



City Pacific Limited

**TOWNSVILLE OCEAN TERMINAL:
SUPPLEMENTARY REPORT - RESPONSES
TO EIS COMMENTS**

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CONTENTS

1	INTRODUCTION	1
1.1	OVERVIEW	1
1.2	THIS REPORT	1
2	RESPONSES TO STAKEHOLDER COMMENTS	2
2.1	OVERVIEW	2
2.2	ENVIRONMENTAL PROTECTION AGENCY (EPA)	2
2.2.1	Overview	2
2.2.2	Heavy Metals Analysis	2
2.2.3	Port Related Issues	3
2.2.4	Particulate Monitoring	3
2.2.5	Wind Direction	3
2.2.6	Dustfall Deposition	4
2.2.7	Wind Speed	6
2.2.8	Figure Numbering	6
2.2.9	Dust Estimation	6
2.2.10	Odour	7
2.2.11	Nickel Ore	9
2.2.12	Emission Estimates	10
2.2.13	Air Emissions Modelling	11
2.2.14	PM10 Concentrations	12
2.3	QUEENSLAND HEALTH	13
2.4	QUEENSLAND TRANSPORT	14
2.5	TOWNSVILLE CITY COUNCIL	16
2.6	TOWNSVILLE PORT AUTHORITY	17
2.7	TOWNSVILLE PORT USERS GROUP	18
3	CONCLUSIONS	20

APPENDIX A: GLOSSARY OF TERMS



1 INTRODUCTION

1.1 OVERVIEW

Air Noise Environment Pty Ltd (ANE) were commissioned by City Pacific Limited to undertake an air quality assessment for the Townsville Ocean Terminal (TOT) development proposed to be constructed in Townsville.

The proposal will provide Townsville with:

- a dedicated cruise terminal and wharf for cruise ships and military vessels, located on the Port Western Breakwater, adjacent to the Port of Townsville;
- an integrated residential and tourism development providing residential land parcels of mixed density for development;
- extended public access to the Breakwaters and provide future open space areas to land to be reclaimed to the north of the existing Townsville Hotel and Casino Complex and the Townsville Entertainment Centre; and
- increased marina berths for the marine industry, general recreational vessels, and provide berthing facilities for superyachts.

The Air Quality Assessment (AQA) undertaken by ANE¹ and included in the Environmental Impact Statement (EIS) for the Project incorporated modelling of future emissions from the Port of Townsville. In addition, monitoring of existing air quality at (or near) the Project Site was undertaken for a range of determinants including oxides of nitrogen, sulphur dioxide, organic hydrocarbons and deposited dust. Monitoring data collected by the Queensland Environmental Protection Agency (EPA) and the Townsville Port Authority (TPA) was also considered in the assessment.

Following submission of the EIS for the TOT, a series of responses were tabled by some of the key stakeholders including governmental agencies and Townsville Port users. This document provides a summary of those responses relating to the air quality assessment.

1.2 THIS REPORT

This report provides direct responses to issues raised by key stakeholders regarding the EIS prepared for the Project. Additional information and comment on specific issues is presented in the following Supplementary Reports:

- Townsville Ocean Terminal: Supplementary Report – Deposited Dust
- Townsville Ocean Terminal: Supplementary Report – Suspended Particulates
- Townsville Ocean Terminal: Supplementary Report – Odourous and Gaseous Emissions
- Townsville Ocean Terminal: Supplementary Report – Metals Emissions

This report, therefore, should be read in conjunction with the AQA and the other Supplementary Reports.

¹ Townsville Ocean Terminal – Air Quality Assessment (October 2007) prepared by Air Noise Environment Pty Ltd on behalf of City Pacific Limited



2 RESPONSES TO STAKEHOLDER COMMENTS

2.1 OVERVIEW

In terms of the potential air quality impacts associated with the proposed Townsville Ocean Terminal development submissions were received from a number of groups including:

- Queensland Environmental Protection Agency (EPA);
- Queensland Health;
- Queensland Transport;
- Townsville City Council;
- Townsville Port Authority; and
- the Townsville Port Users Group.

The following sections provide responses to each of the comments regarding the air quality assessment undertaken as part of the EIS.

2.2 ENVIRONMENTAL PROTECTION AGENCY (EPA)

2.2.1 Overview

The EPA raised a number of issues relating to the air quality assessment undertaken for the proposed Townsville Ocean Terminal project. The following sections provide a summary of each of these issues along with a response.

2.2.2 Heavy Metals Analysis

EPA Comment:

'Page 13, Section 3.5 of the report states that "although some emissions of metals could be expected from Port operations, there is currently limited information available regarding the quantity or type of emissions". As a result consideration of these emissions in the predictive assessment has not been included. However, on page 31, the report states that "It should be noted that a single round of project specific deposited dust samples were also analysed for metals. This analysis identified lead in all samples with comparable levels measured at both the Project Site (Breakwater wall) and at the background monitoring positions. Given these inconclusive results, it is expected that the additional monitoring currently being undertaken by the EPA will provide further information as to the source and extent of existing concentrations."

The EPA advises that an Agency monitoring program is currently being implemented however as the program has just commenced monitoring data will not be available in time to consider with this EIS.

Recommendation:

That the lead levels referred to on page 31 and an assessment against relevant standards is included in the report along with any other metal results and assessment that there are available.'



Response:

This topic is covered in detail in 'Townsville Ocean Terminal: Supplementary Report – Metals Emissions'.

2.2.3 Port Related Issues

EPA Comment:

'Page 19, Section 5 – statement to the effect that “The pollutants considered in the ambient monitoring are as identified by a site audit of existing industrial operations (refer to Section 7.2.12) in the area surrounding the Project Site”. Section 7.3 is limited to discussion of odour from cattle export. There is no sub-section or further description of other Port-related industrial activities / emissions.'

Response:

A description of activities identified at the port is provided in Section 7.4.12 of the AQA.

2.2.4 Particulate Monitoring

EPA Comment:

'Page 22, paragraph 2, line 2/3 – states that “...project specific monitoring has been undertaken for particulates (both nuisance dust)...” The statement suggests that other particulate matter – most likely PM₁₀ – was monitored. Project specific PM₁₀ monitoring results are presented for January to June 2007 in Table 5.4 (page 26).'

Response:

Project specific monitoring of particulates was limited to nuisance dust only. A complete set of these results is presented in 'Townsville Ocean Terminal: Supplementary Report – Deposited Dust'.

In addition, the Townsville Port Authority (TPA) monitors PM₁₀ concentrations at its Berth 10 monitoring station. This data was provided by the TPA and is summarised in Table 5.4 of the AQA.

Additional monitoring data for fine particulates (PM₁₀) and total suspended particulates (TSP) measured since the preparation of the AQA is also presented in 'Townsville Ocean Terminal: Supplementary Report – Suspended Particulates'.

2.2.5 Wind Direction

EPA Comment:

'Page 24, Table 5.3 – records wind directions for 9 am and 3 pm, for the continuous gaseous emissions monitoring exercise. Wind direction observations for 9 am and 3 pm provide only limited information for the period.'



Response:

A more detailed discussion of the meteorological conditions occurring across all periods throughout the monitoring period is provided in 'Townsville Ocean Terminal: Supplementary Report – Gaseous Emissions'.

2.2.6 Dustfall Deposition

EPA Comment:

Dustfall Issue 1: 'Page 27, Table 5.5 (and Figure 11 on page 28) – results for insoluble dustfall deposition suggest spatial and temporal variability. It is difficult to find clear patterns of deposition. Deposition at the Jezzine Army Barracks was generally equal to, or higher than at locations representative of the Project site. Results for June 2007 are confusing as Breakwater Walls 1 and 2 deposition rates are 2 – 3 times higher than for Berth 10. Unfortunately Breakwater Wall results are not available for the windy dry season.'

Page 29, Table 5.7 – the analysis of combustible material as a percentage of total insoluble dust is valuable. Project-specific monitoring for combustible material is not included in the analysis.

Recommendation:

That an analysis of combustible material as a percentage of total insoluble dust for the Project specific monitoring be included in the report.'

Response:

Analysis of dustfall samples collected during the project specific monitoring for combustible material content was not undertaken as part of the project. As such these results are unable to be provided.

A complete set of monitoring results (including results collected since the preparation of the AQA) are provided in 'Townsville Ocean Terminal: Supplementary Report – Deposited Dust'.

EPA Comment:

Dustfall Issue 2: 'Page 30, Table 5.8 (and Figure 12) – insoluble dustfall deposition at existing complainant's locations are generally much lower than those reported for the Port, and Project-specific monitoring. This indicates that deposition rates far below the 120 mg/m²/day guideline causes complaints and in turn suggests that complaints by future residents are likely to be generated by rates measured at the Project site.'

The proposed dust fall out criteria of 120 mg/m²/day is measured using fall out gauges. Previous operational experience has demonstrated that while the fall out gauges measurement results are a suitable indicator for dust nuisance where there is general elevation of the background dust levels, fall out gauges are not a suitable nuisance indicator for short period dust events. Port activities include a number of operations that have the potential for short term dust events. These included unloading and stockpiling of ores from rail rolling stock, the loading and unloading of ships. These operations may typically occur for periods of 1 to 12 hours compared to the 30 day averaging period used for fall out gauges. The long averaging period of the fallout gauges results in the method having inadequate



sensitivity for short period events.

Ambient air quality needs to be monitored using a measurement method capable of recording short term (i.e. 15 minute maximum averaging time) dust impacts (e.g. a tapered element oscillating microbalance (TEOM) unit) which measures Total Suspended Particulate (TSP). The following draft TSP criteria for determining what constitutes environmental nuisance has been derived based on data it has collected at other port operations such as Gladstone and Hay Point where there has been a history of complaint. Recommended criteria is for Total Suspended Particulate Dust limits for sensitive areas such as residential of 80 micrograms per cubic metre expressed as a 24 hour average carried out in accordance with the latest version of the EPA's Air Quality Sampling Manual.'

Response:

The air quality assessments undertaken for the TOT Project have included significant monitoring of deposited dust. A review of all available data, including that collected since submission of the EIS, is presented in Section 5.3 of this document.

Dust emissions in the area surrounding the Townsville Port has recently received significant media attention by local Townsville news agencies with a number of reports relating to soiling of surfaces due to deposited dust. This, combined with the almost continuous operation of the Townsville Port (with vessels normally docked at 2 – 3 berths at a time), resulted in a focus on deposited dust with sampling undertaken in accordance with AS 3580.10.1 (2003).

The adoption of a sampling methodology focusing on deposited dust is supported in the literature^{2,3} where the purpose of the study is to consider the potential for the soiling of surfaces and dust nuisance rather than the identification of dust clouds as a transient phenomenon. Furthermore, the criteria for nuisance dust impacts of 120 mg/m²/day adopted in the assessment is consistent with the conditions placed on emissions of nuisance dust from the operation of a large number of EPA licensed activities including a number of Port industries such as:

- Southern Cross Fertilisers;
- Shell Company of Australian;
- Australian Marshalling Services; and
- Incitec Fertilisers.

Based on this, the request that the Project Team determine compliance with a dust limit of 80 ug/m³ measured as total suspended particulates at the Project Site is inconsistent with the requirements currently placed on operations within the Port. Regardless of this, the compliance of air quality in the vicinity of the Project Site with this criteria is discussed in detail in 'Townsville Ocean Terminal: Supplementary Report – Suspended Particulates'.

² Airborne Particle Matter in the United Kingdom (May 1996), Third Report of the Quality of Urban Air Review Group Prepared at the Request of the Department of the Environment

³ Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions (September 2001) published by the NZ Ministry for the Environment



2.2.7 Wind Speed

EPA Comment:

'Page 47, Section 6.3.3 – predicted wind speeds are “noted to be over-predicted by the Calmet modelling for all seasons”. Higher wind speeds are likely to result in wider dispersion. The extent to which predicted wind speeds differ from measured observations is not described. As such, it is difficult to assess the effects of over-predicted wind speeds on the modelled ground-level concentrations and impact zones.

Recommendation:

'That the extent to which over-predicted wind speeds differ from measured observations be described in the report. This would help address Terms of Reference Dot point 7 on page 8 (The limitations and accuracy of the applied atmospheric dispersion models should be discussed. The air quality modelling results should be discussed in light of the limitations and accuracy of the applied models.).'

Response:

Review of the wind roses presented in Figure 22 of the Air Quality Assessment prepared as part of the EIS for the Project confirms that local wind speeds are over-predicted by the modelling by approximately 1 – 2 m/s for up to 5 % of the time in any given sector. Given this, it is possible that predicted concentrations at the Project Site could be slightly higher under some wind conditions. Typical meteorological conditions in Townsville, however, show a low occurrence of calm conditions (less than 1 % of the time). Despite the apparent over-prediction of wind speeds the Calmet predictions show slightly higher occurrences of calm conditions. These calm conditions often correspond with maximum predicted ground level concentrations as dispersion of pollutants under these conditions is limited. Given this it is likely that for short-term averaging periods, the predictions presented in the Air Quality Assessment are likely to represent a conservative estimate of potential impacts of Port activities.

2.2.8 Figure Numbering

EPA Comment:

'Figure 22 on page 47 is incorrectly labelled.

Recommendation:

'Figure 22 should be renumbered to “Figure 23a”, and Figure 23 on page 48 should be numbered to “Figure 23b”.

Response:

Noted.

2.2.9 Dust Estimation

EPA Comment

Page 55, paragraph 2 – estimate for dust assumes that “... the entire Project area is exposed



to eroding winds” and “This estimate is considered to represent an over-estimate...” An indication of the extent of over-estimation has not been provided.

Recommendation:

That an indication of the extent of over-estimation be provided. This would help address Terms of Reference Dot point 7 on page 8 (The limitations and accuracy of the applied atmospheric dispersion models should be discussed. The air quality modelling results should be discussed in light of the limitations and accuracy of the applied models.).

Response

The predictive modelling assumes that the entire surface of the Project Site is exposed to eroding winds. The construction methodology to be adopted for the Project is likely to include some degree of stabilisation of the surfaces of the finished project as construction progresses. Further, for areas of the Project Site that will be flooded to make the future canal areas of the development, it is likely that the soil will retain a high moisture content throughout much of the project. Overall this could result in reductions in the area of the site potentially exposed to eroding winds of more than 50 %.

In addition, if an effective environmental management plan were to be implemented at the site, it is likely that an additional reduction in emissions as a result of wind erosion of open surfaces could be achieved. For instance, where watering of open surfaces is undertaken reductions in particulate emissions of approximately 50 % are likely. Similarly a reduction of 30 % can be achieved where wind breaks are provided for the construction phase.

2.2.10 Odour

EPA Comment

'Page 58, Table 7.6 – the odour emission rate from cattle export vessels is based on 2187 head of cattle exported on 1 ship in 2005. Export numbers were higher both preceding and following 2005. No information is provided on the average number of cattle per ship or the average number of cattle per ship per year. As such it is not clear whether 2187 cattle per ship is an appropriate assumption for estimating odour.

Recommendation:

It is recommended that the report clarifies the assumption used to estimate odour from cattle export vessels.'

Response

Table 2.1 presents a summary of cattle export shipments from the Port of Townsville since 1997.

TABLE 2.1: SUMMARY OF CATTLE EXPORT SHIPMENTS

Year	Berth	Number of Shipments	Average Head of Cattle Shipped	Minimum Head of Cattle Shipped	Maximum Head of Cattle Shipped	Total Head of Cattle Shipped per Year
1997/1998	3	14	1924	769	2878	26940
	10	17	1129	18	1894	19190



Year	Berth	Number of Shipments	Average Head of Cattle Shipped	Minimum Head of Cattle Shipped	Maximum Head of Cattle Shipped	Total Head of Cattle Shipped per Year
1998/1999	3	16	1640	659	2533	26237
	10	2	1090	937	1242	2179
1999/2000	3	20	4233	985	14607	84665
	10	18	2093	1102	2876	37673
2000/2001	3	5	7827	2525	15055	39137
	8	2	2714	2517	2910	5427
	10	16	2309	935	3019	36948
2001/2002	3	5	2827	2212	4078	14133
	4	1	14501	14501	14501	14501
	9	2	1171	24	2318	2342
	10	23	2021	392	2950	46482
2002/2003	3	5	6676	2558	12540	33380
	4	5	5505	1254	16483	27524
	8	1	3695	3695	3695	3695
	10	41	2453	860	4087	100582
2003/2004	9	1	6819	6819	6819	6819
	10	5	1998	1096	3477	9988
2004/2005	10	2	1094	1006	1181	2187
2005/2006	3	2	6378	4598	8157	12755
2006/2007	3	2	18841	17623	20059	37682
2007/2008	3	1	13605	13605	13605	13605
Averages over all years						
All years	3	-	7106	5059	10390	32059
All years	10	-	1773	1028	2356	31904

The information presented in Table 2.1 shows variation on an annual basis both in terms of the number of shipments and the size of those shipments. For shipments from Berth 10, the closest berth to the Project Site utilised for cattle export, the number of head of cattle per shipment is on average less than 2000 head with only a small number of shipments exceeding this level.

For the other main cattle export berth, Berth 3, a greater variation in export numbers is evident. In recent years this berth has seen cattle shipments with up to 20,059 head of cattle exported. It is noted however that where cattle exports involve larger shipments there are generally less shipments in a year.

From this information it can be expected that on average, the predictive modelling of odour emissions from cattle export activities from Berth 10 is likely to provide a reasonable worst-case



representation of activities at the Port. The assumed continuous emissions in the modelling allows for the assessment of the range of meteorological conditions experienced at the Port and the emission rate adopted, based on 2,187 head of cattle is expected to represent typical export sizes based on the available export information from the Port.

For cattle exports from Berth 3 it is possible that under some circumstances higher levels of odour could be experienced both at the Project Site and throughout much of the Townsville waterfront area. For larger shipments of cattle, odour concentrations could be expected to be proportionally higher at the Project Site. It is noted that, where larger shipments of cattle have occurred in the past, there has generally only been a small number of shipments each year (e.g. in 2005/2006 and 2006/2007 where average cattle shipments exceeded 5000 head of cattle there were only 2 shipments throughout the year). This could limit the potential for adverse amenity impacts on the Project Site to a shorter duration of time.

EPA Comment:

'Page 58, Table 7.8 – contains a single odour concentration prediction but the associated text suggests that a number of “predictions” are compared with a number of “measured emission rates” in the table.

Recommendation:

It is recommended that the report clarifies the presentation and analysis of predicted and measured odour concentrations.'

Response:

Table 7.8 of the air quality assessment report presents a comparison of the predicted ground level concentration downwind of the cattle shipment with that measured at the same location during loading of cattle onto an export vessel docked at Berth 4. It is not known how many cattle had been loaded onto the vessel at the time of the monitoring, however, as the vessel had been docked for two days it is likely that a significant number of cattle had already been loaded. The Townsville Port records indicate that the shipment included a total of 17,623 head of cattle hence the comparison of predicted versus measured odour concentrations tends to suggest a level of conservatism in the modelling. The extent of this conservatism, however, is unable to be determined without a source odour monitoring program.

2.2.11 Nickel Ore

EPA Comment:

'Page 70, Section 7.4.12.7 – It is clear that open stockpiling and overhead crane bucket loaders at the Queensland Nickel Pty Ltd (QNI) site have the potential to generate fugitive nickel ore emissions. No specific Berth for QNI loading/unloading operations is identified. Table 7.9 on page 65 identifies Berths 2 and 7 as possible sites for nickel ore handling/emissions.

Recommendation:

It is recommended that the report clearly identifies the sites for QNI nickel handling as well as identifying what measurements or analysis this is based on.'



Response:

Unloading of nickel ore is undertaken at Berth 2 at the Port of Townsville. This is evidenced by the reddish stockpile of nickel ore visible on Figure 26 in the Air Quality Assessment prepared for the EIS. A further stockpile of nickel ore is located to the east of Berth 2. This area is denoted by the number '27' on Figure 26. The location of these nickel ore stockpiles and the operation of an overhead crane fitted with bucket loader were confirmed with Townsville Port Authority personnel during a site inspection. This site was also informally identified by Townsville Port Authority personnel as likely to be one of the largest existing sources of dust emissions.

2.2.12 Emission Estimates

EPA Comment:

Page 74, Section 7.2.13 – of the report states that “... an average emission rate for the existing Port operations has been calculated based on the sum of emissions estimated for each of the uses identified in Section 7.2.13...”. The report does not contain Section 7.2.13.

The approach appears to assume no change to emissions with Port expansion. As there are existing nuisance dust complaints well beyond the Project site, it is likely that existing dust emissions will result in complaints from the Project Site.

Recommendation:

It is recommended that the report clarifies the basis for estimating potential emissions from the expanded Port.'

Response:

For the purposes of the assessment there was no information available regarding the types or nature of industries likely to operate within the expanded Port area. Given this it was necessary to estimate future emissions based upon existing Port user activities (as discussed in Section 7.4.12 of the AQA – it is noted that the reference to Section 7.2.13 of the AQA was incorrect and should reference 7.4.12). This process essentially assumes that the expanded Port area will represent more of the same types of activities currently undertaken at the Port.

To achieve this, emissions from the following Townsville Port industries were estimated using the emission estimation methods contained in the National Pollutant Inventory Emissions Estimation Manuals:

- Southern Cross Fertilisers;
- Queensland Cement Limited;
- Queensland Nickel;
- Australian Marshalling Service; and
- Queensland Sugar Limited

Emissions were also estimated from the following facilities based on the emission release limits identified in the Environmental Authorities issued for these facilities by the Queensland Environmental Protection Agency:

- Shell Company of Australia – Bitumen Facility; and



- BHP Minerals

Emissions for the Smorgon Steel recycling facility were also estimated based on previous monitoring of a similar facility undertaken by Air Noise Environment personnel. It should be noted that emissions from the QNI facility were not included in the estimates as any future Port expansion would be expected to adopt best practice operating methods. It is unlikely that the use of open stockpiling of raw materials and the unmitigated transfer of materials from the ships via a bucket loader would be approved by the Environmental Protection Agency were an application made.

The estimated emissions from all facilities identified above were then summed to provide an estimated emission rate for existing Port of Townsville operations. These estimated emissions were factored based on the difference in areas between the existing Port operations and the expanded Port facility to provide an estimated emission rate for future expanded Port operations area. These emissions were then modelled to predict future ground level impacts on the proposed development site as a result of the future expanded Port activities. When added to measured ambient pollutant concentrations from existing Port activities (Section 8.4 of the EIS assessment), this provides an estimate of potential future impacts on the proposed development site.

2.2.13 Air Emissions Modelling

EPA Comment:

'Page 76, Section 8.2 – Tables include “Maximum Predicted Cumulative Concentration” values. The relationship to “Maximum Predicted Ground Level Concentration” is unclear. Does “Cumulative” include the sum of Project site plus emissions from the Townsville Port? Predictions for TSP and PM10 during Construction Phase Years 2 and 3 indicate exceedences of both EPP (Air) and NEPM Ambient Air Quality criteria. Predicted concentrations of 24-hour SO₂ and 1-hour NO₂ in Construction Year 3 also exceed the stated criteria.'

Recommendation:

It is recommended that the report clarifies the relationship between “Maximum Predicted Ground Level Concentration” and “Maximum Predicted Cumulative Concentration”.'

Response:

The AQA tables present predicted concentrations as:

Maximum Predicted Ground Level Concentrations (GLC): these represent the maximum concentration predicted across the modelling domain as a result of emissions from construction activities associated with the Project for the pollutant being considered by the modelling;

Existing Ambient Concentration: this represents the existing background concentrations, as defined by the available monitoring data summarised in Section 5 of the AQA, in the absence of any construction activities undertaken on the Project Site; and

Maximum Predicted Cumulative Concentration: this represents the sum of the predicted impact of the construction activities (Maximum Predicted Ground Level Concentrations) plus the existing level of pollutant contamination in the area as defined by the available monitoring datasets (Existing Ambient Concentrations).

Hence:

Maximum Predicted Cumulative Conc. = Maximum Predicted GLC + Existing Ambient Conc.



EPA Comment:

'The report notes that "... these predictions assume worst case uncontrolled emissions and as such are likely to represent a significant over-prediction compared to a construction operating in accordance with an effective environmental management plan".

The report does not include an estimate of the degree to which predictions "... represent a significant over-prediction..."

Recommendation:

It is recommended that the report includes an estimate of the degree to which predictions represent a significant over-prediction. An alternative would be to model the construction operated in accordance with an effective Environmental Management Program.'

Response:

As discussed earlier, the emissions modelling was based on worst-case operation of the TOT construction site using emission factors for equipment largely from the 1980s and including uncontrolled erosion by wind of the project site. For vehicle emissions the use of the outdated emission factors is likely to result in an over-estimate as there have been many advances in the manufacture and operation of industrial internal combustion engines in recent years with many reductions driven by international requirements for lower emissions from non-road vehicles. In particular, in 1996, a Statement of Principles (SOP) pertaining to non-road diesel engines was signed between the United States Environmental Protection Agency, California ARB and engine makers (including Caterpillar, Cummins, Deere, Detroit Diesel, Deutz, Isuzu, Komatsu, Kubota, Mitsubishi, Navistar, New Holland, Wis-Con, and Yanmar). The emission reductions referred to in this SOP were then implemented in the legislature. As a result of these advances similar reductions can also be expected to have occurred in the Australian fleet of non-road industrial vehicles. For newer vehicles complying with the latest emission limits in the US reductions of over 90 % in particulate and NO_x emissions are possible.

Were an effective environmental management plan implemented at the site it is likely that an additional reduction in emissions as a result of wind erosion of open surfaces could be achieved. For instance where watering of open surfaces is undertaken reductions in particulate emissions of approximately 50 % are likely. Similarly a reduction of 30 % can be achieved where wind breaks are provided for the construction phase.

2.2.14 PM₁₀ Concentrations

EPA Comment:

'The report included figures for maximum predicted 24-hour average ground level PM₁₀ concentrations. Dispersion appears to occur in a north-easterly direction, suggesting that south-westerly winds dominate. Maximum ground level concentrations (GLC) and cumulative concentration locations are not indicated on the figures.

Recommendation:

It is recommended that the report clarifies the seaward dispersion indicated in the figures. That the locations of GLC and cumulative concentration maxima be indicated on the figures.'



Response:

The dispersion modelling has included consideration of the impact of different ground surfaces on the dispersion of emissions from the neighbouring uses and the Project Site. For the purposes of the modelling, the surface roughness is estimated at each grid point based on land use as discussed in Section 6.3.2.5 of the AQA. This results in higher wind speeds over water. Therefore, for a given source the higher local wind speeds over water will result in the increased dispersion of the pollutants in comparison to the same pollutants dispersing over land.

2.3 QUEENSLAND HEALTH

Queensland Health raised a number of issues relating to the air quality assessment undertaken for the proposed Townsville Ocean Terminal project as follows:

'Queensland Health believes the EIS has not satisfactorily addressed this requirement of the ToR. In particular, the assessment provided in the "report on air quality (dust, fumes, particulates, odours – organic and inorganic) impacting on the Project site based on current and future port activities" (page 9) has not sufficiently assessed the potential health impacts of air and odour emissions from the Port on future residents.

Current port operations include loading and unloading of mineral ores (e.g. Nickel), mineral concentrates (e.g. Lead and zinc) and live cattle. The EIS identifies these as existing emission sources, however data on emission from these operations, as well as assessment of their impacts on the project, have not been satisfactorily provided. Particular issues include:

- *Very limited data on airborne metals (particularly lead) at the project site (e.g., types, concentrations, particle sizes, water solubility, routes of human exposure, characterisation of risk),*
- *No data on concentrations of metals in surface swabs taken (refer to page 31 of the Townsville Ocean Terminal – Air Quality Assessment (the AQA)),*
- *Given that livestock transport is a function of the Port, an assessment of the possible health risks to future residents has not been provided (e.g. Coxiella burnetii (the infectious agent that causes Q Fever), indirect health effects of excessive odour),*
- *No clarification for using the Port's PM₁₀ sampling location in lieu of locations at the Project Site,*
- *Limited information of air sampling methodology (e.g., locations, air volumes, port activities at time of sampling), and*
- *Reliance on future air quality sampling, analysis and assessment for the EIS by bodies unrelated to the project (e.g. the proposed Environment Protection Agency air quality project referred to on page 39 of the AQA).*

Recommendation:

The proponent reassesses the impact of current and future air emissions from the Port on future residents.'

Response:

The issues raised by Queensland Health relate primarily to a lack of information regarding



emissions from the Townsville Port with the potential for health impacts on the future residents of the Project. The first two issues raised relate to information regarding airborne emissions of metals (particularly lead) from the Port and their impacts on the proposed Project. Further information regarding dust and metals emissions at the Project Site are provided in Section 5.3 of this report. It should be noted that the query relating to the concentrations of lead found in swab samples taken (discussed on Page 31 of the Townsville Ocean Terminal – Air Quality Assessment) refers to the 'black dust' investigation undertaken by the Queensland EPA. A summary of the results of this study are presented in Section 5.4.2 of the AQA with full details of the results and analysis undertaken presented in the EPA report 'Townsville Dust Investigation – Yarrawonga' (2007).

Queensland Health also raises concerns regarding Q Fever and the export of cattle from the Port of Townsville. A literature review undertaken by Air Noise Environment has not identified any previous studies relating to Q Fever impacts on residential areas as a result of export activities that would allow a quantified response to this query. Most of the literature identifies that the members of the population most at risk are those involved in animal husbandry or exposed to birthing fluids. It is noted however that in some instances Q Fever cases have been identified up to 1 km from the suspected source.

The Queensland Health response also queries the sampling methodologies and locations adopted for the AQA. A detailed explanation of the methodologies adopted for this monitoring are provided in the following supplementary reports along with results of additional monitoring undertaken following submission of the EIS document:

- Townsville Ocean Terminal: Supplementary Report – Deposited Dust
- Townsville Ocean Terminal: Supplementary Report – Suspended Particulates
- Townsville Ocean Terminal: Supplementary Report – Gaseous Emissions
- Townsville Ocean Terminal: Supplementary Report – Metals Emissions

2.4 QUEENSLAND TRANSPORT

Queensland Transport also raised some issues relating to the EIS prepared for the Project. In terms of the AQA the Queensland Transport response raises the following:

'The EIS appears to be recommending changes to port operations and procedures to address the amenity impacts of odour as follows: "With respect to odour impacts from live cattle export at the Port of Townsville, mitigation would involve ensuring cattle ships are berthed for no more than 2 days per year." Also, "It is recommended that the Port Authority be requested to notify the general public in the Townsville area and the Project Body Corporate of scheduled cattle export activities and the potential for odour emissions prior to the event." Restricting the berthing of cattle ships to 2 days per year is unrealistic and takes no account of the efficient use of the port. QT also does not believe there should be an obligation on the Townsville Port Authority (TPA) to notify residents when live cattle shipments are scheduled. The TPA is well placed to determine how best to manage its interaction with the community.'

Response:

The AQA prepared as part of the EIS identifies that, while compliance with the criteria would require cattle shipments to occur for no more than two days per year, *'This is likely to be unrealistic and could significantly reduce the ability of the Port to provide export facilities for live cattle'*. The report recognises that odour is associated with nuisance impacts and generally there is no direct



correlation with physical health impacts.

The odour dispersion modelling predicted potential odour impacts on surrounding landuses (including the Project Site) as a result of cattle loading activities at Berths 10 and 3. Figure 1 below presents predicted odour levels as a result of export activities from the Port as discussed in Sections 7.2 and 8.3 of the AQA. As can be seen from the predicted odour concentrations presented in Figure 1, there is potential for odour emissions from cattle export activities to impact on a significant area of the Townsville waterfront and CBD area. This includes significant areas of residential development. In view of this, notification of Townsville residents of planned cattle export events would allow for particularly sensitive members of the community to make arrangements such that they are able to minimise their exposure to potentially elevated levels of odour.



Figure 1: 99.5th Percentile Predicted Odour Concentrations (ou) for Cattle Export Activities from the Port of Townsville

'The Air Quality Assessment at pages 11, 12 and 13 mentions lead in terms of air quality goals and as a potential pollutant. However there is no analysis or discussion on the impact on residents of the development from emissions as a result of lead exports through the Port. This is a significant issue that should be addressed in the EIS, particularly given recent concerns by the community due to lead emissions in the Port of Esperance.'

Response:

The potential for impacts associated with lead emissions from operations at the Port of Townsville is discussed in 'Townsville Ocean Terminal: Supplementary Report – Metals Emissions'.

'EIS 5.8 Compliance Status of Monitoring Data – The EIS makes the following Statement: "At



this stage the ambient monitoring is programmed to continue until at least the end of October 2007 however it is recommended that the project specific gaseous and particulate monitoring is continued until a full twelve months of data is available". Air quality is QT's major amenity concern. Therefore clarification is sought as to how this additional monitoring will be taken into account in the Coordinator General's report on the EIS.'

Response:

Additional monitoring data collected since the preparation of the AQA is presented in 'Townsville Ocean Terminal: Supplementary Report – Deposited Dust'. Also provided is an assessment of the representativeness of the monitoring data through an analysis of meteorological conditions throughout the monitoring.

'At 8.5 a table entitled "Maximum Predicted Ground Level Pollutant Concentrations for TOT Operations" is contained in this appendix but there is no discussion on the impact of the emissions. This would appear to be important as the terminal is the closest source of emissions affecting the amenity of the residential development.'

Response:

The maximum predicted ground level pollutant concentrations presented in Table 8.6 of the AQA demonstrate that compliance with the air quality criteria is expected for all areas of the Project Site for all pollutants and averaging times by a significant margin. Given this, the potential for impacts on the residential areas of the Project Site during operation on the TOT is expected to be minimal.

'Although QT has not sought independent expert advice, it is a concern that dust monitoring on the Western Breakwater was only effectively conducted over two months and may not properly represent the amenity impacts of dust on the Breakwater Cove Development. QT also notes that the EIS concentrates on satisfying nuisance criteria for dust set out in EPA legislation (that is, 120 mg/m²/day). While not wishing to undermine EPA nuisance criteria, QT would like it to be noted that dust levels of 30 to 80 mg/m²/day have triggered the current community complaint over rail and port dust in Gladstone. It is noted that these levels have been recorded at the Breakwater monitoring stations.'

Response:

Additional monitoring data for both deposited and suspended particulates collected since completion of the AQA is presented in the two supplementary reports considering particulate emissions in the area ('Townsville Ocean Terminal: Supplementary Report – Deposited Dust' and 'Townsville Ocean Terminal: Supplementary Report – Suspended Particulates'). In addition an analysis of the measured dust levels in the Townsville area in comparison with other areas of Queensland is also presented.

2.5 TOWNSVILLE CITY COUNCIL

The Townsville City Council did raise issues in relation to port compatibility issues however they did not raise any specific issues relating to air quality in their submission of the TOT EIS.



2.6 TOWNSVILLE PORT AUTHORITY

The Townsville Port Authority prepared submission in response to the EIS prepared for the Project identified a number of concerns relating to the air quality assessment.

'The Proponent's consultants undertook dust deposition monitoring at four (4) locations. Dust deposition jars were placed on the western breakwater (2 months of data collected), at Mariner's Peninsula in the surplus casino land (9 months of data) and at the Jupiter's casino car park (4 months of data). Dustfall was assessed by review of monitoring data only with no modelling undertaken. Given the close proximity of the proposed residential development (which will result in people living immediately adjacent to the port 365 days a year), and the fact that dust particulates will fall out close to the source, dust deposition monitoring would be required to be undertaken specifically at the site for 12 months to ensure a complete dataset of dust fallout from port activities through seasonal and wind variations. Modelling is then also required to predict dust deposition from future expanded port activities.'

Response:

Monitoring of dust deposition was undertaken over a 12 month period from November 2006 to October 2007. 'Townsville Ocean Terminal: Supplementary Report – Deposited Dust' provides a more detailed analysis of deposition data collected included data collected following submission of the EIS. Mathematical modelling of future port activities considered emissions of total suspended particulates (which include the potentially deposited fractions) and fine particulates hence the issue of dust from future uses has already been considered. These emissions from future uses were also considered in the context of existing particulate concentrations to provide a cumulative assessment of potential impacts as the port expands.

'Air quality measurements were taken at Berth 10 during the study period (NO₂, SO₂, hydrocarbon and PM₁₀) and were correlated against port activities. Dust concentration was assessed using modelling. The reports do not provide adequate information on how the dust emission rates for the Port were determined to enable assessment of their accuracy/suitability. To enable the validity of the predictions to be determined, the proponent should supply the calculations and basis upon which the emission rates for port generated air emissions were determined.'

Response:

A more detailed explanation of the emissions estimation methodology adopted for the assessment is presented in Section 2.2.12 of this report.

'The effect of increased emissions as shipping increases has not been assessed directly from any modelling or predictions. Rather the report relies on monitoring at Berth 10 (from existing port operations) and uses the maximum concentrations measured as the value for ambient levels and adds to the predicted port operation concentrations. The study thus does not specifically address the potential for increase in shipping movements/operations with respect to ship emissions. Monitoring was conducted during periods when the port was busy but not operating at or near capacity. Hence, the study is rudimentary only in considering ship emissions.'

Response:

The air quality assessment prepared for the EIS considered maximum existing concentrations as



measured in close proximity to these operations (at Berth 10). Regardless of this, even were existing port operations to double such that ambient concentrations of the primary emissions from shipping (SO₂ and NO_x) were doubled, compliance with the criteria levels is still predicted to be achieved.

'The EIS and air quality report refer to reductions in emissions at the site in the future, relying on possible plans for future port berths in the outer harbour and future relocation of abrasive blasting, ship repair, recreational boat ramp and other activities to Ross River. It must be recognised that activities in the existing port harbour area will continue to grow until port berths reach capacity. Any future port berths in the outer harbour will be activities in addition to the loading, unloading and storage activities that take place at the port currently, not in substitution for these operations.'

Response:

This fact is considered in the AQA in that existing maximum ambient concentrations (based on current activities) are added to emissions for future activities thereby considering an expanded port rather in totality.

'The odour assessment conducted only considered live cattle export and did not consider odour from petroleum/oil, molasses or other products. Air quality samples were taken from a live cattle shipment within the Port. Modelling predictions for live cattle showed resultant maximum odour concentrations far in excess of legislated criterion levels. This clearly demonstrates that excessive odour levels will result at the project site. The study provided thus clearly identifies that inadequate buffer is provided with respect to odour from port activities.'

The EIS recommendations for mitigation including limiting live cattle export to two days per year and requesting the Port to notify the Body Corporate of scheduled activities is considered unrealistic, unfeasible and an undue impost upon the Port and the livestock industry.'

Response:

Sections 2.2.10 and 2.4 of this report provide comment on these issues.

2.7 TOWNSVILLE PORT USERS GROUP

The Townsville Port Users Group (TPUG) through a submission prepared by Maunsell AECOM have raised a number of issues relating to the the air quality assessment undertaken and presented as part of the EIS for the Project.

This submission raises queries regarding the monitoring program undertaken including the location of the monitoring positions and the length of time that monitoring was undertaken. A more detailed description of the monitoring undertaken is presented in the four supplementary reports prepared by Air Noise Environment. It should also be noted that a description of the monitoring undertaken including the location of the monitoring stations is included in Section 5 of the AQA.

The submission also raises concerns regarding the levels of dust likely to be experienced at the



Project Site. 'Townsville Ocean Terminal: Supplementary Report – Deposited Dust' presents an analysis of all monitoring data collected at the Project Site and the Port of Townsville along with a comparison to typical deposited dust levels in Queensland.

The TPUG submission queries the information presented regarding odour emissions during cattle export activities at the Port. It is noted that much of the information discussed in this submission is provided in the AQA. This includes the monitoring of odour emissions, the predicted odour concentrations at the Project Site and the basis for these predictions. Further information regarding these odour emissions is also provided in Section 2.2.10 above.



3 CONCLUSIONS

The Townsville Ocean Terminal (TOT) project site (the Project Site) is located on and adjacent to the existing Townsville foreshore and incorporates the existing Port Western Breakwater and the Northern (Offshore) Breakwater, the existing perimeter of the land around the Townsville Hotel and Casino Complex and the Townsville Entertainment Centre.

In response to the EIS prepared for the TOT Project a number of key stakeholders have raised issues regarding the Air Quality Assessment (AQA). The focus of these comments is varied although most respondents have identified that the meteorological conditions and activities considered by the air quality monitoring undertaken for the project is not considered to be adequate. This report has responded to each of the issues regarding the AQA raised by the stakeholders. For some issues, more detailed responses are provided in the other supplementary reports in this series as identified in Section 1.2 of this report.



APPENDIX A

GLOSSARY OF TERMS



APPENDIX A: GLOSSARY OF AIR QUALITY TERMINOLOGY

Term	Definition
Conversion of ppm to mg/m ³	<p>Where R is the ideal gas constant; T, the temperature in kelvin (273.16 + T°C); and P, the pressure in mm Hg, the conversion is as follows:</p> $\mu\text{g m}^{-3} = (P/RT) \times \text{Molecular weight} \times (\text{concentration in ppm})$ $= \frac{P \times \text{Molecular weight} \times (\text{concentration in ppm})}{62.4 \times (273.2 + T^{\circ}\text{C})}$ <p>For the purposes of the air quality assessment all conversions were made at 25°C.</p>
g/s	grams per second
mg/m ³	milligrams (10 ⁻³) per cubic metre. Conversions from mg/m ³ to parts per volume concentrations (ie, ppm) are calculated at 25 degrees Celsius as required by the SEPP(AQM).
µg/m ³	micrograms (10 ⁻⁶) per cubic metre. Conversions from µ g/m ³ to parts per volume concentrations (ie, ppb) are calculated at 25 degrees Celsius.
ppb	parts per billion.
ppm	parts per million.
VOC	Volatile Organic Compounds. These compounds can be both toxic and odorous.
PM ₁₀ , PM _{2.5} , PM ₁	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
50th percentile	The value exceeded for 50 % of the time.
NO _x	Oxides of nitrogen – a suite of gaseous contaminants that are emitted from road vehicles and other sources. Some of the compounds can react in the atmosphere and, in the presence of other contaminants, convert to different compounds (eg, NO to NO ₂).
NO ₂	Nitrogen dioxide – one of the group of NO _x compounds that can form through chemical interactions in the atmosphere following emission from the source.