission restrictions are utilised such as exhaust gas cleaning systems or scrubbers which act to remove the SO_X directly from the ship exhaust The use of an alternative method needs to be at least as effective, in terms of emission reduction, as the fuel oil requirements outlined above. Where low sulphur fuel is the proposed mitigation measure, ship fuel bunker notes must be provided and included in the Operation Compliance Reports;*

(c) *ship generators/engines/exhaust must be maintaine*d, upgraded and operated efficiently to reduce air emissions while in the Port of Eden."

Proposed change to Condition E20

E20 *"The Air Quality Management OEMP Sub-plan must include the following measures to reduce emissions from cruise ships:*

(a) *Cruise ships must use low sulphur fuels at berth. Sulphur content is not to exceed 0.5% m/m (mass/mass) unless alternative methods to meet sulphur emission restrictions are utilised such as exhaust gas cleaning systems or scrubbers which act to remove the SO_X directly from the ship exhaust.*

(b) *The proponent shall operate the project with the objective that emissions from cruise ships berthed at the SSI at the Port of Eden do not result in an exceedance of the predicted concentrations;*

(c) *Ship generators/engines/exhaust must be maintained and operated efficiently to reduce air emissions while at the SSI at the Port of Eden;*

(d) *Where it is identified that the predicted air quality concentrations have been exceeded or a complaint is received from a residential receiver in relation to a specific cruise ship about dark smoke emissions or odours, the source and nature of the exceedance will be investigated where possible. If the investigation indicates an ongoing exceedance of the predicted concentrations, reasonable and feasible measures shall be investigated and implemented where possible."*

Regulatory Background

In March 2015 the then Minister for the Environment, announced that the Government would require all cruise ships to use low sulphur fuel in Sydney Harbour by 1 July 2016 and earlier whilst at berth in Sydney Harbour.

It was proposed to amend the *Protection of the Environment Operations (Clean Air) Regulation 2010* (the POEO regulation) to mandate the use of low sulphur fuel by cruise ships in Sydney Harbour in two stages:

i. Stage 1 – requiring the use of low sulphur fuel (0.1% or less) by cruise ships while berthed in Sydney Harbour from 1 October 2015.

ii. Stage 2 – requiring the use of low sulphur fuel (0.1% or less) by cruise ships while in Sydney Harbour from 1 July 2016.

Under the *Protection of the Environment Operations Act 1997 (*POEO Act) and the POEO regulation, the Environment Protection Authority (EPA) had general powers relating to the sulphur content of fuels.

The Commonwealth Government is responsible for regulating fuel used by ships in all Australian Ports (including NSW). Commonwealth amendments to *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, effective January 2016 in effect made State Governments powers to regulate low sulphur requirements for shipping inoperative. The Commonwealth introduced requirements for cruise ships to use 0.1% or less sulphur fuel at berth in Sydney Harbour (mirroring previous NSW at berth requirements).

The main air pollutant from ships is fine particles ($PM_{2.5}$). Low sulphur marine fuel is the most common measure used overseas to reduce particle emissions from ships.

In relation to broader shipping, the International Convention for the Prevention of Pollution from Ships (MARPOL) is the principal convention covering prevention of pollution of the marine environment. The Australian Maritime Safety Authority implements the MARPOL limits on sulphur in fuel. From January 2020 the International Maritime Organization reduces the global sulphur cap from 3.5% to 0.5% for fuel oil used by ships. This will be the minimum requirement for all ships.

Current NSW Greater Metropolitan Region average sulphur content of marine fuel is 2.7% and is usually a heavy fuel oil. The 0.5% maximum sulphur requirement is estimated to reduce $PM_{2.5}$ emissions from all shipping in NSW by between 59% and 80% (depending if fuel used is heavy fuel oil

or low-sulphur distillate). *Sources: Emissions from ships operating in the Greater Metropolitan Area, DNV GL, 2015. Estimated using test methods In the NSW EPA Emissions Inventory 2012.*

Concerns regarding shipping emissions

Shipping contribution to local and regional air emissions

The impact of air emissions from shipping in coastal regions and ports in nearby urban regions is increasing with growth in shipping activity.

Powered by large engines operating on high sulphur fuel, many ships emit high levels of $PM_{2.5}$ and SO_2, both of which are harmful to human health. The average sulphur content of shipping fuel used in the NSW Greater Metropolitan Region (GMR) is 2.7%.

Fine particle emissions

$PM_{2.5}$ is a priority due to its potential adverse health impacts. Those most affected are the elderly, children and those with existing health conditions. Health studies show that there is no threshold concentration for exposure to particle emissions, below which health impacts are not observed. Numerous studies have linked fine particle exposure to a variety of cardiovascular and respiratory diseases and, in 2012, the World Health Organisation's International Agency for Research on Cancer classified diesel exhaust as a human carcinogen. Reducing sulphur in fuel is a key means to reduce fine particulate pollution.

Reduction potential for shipping emission control options

Emission control option	**$PM_{2.5}$** (Reduction compared to around 2.7% sulphur)
Scrubber	80-85%
Liquefied Natural Gas (LNG) fuel	>90%
Low-sulphur distillate (0.1% sulphur)	88-96%
Low-sulphur distillate (0.5% sulphur)	77-80%
Heavy fuel oil (0.1% sulphur)	70%
Heavy fuel oil (0.5% sulphur)	59.2%
Shore-side power	96%

Sources: PAEHolmes, 2011;(DNV GL, 2015;(EPA, 2012)

Capital and operating costs for shipping emission control technologies

Emission control technology	**Capital cost**†	**Operating cost** (compared with 2.7% sulphur fuel)
Scrubber	$200 to $420 per kW installed power	+1.5-2% (higher fuel consumption)
LNG fuel	$700 to $1200 per kW installed power	+30% (higher fuel cost)
Low-sulphur distillate (0.1% or 0.5% sulphur)	Variable depending on piping, storage, systems & training requirements	+40-80% (higher fuel cost)
Low-sulphur Heavy Fuel Oil (0.1 or 0.5% sulphur)	Variable depending on piping, storage, systems & training requirements	Around 85% of costs 0.1% or 0.5% low-sulphur distillate fuels
Shore-side power* Land	Land-based infrastructure - $35M to $70M per port Vessel refit: $320k to $1.8M per vessel	$375K to $2M

** (DNV GL, 2015) ‡Passenger ships in the four NSW GMR ports; Bunker world marine fuel prices (http://www.bunkerworld.com)*

The additional fuel cost attributable to the early introduction of 0.1% or 0.5% sulphur shipping fuel in NSW ports would only apply until the MARPOL global sulphur limit of 0.5% sulphur comes into effect in 2020. The substantial cost of removing sulphur from shipping fuels lies in moving from the current high sulphur levels (up to 3.5% sulphur) to a relatively low 0.1% or 0.5% sulphur.

Justification
The key concern with these conditions is the requirement for the use of low sulphur fuels for cruise ships.

As part of the EIS for the project, modelling was undertaken for three fuel sources: residual oil fuels with 2.7% sulphur, marine distillate with 0.5% sulphur and low sulphur fuels with 0.1% sulphur. The modelling results demonstrated that at the most affected sensitive receiver locations (i.e. dwellings) of the NSW EPA ambient impact assessment criteria would be complied with in relation to oxides of nitrogen emissions and particulate matter ($PM_{2.5}$) for fuel sources. The modelling showed no exceedances of the sulphur dioxide (SO_2) criterion for marine distillate or low sulphur fuels. For cruise ships using residual oil fuels, there were exceedances of the SO_2 and particulate matter criteria for the 1-hour and 24-hour averaging periods. However, it is noted that the modelling was based on worst-case scenarios and the probability of an exceedance in practice would be low due to cruise ships not being at the berth every day of the year (i.e. only 60 ships would visit the area per year or only 7% of the time) and the maximum increments from ship emissions would also have to coincide with maximum background levels, along with worst-case dispersion meteorology when at the berth. The modelled results were also conservatively based on a cruise ship of greater than 300m in length being at the berth every time.

Various mitigation measures addressing the potential environmental impacts of a cruise ship at berth will be incorporated into the Air Quality Management OEMP Sub-plan and will include a 24 hour complaints handling mechanism, measure to minimise dark smoke emissions, minimise offensive odours and the potential use of low sulphur fuel during berthing and transit periods and the powering down of cruise ship vessels once berthed at Breakwater Wharf.

In addition, Conditions D8 and E21 require an Air Quality Operation Monitoring Program, this program will be used to understand the potential environmental impact and any exceedance of NSW EPA ambient impact assessment criteria of using fuel with 0.5% sulphur content. This monitoring program could be enhanced to include continuous monitoring for the first two cruise seasons.

Condition

E22 *"In the event of dark smoke emissions, offensive odours and/complaints from residential receivers in relation to a specific cruise ship, additional details are to be provided to the relevant Maritime Authority on the ship's exhaust management. Upon the return of the vessel, monitoring as par Condition 7 and testing of ship stack emissions and fuel used in transit and berth must be undertaken by a suitably qualified specialist with results submitted to the Secretary. Should further community complaints be received, and monitoring indicates emissions levels in excess of that typically recorded for other cruise ships as part of the Operation Monitoring Program required under Condition D7, in the future the ship must not be permitted to berth at the SSI, unless it can be demonstrated that measures have been taken to reduce (air) emission levels."*

Proposed change to Condition E22
It is proposed that this condition be deleted and captured in Condition E20.

Justification
It is noted that the revised condition E20 will be similar to the requirements outlined in condition E22 of the Infrastructure Approval and therefore it is proposed to combine the requirements of both conditions into a single condition under E20.

The current requirement in the Infrastructure Approval that if complaints are received (whether valid or not) and demonstrable measures to reduce air quality levels are not satisfactory to the Secretary then the ship is not permitted to berth at the Port of Eden would potentially reduce the number of ships to the wharf extension, contradict the purpose of the Project, and impact the local economy.
An Air Quality Management OEMP Sub-plan will be developed and implemented coupled with an Air Quality Operation Monitoring Program to manage air quality impacts from ships.

From the above information, emissions from ships are difficult to quantify and control, and it is possible that an air quality compliant may be received while a ship is at berth or in transit. Any complaint

received will be recorded, investigated and closed out in accordance with Air Quality Management OEMP Sub-plan.

Further Reading

Better Regulation Statement *Protection of the Environment Operations (Clean Air) Amendment (Cruise Ships) Regulation 2015*

NSW Ship Emissions Study, *Emissions from Ships Operating in the Greater Metropolitan Area* – NSW Environment Protection Authority

Useful Links

Australian Government – AMSA – 2020 low sulphur fuel:
https://www.amsa.gov.au/marine-environment/marine-pollution/2020-low-sulphur-fuel

NSW EPA – Cruise ship fuel compliance in Sydney Harbour:
https://www.epa.nsw.gov.au/your-environment/air/non-road-diesel-marine-emissions/reducing-diesel-emissions-shipping/cruise-ship-fuel-compliance-sydney-harbour

Appendix B: Eden Breakwater Wharf Extension Project- Cruise Ship Noise Impacts, Ship Public Address Systems

Simon Wakefield
Practice Lead – Environment and Society
Advisian
Simon.wakefield@advisian.com

29 June 2018.

Dear Simon

Eden Breakwater Wharf Project – Cruise Ship Noise Impacts, Ship Public Address Systems

This letter provides an assessment of noise impacts associated with cruise ships accessing the Eden Breakwater Wharf Extension Project (the Project), specifically potential noise impacts from the operation of cruise ship public address systems.

This letter has been prepared with reference to the Noise, Vibration and Air Quality Assessment (Pacific Environment 2016) and noise modelling undertaken as part of this assessment.

This objective of this assessment is to quantify noise impacts associates with ship public address systems and compare these against approved project noise impacts, with regard to sensitive receivers in Eden NSW.

Yours sincerely

Aaron McKenzie

Principal Consultant

ERM
Level 15, 309 Kent Street
Sydney, NSW, 2000

ABN: 86 127 101 642
www.erm.com
Ph: +61 2 8584 8888

1 Introduction

The Eden Breakwater Wharf is located in Snug Cove, Eden, NSW. It is one of only a few deep ports in NSW that has the potential to accommodate cruise ships.

The NSW Department of Industry has been granted approval by the NSW Minister for Planning for the Eden Breakwater Wharf Extension Project (the Project) which includes an extension of the existing Eden Breakwater Wharf by 95m and dredge the approach channel and berth pocket, to accommodate cruise ships of up to 325 m in length.

The Infrastructure Approval includes specific requirements to minimise noise impacts associated with public address systems and requires in Condition E17

> *"No deck announcements and music from open decks while in the Port of Eden or transit, with the exception of safety announcements"*

This letter provides an assessment of noise impacts associated with the operation of ship public address systems and provides discussion of impacts, with regard to the project approval.

2 Noise Regulation and Policy

In NSW, noise pollution is regulated through the *Protection of the Environment Operations Act 1997* (POEO Act) as a key piece of environment protection legislation. Noise pollution is defined under the POEO Act as:

'the emission of offensive noise, which means noise that by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances, is harmful (or is likely to be harmful) to or interferes unreasonably (or is likely to interfere unreasonably) with the comfort or repose of a person outside the premises from which the noise is emitted'.

Under the POEO Act, the *POEO (Noise Control) Regulation 2008* addresses common noisy activities that occur in residential situations; it limits the time of day that noisy articles (such as lawn mowers, stereos and leaf blowers) are permitted to be heard in neighbouring residences, however it does not specify noise limits and an applicable approach for the assessment of sites.

Various noise and vibration assessment guidelines endorsed by NSW regulators provide a guidance framework and methodology for deriving acceptable levels and standard methods for assessing and measuring construction and operational impacts with due regard to the POEO Act.

The Project Air Quality and Noise Assessment, AQNA (PEL 2016) referenced the Industrial Noise Policy INP (EPA 2000) and associated guidance documents to develop noise criteria and a noise impact assessment methodology.

3 Noise Assessment

This section presents the assessment approach adopted as part of the Noise, Vibration and Air Quality Assessment (NVAQA) (PEL 2016) and provides further detail and discussion on noise impacts associated with the expected operation of ship public address (PA) systems.

3.1 Modelling Approach

The noise assessment (PEL 2016) utilised the ISO 9613 Acoustics – Attenuation of sound during propagation outdoors (ISO, 1996) and CONCAWE's Special Task Forces in Noise Propagation (CONCAWE, 1981) algorithms, as implemented within the CadnaA 4.5 acoustic modelling package.

Modelling was undertaken to determine noise impacts for cruise ship operational noise emissions from two assessment scenarios, including;

- ship in transit to berth (Model Scenario 1), and
- ship at berth (Model Scenario 2a and 2b)

Scenario 2 assessed noise impacts from a quieter (2a - 102 dBA) and louder (2b - 114 dBA) ships in terms of power generation and ventilation plant noise sources.

The assessment scenarios included all associated noise generating sources expected for these scenarios assessed as a LAeq 15 minute impact noise level for comparison with the NSW INP (EPA 2000) intrusive noise criteria.

The ship at berth model scenario included noise sources representing a PA system. Point sources were distributed around the exterior of the vessel to provide a simulation of PA chimes and announcements or music. As the PA system would be unlikely to be in operation for a full 15 minute assessment period, the PA sources were normalised to a 15 minute average noise level assuming 30 seconds of operations in any 15 minute period. This time correction is -15dB between the 30 second noise emission and 15minute average noise level.

3.2 Predicted Impacts

The noise assessment (PEL 2016) presented a single number LAeq noise level assessment for each sensitive receiver location across 2 noise catchment areas within the Eden township (refer Figure in Attachment 1).

- NCA 1 – representative of receivers in the main township
- NCA 2 – representative of receivers on the Eden peninsular.

The summary of impacts is presented in Table 1.

Table 1: *Predicted noise levels and PA system contribution*

	Predicted Noise levels dB(A)				
	Scenario 1 L_{Aeq} 15min	Scenario 2a L_{Aeq} 15min	Scenario 2b L_{Aeq} 15min	PA noise contribution L_{Aeq} 15min	PA noise contribution instantaneous L_{Aeq}
NCA1	49	40	51	17	32
NCA2	49	41	52	20	35

Notes: results presented for the highest impacted receiver in each NCA.

3.3 Discussion

Based on the predicted receiver noise levels for cruise ships in transit to the berth (Scenario 1) in comparison with expected contribution from PA noise sources when at the nearest point (at berth) the ship ventilation plant and exhaust are expected be the dominant noise source.

A review of the source contributions over a 15 minute assessment period did not show a significant contribution from the PA noise sources in either noise catchment area, when ships are at berth (scenario 2). These sources are not expected to increase the L_{Aeq} 15 minute noise impact compared with the contribution from all other noise sources.

During operation of the PA systems, the instantaneous noise level from these sources is expected to be between 5 - 8 dB below the ship mechanical noise sources when at berth. When in transit the contribution from ship PA systems are expected to be 14 - 17 dB less than ship mechanical noise emissions when ships are in transit.

Although ship PA system announcements are not expected to result in additional noise levels when compared with the noise emission from ship engines and ventilation systems, due to the frequency and characteristic of PA system operations and the short term noise level, it is expected that PA sources will be audible in both NCA1 and NCA2.

Where the PA systems are assessed against the NSW INP (EPA 2000) no additional "*annoying characteristics*" penalties would be expected to apply. However, as annoyance to noise is subjective, there may still be potential for adverse comment from the community.

4 Conclusion and Recommendations

An assessment of the noise contribution from PA noise emissions has been undertaken to determine the likely noise level from ship public address system operations.

Noise modelling completed for the Project (PEL 2016) was reviewed to provide a comparison of ship mechanical noise contribution with the contribution of ship public address systems. The results of noise modelling indicated that PA system noise impacts would not be likely to result in additional noise levels above the predicted noise levels from ships in transit to the breakwater wharf or while at berth.

However, due to the acoustic characteristics of the ship PA systems, they are expected to be audible at sensitive receivers around the Port of Eden.

Noise impacts from PA systems, are expected to be less noticeable when the ship is underway in transit, as noise emission from mechanical noise sources are expected to be louder than when at berth.

As annoyance from noise is subjective, and the characteristic of PA system noise sources can potential annoy sensitive individuals, the potential for complaints cannot be ruled out.

Measures to minimise potential for annoyance should include:

- Minimising use of PA systems while at berth to safety and important passenger communications.
- The Operational Environmental Management Plan - Noise Management Sub-plan should include a system (while ships are in berth) where by the community can directly provide feedback to the Port and the Ship when they are being adversely impacted by ship PA systems.

5 References

CONCAWE Report No. 4/81, Manning C.J., 1981, *The propagation of noise from petroleum and petrochemical complexes to neighbouring communities.*

International Standards Organisation (1996), ISO 9613-2:1996, *Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation.*

NSW Environmental Protection Authority (2000), *Industrial Noise Policy* (INP).

NSW Environmental Protection Authority (2008), *Industrial Noise Policy Application Notes.*

Pacific Environment (2016). *Eden Port Redevelopment - Noise, Vibration and Air Quality Assessment.*

Attachment 1

Figure 1: Noise Catchment Areas and Sensitive Receivers

Appendix C: Eden Breakwater Wharf Extension Project – Refined SO_2 Emission Modelling

Eden Breakwater Wharf Extension Project – Refined SO_2 Emission Modelling

Advisian Pty Ltd

29 June 2018

Project No.: 0464907

0464907-R2

The business of sustainability

ERM

Project name: Eden Breakwater Wharf Extension Project - Refined SO2 Modelling

Document control number: 0464907-R2

Prepared for: Advisian Pty Ltd

Document history

				ERM approval to issue		
Version	**Revision**	**Authors**	**Reviewed by**	**Name**	**Date**	**Comments**
Draft	D11	James Grieve, Francine Manansala	Damon Roddis	Damon Roddis	22.06.2018	Draft for Client Review
Final	R1	James Grieve	Damon Roddis	Damon Roddis	28.06.2018	Final
Final	R2	James Grieve	Damon Roddis	Damon Roddis	29.06.2018	Revised Final

Table of contents

1 Introduction 4
1.1 Objective and scope 4
2 Overview of EIS Modelling 5
2.1.1 Modelling assumptions and emissions 5
2.1.2 Previous modelling Results 5
3 Refined Modelling 7
3.1 Cruise Ship Schedule 7
3.2 Model Schedules 8
3.3 Hoteling Demand 8
3.4 Emission Parameters 11
3.5 Summary of Refined Modelling Assumptions 12
4 Results and discussion 13
5 Conclusions 20
References 21

List of Figures

Figure 3-1: *Cumulative frequency distribution of estimated hoteling demand with comparison to EIS modelling* 11
Figure 4-1: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for residual oil (µg/m³) – Typical Operations* 14
Figure 4-2: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for marine distillate (µg/m³) – Typical Operations* 15
Figure 4-3: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for low sulfur fuel (µg/m³) – Typical Operations* 16
Figure 4-4: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for residual oil (µg/m³) – Expanded Operations* 17
Figure 4-5: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for marine distillate (µg/m³) – Expanded Operations* 18
Figure 4-6: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for low sulfur fuel (µg/m³) – Expanded Operations* 19

List of Tables

Table 2-1. *Summary of EIS modelling assumptions SO_2* 5
Table 2-2. *Previously predicted maximum ground level concentrations of SO_2 – incremental and (cumulative)* 6
Table 3-1– *Port of Eden cruise ship schedule (2018 – 2020)* 7

Table 3-2: *Estimated hoteling demand estimate as a function of passenger number* 9
Table 3-3: *Summary of estimated hoteling demand and estimated emission rates – Current Operations Scenario* 10
Table 3-4: *Summary of refined modelling assumptions* 12
Table 4-1. *Predicted maximum SO_2 concentrations (µg/m³) – incremental and (cumulative) – Typical Operations* 13
Table 4-2. *Predicted maximum SO_2 concentrations (µg/m³) – incremental and (cumulative) – Expanded Operations* 14

1 Introduction

ERM Australia Pacific Pty Ltd (ERM) has been commissioned by Advisian Pty Ltd (Advisian) to undertake refined atmospheric dispersion modelling of SO_2 emission for the Eden Breakwater Wharf project ('the Project').

The Eden Breakwater Wharf is located in Snug Cove, Eden, New South Wales (NSW) and is currently being developed to accommodate cruise ship operations. In July 2016, ERM (then Pacific Environment) completed an Air Quality Impact Assessment (AQIA) which was used as input to the Environmental Impact Statement (EIS) for the Project (**PEL, 2016**) ('the EIS modelling').

The AQIA used atmospheric dispersion modelling to predict maximum ground level concentrations (glcs) of key air quality metrics as a result of the port upgrade. The main emission sources were associated with cruise ships in transit and at berth.

Subsequent to the EIS, a refined understanding of potential sulfur dioxide (SO_2) impacts from cruise ship hoteling operations is required, as related to the grade of fuel combusted whilst at berth.

This report therefore provides a refined assessment of the potential SO_2 concentrations associated with the Project, as well as detail of the revised operational assumptions.

1.1 Objective and scope

The EIS modelling assessed potential air quality impacts using conservative emission estimation methodologies in conjunction with generic information on the cruise ship fleet and fuel grades.

A refined understanding of potential ambient air quality impacts of SO_2 emissions from cruise ship operations is required, with consideration of assessment sensitivity to fuel grade and frequency of port operations.

As a means of refinement, ERM have been commissioned to undertake the following scope of works:

- Conduct a review of assumptions used within the EIS air quality modelling.
- Conduct a review of information on cruise ship fleet and docking operations.
- Prepare a fleet-specific emission inventory.
- Conduct SO_2 dispersion modelling using refined emission parameters and cruise ship frequency.
- Prepare a technical memorandum documenting the methodology and findings of the analysis (this document).

This work has been undertaken with a focus on operations that may occur in the period prior to 2020, after which the use of 0.5 wt% sulfur fuel is mandated under Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL Convention).

In addition, noting the similarity in scale of propulsion and hoteling emissions, as well as the significantly higher levels of dispersion present under transit, the relative effect of transit emissions at key receptors is likely to be small to negligible. Accordingly, this analysis is targeted to potential air quality impacts from cruise vessels in hoteling service.

2 Overview of EIS Modelling

The EIS modelling was completed in July 2016, and considered key air emissions including oxides of nitrogen (NO_x), SO_2, particulate matter (as PM_{10} and $PM_{2.5}$ size fractions) and carbon monoxide (CO) from cruise ships in transit and at berth. A summary of the assumptions and findings of the EIS modelling are provided in this section.

2.1.1 Modelling assumptions and emissions

Table 2-1 provides a summary model assumptions and emission factors used in the EIS modelling of SO_2.

Table 2-1: *Summary of EIS modelling assumptions SO_2*

Parameter	Value
Hours at berth (in hoteling service)	- 7 am to 6 pm - Emissions modelled each day of the 365 day modelling period.
Hoteling power generation	- The Noordam 4 was adopted as a reference vessel (51,940 kW main engine). - Hoteling demand assumed to be 25% of main engine power 12,985 kW.
Exhaust parameters	- Height: 55 m - Diameter 1 m - Velocity 24.3 m/s - Temperature 160°C - Building downwash included
Fuel grades assessed	- Residual Oil - 2.7% wt - Marine Distillate - 0.5% wt - Low Sulfur Fuel - 0.1% wt
SO_2 Emissions (per unit of power output)	- Residual Oil – 12.0 g/kWh - Marine Distillate – 2.1 g/kWh - Low Sulfur Fuel – 0.3 g/kWh.

2.1.2 Previous modelling Results

Dispersion modelling was completed using the CALMET/CALPUFF modelling suite. The dispersion modelling identified that predictions were sensitive to the fuel type used. For example, low sulfur fuel resulted in glcs that were below the criteria for all assessed pollutants, whilst SO_2 concentrations exceeded the 10-minute, 1-hour and 24-hour EPA assessment criteria when cruise ships were using residual oil.

These results are summarised in **Table 2-2** below. The table provides maximum incremental and cumulative results for the most affected receptor.

Table 2-2: *Previously predicted maximum ground level concentrations of SO_2 – incremental and (cumulative)*

Averaging period	Criteria (µg/m^3)	Adopted background concentration (µg/m^3)	Maximum concentration at most affected receptor		
			Residual oil (µg/m^3)	Marine distillate (µg/m^3)	Low sulfur fuel (µg/m^3)
10-minute	712	149	1,843 (1,992)	323 (472)	60 (209)
1-hour	570	104	1,288 (1,392)	226 (330)	42 (146)
24-hour	228	24	273 (297)	48 (72)	9 (33)
Annual	60	3	0.8 (3.8)	0.1 (3.1)	0.03 (3.0)

The AQIA recommended that all cruise ships entering the port use either marine distillate (0.5%wt sulfur) or low sulfur fuels (0.1% sulfur), so as to ensure that ambient air quality criteria for sulfur dioxide are met.

3 Refined Modelling

Refined dispersion modelling has been undertaken to reflect the frequency and scale of proposed port operations. Details of this methodology are provided in the following.

3.1 Cruise Ship Schedule

Table 3-1 provides a summary of the current cruise ship schedule for the period 2018 – 2020.

Table 3-1: *Port of Eden cruise ship schedule (2018 – 2020)*

Vessel	Date
Caledonian Sky	27/10/2018
Pacific Jewel	29/11/2018
Noordam	06/12/2018
Seven Seas Mariner	14/12/2018
Norwegian Jewel	21/12/2018
Regatta	01/01/2019
Regatta	15/01/2019
Noordam	17/01/2019
Silver Muse	29/01/2019
Regatta	03/02/2019
Seabourn Encore	05/02/2019
Amadea	06/02/2019
Crystal Serenity	24/02/2019
Viking Sun	25/02/2019
Seabourn Encore	17/03/2019
Noordam	26/03/2019
Noordam	29/03/2019
Maasdam	05/04/2019
Pacific Jewel	27/09/2019
Maasdam	13/11/2019
Noordam	*01/01/2020*
Pacific Jewel	*03/01/2020*
Regatta	*06/01/2020*
Regatta	*07/01/2020*
Regatta	*02/02/2020*
Pacific Jewel	*04/02/2020*
Silver Muse	*05/02/2020*
Noordam	*16/02/2020*
Seven Seas Navigator	*25/02/2020*
Seabourn Encore	*27/02/2020*
Celebrity Solstice	*07/03/2020*
Seabourn Encore	*19/03/2020*
Seabourn Encore	*21/03/2020*

Note: Post-2020 entries shown in grey italicised text.

3.2 Model Schedules

The modelling has been configured to reflect operational schedules. This reflects a refinement beyond the EIS modelling which assumed that ships would visit on every day of the modelled 2013 meteorological dataset. The current schedule anticipates that five ships will visit the port in 2018, with a total of 15 in 2019, whilst it is anticipated that the Project may accommodate 40 – 60 ships per year at full scale operation.

Model schedules have been prepared for the following scenarios:

- *Typical Operations:* 20 ships per annum, achieved by collation of 2018 and 2019 operations into a single year. This is assumed to reflect current intensity of operations with some contingency for an increase in scheduled visits over the next year.
- *Expanded Operations:* 60 ships per annum as reflective of full scale operation. This scenario has been included in order to interrogate the influence increased operating frequency on potential air quality impacts, whilst also representing the scale of operations proposed under the full implementation of the Project. Based on current scheduling, it is not envisaged that the Project will operate at this intensity prior to 2020.

The Expanded Operations have been prepared by overlaying the Typical Operations schedule in triplicate, with 6 day lag and 4 day lead on the Typical Operations schedule in order to avoid overlapping days.

3.3 Hoteling Demand

Emissions from cruise ship hoteling are variable in nature, and depend on a range of contributing factors that define the electrical demand of a given ship whilst at berth ('hoteling demand'). Information on hoteling demand for ships scheduled to visit the port are not available, hence an estimation process has been undertaken.

As outlined in Section 2, the EIS modelling was based on the assumption that hoteling demand is equal to 25% of the total installed generation capacity. This reflects the arrangement whereby ships are powered by a number of diesel-electric generator sets that are used across both propulsion systems and on-board utilities. The assumption of 25% load reflects a typical scenario whereby generator operation is limited to one of four installed generator sets during hoteling operations, and hence provides a simplistic and generally conservative representation of hoteling demand.

Since the time of the EIS modelling, additional refinement has been available, as documented in Starcrest (2017a; 2017b) which provides a method for estimation of hoteling demand as a function of the number of passengers on the vessel. Table 3.2 presents this estimate:

Table 3-2: *Estimated hoteling demand estimate as a function of passenger number*

Passenger Range	Hoteling Demand Estimate (kW) (Starcrest, 2017b)
< 1500	3,000
1500 < 2000	6,500
2000 < 2500	9,500
2500 < 3000	10,000
3000 < 3500	10,500
3500 < 4000	11,000
4000 < 4500	12,000
4500 < 5000	13,000
5000 < 5500	13,500
5500 < 6000	14,000
6000 < 6500	14,500
6500 +	15,000

Site specific hoteling demand has been estimated as a function of passenger numbers for the ships scheduled to visit the port of Eden. Passenger numbers have been referenced from a publically available source (Cruisemapper, 2018).

Table 3-3 provides a summary of estimated hoteling demand and estimated emission rates as based on the emission factors applied in the EIS modelling (see Table 2-1).

Figure 3-1 shows a cumulative frequency distribution of estimated hoteling demand, as based on the 2018/2019 fleet mix (which forms the basis for both Typical Operations and Expanded Operations modelling). Comparison to the EIS modelling hoteling demand value is also provided.

Table 3-3: *Summary of estimated hoteling demand and estimated emission rates – Current Operations Scenario*

Ship	Model Date	Estimated Hoteling Demand (kW)	Emission Rate (g/s)		
			Low Sulfur	Marine Distillate	Residual Oil
Regatta	1/01/2013	3,000	0.3	1.8	10.0
Regatta	15/01/2013	3,000	0.3	1.8	10.0
Noordam	17/01/2013	9,500	1.0	5.5	31.7
Silver Muse	29/01/2013	3,000	1.0	1.8	10.0
Regatta	3/02/2013	3,000	0.3	1.8	10.0
Seabourn Encore	5/02/2013	3,000	0.3	1.8	10.0
Amadea	6/02/2013	3,000	0.3	1.8	10.0
Crystal Serenity	24/02/2013	3,000	0.3	1.8	10.0
Viking Sun	25/02/2013	3,000	0.3	1.8	10.0
Seabourn Encore	17/03/2013	3,000	0.3	1.8	10.0
Noordam	26/03/2013	9,500	1.0	5.5	31.7
Noordam	29/03/2013	9,500	1.0	5.5	31.7
Maasdam	5/04/2013	6,500	0.7	3.8	21.7
Pacific Jewel	27/09/2013	9,500	0.7	5.5	31.7
Caledonian Sky	27/10/2013	3,000	0.3	1.8	10.0
Maasdam	13/11/2013	6,500	0.3	3.8	21.7
Pacific Jewel	29/11/2013	9,500	1.0	5.5	31.7
Noordam	6/12/2013	9,500	1.0	5.5	31.7
Seven Seas Mariner	14/12/2013	3,000	0.3	1.8	10.0
Norwegian Jewel	21/12/2013	10,000	0.3	5.8	33.3

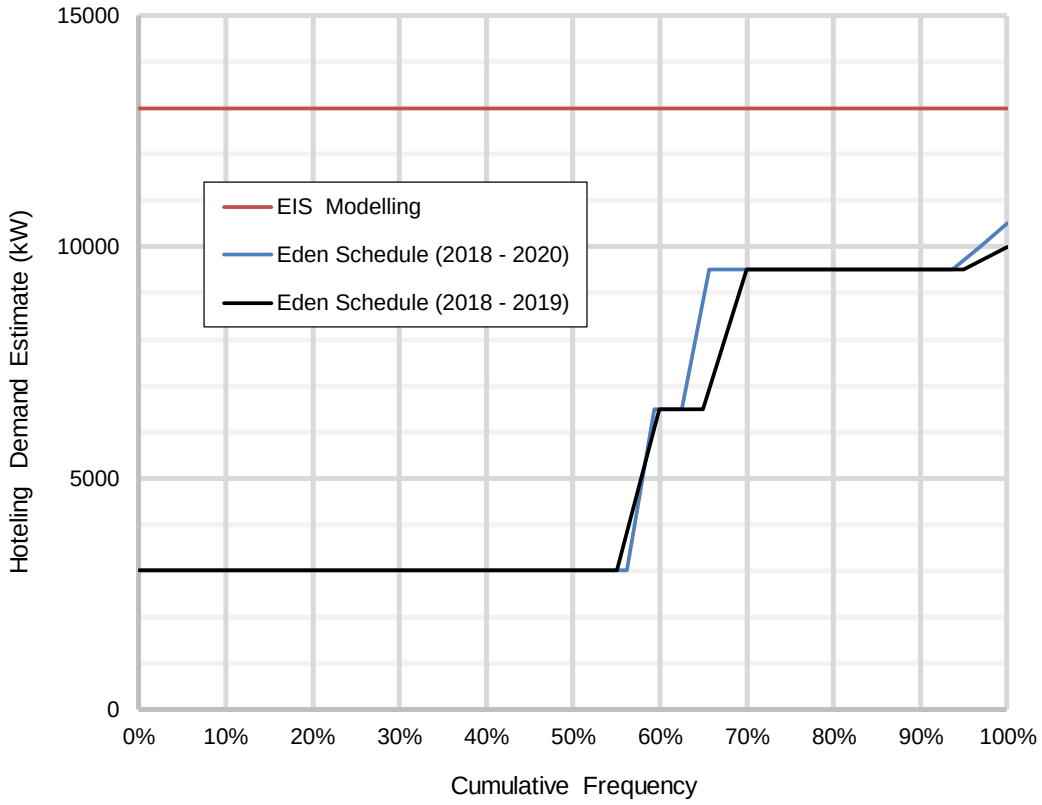

Figure 3-1: *Cumulative frequency distribution of estimated hoteling demand with comparison to EIS modelling*

3.4 Emission Parameters

Emission parameters have primarily been carried over from the EIS modelling with some adaptation to reflect the range of hoteling demand and frequency of ships visiting the port.

Exhaust velocity has been linearly scaled according to the hoteling demand, with the assumption that the SKM (2010) parameters are representative of an exhaust flow for a diesel engine producing 8,000 kW. This approach ensures that buoyancy flux (the key parameter in buoyant plume rise) is represented in a manner that is reflective of the scale of the generator output. Building downwash has been incorporated as per the EIS modelling.

Variable emission files have been prepared for both Typical Operations and Expanded Operations with the assumption that emissions occur on a continuous basis between 7 am and 6 pm on days as per the respective schedules, with emission rates and exhaust flows reflecting the ship that is scheduled to visit on a given day. This approach enables the frequency and intensity of Typical and Expanded Operations to be reflected in the modelling statistics.

3.5 Summary of Refined Modelling Assumptions

Table 3-4 presents a summary of refined modelling assumptions.

Table 3-4: *Summary of refined modelling assumptions*

Parameter	Value
Hours at berth (in hoteling service)	7 am to 6 pm on scheduled days (Current and Expanded schedules).
Hoteling power generation	Variable rates as per hoteling demand estimates and schedule.
Exhaust parameters	- Height: 55 m - Diameter 1 m - Variable as generation capacity - Temperature 160°C - Building downwash included.
Fuel grades assessed	- As per EIS modelling.
SO_2 Emissions (per unit of power output)	- As per EIS modelling.

4 Results and discussion

The NSW Environment Protection Authority (EPA) provides SO_2 assessment criteria for 10-minute, 1-hour, 24-hour and annual averaging times. An empirical relationship (**VEPA, 1986**) was used to predict the maximum 10-minute SO_2 concentrations from the models predicted 1-hour average SO_2 concentrations, as follows:

$$C_t = C_{60} [60/t]^{0.2}$$

where:

- C_t = concentration for averaging time t
- C_{60} = concentration for 60 minute averaging time
- t = time in minutes

Figure 4-1, **Figure 4-2** and **Figure 4-3** show the predicted maximum 1-hour average SO_2 concentrations as contour plots for the three fuel types under Typical Operations.

Figure 4-4, **Figure 4-5** and **Figure 4-6** show the predicted maximum 1-hour average SO_2 concentrations as contour plots for the three fuel types under Expanded Operations.

The predicted maximum 1-hour average SO_2 concentrations at the most affected sensitive receptor are presented in **Table 4-1** (Typical Operations) and **Table 4-2** (Expanded Operations). Predicted exceedances of the 1-hour average SO_2 criterion are shown in bold.

The results indicate that, under Expanded Operations (i.e. ~60 ships per annum), the 1-hour criterion will be exceeded, on occasion, when ships are using residual oil. The 10-minute criterion will also potentially be exceeded using this fuel type.

Using the marine distillate and low sulfur fuel there is not predicted to be any exceedances of the SO_2 criteria under either Typical or Expanded Operations

Table 4-1: *Predicted maximum SO_2 concentrations (µg/m³) – incremental and (cumulative) – Typical Operations*

Averaging period	Assessment Criterion	Background concentration	Maximum concentration at most affected sensitive receptor		
			Residual oil	Marine distillate	Low sulfur fuel
10-min	712	149	340 (489)	59 (208)	11 (160)
1-hour	570	104	237 (341)	42 (146)	8 (112)
24-hour	228	24	86 (110)	15 (39)	3 (27)
Annual	60	3	0.24 (3)	0.04 (3)	0.01 (3)

Table 4-2: *Predicted maximum SO_2 concentrations (µg/m³) – incremental and (cumulative) – Expanded Operations*

Averaging period	Assessment Criterion	Background concentration	Maximum concentration at most affected sensitive receptor		
			Residual oil	Marine distillate	Low sulfur fuel
10-min	712	149	707 (**856**)	124 (273)	23 (172)
1-hour	570	104	494 (**598**)	86 (190)	16 (120)
24-hour	228	24	94 (118)	16 (40)	3 (27)
Annual	60	3	0.65 (4)	0.11 (3)	0.02 (3)

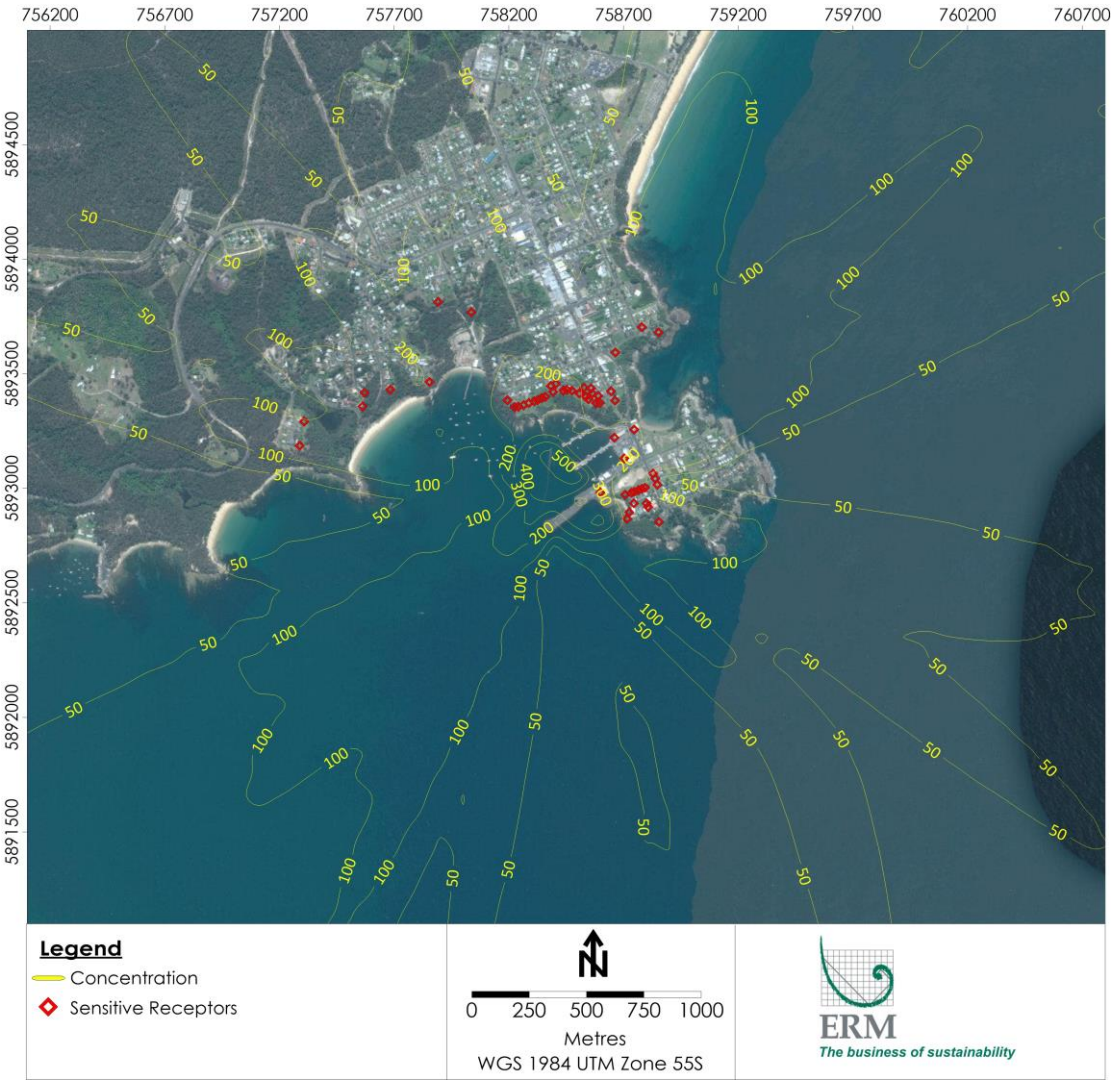

Figure 4-1: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for residual oil (µg/m³) – Typical Operations*

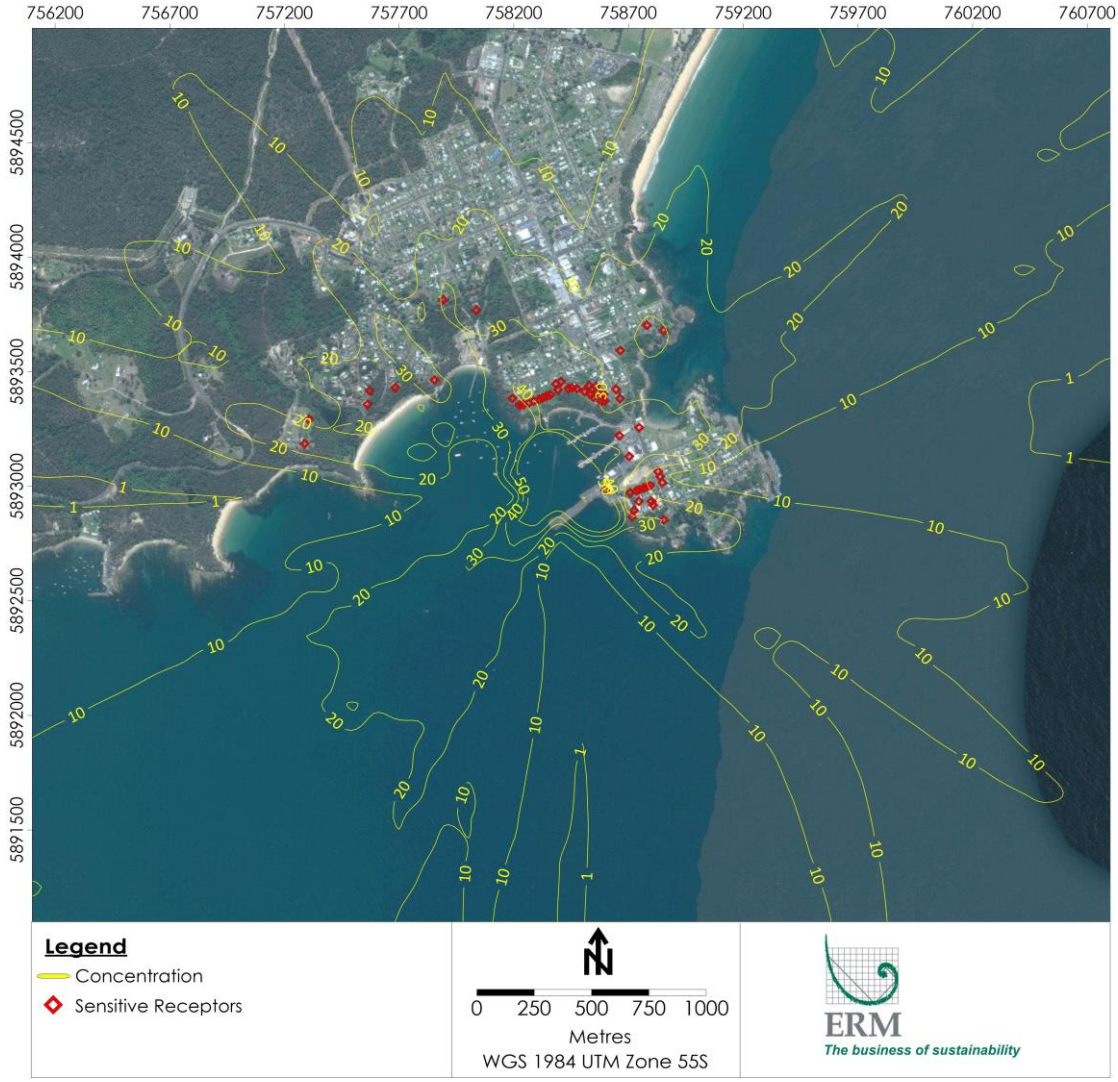

Figure 4-2: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for marine distillate (µg/m³) – Typical Operations*

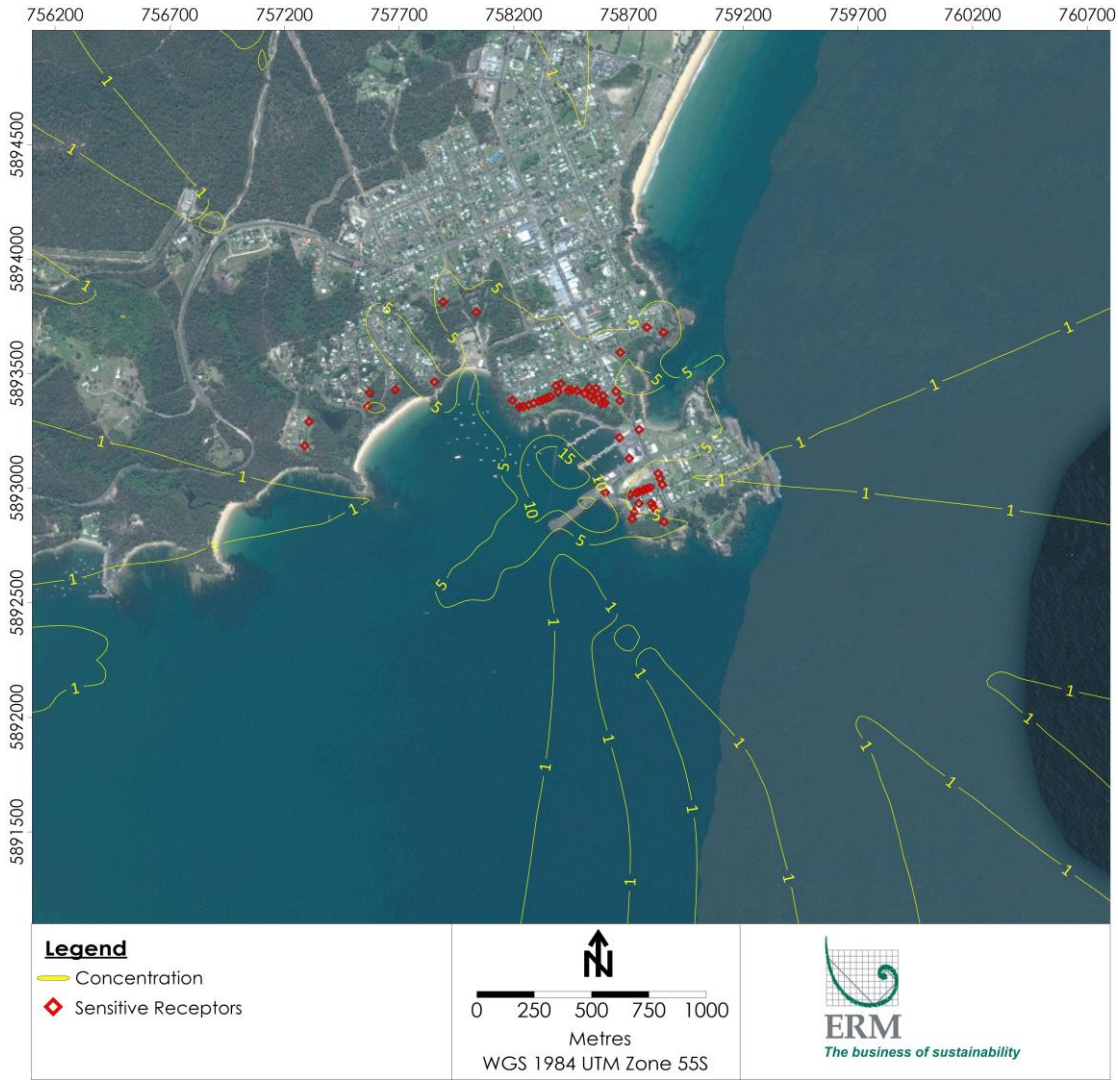

Figure 4-3: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for low sulfur fuel (µg/m³) – Typical Operations*

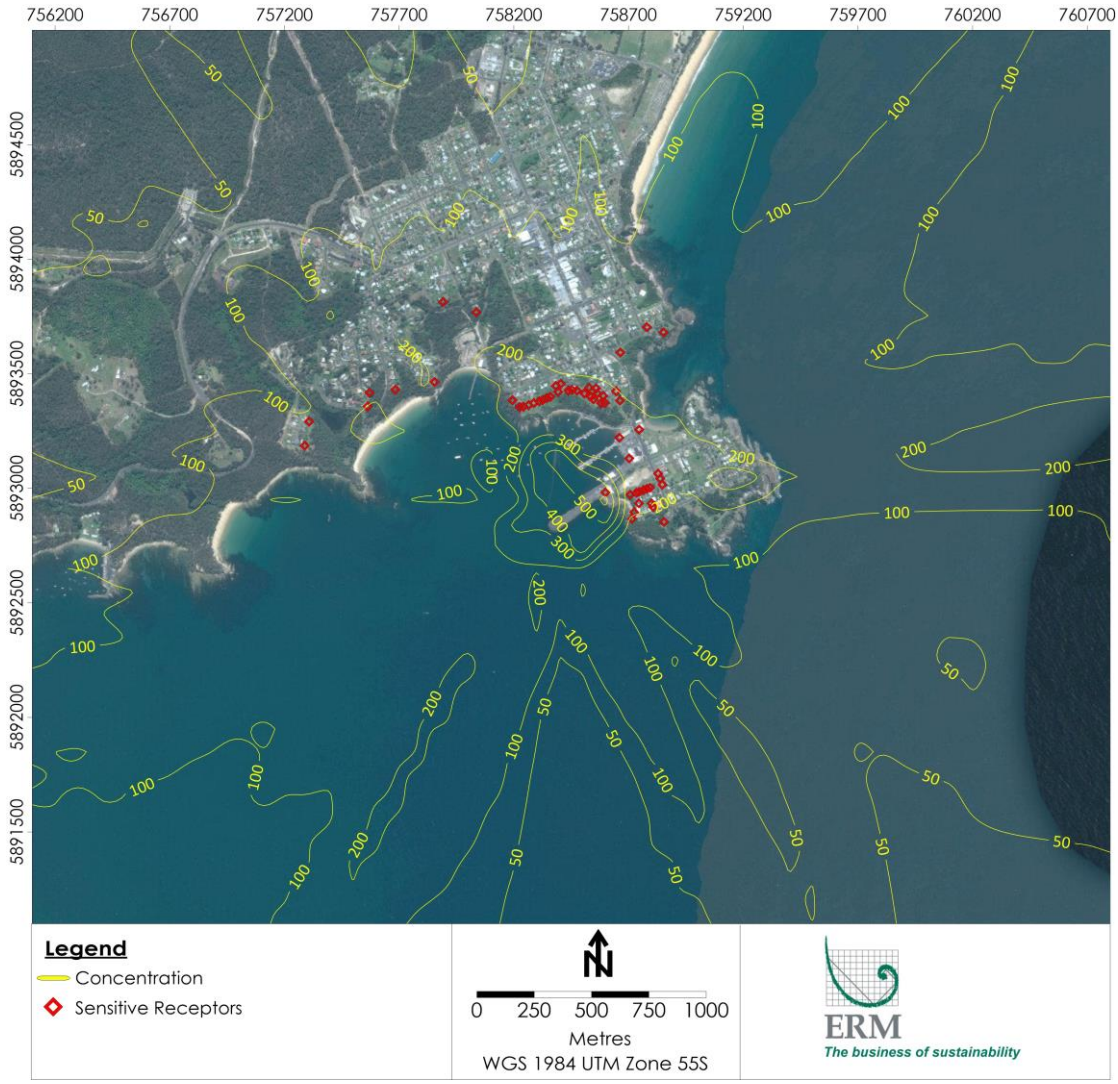

Figure 4-4: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for residual oil (µg/m³) – Expanded Operations*

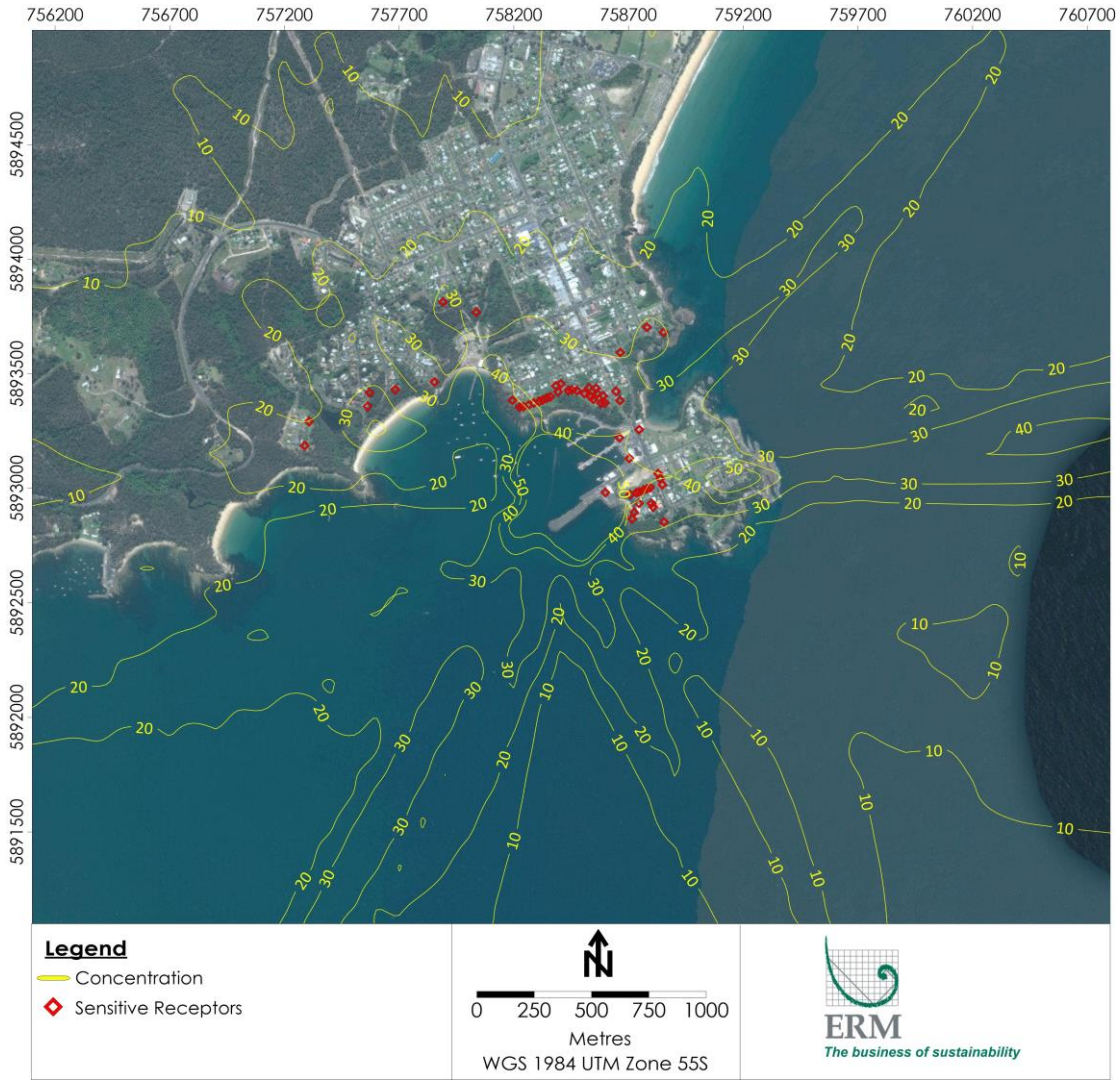

Figure 4-5: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for marine distillate (µg/m³) – Expanded Operations*

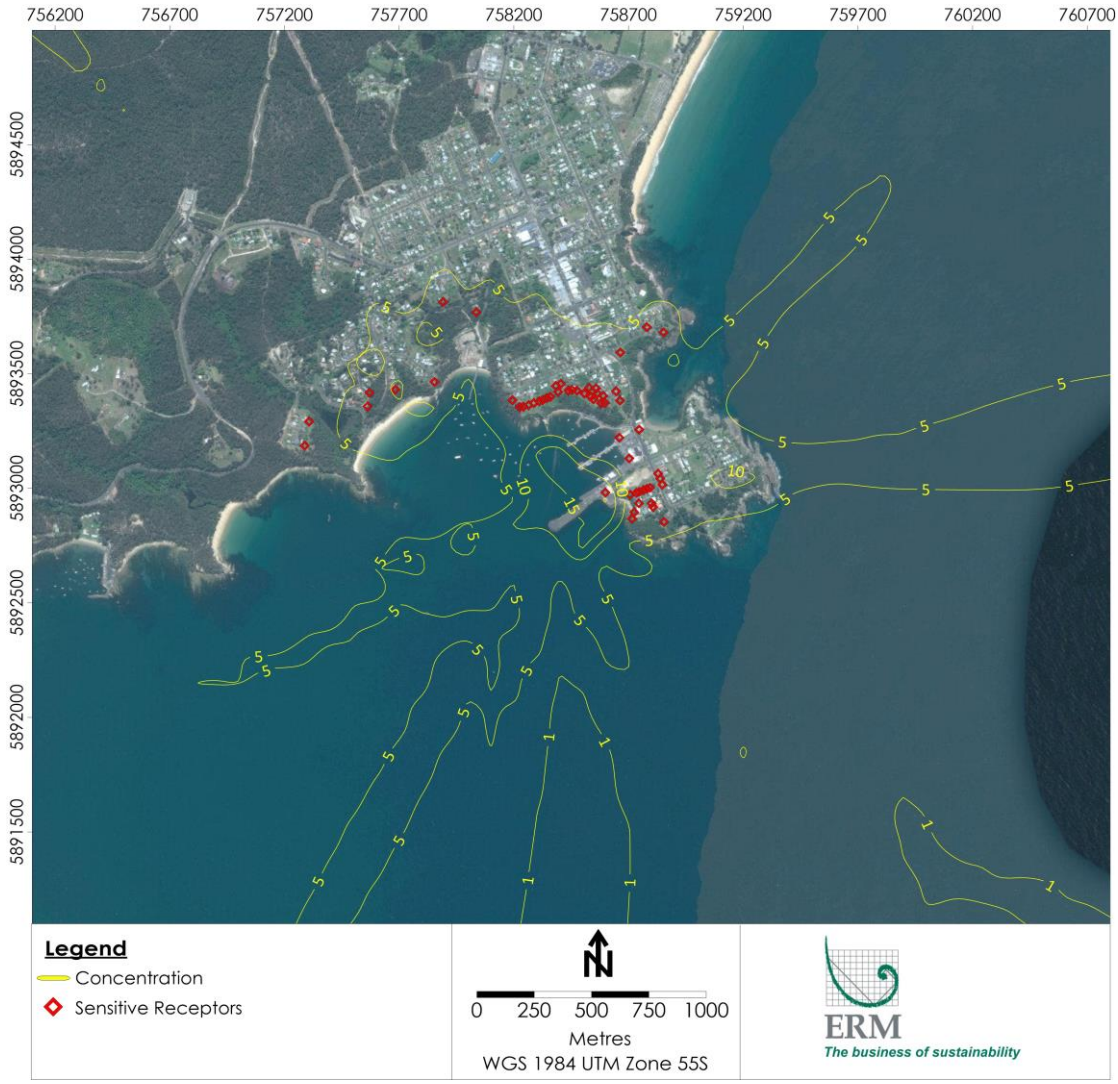

Figure 4-6: *Predicted 100th Percentile 1-hour SO_2 Concentrations (Incremental) for low sulfur fuel (µg/m³) – Expanded Operations*

5 Conclusions

A refined understanding was required of potential ambient air quality impacts of SO_2 emissions from cruise ship operations at the Port of Eden, NSW. The refined analysis considers the assessment sensitivity to fuel grade and frequency of port operations.

This work has been undertaken with a focus on operations that may occur in the period prior to 2020, after which the use of 0.5 wt% sulfur fuel is mandated under Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL Convention).

The outcomes of the refined assessment dispersion modelling indicate that there is, on occasion, potential for exceedance of ambient SO_2 criteria at the closest sensitive receptor when ships are using residual oil. This outcome is only applicable for Expanded Operations assumptions (i.e. ~60 ships per annum).

Predictions for marine distillate and low sulfur fuel are lower. There is not predicted to be any exceedances of the SO_2 criteria under either Typical or Expanded Operations. For the Expanded Operations with marine distillate fuel, the peak 1 hour incremental prediction has been estimated at approximately 15% of the assessment criterion indicating a relatively low risk of exceedances.

In view of the above, it is concluded that the use of marine distillate (0.5 wt% sulfur) will provide adequate environmental safeguards and assurance that existing air quality in Eden will be sustained with the introduction of a cruise ship port at the Eden Breakwater Wharf.

References

Cruisemapper 2018 *Cruise Ship Passenger Capacity*, Wiki, November 2015, http://www.cruisemapper.com/wiki/761-cruise-ship-passenger-capacity-ratings (accessed 19/06/2018).

EPA 2017 *Approved methods for Modelling and Assessment of Air Pollutants in New South Wales*, NSW, January 2017, https://www.epa.nsw.gov.au/your-environment/air/industrial-emissions/modelling-assessing-air-emissions/approved-methods-modelling-assessing-air-pollutants (accessed 19/06/2018).

Jacobs 2017 *Port Authority of NSW, White Bay Cruise Terminal, Air Quality Assessment,* Jacobs Australia Pty Limited, March 2017, https://www.portauthoritynsw.com.au/media/2569/appendix-3_air-quality-assessment-jacobs.pdf (accessed 19/06/2018).

PANSW 2018 *Port Authority of NSW,* Cruise Schedule, Port Authority Dashboard, 2018, https://dashboard.portauthoritynsw.com.au/wspublicweb/PublicExport/PublicSiteExportTo?OutputFormat=pdf (accessed 19/06/2018).

PEL 2016 *Port of Eden Redevelopment,* Noise, Vibration and Air Quality Assessment*,* Pacific Environment Limited, July 2016.

Starcrest 2017b *Port of Los Angeles, Inventory of Air Emissions for Calendar Year 2016*, Technical Report AAPP# 160825 520A, Starcrest Consulting Group, LLC, July 2017, https://www.portoflosangeles.org/pdf/2016_Air_Emissions_Inventory.pdf (accessed 19/06/2018).

Starcrest 2017a *Port Authority of New South Wales, White Bay Cruise Terminal Shore Power Analysis,* Final Report, Starcrest Consulting Group, LLC, April 2017, https://www.portauthoritynsw.com.au/media/2568/appendix-2_shore-power-analysis-cost-and-benefits-study-starcrest.pdf (accessed 19/06/2018).

VEPA (1986). The Ausplume Gaussian Plume Dispersion Model. Environment Protection Authority, Olderfleet Buildings, 477 Collins Street, Melbourne Victoria 3000, Publication Number 264.

S. Espinosa et al. (2016) / *Hoteling Cruise Ship's Power Requirements for High Voltage Shore Connection Installations.* Journal of Maritime Research Vol XIII. No. II (2016) 19–28*,* https://www.jmr.unican.es/index.php/jmr/article/view/447/490 (accessed 19/06/2018).