11.0 Air Quality

This chapter provides an assessment of the potential impacts of the proposed modification on air quality. The full technical report is provided in **Appendix I**.

11.1 Existing Environment

Land use in the Port Kembla area includes industrial, mixed commercial and residential. Industrial land uses include coal and grain handling facilities, steel works, a fertiliser manufacturer and ship loading facilities. Residential premises are located within one kilometre of the Port. These industrial land uses in particular are sources of dust emissions and air pollutants from combustion of fossil fuels. The following sections describe the background air quality in the area and the criteria for air pollutants.

11.1.1 Air Quality Monitoring Sites

Background air quality data for the Port Kembla area is available from EPA monitoring sites and from on site air quality monitors.

EPA operates two air quality monitoring sites in the vicinity of Port Kembla. The Wollongong monitoring site is the closest to Port Kembla, located approximately 6 kilometres north west of the site, and gathers data on particulate matter less than or equal to 10 micrometres (µm) (PM_{10}), particulate matter less than or equal to 2.5 µm ($PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and carbon dioxide (CO). In addition, PM_{10} and NO_2 data are available from the Kembla Grange monitoring site which is located approximately 7 kilometres west of the site.

There is a high volume air sampler (HVAS) located in the residential area to the south west of the site. The HVAS collects data on dust levels in the residential area. The HVAS began operation in September 2011. There are also dust deposition gauges located on site. The location of the HVAS and the dust deposition gauges is shown in **Appendix I**.

11.1.2 EPA Air Quality Criteria

The EPA specifies criteria for air pollutants within the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (EPA, 2005). The criteria are listed in **Table 11-1**.

Table 11-1 EPA air quality impact assessment criteria

Pollutant	Averaging Period	Unit	Criteria
PM_{10}	24-hour	µg/m^3	50
	Annual	µg/m^3	30
TSP	Annual	µg/m^3	90
Dust deposition	Annual (increment)	g/m^2/month	2
	Annual (cumulative)	g/m^2/month	4
NO_2	1-hour	µg/m^3	246
	Annual	µg/m^3	62
SO_2	10-minute	µg/m^3	712
	1-hour	µg/m^3	570
	24-hour	µg/m^3	228
	Annual	µg/m^3	60
CO	15-minute	mg/m^3	100
	1-hour	mg/m^3	30
	8-hour	mg/m^3	10

The Approved Methods do not contain assessment criteria for $PM_{2.5}$. In May 2003, the National Environment Protection Council (NEPC) released advisory reporting standards for $PM_{2.5}$ (refer to **Table 11-2**). The advisory reporting standards are not impact assessment criteria, however, in the absence of any other relevant standard or goal, the advisory reporting standards have been used in this assessment for comparison against the dispersion modelling results.

Table 11-2 Advisory reporting standards for $PM_{2.5}$

Pollutant	Averaging Period	Unit	Criteria
$PM_{2.5}$	24-hour	$\mu g/m^3$	25
	Annual	$\mu g/m^3$	8

11.1.3 Background Air Quality

Background air quality data collected from the EPA monitoring sites show that PM_{10} and $PM_{2.5}$ concentrations in the area exceed the EPA assessment criterion from time to time. A summary of the EPA monitoring data for PM_{10} and $PM_{2.5}$ is provided in the sections below, with more details provided in **Appendix I**. The EPA monitoring data also show that concentrations of NO_2, SO_2 and CO meet the EPA assessment criterion (refer to **Appendix I** for details).

PM_{10} Concentrations

The Wollongong and Port Kembla monitoring sites collect data on annual average and 24-hour average PM_{10} concentrations. A summary of the annual average PM_{10} data from the EPA monitoring sites is presented in **Table 11-3**.

Table 11-3 Summary of annual average PM_{10} from EPA monitoring sites

Date	Wollongong	Kembla Grange
	Annual Average PM_{10} ($\mu g/m^3$)	
2007	20	19
2008	18	18
2009	24	24
2010	18	18
2011	17	17
2012	18	18
Average	**19**	**19**

The monitoring results show that there have been no exceedances of the EPA annual average assessment criterion of 30 micrograms per cubic metre ($\mu g/m^3$) at either monitoring site between 2007 and 2012. The average annual PM_{10} concentration at the Wollongong and Kembla Grange monitoring sites between 2007 and 2012 is 19 $\mu g/m^3$.

The monitoring results show that there were exceedances of the 24-hour average PM_{10} criterion of 50 $\mu g/m^3$ in 2007 and 2008 at the Wollongong monitoring site. Exceedances of the EPA assessment criterion also occurred in 2009 which was a particularly dry year in NSW with severe dust storms. Both monitors recorded concentrations above 1,000 $\mu g/m^3$ on 23 September 2009. Severe dust storms and bushfires were recorded throughout NSW from 23 to 25 September 2009 (BOM, 2013).

There were a total of 27 exceedances of the 24-hour average PM_{10} at the Kembla Grange site between 2007 and 2012. The general trend of the data at Kembla Grange is similar to the Wollongong site. However, it is noted that the monitor is located at the Kembla Grange racecourse and therefore maybe influenced by the activities at the racecourse.

The HVAS which is located in the residential area to the south west of the site recorded an annual average PM_{10} concentration of 24 µg/m^3 in 2012 (the only full year for which data is available). The data from the HVAS indicates that the dust levels at the residences to the south west of the site are below the EPA annual average PM_{10} criterion of 30 µg/m^3.

The data collected at the dust deposition gauges on site (near the No.6 Jetty Port Kembla Gateway) show that average dust deposition at all sites for the monitoring period are well below the EPA assessment criterion of 4 grams per metre squared per month (g/m^2/month), except for the dust gauge DG1. The average dust deposition level at DG1 (a background site) was 7.9 g/m^2/month for the 2011 and 2012 period. The average at DDG2 and DDG3 is 2.0 g/m^2/month and 2.1 g/m^2/month, respectively which is below the EPA assessment criterion of 4 g/m^2/month. DDG1 is the background site but it measured much higher dust deposition levels compared with DDG2 and DDG3. The average dust deposition level at DDG1 is 6.9 g/m^2/month. The data suggests that the background site (DDG1 and DG1) is heavily influenced by other industrial activities in the area.

$PM_{2.5}$ Concentrations

A summary of the annual average $PM_{2.5}$ data at the Wollongong monitoring site are presented in **Table 11-4.** There were no exceedances of the annual average $PM_{2.5}$ advisory reporting standard of 8 µg/m^3 at the Wollongong monitoring site, however concentrations close to the operating standard were recorded in 2009. Exceedances of the advisory reporting standard of 25 µg/m^3 for the 24-hour average $PM_{2.5}$ concentrations occurred in 2009.

Table 11-4 Summary of annual average $PM_{2.5}$ from EPA Wollongong monitoring site

Date	Wollongong
	Annual Average $PM_{2.5}$ (µg/m^3)
2007	6
2008	5
2009	7
2010	5
2011	5
2012	5
Average	5

11.2 Methodology

The air quality assessment has been prepared in accordance with the DGRs for the modification which require:

- A revised air quality assessment addressing changes in dust deposition, total suspended particulates and other atmospheric pollutants of concern or local and regional air quality, arising from fugitive and point sources (e.g. locomotives, wagons, ship exhaust, stockpiles, loading and unloading of cargo, scrubbers) consequent to the proposed modification. The assessment is to take into account the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2005); and
- Potential increases in the intensity and duration of any odour from dredge spoil consequent to increased dredge volumes, and proposed odour control.

The air quality assessment which formed part of the original Environmental Assessment and the Environmental Assessment for the CGM has been referred to during preparation of the air quality assessment for the proposed modification.

11.2.1 Emissions Inventory and Air Dispersion Modelling

The operational impact assessment has been undertaken in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2005). To assess the potential impacts of operation of the proposed modification:

- An emissions inventory was developed for use in the dispersion modelling. This was generated using operational information supplied by PKOPL and in consultation with AECOM port and rail engineers. The sources of emissions in the inventory include road traffic, trains, ships at berth, and other on site sources such as bulk unloaders, storage sheds, conveyors and mobile equipment (refer to **Appendix I** for details).
- Dispersion modelling was undertaken to predict potential impacts at the closest receivers as a result of the proposed modification, as well as the cumulative impacts of the modification in the context of the overall Concept Plan (and including the CGM which is currently under construction).

The dispersion modelling was completed using the AERMOD dispersion model. AERMOD was chosen as the most suitable model for conducting the operational impact assessment due to the source types, location of closest receivers and nature of the local topography. AERMOD is the US-EPA's recommended steady-state plume dispersion model for regulatory purposes. AERMOD replaced the Industrial Source Complex (ISC) model for regulatory purposes in the US in December 2006 as it provides more realistic results. AUSPLUME, a steady state Gaussian plume dispersion model developed by the Victorian EPA and frequently used in Australia for simple near-field applications is based on ISC, which has now been replaced by AERMOD. AUSPLUME was the dispersion model used for the air quality assessment which was conducted as part of the previous Environmental Assessment. AERMOD has previously been demonstrated to provide better comparison between predicted and measured concentrations in the Port Kembla area (Moriarty, Roddis and Scorgie, 2009) (refer to **Appendix I** for details).

The methodology was developed in consultation with the EPA during discussions held on 30 April and 8 May 2013 (refer to **Chapter 7.0** for details). The EPA agreed that a qualitative assessment was appropriate for the construction impact assessment. It was also agreed with EPA that the AERMOD dispersion model would be appropriate to use for the operational impact assessment. The EPA specified that the operational impact assessment was to assume that all berths are occupied as the worst case scenario (e.g. seven ships at berth). However, the EPA noted the option available to present an additional scenario of occupied berths following PKOPL's opinion that a seven berth scenario would have a very low probability of occurring.

The operational impact assessment therefore includes modelling of three scenarios:

- Major Project (Stage 1).
- Concept Plan – Typical Case (where the difference between the worst case scenario is four ships at berth and a lower silt loading on internal roads).
- Concept Plan – Worst Case (where the difference between the typical case scenario is seven ships at berth and a higher silt loading on internal roads).

11.2.2 Sensitive Receivers

The impact assessment focused on the sensitive receivers located within the likely area of impact from the proposed modification and Concept Plan. The sensitive receivers are listed in **Table 11-5** and shown on **Figure 11-1**.

Table 11-5 Relevant sensitive receivers

Receptor ID	Receptor Type
R1	Residential
R2	Residential
R3	Residential
R4	Residential
R5	Residential
R6	Residential
R7	Residential
R8	Residential
R9	Residential
R10	School

Receptor ID	Receptor Type
R11	Church
R12	Commercial
R13	Industrial
R14	Industrial
R15	Residential
R16	Residential
R17	Residential
R18	Residential
R19	Residential
R20	Residential
R21	Pre-school

11.3 Impact Assessment

11.3.1 Construction

The proposed modification would increase the volume of material to be temporarily stockpiled during construction and would also increase the total stockpile area from 1.5 to 3 hectares. Whilst this increases the potential for emissions from wind erosion, the stockpiled fill material would comprise waste materials from other industries (including coal washery refuse) and VENMs from other civil construction projects (including interburden rock and quarry overburden material), depending on the availability of material. Due to either the high moisture content and/or physical size or the material it is considered that the stockpiled material has very low potential for wind erosion.

The air quality assessment which formed part of the previous Environmental Assessment for the Major Project estimated the maximum predicted dust concentrations at the nearest receivers as a result of construction (refer to **Table 11-6**). As shown in the table, the results were well below the EPA assessment criteria.

Table 11-6 Maximum predicted concentrations from construction operations

Pollutant	Unit	Averaging Time	Predicted Concentration	Criterion
PM_{10}	$\mu g/m^3$	24-hour	8	50
TSP	$\mu g/m^3$	Annual	1.2	90
Dust deposition	g/m^2/month	Annual	0.13	2

Source: AECOM, 2010.

Air quality monitoring is currently being conducted in the vicinity of the construction activities for the Major Project (as approved). No exceedances of the relevant EPA assessment criteria have been recorded to date except at two dust deposition gauges (DG1 and DDG1) which are background monitoring sites. Data from these gauges is significantly higher than other on site monitors which suggests that they are being influenced by other industrial activities in the area and are not representative of impacts from construction works on site. To date there have been no complaints from nearby residents regarding dust emissions from the ongoing construction works and stockpile associated with construction of the Major Project (as approved).

The increase in stockpile area is unlikely to result in any additional exceedances of the EPA assessment criteria at the receivers. PKOPL has committed to ongoing use of appropriate dust control measures on stockpiles and to continuing to monitor construction activities on site to ensure that any potential impacts on nearby residences are minimised (refer to **Section 11.4** for details).

The proposed modification would increase the volume of material to be dredged, however, the dredged material is not expected to be a source of odour. Where practicable, the dredged material would be handled beneath the water surface except when it is being transported by barge from the dredge area to the reclamation area. Field screening of odour during dredging would be conducted to identify any potential odour impacts which would be managed appropriately (refer to **Section 11.4** for details).

11.3.2 Operation

The following sections present a summary of the dispersion modelling results for the three scenarios described in **Section 11.2.1**, along with the results of the cumulative assessment. The results of a sensitivity analysis of the silt loading factor applied to the Concept Plan – Worst Case scenario is also presented below.

Major Project

- No exceedance of the EPA assessment criterion for annual average PM_{10} as a result of the Major Project only. However, there is a predicted exceedance of the criterion at the industrial receiver R14 when the Major Project is considered in a cumulative context. Emissions of coarse particles of particulate matter such as PM_{10} are derived primarily from mechanical processes resulting in the suspension of dust or soil from roads, farming, mining and dust storms.
- Predicted exceedance of the EPA assessment criterion for 24-hour average PM_{10} at residential receivers R2 and R3, commercial receiver R12, and industrial receiver R14 as a result of the Major Project. However, the results show that there would only be one day where concentrations would exceed the 50 $\mu g/m^3$ criterion.
- No exceedance of the advisory reporting standard for annual average $PM_{2.5}$ as a result of the Major Project only. However, there are predicted exceedances of the standard at the residential receivers R2 and R3 and industrial receiver R14 when the Major Project is considered in a cumulative context. Emissions of $PM_{2.5}$ are derived primarily from combustion processes, such as vehicle emissions, wood burning, coal burning for power generation and from natural processes such as bush fires.
- Predicted exceedance of the advisory reporting standard for 24-hour average $PM_{2.5}$ at residential receiver R3 as a result of the Major Project.
- No exceedance of the EPA assessment criteria for annual average TSP, annual average dust deposition, 1-hour or annual average NO_2, CO, or 1-hour, 24-hour or annual average SO_2 as a result of the Major Project.

Concept Plan – Typical Case

- No exceedance of the EPA assessment criteria for annual average PM_{10} as a result of the Concept Plan – Typical Case.
- Predicted exceedance of the 24-hour average PM_{10} EPA assessment criterion at commercial receiver R12 and industrial receiver R14 as a result of the Concept Plan – Typical Case. However, the results show only one day where concentrations are predicted to exceed the 50 $\mu g/m^3$ criteria.
- No exceedance of the advisory reporting standard for annual average $PM_{2.5}$ as a result of the Concept Plan – Typical Case only. However, there is a predicted exceedance of the standard at the residential receivers R2 and R3, commercial receiver R12, and industrial receiver R14 when the Concept Plan – Typical Case is considered in a cumulative context.
- No exceedance of the advisory reporting standard for 24-hour average $PM_{2.5}$ as a result of the Concept Plan – Typical Case.
- No exceedance of the EPA assessment criteria for annual average TSP, annual average dust deposition, 1-hour or annual average NO_2, CO, or 1-hour, 24-hour or annual average SO_2 as a result of the Concept Plan – Typical Case.

Air quality contour maps for the Concept Plan – Typical Case are provided in **Figure 11-2** through **Figure 11-7**.

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881991 F11-1 Sensitive Receivers for the Air Quality Assessment 30 05 2013 TO

AECOM

SENSITIVE RECEIVERS FOR THE AIR QUALITY ASSESSMENT

Port Kembla Outer Harbour Development Modification
Environmental Assessment

FIGURE 11-1

\Projects\602\602881991\4. Tech work area\4.2 Graphics\FIGURES\EA\602881991 F11-2 PM10 Concentrations All Sources - Concept Plan 30 05 2013 TO Rev B

AECOM

PREDICTED CUMULATIVE ANNUAL AVERAGE PM10 CONCENTRATIONS DUE TO EMISSIONS FROM ALL SOURCES - CONCEPT PLAN (TYPICAL CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-2

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F11-3 PM10 24hr Concentrations Project Alone - Concept Plan - Typical Case 30 05 2013 TO

AECOM

PREDICTED 24 HOUR AVERAGE PM10 CONCENTRATIONS DUE TO EMISSIONS FROM THE PROJECT ALONE - CONCEPT PLAN (TYPICAL CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-3

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F11-4 PM2.5 Concentrations All Sources - Concept Plan - Typical Case 30 05 2013 TO

AECOM

PREDICTED CUMULATIVE ANNUAL AVERAGE PM2.5 CONCENTRATIONS DUE TO EMISSIONS FROM ALL SOURCES - CONCEPT PLAN (TYPICAL CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-4

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F11-5 PM2.5 Concentrations Project Alone - Concept Plan - Typical Case 31 05 2013 TO Rev A

AECOM

PREDICTED 24 HOUR AVERAGE PM2.5 CONCENTRATIONS DUE TO EMISSIONS FROM THE PROJECT ALONE - CONCEPT PLAN (TYPICAL CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-5

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F11-6 Annual Average TSP Concentrations All Sources - Concept Plan - Typical Case 30 05 2013 TO

AECOM

PREDICTED CUMULATIVE ANNUAL AVERAGE TSP CONCENTRATIONS DUE TO EMISSIONS FROM ALL SOURCES - CONCEPT PLAN (TYPICAL CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-6

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F11-7 Annual Average Dust Deposition Concentrations All Sources - Concept Plan - Typical Case 30 05 2013 TO

AECOM

PREDICTED CUMULATIVE ANNUAL AVERAGE DUST DEPOSITION CONCENTRATIONS DUE TO EMISSIONS FROM ALL SOURCES - CONCEPT PLAN (TYPICAL CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-7

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Concept Plan – Worst Case

- Predicted exceedance of the EPA assessment criterion for annual average PM_{10} as a result of the Concept Plan – Worst Case at residential receiver R2 and industrial receiver R14. There are predicted exceedances of the criteria at these receivers as well as residential receivers R3, R5, R6 and R7 and commercial receiver R12 when the Concept Plan – Worst Case is considered in a cumulative context.
- Predicted exceedance of the 24-hour average PM_{10} EPA assessment criterion at residential receivers R2, R3, R5, R6, R7, R9, R10, R11, R17, R18, R19, at commercial receivers R12 and R13, and industrial receiver R14 as a result of the Concept Plan – Worst Case.
- Predicted exceedance of the advisory reporting standard for annual average $PM_{2.5}$ at residential receivers R2 and R3, commercial receiver R12 and industrial receiver R14 as a result of the Concept Plan – Worst Case. There are predicted exceedances of the standard at these receivers as well as residential receivers R5, R6, R7, R10, R11 and R19, and industrial receiver R13 when the Concept Plan – Worst Case is considered in a cumulative context.
- Predicted exceedance of the advisory reporting standard for 24-hour average $PM_{2.5}$ at residential receivers R2, R3, R5, R6, R7, R8, R9, R11, R18 and R19, at commercial receiver R12, and industrial receiver R14 for the Concept Plan – Worst Case.
- Predicted exceedance of the EPA assessment criterion for annual average TSP at residential receivers R2 and R3, and industrial receiver R14 as a result of the Concept Plan – Worst Case. There are predicted exceedances of the criteria at these receivers as well as residential receivers R5, R6, R7, commercial receiver R12 when the Concept Plan – Worst Case is considered in a cumulative context.
- Predicted exceedance of the EPA assessment criterion for annual average dust deposition at residential receivers R2 and R3, commercial receiver R12 and industrial receiver R14 as a result of the Concept Plan – Worst Case alone and in a cumulative context.
- Predicted exceedance of the EPA assessment criterion for 1-hour NO_2 at industrial receiver R14 for the Concept Plan – Worst Case only. However, there are predicted exceedances at this receiver as well as residential receivers R2, R3, R6, R7, R9, R10 and R11, at commercial receiver R12, and industrial receiver R13 as a result of the cumulative impact of this scenario. Oxides of nitrogen (NO_x) which are comprised of nitric oxide (NO) and NO_2 are produced when fossil fuels are combusted in internal combustion engines (e.g. motor vehicles, locomotives, and ships). Exceedance of the criterion for 1-hour NO_2 for this scenario is primarily as a result of modelling seven ships at berth which in reality has a very low probability of occurring. As discussed in the section above, there would be no exceedance of the 1-hour NO_2 criteria for the Concept Plan – Typical Case which modelled four ships at berth.
- No exceedance of the EPA assessment criterion for annual average NO_2, CO, or 1-hour, 24-hour or annual average SO_2 as a result of the Concept Plan – Worst Case.

As discussed above, the Concept Plan - Worst Case is predicted to result in a number of residences potentially exceeding the EPA assessment criteria for dust. The main contribution to dust emissions is from hauling material on internal sealed roads. A conservative silt loading of 9.7 g/m^2 and 4.9 g/m^2 was applied to the haul roads for the Concept Plan – Worst Case scenario.

A sensitivity analysis of the silt loading factor was conducted and it was found that applying a silt loading of 0.6 g/m^2 would reduce the annual average dust concentrations at the majority of the sensitive receptors to a level below the EPA impact assessment criteria. For example, the 24-hour average PM_{10} emissions for the Concept Plan – Worst Case would result in one residential receiver R2 (as opposed to 11 residential, two commercial and one industrial receiver) exceeding the EPA impact assessment criterion when a silt loading of 0.6 g/m^2 is used. Similarly, two residential receivers R2 and R6 (as opposed to 10 residential, one commercial and one industrial receiver) are predicted to marginally exceed the EPA 24-hour $PM_{2.5}$ impact assessment criterion when a silt loading of 0.6 g/m^2 is used. The silt loading factor of 0.6 g/m^2 is for public roads with less than 500 vehicles a day and was used for the Concept Plan – Typical Case because it is similar to the number of vehicles that would be generated by Concept Plan. The predicted dust concentrations are extremely sensitive to the assumed silt loading on the sealed roads within the site, and therefore it is recommended that PKOPL collect data on the silt loading of the Major Project (Stage 1) once it is operational to provide more certainty in any future dispersion modelling which will be undertaken for Stage 2 and 3.

Detailed results are provided in **Appendix I** and air quality contour maps are provided in **Figure 11-8** through **Figure 11-12**.

\Projects\602\602981994. Tech work area\4.2 Graphics\FIGURES\EA\602981994 F11-8 PM10 Concentrations All Sources - Concept Plan - Worst Case 30 05 2013 TO

AECOM

PREDICTED CUMULATIVE ANNUAL AVERAGE PM10 CONCENTRATIONS DUE TO EMISSIONS FROM ALL SOURCES - CONCEPT PLAN (WORST CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-8

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F11-9 PM2.5 Concentrations All Sources - Concept Plan - Worst Case 31 05 2013 TO Rev A

AECOM

PREDICTED CUMULATIVE ANNUAL AVERAGE PM2.5 CONCENTRATIONS DUE TO EMISSIONS FROM ALL SOURCES - CONCEPT PLAN (WORST CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-9

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F11-10 PM2.5 Concentrations Project Alone - Concept Plan - Worst Case 30 05 2013 TO

AECOM

PREDICTED CUMULATIVE 24 HOUR AVERAGE PM2.5 CONCENTRATIONS DUE TO EMISSIONS FROM THE PROJECT ALONE - CONCEPT PLAN (WORST CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-10

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F11-11 Annual Average TSP Concentrations All Sources - Concept Plan - Worst Case 30 05 2013 TO

AECOM

PREDICTED CUMULATIVE ANNUAL AVERAGE TSP CONCENTRATIONS DUE TO EMISSIONS FROM ALL SOURCES - CONCEPT PLAN (WORST CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-11

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881199 F11-12 Annual Average Dust Deposition Concentrations All Sources - Concept Plan - Worst Case 30 05 2013 TO

AECOM

PREDICTED CUMULATIVE ANNUAL AVERAGE DUST DEPOSITION CONCENTRATIONS DUE TO EMISSIONS FROM ALL SOURCES - CONCEPT PLAN (WORST CASE)

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 11-12

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11.4 Mitigation and Management Measures

The existing consent conditions for the Concept Plan and Major Project relating to air quality are generally considered appropriate to ameliorate the potential impacts associated with the proposed modification. Consistent with the existing consent conditions and the commitments made in the previous Environmental Assessment, the following mitigation and management measures would be implemented:

- Construction would take place in a manner that minimises dust emissions, including wind-blown and traffic-generated dust. All construction activities would be undertaken with the objective of preventing visible emissions of dust from construction sites. Mitigation measures would be implemented to achieve this objective including covering truck loads (except during loading and unloading), road sweeping, enforcing vehicle speed limits, using truck washes and shaker grids at site exits, unloading fill trains through a below track system, sealing trafficable areas and areas susceptible to windblown dust impacts, watering dusty areas, and ceasing construction works, as appropriate. Other dust control mitigation measures, including barriers, internal storage of fine construction materials (less than 3 millimetres), exhaust emission controls and the use of mains electricity would also be evaluated.
- These management measures would be incorporated into a Construction Air Quality Management Plan (Major Project Condition C1). It is important to note that a Construction Environmental Management Plan (CEMP) has already been prepared for the construction works which have taken place for the Major Project (as approved) and the Construction Air Quality Management Plan which forms a component of this plan would be updated for the proposed modification.
- Management measures would be implemented for fill receival and stockpiling activities including the use of water carts and/or sprinklers to suppress dust, installation of a shaker grid to prevent drag out of dust from the site, enforcing a speed limit of 40 kilometres per hour for all vehicles on site, hydromulching the stockpile surfaces to establish a stabilising grass cover or other type of sealing, and real time dust monitoring during material haulage and stockpile construction activities with automated alarms when trigger levels are exceeded. These measures are currently implemented for the existing stockpile.
- Consistent with Major Project Condition B1, offensive odour, as defined under Section 129 of the *Protection of the Environment Operations Act 1997*, must not be emitted beyond the boundary of the site. The risk of odour being emitted from dredging activities is low, however, dredging activities would be monitored for odours using field screening. The results of olfactory determination of the degree and extent of odour would be recorded together with a description of the concurrent operational activities (Major Project Condition C1).
- An Operation Air Quality Management Plan would be prepared to outline measures to minimise and manage impacts from operation (Major Project Condition D7). The Plan would include, but not necessarily be limited to, the following mitigation measures:
    - identification of all major sources of particulate matter emissions that may occur as result of the operation.
    - identification of air quality objectives consistent with Concept Plan approval.
    - description of the procedures to manage the particulate matter emissions from the sources identified, including minimising open stockpiles of materials and the utilisation of enclosed material handling practices.
    - procedures for monitoring particulate matter emissions.
    - protocols for regular maintenance of plant and equipment, to minimise the potential for particulate matter emissions.
    - description of procedures to be undertaken if any non-compliance is detected.
- A Shore Side Power (cold ironing) Feasibility Report would be prepared to investigate the feasibility of providing shore side power at each berth as part of the Concept Plan (Concept Plan approval Condition 2.26). The report would include a discussion of best management practices for shore-side power, consideration of all feasible and reasonable measures that could be adopted at the berths, and potential options and future recommendations.
- Dispersion modelling has shown that the predicted emissions of particulates from operations are very sensitive to the assumed silt loading on sealed roads. Therefore, PKOPL would obtain a site specific silt loading factor for the internal road once Stage 1 of the Major Project is operational. This site specific data

would be used to inform any management measures, if required, to reduce particulate emissions from internal roads.

- PKOPL has also committed to investigating other options/technologies to reduce combustion emissions from ships, trains and trucks associated with the Concept Plan.
- Further analysis and atmospheric dispersion modelling would be undertaken for Stages 2 and 3 of Concept Plan. The reporting of this modelling will be included in separate project applications for Stage 2 and 3 of the Concept Plan. This would include use of a site specific silt loading factor for the internal road determined during operation of Stage 1 of the Major Project.

11.5 Conclusion

Construction of the proposed modification is not anticipated to have adverse impacts. While the volume and area of the fill material stockpiles would increase, the increase is unlikely to result in exceedances of the EPA assessment criteria at receivers. Dust monitoring at the existing stockpile demonstrates that current dust management measures are effective. These management measures would be used on the stockpile areas for the proposed modification and the existing air quality monitoring system would continue to monitor construction activities on site. Mitigation and management measures would be included in the Construction Air Quality Management Plan.

The proposed modification would increase the volume of material to be dredged during construction, however, the dredged material is not expected to be a source of odour. Field screening of odour would be conducted during dredging to identify any potential odour impacts. If necessary, mitigation and management measures would be implemented to minimise any offensive odour from dredging.

The design of the proposed modification includes a number of improvements from an air quality perspective, the most important of which is the use of enclosed storage sheds and conveyors for handling bulk materials.

The dispersion modelling results predict that operation of the Major Project and the Concept Plan – Typical Case alone, and when considered in a cumulative context, would result in some exceedances of the EPA assessment criterion for particulate matter (PM_{10} and $PM_{2.5}$). The results predict that only the closest receivers to the south west of the site would be impacted by concentrations of PM_{10} and $PM_{2.5}$ which exceed the criterion. No exceedance of the EPA assessment criterion for TSP, dust deposition, NO_2, CO, or SO_2 is predicted to occur as a result of the Major Project or Concept Plan – Typical Case.

The dispersion modelling results predict that operation of the Concept Plan – Worst Case alone, and when considered cumulatively, would result in a greater number of exceedances of the EPA assessment criterion for particulate matter (PM_{10} and $PM_{2.5,}$ TSP, and deposited dust) when compared to the other two scenarios. The main contribution of dust emissions for this scenario is from vehicle movements on internal sealed roads. A more conservative silt loading was applied to the haul roads for this worst case scenario. A sensitivity analysis of the silt loading factor indicated that with a less conservative silt loading, the annual average dust concentrations at the majority of the sensitive receivers would be reduced to a level below the EPA assessment criterion. Given this sensitivity, PKOPL have committed to obtaining site specific silt loading data for the internal roads once Stage 1 of the Major Project is operational. This site specific data would be used to inform any management measures, if required, to reduce particulate emissions from internal roads.

Dispersion modelling also predicts exceedances of the EPA assessment criterion for 1-hour NO_2 at some receivers as a result of the Concept Plan – Worst Case alone and when considered cumulatively. NO_2 is produced when fossil fuels are combusted in internal combustion engines (e.g. motor vehicles, locomotives, and ships). Exceedance of the criterion for 1-hour NO_2 for this scenario is primarily as a result of modelling seven ships at berth which in reality has a very low probability of occurring. No exceedance of the EPA assessment criterion for CO or SO_2 is predicted to occur as a result of the Concept Plan – Worst Case. For the Concept Plan PKOPL has committed to investigating the feasibility of providing shore side power at berths and to investigating other options/technologies to reduce combustion emissions from ships, trains and trucks.

12.0 Noise and Vibration

This chapter provides an assessment of the potential impacts of the proposed modification on noise and vibration, and is based on the noise and vibration technical report located at **Appendix J**.

12.1 Existing Environment

Land use in the Port Kembla area includes industrial, mixed commercial and residential. Industrial land uses include coal and grain handling facilities, steel works, and ship loading facilities. Rail-related activities also occur in areas within Port Kembla, which are associated with freight and passenger train movements. Residential premises are located within one kilometre of the Port. The industrial land uses, road traffic and freight train movements are a key source of noise with the local area. The following sections describe the background noise levels and the criteria for noise and vibration.

12.1.1 Background Noise Levels

Three unattended noise loggers were used to continuously measure background noise levels between Thursday 18th September 2008 and Wednesday 24th September 2008. The loggers were located at 7 Wentworth Street, 14 O'Donnell Street and 2 Reservoir Street, Port Kembla. These locations are considered to be representative of the sensitive receivers in the area. There have been no notable changes to the surrounding noise environment since the time of logging. Therefore, the logged data is considered representative of the current noise environment. An additional logger was used to continuously measure road traffic noise levels between Thursday 18th September 2008 and Wednesday 24th September 2008. The logger was located at 43-57 Five Islands Road, Cringlia, adjacent to the carriageway. The loggers and receiver locations are shown on **Figure 12-1**.

A noise logger measures the noise level over the sample period and then determines L_{A1}, L_{A10}, L_{A90}, L_{Amax} and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for one percent, 10 percent and 90 percent of the sample period, respectively. The L_{Amax} is indicative of maximum noise levels due to individual noise events. The L_{A90} is taken as the background noise level.

The Assessment Background Level (ABL) is established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each period of interest. The background noise level or Rating Background Level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over the entire monitoring duration. The RBLs for the two logger locations are shown in **Table 12-1**.

Table 12-1 Summary of ambient noise levels dB(A)

Logger Location	Day		Evening		Night	
	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}	L_{Aeq}
7 Wentworth Street						
RBL	47		46		45	
Log Average L_{Aeq}		61		53		52
14 O'Donnell Street						
RBL	39		40		37	
Amended RBL	39		39		37	
Log Average, L_{Aeq}		51		45		46

The NSW EPA *Industrial Noise Policy* (INP) (EPA, 2000) application notes recommend that when higher background noise levels (RBL) occur in the night time or evening assessment periods, the criteria are generally set to the lower evening or daytime criteria in accordance with community expectations.

Road traffic noise levels from Five Islands Road have been logged and post-processed in accordance with the EPA's *NSW Road Noise Policy* (RNP) (DECCW, 2011). Results of the noise logging are summarised in **Table 12-2**.

Table 12-2 Summary of road traffic noise levels 7 metres from Five Islands Road

Location	Daytime $L_{Aeq, (15\ hour)}$, dB(A)	Night Time $L_{Aeq, (9\ hour)}$ dB(A)
7 metres from Five Islands Road	71	68

12.1.2 Sensitive Receivers

The logger located at 7 Wentworth Street was affected by road traffic noise from the nearby Five Islands Road, industrial and rail noise. This location has been assumed to be representative of residential properties adjacent to or in close proximity to the more heavily used roads in the area. This area has been designated Sensitive Catchment Area 1 (SCA1).

The logger located at 14 O'Donnell Street is considered to be representative of residential properties located further away from the more heavily used roads and industrial noise in the area. This area has been designated Sensitive Catchment Area 2 (SCA2).

The sensitive receivers for this assessment are provided in **Table 12-3** with the SCAs depicted in **Figure 12-1**.

Table 12-3 Representative noise receiver locations

Receiver	Address	Receiver Type	Sensitive Catchment Area
R1	48 Flagstaff Rd, Warrawong	Residential	SCA1
R2	5-7 Military Rd, Port Kembla	Residential	SCA1
R3	7 Wentworth St, Port Kembla	Residential	SCA1
R4	1 Holman St , Port Kembla	Residential	SCA1
R5	14 Lawarra St , Port Kembla	Residential	SCA1
R6	1 Jubilee Rd , Port Kembla	Residential	SCA2
R7	14 O'Donnell St , Port Kembla	Residential	SCA2
R8	2 Reservoir St, Port Kembla	Residential	SCA1
R9	188 Wentworth St, Port Kembla	Residential	SCA2
R10	St Patricks School - 45 Kembla St, Port Kembla	School	-
R11a	St Stephens Anglican Church - 111 Military Rd, Port Kembla	Church	-
R11b	Port Kembla Tongan Uniting Church – 4 Fitzwilliam St, Port Kembla	Church	-
R12	21-23 Military Rd , Port Kembla	Commercial	-
R13	37 Five Islands Rd, Port Kembla	Industrial	-
R14	Lot 1 Darcy Rd, Port Kembla	Industrial	-

AECOM

SENSITIVE RECEIVERS FOR THE NOISE ASSESSMENT

Port Kembla Outer Harbour Development Modification
Environmental Assessment

FIGURE 12-1

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12.1.3 Construction Noise Criteria

The *Interim Construction Noise Guidelines* (ICNG) (EPA, 2009) identifies noise management levels for construction noise assessments.

Under the ICNG a construction noise management plan is required to be prepared by the contractor, prior to construction commencing. Noise level objectives must be set for the daytime evening and night-time periods, and must be complied with where reasonably practicable. Work that is proposed outside of standard working hours, as defined in the ICNG, generally requires strong justification. The noise management plan should detail the 'best practice' construction methods to be used, presenting a reasonable and feasible approach.

Construction noise management levels (NMLs) for residential sensitive receivers and other sensitive land uses (such as schools) have been set using the ICNG and are provided in **Table 12-4** and **Table 12-5**. Criteria for industrial and commercial premises are shown below:

- Industrial premises: external $L_{Aeq\ (15min)}$ 75 dB(A).
- Offices, retail outlets: external $L_{Aeq\ (15min)}$ 70 dB(A).

Table 12-4 Construction noise management levels – residential receivers

Receivers	Background Noise Level, L_{A90} Day dB(A)	Standard Construction Hours Noise Management Levels (NMLs) L_{Aeq} dB(A)	Background Noise Level, L_{A90} Night dB(A)	Out of Hours Works – Night-time Noise Management Levels (NMLs) L_{Aeq} dB(A)
Sensitive Catchment Area 1	47	57	45	50
Sensitive Catchment Area 2	39	49	37	42

Table 12-5 Construction noise management levels – sensitive land uses other than residential

Land Use	Management Level, L_{Aeq} (15 min) (applies when properties are in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas(characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

12.1.4 Construction Traffic Noise Criteria

The EPA's ICNG does not provide direct reference to an appropriate criterion to assess the noise arising from construction traffic on public roads.

Given the relative short duration of most construction activities and taking into consideration the EPA's RNP (EPA, 2011) which provides guidance when assessing relative increases in criteria, the following was taken into account:

'In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person'.

Thus, the criterion applied to traffic movements on public roads generated during the construction phase of the project is an increase in existing road traffic noise of no more than 2 dB(A).

12.1.5 Construction Blasting

Construction blasting can result in two adverse environmental effects, namely air blast and ground vibration. The air blast and ground vibration produced may cause human discomfort and may have the potential to cause damage to structures, architectural elements and services.

Air blast would have no impact during the construction stage of the Major Project or Concept Plan as all blasting is to take place under a minimum water depth of 5 metres. The acoustic impedance mismatch between air and water means that the vast majority of acoustic energy from an underwater blast would be reflected at the water surface. The minimal amount of energy that is not reflected is likely to be at a low sound pressure level at infrasound frequencies, and as such would comply with the airborne noise criteria at the nearest receivers.

Two guidelines have been considered as part of the blasting vibration assessment:

- *Australian and New Zealand Environment Conservation Council (ANZECC) Guidelines - Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.

  This has been adopted by the EPA as comfort criteria in order to avoid annoyance and discomfort to persons at noise sensitive sites (for example, residences, schools, etc). The guidelines are not intended to be structural damage criteria however, they do provide a conservative approach to assessing blasting impacts.

- *Australian Standard 2187.2-2006 Explosives - Storage and Use Part 2: Use of Explosives – Appendix J*

  AS 2187.2 recommends ground vibration limits which are consistent with the ANZECC guidelines, however this standard provides more detail. It considers criteria for human comfort and structural damage and different types of structures such as more sensitive masonry and plasterboard buildings and less sensitive reinforced concrete buildings.

It is recommended that the AS 2187.2-2006 be considered for blasting vibration assessments of the Outer Harbour Development. Measurement of vibration should be taken at the base of the building facing the source of the vibration in the vertical and two horizontal directions. For multi-story structures where vibration amplification is likely, measurements should also be made on the floor with the highest vibration level. A summary of the applicable criteria is provided in **Table 12-6**, with the controlling criteria identified in italics.

Table 12-6 Blasting criteria summary

Category	Human Comfort	Structural Damage
Sensitive structures (e.g. residential, theatres, schools etc.)	*5 mm/s for 95% blasts per year* *10 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply.*	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Occupied non-sensitive structures of reinforces concrete or steel construction (e.g. factories and commercial premises)	*25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacture's specifications or levels that can be shown to adversely affect the equipment operation.*	50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply[1]

Category	Human Comfort	Structural Damage
Occupied non-sensitive structures that include masonry, plaster and plasterboard in their construction (e.g. factories and commercial premises)	*25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacture's specifications or levels that can be shown to adversely affect the equipment operation.*	*15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above*
Unoccupied non-sensitive structures of reinforces concrete or steel construction (e.g. factories and commercial premises)	N/A	*50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply*[18]
Unoccupied non-sensitive structures that include masonry, plaster and plasterboard in their construction	N/A	*15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above*
Services structures, such as pipelines, powerlines and cables	N/A	Limit to be determined by structural design methodology. Special consideration may be required for high pressure gas pipelines.

1 - Note these requirements do not cover high rise buildings, buildings with long span floors, specialist structures such as reservoirs, dams and hospitals, or buildings housing scientific equipment sensitive to vibration. These require special considerations, which may necessitate taking additional measurements on the structure itself. Particular attention should be given to the response of suspended floors.

Conditions of Approval – Major Project (Stage 1)

The Major Project Condition C10 includes a condition for blasting limits, which has been reproduced below:

Ground vibration peak particle velocity from blasting operations at the project shall not exceed 5mm/sec more than 5 percent of the total number of blasts over each reporting period and shall not exceed 10mm/sec at any time.

This does not differentiate between residential, commercial and other non-sensitive receivers and can render the blasting operation overly restrictive for non-sensitive receivers (e.g. commercial, non-sensitive masonry structures, etc.). This is discussed later in **Section 12.4.2**.

12.1.6 Operational Noise Criteria

The INP provides guidance and recommendations on the assessment of noise impacts from industrial and commercial facilities throughout all defined day, evening and night periods. The assessment procedure for industrial noise sources has two components that must be satisfied; intrusiveness criteria and amenity criteria.

As the noise emissions from the Concept Plan and Major Project would be a mixture of relatively constant activities and short term noise events the noise emissions during a 'reasonable' worst case 15-minute period and entire night period may vary considerably. As such both the amenity ($L_{Aeq,\ period}$) and intrusive ($L_{Aeq,\ 15\ min}$) scenarios have been assessed separately against the relative criterion. Operational assessment scenarios for both assessment periods have been developed for the modelling purposes, to ensure compliance with both the intrusive and amenity criteria at nearby noise sensitive receivers.

The project specific noise goals in **Table 12-7** are applicable for all the operational noise sources associated with the Major Project and the Concept Plan at the residential receivers most likely to be affected.

The INP provides additional guidance and criteria for assessing noise emission from sources defined as 'tonal' in nature. Penalties of up to 5 dB(A) may be applied where the subject noise emission is tonal in character at the receiver. The need for such penalties has been considered in the impact assessment provided in **Section 12.3**.

Table 12-7 Project-specific noise goals for the Outer Harbour Development

Receiver	Period	RBL (L_{A90})	Intrusive Criterion RBL + 5	Ambient (L_{Aeq})	Amenity Criterion
Sensitive Catchment Area 1	Day	47	52	61	52
	Evening	46	51	53	43
	Night	45	50	52	42
Sensitive Catchment Area 2	Day	39	44	51	60
	Evening	39	44	45	48
	Night	37	42	46	37

The INP specifies the following noise criteria for non-residential land uses as detailed in **Table 12-8**. These criteria are applicable to receivers R10, R11a, R11b, R12, R13 and R14.

Table 12-8 Non-residential receiver noise criteria

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level dB(A)	
			Acceptable	Recommended Maximum
School classroom	Noisiest 1-hour period when in use	When in use	50[1,2]	55[1,2]
Place of worship	Noisiest 1-hour period when in use	When in use	50[2]	55[2]
Commercial Premises	All	When in use	65	70
Industrial Premises	All	When in use	70	75

Notes:

1 In the INP, the school classroom criteria is an internal noise level, with an acceptable noise level of 35 dB(A) and a recommended maximum of 40 dB(A). However, this acceptable level is increased to 40 dB(A) in the case that the school is affected by noise from existing industry.

2 A 10 dB reduction has been assumed between external and internal noise levels based upon a window being open for adequate natural ventilation.

12.1.7 Sleep Disturbance

To minimise the risk of sleep disturbance as a result of industrial type operations during the night-time period, the INP application notes recommends that, the $L_{A1(1\ minute)}$ noise level outside a bedroom window should not exceed the L_{A90} background noise level by more than 15 dB(A) during the night-time period (10 pm to 7 am).

The EPA considers it is appropriate to use this metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

The INP application notes reference the NSW RNP for some guidance in assessing the potential for sleep disturbance. The RNP contains an assessment of sleep disturbance which represents NSW EPA advice on the subject of sleep disturbance due to noise events. Section 5.4 of the RNP states that 'Maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep'. Therefore, given that an open window provides 10 dB(A) noise attenuation from outside to inside, external noise levels of 60 to 65 dB(A) are unlikely to result in awakening reactions.

The sleep disturbance criteria for SCA 1 and SCA 2 are summarised in **Table 12-9**.

Table 12-9 Sleep disturbance criteria

Catchment Area	Measured RBL $L_{A90,\ 15\ mins}$ dB(A)	Sleep Disturbance Criteria $L_{A1\ (1\ minute)}$ dB(A)	
		Screening Level	Awakening Reaction
SCA 1	45	60	65
SCA 2	37	52	65

12.1.8 Conditions of Approval

The Major Project Approval Condition D1 requires PKOPL to design and operate the project with the objective of ensuring that noise contributions do not exceed the limits specified in the condition, which includes sleep disturbance criteria. The noise limits set within that condition are provided in **Table 12-10**. It is noted that these criteria were established through P&I's consideration of the previous Environmental Assessment, and reflect the predicted noise levels.

Table 12-10 Project-specific noise goals for the Outer Harbour Development as set in the Major Project approval

Location	$L_{Aeq(15min)}$ dB(A)			$L_{A1,\ (1min)}$ dB(A)
	Day	Evening	Night	Night
Military Road	-	39	39	62
Wentworth Street	-[17]	42	42	60
Jubilee Road	-[17]	Note 1	36	59
Any other residential receiver	-[17]	Note 1	35	Note 1
St Patrick's Primary School	39	39	39	Note 1
Church on Church Street and Military Road	39	39	39	Note 1

1 - Noise limits have not been set as predicted noise levels with mitigation measures proposed in the Environmental Assessment are below the reported background noise level. Where street locations are mentioned, the noise limit applies to any residential receiver on that street.

12.1.9 Rail Related Noise Criteria

Rail related activities, including the loading and unloading of trains, shunting operations, train idling, splitting of trains, are to be undertaken within the areas within the Outer Harbour which are in the control of PKOPL. As such, the rail movements have been assessed against the EPA's INP, and not the now superseded EPA's *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (IGANRIP) as specified in the DGRs. It is recommended that noise outside of the development be assessed as part of a larger review of the rail network by the rail infrastructure providers who are planning to upgrade capacity.

12.1.10 Road Traffic Noise Levels (Operational)

The RNP sets road traffic noise criteria for residences that would be affected by additional traffic noise generated by a traffic generating developments. As additional traffic would be generated by the project, additional traffic noise may result on Five Islands Road, Flinders Road and Old Port Road. These roads are considered to be arterial and sub-arterial roads under the RNP. There are no residential properties in the vicinity of Old Port Road.

Table 12-11 provides the applicable criteria for residential receivers for this project. The external criteria are assessed at one metre from the affected residential building façades and at a height of 1.5 metres from the floor.

Table 12-11 Road traffic noise assessment criteria for residential land uses

Road Category	Type of Project/Land Use	Assessment Criteria - dB(A)	
		Day (7 am – 10 pm)	Night (10 pm – 7am)
Freeway/arterial /sub-arterial roads	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq, (15\ hour)}$ 60	$L_{Aeq, (9\ hour)}$ 55

In cases where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

12.1.11 Vibration Criteria

Vibration generated by operation and construction activities can travel though the ground and cause nearby building structures to vibrate. This may cause damage to the building structure ranging from minor hairline cracking to major structural cracking. Long term exposure to vibration in buildings may also cause annoyance to the occupants. The levels at which annoyance occurs are much lower than the structural damage criteria in buildings.

Vibration assessment criteria is set in *British Standard 7385: Part 2 1993 Evaluation and Measurement of Vibration in Buildings*, *DIN Standard 4150 - Part 3 - Structural Vibration in Buildings - Effects on Structures* and *British Standard 6472-1992 Evaluation of Human Exposure to Vibration in Buildings*. These have been summarised in **Table 12-12**. Measurement of vibration should be taken at the base of the building facing the source of the vibration in the vertical and two horizontal directions. For multi-story structures where vibration amplification is likely measurements should also be made on the floor with the highest vibration level.

Table 12-12 Operation and construction vibration criteria summary

Category	Human Comfort, Vibration Dose Value ($m/s^{1.75}$)		Structural Damage (mm/s)
	Day	Night	
Particularly sensitive structures (e.g. listed buildings under preservation order)	0.2 – 0.8 (depending on its use)	0.13 – 0.8 (depending on its use)	3
Residential Structures	0.2	0.13	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Offices, schools, educational institutions and places of worship	0.4	0.4	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Category	Human Comfort, Vibration Dose Value ($m/s^{1.75}$)		Structural Damage (mm/s)
	Day	Night	
Occupied non-sensitive structures of reinforced concrete or steel construction (e.g. factories and commercial premises)	0.8	0.8	50 mm/s at 4 Hz and above
Occupied non-sensitive, light framed structures	0.8	0.8	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Unoccupied non-sensitive structures of reinforces concrete or steel construction (e.g. factories and commercial premises)	N/A	N/A	50 mm/s at 4 Hz and above
Unoccupied non-sensitive, light framed structures	N/A	N/A	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Vibration generated by train movement enters buildings via the ground. This causes the floors, walls and ceilings to vibrate and to radiate noise. This noise is commonly referred to as structure- or ground-borne noise or regenerated noise. Regenerated noise is low frequency and if audible is perceived as a 'rumble'. The ground-borne noise goals as outlined in the EPA document IGANRIP are employed as a guide to assess ground borne noise. These noise goals are summarised in **Table 12-13**.

The closest residential receivers that may be impacted by ground borne noise from rail movements are located approximately 100 metres from the South Yard, on Wentworth Street.

Table 12-13 Recommended ground-borne noise goals for operational activities

Receiver	Time of Day	Noise Trigger Levels dB(A)
Residential	Day (7 am – 10 pm)	40 dB(A) $L_{Amax, slow}$
	Night (10 pm – 7 am)	35 dB(A) $L_{Amax, slow}$
Schools, educational institutions, places of worship	When in use	40-45 dB(A) $L_{Amax, slow}$

12.2 Methodology

The noise and vibration assessment has been prepared in accordance with the DGRs for the modification which require:

- A description of the noise and vibration from all activities and sources during operation both on and off site; and a revised noise assessment, taking into account the *NSW Industrial Noise Policy* (Environment Protection Authority, 2000) and the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (Department of Environment and Climate Change/ Department of Planning, 2007).
- The noise assessment must consider the construction and operational impacts from the proposed modification in isolation and in a cumulative context.

- Operational impacts are to include noise associated with increased shipping movements, increased rail movements (including shunting, acceleration and deceleration), conveyor systems, unloading and loading activities, and scrubber systems (if installed).

The noise and vibration assessment which formed part of the previous Environmental Assessment has been referred to during preparation of the noise and vibration impact assessment for the proposed modification. The noise and vibration assessment for the CGM has also been considered. The modification involves upgrades to the rail infrastructure within the Outer Harbour rail loop which is owned and operated by NSW Ports. Therefore this investigation has assessed noise impacts associated with trains travelling within the Outer Harbour rail loop. This is consistent with the Director-General's Environmental Assessment Requirements for the modification dated 18 December, 2012 which required that the noise assessment be conducted in accordance with the INP. The noise assessment was undertaken on this basis.

In consultation with P&I it was agreed that rail noise associated with trains travelling on the wider rail network was beyond the scope of this modification. The modification will result in an increase in train movements on the wider rail network and there will need to be rail infrastructure upgrades on the network to accommodate this increase in train movements. However, these infrastructure upgrades will be the responsibility of the rail owner/operator, such as ARTC, or potential customers, such as mining companies who are supplying the product. The exact detail and timing of these infrastructure upgrades are still to be determined and ultimately they will be subject to a separate assessment/approval process. Noise impacts associated with increased train movements on the wider rail network should be assessed at this time.

12.2.1 Construction

For the construction assessment, a quantitative assessment based on several 'reasonable' worst case construction scenarios has been carried out for the Major Project (Stage 1) in accordance with the ICNG. As part of this assessment, the 'reasonable' worst case scenarios have considered the additional construction activities and the additional construction footprint. One cumulative assessment has been undertaken to represent the concurrent construction activity across Stage 1, where the construction activities associated with the terminal and the South Yard occur at the same time. For each activity the equipment has been assumed to be used simultaneously for the assessment period to provide a conservative assessment.

Construction noise emissions were modelled using SoundPLAN v7.0 (industry standard) noise modelling software. The construction noise levels were predicted using an implementation of CONCAWE algorithms in the SoundPLAN noise propagation software.

12.2.2 Operation

An assessment of operational noise impact from the Major Project and the Concept Plan has been carried out. Both assessments are based on likely operational scenarios that were determined following discussion with AECOM maritime and rail engineers and PKOPL.

While only some aspects of the Major Project and the Concept Plan development would be modified, the assessment reassesses the whole development for completeness and to satisfy the DGRs. In doing so, it is recognised the key changes to the Concept Plan and Major Project relate to the additional bulk train movements, a larger operational area for the multi-purpose terminal under Stage 1, enclosed storage sheds and conveyor systems. There is also an improved understanding of rail and terminal operations based on further rail planning and engineering design work undertaken by PKOPL associated with the initial works for Stage 1. This has resulted in some adjustments to the original assumptions for the previous Environmental Assessment. As such, an assessment against the INP criteria has been undertaken.

The Outer Harbour Development is to operate 24 hours a day, however, operations would likely be less extensive during the night-time period. For the assessment model, the daytime, evening and night-time operations have been assumed to be the same, where activities are evenly spread over the 24 hour period. These 'reasonable' worst case intrusive and amenity scenarios have then been assessed and compared against the daytime, evening and night-time project specific noise goals as identified in **Section 12.1**. Further information on the model assumptions are provided in the noise and vibration assessment report, located in **Appendix J**.

The assessment was then re-run with mitigation measures to determine what reasonable and feasible mitigation strategies were available.

Operational noise emissions were modelled using SoundPLAN v7.0 (industry standard) noise modelling software. The levels were predicted using an implementation of CONCAWE[12] algorithms in the SoundPLAN noise propagation software.

Meteorological conditions such as the presence of a temperature inversion or light to moderate winds can have an effect on sound propagation. Data used to perform the meteorological assessment was sourced from the EPA Wollongong Automatic Weather Station (AWS) which is approximately 6 kilometres north of the Outer Harbour Development site. A review of this data identified that the worst case meteorological conditions consist of an F-class temperature inversion during the evening and night-time period and a 3 m/s source to receiver wind during the daytime. This has been incorporated in the operational modelling in accordance with the requirements of the INP.

In summary, the following operational noise scenarios were considered:

- Intrusiveness – Major Project – with and without mitigation during neutral (day, evening, night), temperature inversion (evening/night) and 3 m/s (daytime).
- Amenity – Major Project – with and without mitigation during neutral (day, evening, night), temperature inversion (evening/night) and 3 m/s (daytime).
- Intrusiveness – Concept Plan – with and without mitigation during neutral (day, evening, night), temperature inversion (evening/night) and 3 m/s (daytime).
- Amenity – Concept Plan – with and without mitigation during neutral (day, evening, night), temperature inversion (evening/night) and 3 m/s (daytime).

12.3 Impact Assessment

12.3.1 Construction

Construction Noise

For the Major Project (Stage 1), the proposed modification would alter or involve additional construction activities, such as:

- An increase in the operational footprint of Stage 1.
- Additional dredging activities.
- Additional rail infrastructure upgrades, this includes the two bulk loops, sidings and unloaders.
- Construction of storage sheds and conveyor systems.

The majority of construction would continue to occur during standard construction hours, however, dredging activities are proposed to occur 24 hours a day. This is consistent with the existing Major Project (Stage 1) conditions of approval.

The construction of the Major Project (Stage 1) would occur progressively to match customer demands at the Outer Harbour Development. As such, it is unlikely that all construction activities would be underway or completed at the same time. For example, the construction of the second bulk loop and unloader may not occur for some time after the commencement of operations on part of the Stage 1 footprint.

For the purposes of this assessment, the construction noise impact assessment has been refreshed. This considered five key construction scenarios – being the:

- Demolition of Jetty No.3 and Jetty No.4.
- General construction activities (such as access roads, storage shed construction, and operation of a construction compound).
- Terminal and berth construction, including both terminals and utilities construction.
- Rail infrastructure upgrades.

12 CONCAWE – The oil companies' international study group for conservation of clean air and water – Europe (established in 1963) Report 4/81 "The propagation of noise from petroleum and petrochemical complexes to neighbouring communities".

- Dredging and spoil emplacement.

A cumulative noise impact, which assumes each of the five scenarios would overlap, was also considered.

Except for the rail infrastructure scenario and the cumulative assessment, the assessment found that the construction scenarios would comply with the noise management levels at all sensitive receivers during standard construction hours. Further, the dredging and spoil emplacement scenario would comply with the out-of-hours noise management levels and sleep disturbance criterion at all receivers.

For the rail infrastructure upgrade scenario, exceedances were predicted at sensitive receivers R2 and R3 by 1 dB and 4 dB respectively during the daytime period. These are the closest receivers to the South Yard. The key noise source is associated with the demolitions saw and mobile plant. However, it is noted that this would only persist for a fraction of the assessment period, and the overall construction period. It has also assumed the shortest distance between the source and receivers, and that the nosiest activities would be occurring concurrently.

The cumulative construction impact assessment predicted an exceedance of up to 5 dB would occur at sensitive receiver R3, with three other receivers predicted to experience an exceedance between 1 and 2 dB (R2, R6 and R7). The results are presented in **Table 12-14**. The results of this assessment confirms that construction activities at the South Yard are the dominant source of construction noise, and should be carefully managed to reduce noise impacts at nearby sensitive receiver locations.

Table 12-14 Predicted noise levels for constriction (cumulative)

Receiver	Receiver Type	Construction Noise Levels, $L_{Aeq\ 15min}$		
		Criterion	Result	Exceedance
R1	Residential	57	44	-
R2	Residential	57	59	2
R3	Residential	57	62	5
R4	Residential	57	44	-
R5	Residential	57	52	-
R6	Residential	49	50	1
R7	Residential	49	50	1
R8	Residential	57	52	-
R9	Residential	49	33	-
R10	School	55	50	-
R11a	Place of worship	55	50	-
R11b	Place of worship	55	51	-
R12	Commercial	70	55	-
R13	Industrial	75	54	-
R14	Industrial	75	59	-

Construction Road Traffic Noise

Road traffic associated with the construction of the Major Project (Stage 1) would add an additional 35 trucks per hour during the peak flow period. However, the modification would only be adding an additional eight trucks per hour per day. This is representative of the 'reasonable' worst case construction traffic movements during Stage 1 of the construction, and is based on recent experience with the initial reclamation activities in Stage 1. All additional traffic will pass receivers near Lake Avenue (adjacent to Five Island Road) and along Gladstone Avenue (adjacent to Masters Road). The predicted increase in noise level at the worst affected receivers resulting from construction traffic is shown in **Table 12-15**.

Table 12-15 Construction traffic - predicted increase in noise levels along construction traffic path

Time Period	2016 Heavy Vehicle Peak Hour Traffic Flow – Without Construction	2016 Heavy Vehicle Peak Hour Traffic Flow – With Construction	Predicted Increase in Noise Levels dB(A)
AM peak	258	293	< 1.0
PM peak	228	263	< 1.0

The increase in noise levels resulting from construction traffic is predicted to comply with the road traffic noise criteria for the peak hour flow rates at the worst affected receivers.

Construction Vibration

Construction activities that can generate high levels of vibration include:

- general earthworks
- ground compaction (e.g. vibratory rollers)
- re-sleepering
- rail tamping and dynamic track stabilization
- spoil removal via road.

The construction vibration assessment focuses on ground compaction, rail tamping or dynamic track stabilisation as these activities are significantly more vibration intensive than earthworks and spoil removal.

Structural Damage

Table 12-16 lists the estimated setbacks for these activities which are likely to be required to ensure that a peak particle velocity (PPV) of 5 mm/s (residential) and 10 mm/s (commercial) is not exceeded.

Table 12-16 Required setbacks to limit PPVs to within 5 mm/s and 10 mm/s

Activity	Required Setback to Limit PPV to Less 5 mm/s (Residential)	Required Setback to Limit PPV to Less 10 mm/s (Commercial)
2-tonne vibratory roller	5 m	3 m
10-tonne vibratory roller	20 m	12 m
Rail tamping	5 m	3 m
Dynamic track stabilization	10 m	6 m

The required minimum setback distances to avoid breaching the cosmetic damage criteria range from 5 metres through to 20 metres for a residential receiver. Given that there are no sensitive receivers, residential or otherwise, located within 20 metres of the proposed construction works the cosmetic damage vibration criteria is unlikely to be breached.

It is recommended that attended vibration monitoring is undertaken in situations if a plant is predicted to exceed the applicable vibration criteria (i.e. the separation of the plant to critical receivers is less than the required setbacks in **Table 12-16**). Attended measurements will allow for establishing site rules and for determining safe working distances.

The estimated setbacks must be considered as preliminary since they depend on geological and other factors. This preliminary study should be refined following early works once site-rules and buffer distances are established.

Human Comfort – Tactile vibration

There are wide variations in vibration tolerance of humans and accordingly acceptance goals for human comfort are hard to define and quantify. Acceptable values of human exposure to vibration are primarily dependent on the activity taking place in the occupied space (e.g. workshop, office, or residence) and the character of vibration (e.g.

continuous or intermittent). In addition, specific values are dependent upon social and cultural factors, psychological attitudes, expected interference with privacy, and ultimately the individual's perceptibility.

As the closest residential receivers are located approximately 100 metres from the proposed construction area, it is deemed very unlikely that residential receivers would be adversely affected by vibration from construction activities. Receivers located closer to the works may require careful management.

Construction Blasting

The previous Environmental Assessment considered the potential impacts of blasting based on a number of assumptions, and include varying blasting charges and distances to sensitive receivers. This found that predicted vibration levels at residential sensitive receivers in SCA 1 and SCA 2 would be within the applicable criteria. However, exceedances at the closest industrial/commercial facilities were predicted. It was noted that site data would be needed, such as through the completion of trial blasts, before an accurate understanding of the potential impacts can be obtained. As the assumptions of the previous assessment have not changed, the outcome of the assessment remains valid. However, it is still recommended that a detailed assessment is undertaken to consider specific site and nearby building conditions to quantify allowable charge sizes. Discussion on the modification required to the blasting condition, as set with the Major Project approval, is provided in **Section 12.4.2**.

12.3.2 Operation

Operational Noise Assessment

The key changes to the Concept Plan and Major Project that would change the noise contributions from the Outer Harbour Development, as approved, include:

- Additional bulk train movements to facilitate the increase in operational throughput of bulk cargo.
- A larger operational area for the multi-purpose terminal under Stage 1, noting however, a minor reduction in the total reclamation footprint is proposed.
- Enclosed storage sheds and conveyor systems for dry bulk cargo.
- A combination of storage sheds and stockpiles for break bulk cargo.
- Redistribution of noise-generating activities within the Stage 1 footprint, namely the break bulk stockpile area in the southern portion of the Stage 1 footprint.

Key noise sources generally for the Concept Plan include trains idling and moving, train horns or 'toots', conveyors, cranes, ship auxiliary power units, hoppers and the unloaders (tippler or dump unloader), forklifts, container handling and internal truck movements.

There is also an improved understanding of rail and terminal operations based on further rail planning and engineering design work undertaken by PKOPL associated with the Major Project. This has resulted in some adjustments to the original assumptions for the previous Environmental Assessment. As such, while only some aspects of the Major Project and the Concept Plan development would be modified, the assessment reassesses the whole development for completeness and to satisfy the DGRs.

The 'reasonable' worst case scenario considered for the assessment of the Concept Plan and the Major Project (as modified) assumed the following:

- All berths would be occupied by the largest vessel for which the berth was designed. That is, all seven berths (five berths for Panamax size vessels, one berth for Cape size vessels and one berth for Super Post-Panamax size vessels) for the Concept Plan and one berth (for Cape size vessels) for the Major Project (Stage 1), with the use of auxiliary power units (APUs).
- Rail movements based on predicted rail movements generated by bulk, general cargo and terminal operations, with rail movements arriving consistently over a 24 hour period. Assumptions concerning number of trains and the behaviour of trains within the bulk loops and sidings were determined in consultation with AECOM rail engineers and PKOPL.
- The bulk storage sheds would be suitably designed so that noise emissions from these operations would be negligible at all sensitive receiver locations.
- The enclosed conveyors and transfer towers would be enclosed with the adoption of specific sound power levels.

- The truck movements on the site would be equal to the peak hour truck movements during day, evening and night time periods.
- Tonal reverse alarms have been assumed for general truck delivery operations. However, a penalty was not applied when assessed for sleep disturbance.

Major Project (Stage 1)

For the intrusiveness assessment, the full results are provided in **Table 12-17**. In summary, the following exceedances were identified:

- Exceedances of up to 5 dB, 6 dB and 7 dB during the day, evening and night, respectively during neutral conditions at sensitive receivers R2 and R3.
- Exceedances up to 6 dB and 7 dB during the evening and night, respectively under inversion conditions at sensitive receivers R2, R3, R6 and R8. R6 is the only sensitive receiver of the four that would not experience an exceedance in the evening period. Refer to **Figure 12-2** for the results of this scenario.
- Exceedances up to 6 dB during the day during a 3 m/s wind conditions, with three receivers during the daytime period (R2, R3 and R8).

Table 12-17 Major Project - intrusive - no mitigation, operational noise modelling results

Receiver Number	Criteria, dB(A)	Predicted Noise Levels, dB(A) and Exceedances, dB Under Meteorological Conditions					
	Day/ Evening/ Night	Neutral Conditions	Exceedance Day / Evening / Night	Temperature Inversion Evening / Night	Exceedance	3 m/s wind (Day)	Exceedance, Day
R1	52 / 50	37	- / - / -	40	- / -	41	-
R2	52 / 51 /50	55	**3** / **4** / **5**	56	**5** / **6**	56	**4**
R3	52 / 51 / 50	57	**5** / **6** / **7**	57	**6** / **7**	58	**6**
R4	52 / 51 / 50	38	- / - / -	40	- / -	41	-
R5	52 / 51 / 50	45	- / - / -	47	- / -	48	-
R6	44 / 44 / 42	41	- / - / -	43	**- / 1**	44	-
R7	44 /44 / 42	38	- / - / -	41	- / -	42	-
R8	44 / 44 / 42	41	- / - / -	45	**1** / **3**	46	**2**
R9	52 / 51 /50	27	- / - / -	30	- / -	30	-
R10	50 / 50/ 50	40	- / - / -	43	- / -	44	-
R11a	50 / 50/ 50	40	- / - / -	43	- / -	44	-
R11b	50 / 50 / 50	41	- / - / -	44	- / -	45	-
R12	65 / 65 / 65	43	- / - / -	46	- / -	47	-
R13	70 / 70 / 70	47	- / - / -	49	- / -	50	-
R14	70 / 70 / 70	56	- / - / -	57	- / -	57	-

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\Projects\603\603095813 Port_Kembla_Mod4. Tech work area\4.7 Graphics\FIGURES\603095813 F12-2 Major Project - Intrusive - No Mitigation - F Class Thermal Inversion 21 11 2013 TO

AECOM

MAJOR PROJECT - INTRUSIVE - NO MITIGATION - F-CLASS THERMAL INVERSION - EVENING AND NIGHT

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 12-2

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For the amenity assessment, the full results are provided in **Table 12-18**. In summary, the following exceedances were identified:

- Exceedances of up to 2 dB and 3 dB during the evening and night, respectively during neutral conditions at sensitive receivers R2, R3 and R8. R8 is the only sensitive receiver of the three that would not experience an exceedance the evening period.
- Exceedances up to 3 dB and 6 dB during the evening and night, respectively under inversion conditions at sensitive receivers R2, R3, R6, R7 and R8 (refer to **Figure 12-3**). Only R2 and R3 would experience an exceedance in the evening period.
- No exceedances were predicted for receivers during the daytime period during 3 m/s wind conditions.

Table 12-18 Major Project - amenity - no mitigation, operational noise modelling results

Receiver Number	Criteria, dB(A)	Predicted Noise Levels, dB(A) and Exceedances, dB Under Meteorological Conditions					
	Day/ Evening/ Night	Neutral Conditions	Exceedance Day / Evening / Night	Temperature Inversion	Exceedance Evening / Night	3 m/s wind	Exceedance , Day
R1	52 / 43 /42	30	- / - / -	34	- / -	35	-
R2	52 / 43 / 42	44	- / **1** / **2**	45	**2** / **3**	46	-
R3	52 / 43 / 42	45	- / **2** / **3**	46	**3** / **4**	47	-
R4	52 / 43 / 42	30	- / - / -	33	- / -	34	-
R5	52/ 43 / 42	37	- / - / -	40	- / -	41	-
R6	60 / 48 / 37	36	- / - / -	39	- / **2**	40	-
R7	60 / 48 / 37	36	- / - / -	40	- / **3**	41	-
R8	60 / 48 / 37	40	- / - / **3**	43	- / **6**	44	-
R9	52 / 43 /42	22	- / - / -	26	- / -	26	-
R10	50 / 50/ 50	36	- / - / -	40	- / -	41	-
R11a	50 / 50/ 50	37	- / - / -	41	- / -	42	-
R11b	50 / 50 / 50	37	- / - / -	41	- / -	42	-
R12	65 / 65 / 65	41	- / - / -	43	- / -	44	-
R13	70 / 70 / 70	39	- / - / -	41	- / -	42	-
R14	70 / 70 / 70	44	- / - / -	46	- / -	46	-

Mitigation measures have been identified and all scenarios re-assessed to determine what reductions could be achieved. These are discussed further in **Section 12.4**.

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\Projects\603\603095813 Port_Kembla_Mod4. Tech work area\4.7 Graphics\FIGURES\603095813 F12-7 Major Project - Amenity - Mitigation - F Class Thermal Inversion Evening and Night 21 11 2013 TO

AECOM

MAJOR PROJECT - AMENITY - MAJOR PROJECT - MITIGATION - F-CLASS THERMAL INVERSION - EVENING AND NIGHT

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 12-7

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Concept Plan

For the intrusiveness assessment, the full results are provided in **Table 12-19**. In summary, the following exceedances were identified:

- Exceedances of up to 9 dB, 10 dB and 11 dB during the day, evening and night, respectively during neutral conditions at sensitive receivers R2, R3, R6 and R8.
- Exceedances up to 11 dB and 12 dB during the evening and night respectively under inversion conditions at sensitive receivers R2, R3, R5, R6, R7 and R8. R5 is the only sensitive receiver of the six that would not experience an exceedance in the evening period. The results are presented in **Figure 12-4**.
- Exceedances up to 10 dB during the day during a 3 m/s wind conditions, with five receivers during the daytime period (R2, R3, R6, R7 and R8). The results are presented in **Figure 12-5**.

Table 12-19 Concept Plan - intrusive - no mitigation, operational noise modelling results

Receiver Number	Criteria, dB(A)	Predicted Noise Levels, dB(A) and Exceedances, dB Under Meteorological Conditions					
	Day/ Evening/ Night	Neutral Conditions	Exceedance Day / Evening / Night	Temperature Inversion Evening / Night	Exceedance	3 m/s wind (Day)	Exceedance, Day
R1	52 / 50	40	- / - / -	43	- / -	44	-
R2	52 / 51 /50	61	**9 / 10 / 11**	62	**11** / **12**	62	**10**
R3	52 / 51 / 50	59	**7 / 8 / 9**	59	**8** / **9**	60	**8**
R4	52 / 51 / 50	40	- / - / -	43	- / -	44	-
R5	52 / 51 / 50	48	- / - / -	51	- / **1**	51	-
R6	44 / 44 / 42	46	**2 / 2 / 4**	49	**5** / **7**	49	**5**
R7	44 /44 / 42	42	- / - / -	46	**2** / **4**	47	**3**
R8	44 / 44 / 42	46	**2 / 2 / 4**	50	**6** / **8**	51	**7**
R9	52 / 51 /50	30	- / - / -	34	- / -	34	-
R10	50 / 50/ 50	43	- / - / -	47	- / -	47	-
R11a	50 / 50/ 50	45	- / - / -	48	- / -	49	-
R11b	50 / 50 / 50	45	- / - / -	49	- / -	49	-
R12	65 / 65 / 65	48	- / - / -	51	- / -	52	-
R13	70 / 70 / 70	50	- / - / -	52	- / -	53	-
R14	70 / 70 / 70	61	- / - / -	61	- / -	61	-

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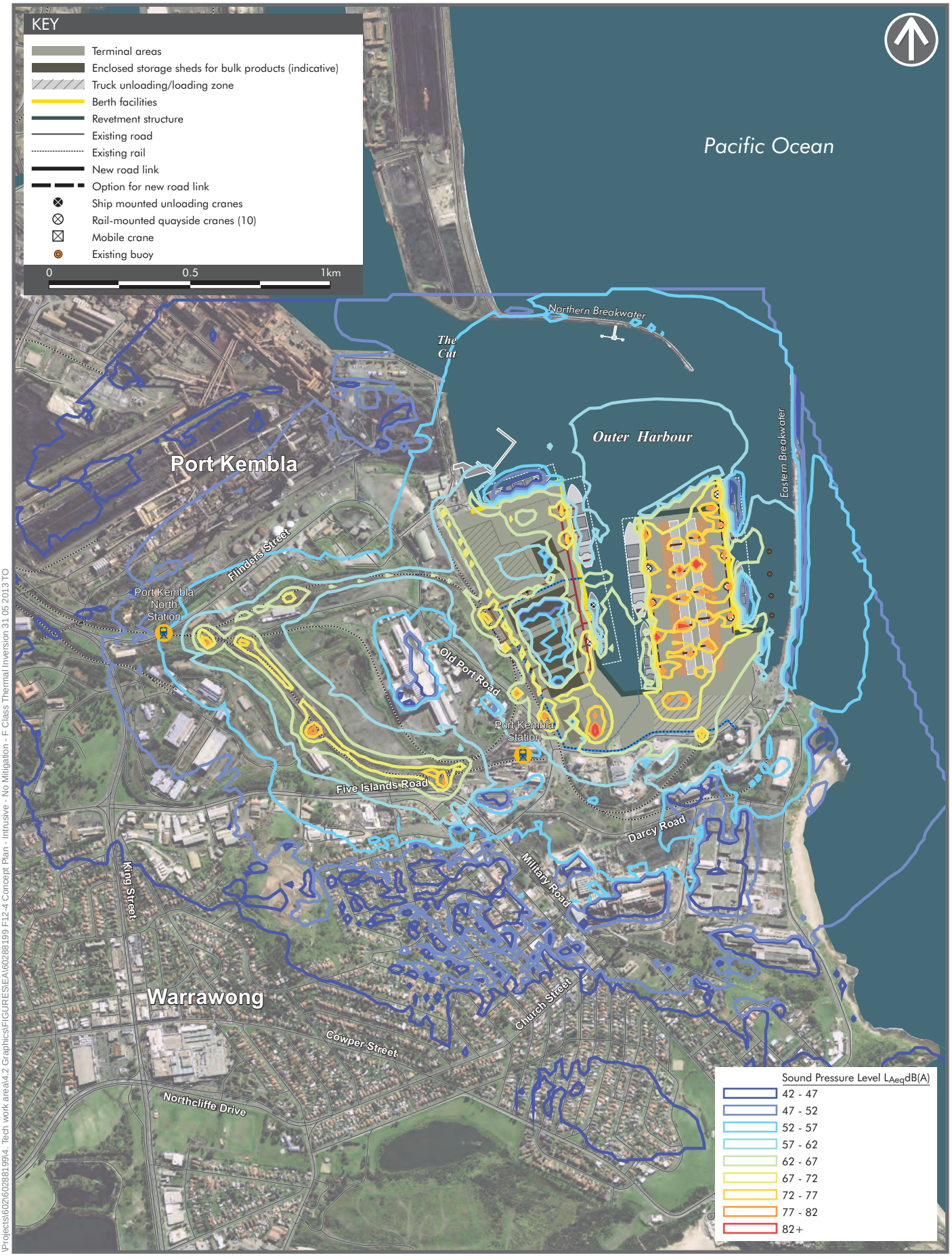


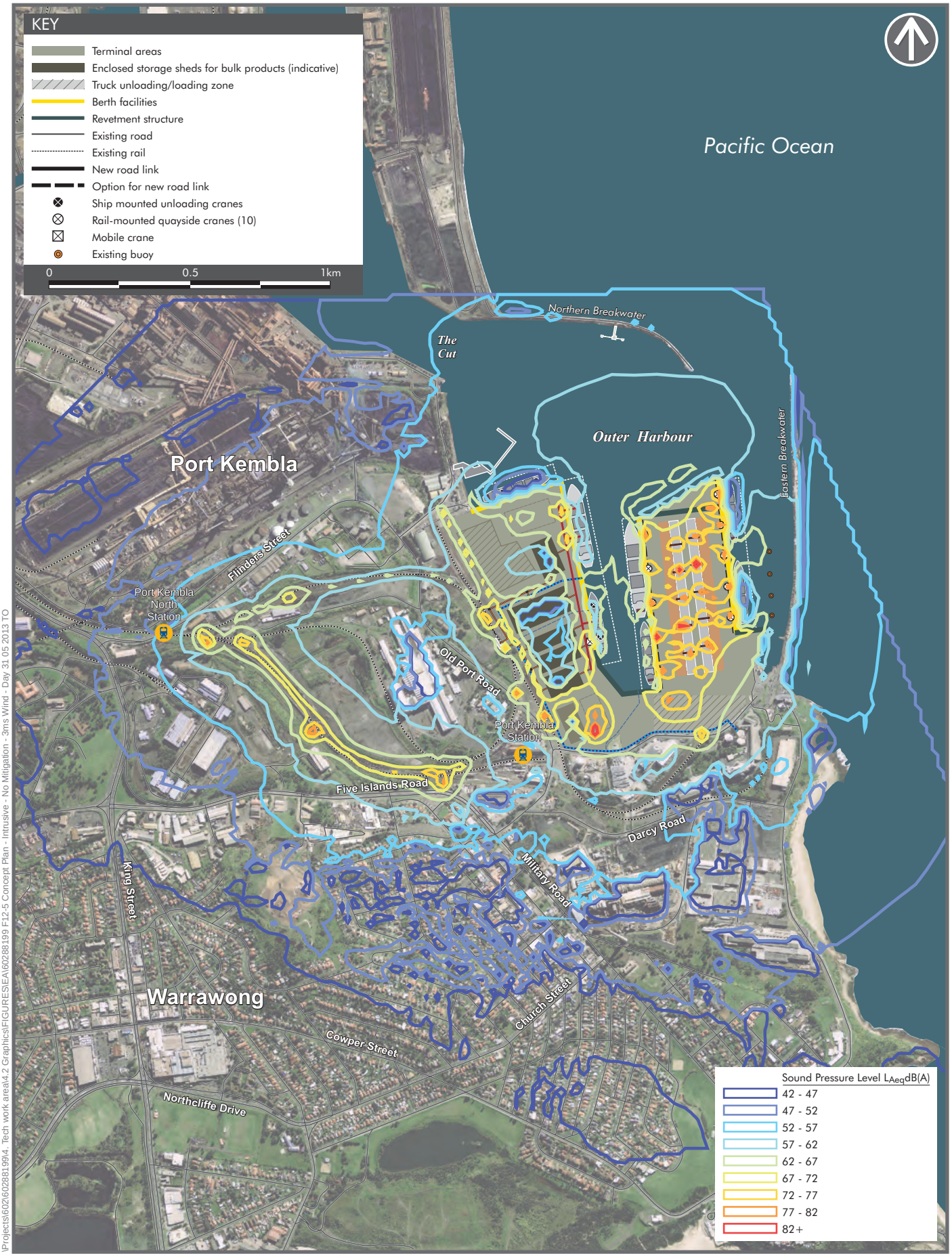
\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F12-4 Concept Plan - Intrusive - No Mitigation - F Class Thermal Inversion 31 05 2013 TO

AECOM

CONCEPT PLAN - INTRUSIVE - NO MITIGATION - F-CLASS THERMAL INVERSION - EVENING AND NIGHT

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 12-4



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AECOM

CONCEPT PLAN - INTRUSIVE - NO MITIGATION - 3 M/S WIND - DAY

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 12-5

For the amenity assessment, the full results are provided in **Table 12-20**. In summary, the following exceedances were identified:

- Exceedances of up to 3 dB, 12 dB and 13 dB during the day, evening and night, respectively during neutral conditions at sensitive receivers (R2, R3, R5, R6, R7 and R8). Only R2 would experience an exceedance during the day and only R2 and R3 would experience an exceedance during the evening.
- Exceedances up to 12 dB and 13 dB during the evening and night respectively under inversion conditions at sensitive receivers R2, R3, R5, R6, R7 and R8. Only R6 and R7 would not experience an exceedance in the evening period. The results are presented in **Figure 12-6**.
- Exceedances up to 3 dB were predicted for receivers during the daytime period at sensitive receivers R2 and R3 during 3 m/s wind conditions.

Mitigation measures have been identified and all scenarios re-assessed to determine what reductions could be achieved. These are discussed further in **Section 12.4**.

Table 12-20 Concept Plan - amenity - no mitigation, operational noise modelling results

Receiver Number	Criteria, dB(A)	Predicted Noise Levels, dB(A) and Exceedances, dB Under Meteorological Conditions					
	Day/ Evening/ Night	Neutral Conditions	Exceedance Day / Evening / Night	Temperature Inversion	Exceedance Evening / Night	3 m/s wind	Exceedance , Day
R1	52 / 43 /42	35	- / - / -	40	- / -	40	-
R2	52 / 43 / 42	55	**3** / **12** / **13**	55	**12** / **13**	55	**3**
R3	52 / 43 / 42	51	- / **8** / **9**	52	**9** / **10**	53	**1**
R4	52 / 43 / 42	34	- / - / -	38	- / -	38	-
R5	52/ 43 / 42	43	- / - / **1**	46	**3** / **4**	47	-
R6	60 / 48 / 37	43	- / - / **6**	46	- / **9**	47	-
R7	60 / 48 / 37	41	- / - / **4**	45	- / **8**	45	-
R8	60 / 48 / 37	45	- / - / **8**	49	**1** / **12**	49	-
R9	52 / 43 /42	28	- / - / -	32	- / -	32	-
R10	50 / 50/ 50	41	- / - / -	45	- / -	45	-
R11a	50 / 50/ 50	43	- / - / -	47	- / -	48	-
R11b	50 / 50 / 50	43	- / - / -	47	- / -	47	-
R12	65 / 65 / 65	46	- / - / -	49	- / -	50	-
R13	70 / 70 / 70	44	- / - / -	46	- / -	47	-
R14	70 / 70 / 70	57	- / - / -	57	- / -	58	-

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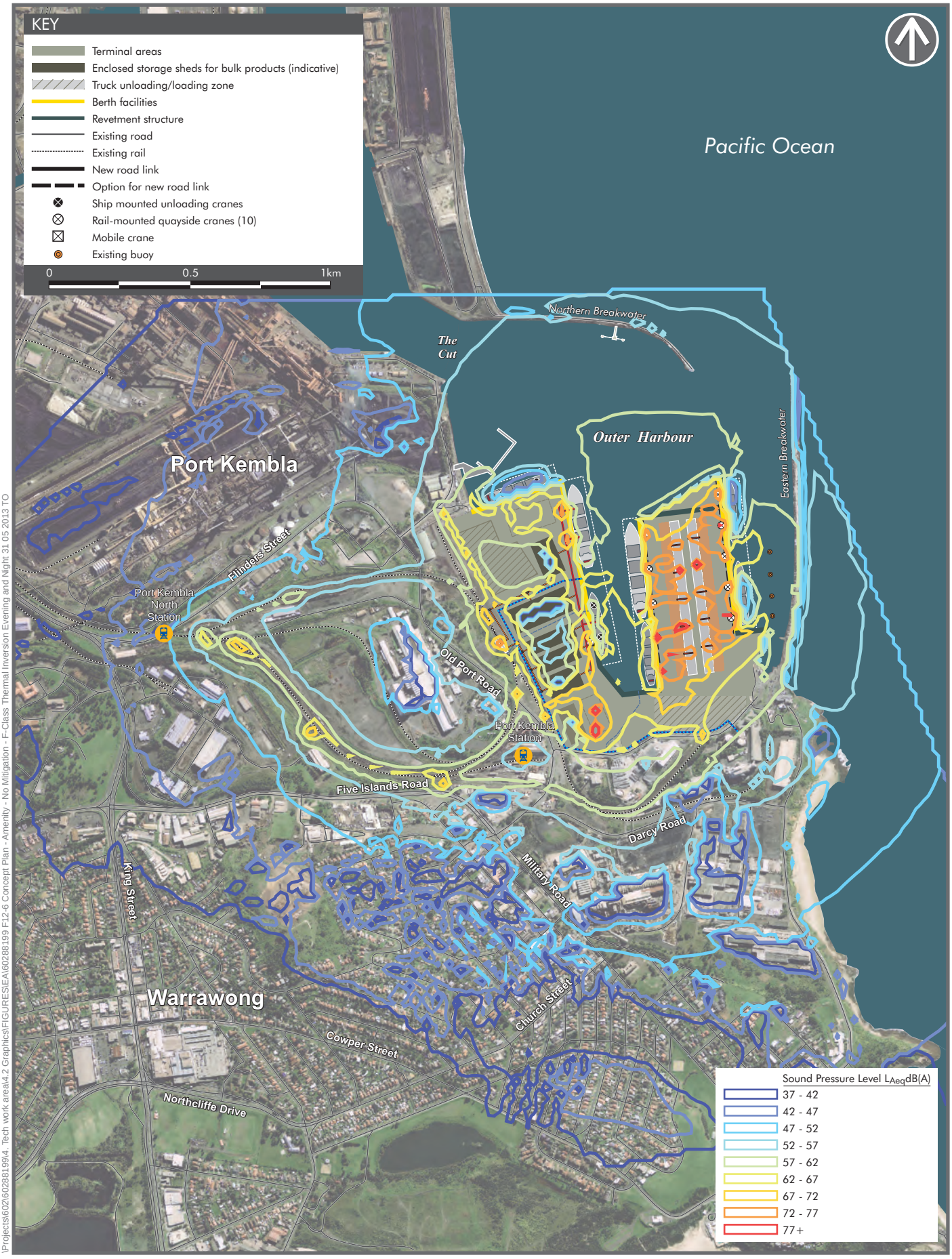

\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881994 F12-6 Concept Plan - Amenity - No Mitigation - F-Class Thermal Inversion Evening and Night 31 05 2013 TO

AECOM

CONCEPT PLAN - AMENITY - NO MITIGATION - F-CLASS THERMAL INVERSION - EVENING AND NIGHT

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 12-6

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12.3.3 Sleep Disturbance

A sleep disturbance assessment has been undertaken in accordance with the INP Application Notes and with consideration of the NSW RNP sleep disturbance research. The assessment is applicable to the Concept Plan and Major Project as it relates to loud noises which would be common to all stages of development. Metal 'clangs' from the container operations and noise from train horns are likely to provide the greatest L_{A1} values. As such, these activities have been assessed.

Train horns are currently sounded at night in three locations within the balloon loop at the Outer Harbour, which includes the South Yard. Horns are currently used as trains cross the at-grade rail crossing on the eastern side of the rail loop on Old Port Road, at Foreshore Road and as trains join the main line at Flinders Street Bridge.

A number of options are being investigated for the treatment of the rail crossing on Old Port Road, which includes a temporary or permanent closure of the crossing or grade separation of the crossing. Should the crossing be permanently closed or grade separated it would nullify the train horn noise issue for this location.

As part of the previous Environmental Assessment, it was noted that PKOPL would commit to the use of short duration horn 'toots' being included in the noise management plan for the Outer Harbour Development. As such, this assessment has only looked at the impacts of horn 'toots' in contrast to blasts. A horn 'toot' is generally considered to be less than a second in duration, while a horn 'blast' may persist for 2 to 3 seconds.

The results of the sleep disturbance assessment are presented in **Table 12-21**. The results show that the sleep disturbance screening criteria would be breached at receivers R2, R6, R7 and R8 by up to 3 dB. A further investigation has been undertaken against the sleep disturbance awakening reaction criteria. The results of this assessment show compliance at each of the identified receivers.

The predicted external impact at R2 is 61 dB(A), giving a likely internal impact (with an open window) of approximately 51 dB(A). This is unlikely to result in awakening reactions, which is supported by the fact that train horns are currently sounded at this location without complaint.

The Major Project would increase the number of train movements at night, whereas no additional train movements would occur to that approved for Stages 2 and 3. Therefore, while it is likely that the number of times the train horns are sounded would increase for Concept Plan operations, there would be compliance with the sleep disturbance awakening reaction criteria.

Table 12-21 Sleep disturbance results

Receiver	Receiver Type	Predicted $L_{A1(1min)}$, dB(A)	Sleep disturbance - screening criteria	Exceedance – screening criteria	Sleep disturbance criteria – awakening reaction	Exceedance – awakening reaction
R1	Residential	54	60	-	65	-
R2	Residential	61	60	**1**	65	-
R3	Residential	59	60	-	65	-
R4	Residential	53	60	-	65	-
R5	Residential	54	60	-	65	-
R6	Residential	55	52	**3**	65	-
R7	Residential	55	52	**3**	65	-
R8	Residential	53	52	**1**	65	-
R9	Residential	35	60	-	65	-
R10	School	52	N/A[1]	-	N/A[1]	-
R11a	Place of worship	53	N/A[1]	-	N/A[1]	-

Receiver	Receiver Type	Predicted $L_{A1(1min)}$, dB(A)	Sleep disturbance - screening criteria	Exceedance – screening criteria	Sleep disturbance criteria – awakening reaction	Exceedance – awakening reaction
R11b	Place of worship	53	N/A[1]	-	N/A[1]	-
R12	Commercial	60	N/A[1]	-	N/A[1]	-
R13	Industrial	57	N/A[1]	-	N/A[1]	-
R14	Industrial	63	N/A[1]	-	N/A[1]	-

1 – There is no requirement to assess non-residential receivers against a sleep disturbance criteria.

12.3.4 Operation – Vibration

Tactile Vibration

Vibration intensive operations remain unchanged from the previous Environmental Assessment, with train movements representing the only source of vibration intensive operations. Given that the distance offset is unchanged for the modification, the tactile vibration assessment from the previous Environmental Assessment remains unchanged and further assessment has not been undertaken for the purposes of the proposed modification.

Regenerated Noise

Train movements associated with the Outer Harbour Development represent the only likely source of regenerated noise. Given that the distance offset is unchanged for the modification, the regenerated noise assessment from the previous Environmental Assessment remains unchanged and further assessment has not been undertaken for the purposes of the proposed modification.

The previous Environmental Assessment concluded that regenerated noise criteria for the closest commercial receiver located on Foreshore Road has not been assessed as it is anticipated that the regenerated noise would be masked by air-borne noise associated with train movements. Therefore, further assessment of regenerated noise is not required.

12.3.5 Road Traffic Noise Assessment

The proposed modification would result in a minor increase in road traffic movements associated with the Major Project and the Concept Plan, with an additional eight vehicle movements during the peak hour. The increase is associated with employees travelling to/from the Outer Harbour Development. The contribution of the total contribution of the Concept Plan and Major Project (Stage 1) would be less than 0.5 dB(A) at residences along Five Islands Road and Masters Road. This would comply with the EPA's RNP noise criteria during the daytime and night time periods.

12.3.6 Cumulative Noise

The CGM was approved in September 2011, and the approval includes noise limits for the operations at the site. In the case that the CGM does produce these predicted noise levels at receiver locations, then it can be expected that the cumulative industrial noise contribution would likely increase by 2 to 3 dB(A) from the predicted noise levels in the noise assessment for the Outer Harbour Development modification.

It is anticipated that there will be a period of time between the CGM commencing its operation to when Stage 1 operations begin at the multi-purpose terminal. This lead time will provide an opportunity to monitor the noise levels from the CGM and investigate any potential exceedances of noise limits in a cumulative context.

PKOPL would be responsible for noise emissions from the Major Project and the Concept Plan, and PKOPL has identified a suite of mitigation measures that would reduce noise contributions. Cement Australia would be responsible for noise emissions from the CGM.

Existing approval conditions for the Outer Harbour Development require noise monitoring and management which would include the progressive assessment of noise emissions as the cargo capacity of the development increases over time. This provides an opportunity for PKOPL to consider and implement any additional noise mitigation measures that may be required at each stage of development to address any cumulative noise impacts. There will also be a greater appreciation of the operational requirements for the future stages, which may alter the conservative assumptions applied in this assessment.

12.4 Mitigation and Management Measures

12.4.1 Construction

Construction Noise

All construction activities associated with the Major Project (Stage 1), with the exception of the rail infrastructure upgrades, are predicted to comply with the daytime and night time noise management levels as presented in **Section 12.3.1**. Similarly, exceedances under a cumulative worst case construction scenario were identified.

The use of temporary noise barriers to shield the use of demolition saws and other noise intensive equipment used in the South Yard during rail infrastructure upgrades would reduce the predicted impact by up to 10 dB(A) from the demolition saws and up to 5 dB(A) for other noise intensive equipment. It is also important to note that the demolition saws are only likely to be operational for a fraction of the construction assessment period. Furthermore, it is recommended that the Construction Noise and Vibration Management Plan (CNVMP) for the South Yard construction works identifies respite periods when demolition saws cannot be used.

The existing conditions of approval and Statement of Commitments provide a framework for managing construction noise during Stage 1, including the implementation of a Construction Noise and Vibration Management Plan. In particular, the Major Project Approval Condition C6 requires the implementation of all reasonable and feasible noise mitigation measures (as necessary) to achieve the construction noise management levels (Major Project Approval Condition C6). This condition also recognises that where noise would be above the noise management levels, that these activities are identified and managed in accordance with the CNVMP.

These existing conditions and Statement of Commitments are considered to be appropriate for managing the potential impacts during the construction of the Major Project (Stage 1).

Future project applications for Stage 2 and Stage 3 would assess construction noise impacts, and identify any appropriate mitigation and management measures, at that point in time. Any cumulative impact from the construction and operation of future stages with Stage 1 would also be assessed at that point in time. The Cumulative Impact Protocol, as required by the Concept Plan approval Condition 2.29, would also provide the framework for managing and monitoring any such cumulative noise impacts.

Construction Vibration

Minimum safe working distances have been provided for vibration intensive plant to minimise risk of structural damage or human discomfort. In doing so, it is recommended that on site vibration measurements are conducted as a part of the CNVMP in order to determine site specific safe working distances. Mitigation measures would be developed further in the CNVMP.

Blasting

The Major Project Approval Condition C10 specifies the following criteria for ground vibration peak particle velocity from blasting operations:

- Ground vibration peak particle velocity from blasting operations at the project shall not exceed 5mm/sec for more than five percent of the total number of blasts over each reporting period and shall not exceed 10mm/sec at any time.

The Major Project Approval Condition C11 allows the use of blasting trials, as well as the need to monitor compliance with that condition.

It is noted that the above criteria does not specify where the criteria would need to be satisfied, and the type of receiver – that is industrial, commercial or residential. The criteria are typically applied to residential receivers and other sensitive land uses, not industrial receivers. Further, it does not provide a process for entering into agreements with landowners where vibration levels cannot be met. As such, it is recommended that P&I consider the suggested criteria, as provided in **Table 12-6** as an alternative to the Condition C10 in the Major Project Approval. The suggested criteria consider both human comfort and structural damage.

12.4.2 Operation

Operational Noise

As identified in **Section 12.3.2**, exceedances at sensitive receivers were identified as a result of the Major Project (Stage 1) and the Concept Plan 'worst case' scenarios, under various meteorological conditions.

Major Project (Stage 1)

To mitigate the predicted exceedances for the Major Project (Stage 1), a number of mitigation options have been identified to target contributions from the South Yard, the southern break bulk area and operations at the multi-purpose terminal. These are the key contributors to noise that can be targeted by PKOPL, noting that achieving reductions in noise levels from vessel APUs is out of the control of PKOPL.

As such, the following mitigation options have been identified and applied to the noise model under the various scenarios to determine what reductions could be achieved:

- A 420-metre-long, eight-metre-high acoustic barrier along part of the South Yard adjacent to the residential area on the opposite side of Five Islands Road to reduce noise from rail operations. This would require further consideration to determine if this is reasonable or feasible, with consideration of matters such as the location, height, land ownership, constructability and visual impacts.
- The partial enclosure of the open southern break bulk area with a shed with an opening to the north.
- Reduction of sound power levels of the ship unloader by 3 dB, which is considered to be feasible through the selection of enclosures
- Reduction of sound power levels for the rail tippler unloader by 3 dB, which is considered to be to be feasible by using enclosures.

These are indicative mitigation measures and are subject to detailed investigation.

As a result of these mitigation measures, the following was observed:

- There would be no exceedance of the intrusive criteria at all the sensitive receivers during all assessment periods and meteorological conditions.
- There would be no exceedance of the amenity criteria at all the sensitive receivers during all assessment periods and meteorological conditions, except for R8. This sensitive receiver is predicted to experience an exceedance of 2 dB(A) during the evening period and under temperature inversion conditions (refer to **Figure 12-7**).

As mentioned earlier, the final selected mitigation measures would be confirmed through the Operational Noise and Vibration Management Plan (ONVMP) for Stage 1. A number of proposed amendments to the Statement of Commitments are proposed to reflect the final selection as well as confirming the feasibility of the suggested mitigation measures.

It is also proposed that the ONVMP would identify stages of operations where the development would exceed the criteria and require mitigation measures. This would enable the progressive implementation of mitigation measures to reflect the increases in bulk cargo growth over time. Noise level in the area would be regularly audited through the Noise Verification Monitoring program. Based on these levels mitigation measures would be planned for implementation when levels approach the project criteria. Each noise source would be taken into consideration, with mitigation measures being investigated for the higher noise contributors.

It is also proposed that P&I modify Major Project Approval Condition D1 to reflect this assessment. As noted, these noise levels were based on predicted noise levels of the previous assessment.

<u>Rail Noise (Stage 1)</u>

Rail noise emissions associated with the Stage 1 operations has been assessed against the NSW INP. It is recommended that noise outside of the development be assessed as part of a larger review of the rail network by the rail infrastructure providers who are planning to upgrade capacity. Rail activities within the areas within the Outer Harbour that are under the control of PKOPL have been included in the operational scenarios which have been assessed against the INP criteria.

Sleep Disturbance (Stage 1)

The additional train horn soundings associated with the Major Project would unlikely result in awakening reactions at the worst affected noise sensitive receivers. However, the following strategies have been proposed to minimise disturbances:

- Operations would be managed to restrict trains from re-joining the main line at the southern end of the South Yard, which is in close proximity to receivers on Wentworth Avenue and Military Road. Trains would instead pass through the South Yard on a siding and re-join the main line at the Flinders Street Bridge, which is further removed from the closest residential receivers.
- No train horns would be sounded when trains move onto sidings from the main line.
- The option to permanently close or grade separate the level rail crossing at Old Port Road would eliminate the need for horn soundings at this location.

These measures would be documented in the ONVMP.

Concept Plan

The mitigation options identified for the Major Project would contribute to noise reductions for the total Concept Plan, however, exceedances against the amenity and intrusiveness criteria would still remain at certain sensitive receivers. However, it is noted that the Concept Plan conservatively assumes seven vessels at berth. This is considered to be a worst case scenario and has a low probability of occurring. The assessment is also modelled on the potential simultaneous movement of trains through the unloaders, which is a very conservative assessment.

As such, the following mitigation options have been identified and applied to the noise model under the various scenarios to determine what reductions could be achieved:

- Reduction of sound power levels of all rail-mounted gantry cranes and quayside cranes (rail-mounted) through selection of equipment or through the application of noise treatments to achieve reductions of 3 dB.
- Further treatment of rail noise sources, such as through the use of barriers or sheds. However, this would need to be tested for reasonableness and feasibility as initial investigations indicate that a sizeable barrier with a roof would only achieve a 1 dB noise reduction at the nearest residential sensitive receiver.

As a result of these mitigation measures, the following was observed (refer to **Figure 12-8** to **Figure 12-10**):

- Exceedances of the intrusive criteria up to 1 dB during the night under neutral conditions at sensitive receivers R3, R6 and R8.
- Exceedances of the amenity criteria of 2 dB to 6 dB during the evening and night time periods under neutral conditions at sensitive receivers R2, R3, R6, R7 and R8.
- Exceedances of the intrusive criteria up to 3 dB and 5 dB during the evening and night time period respectively under inversion conditions at R2, R3, R6, R7 and R8.
- Exceedances of the amenity criteria up to up to 4 dB and 10 dB during the evening and night time period respectively under inversion conditions at R2, R3, R5, R6, R7 and R8.
- Exceedances of the intrusive criteria to 1 dB to 4 dB during the daytime period and during 3 m/s wind conditions at sensitive receivers R3, R6 and R8.
- No exceedances of the amenity criteria during 3 m/s wind conditions at all sensitive receivers

It is acknowledged that the concept plan noise levels are predicted to exceed the relevant criteria by up to 10 dB at one receiver during the night. While 10 dB is a considerable exceedance it is important to recognise that the development of the Concept Plan would occur over 25 to 30 years. Future assessments would need to consider noise contributions and mitigation strategies, which can feasibly reduce noise contributions from the total Outer Harbour Development. This is consistent with the approvals framework established within the Concept Plan approval, which includes the Cumulative Impact Protocol (Condition 2.29).

Noise emissions from APUs could also lead to reductions to the noise exceedances. However, as noted previously, PKOPL does not have control of the equipment associated with vessels that would use the Port. The Concept Plan approval Condition 2.26, which requires investigation into the feasibility of shore based power, may assist in reducing noise emissions.

Sleep Disturbance

The additional train horn soundings associated with the Major Project would unlikely result in awakening reactions at the worst affected noise sensitive receivers. However, in addition to those measures identified for the Major Project (Stage 1), the removal of the Foreshore Road crossing to eliminate the need for train horns would be considered. Sleep disturbance impacts would also be considered in future assessments for Stage 2 and Stage 3.

Operational Vibration

Operational vibration levels are unlikely to change from the previous Environmental Assessment based on the modifications. Therefore no additional mitigation has been recommended.

Road Traffic Noise

Given that road traffic levels are not predicted to result in a significant contribution to road traffic noise, no specific mitigation has been proposed.

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AECOM

MAJOR PROJECT - AMENITY - MAJOR PROJECT MITIGATION - F-CLASS THERMAL INVERSION - EVENING AND NIGHT

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FIGURE 12-7

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CONCEPT PLAN - INTRUSIVE - CONCEPT PLAN MITIGATION - F-CLASS THERMAL INVERSION - EVENING AND NIGHT

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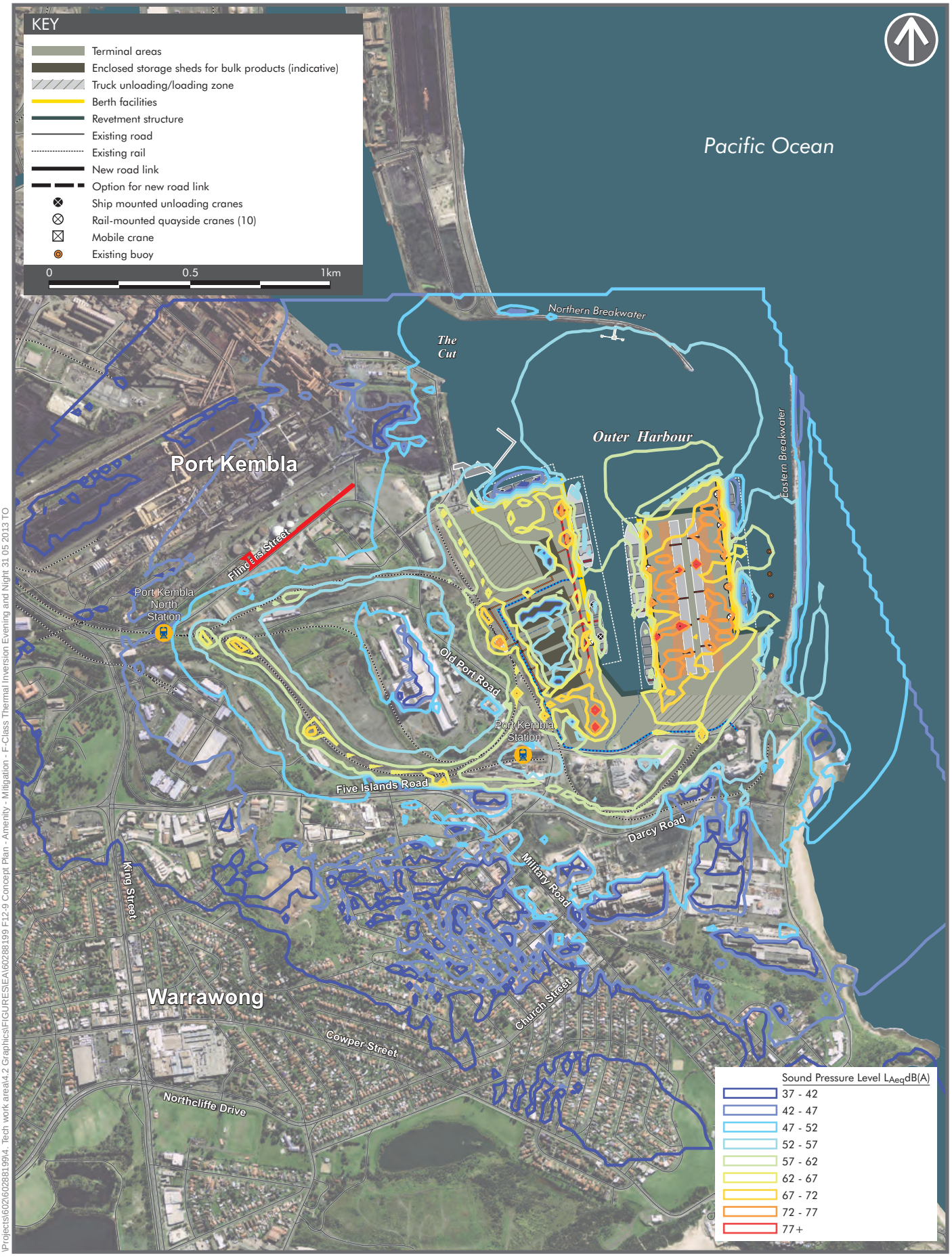
FIGURE 12-8



\Projects\602\602881994. Tech work area\4.2 Graphics\FIGURES\EA\602881199 F12-9 Concept Plan - Amenity - Mitigation - F-Class Thermal Inversion Evening and Night 31 05 2013 TO

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CONCEPT PLAN - AMENITY - CONCEPT PLAN MITIGATION - F-CLASS THERMAL INVERSION - EVENING AND NIGHT

Port Kembla Outer Harbour Development
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FIGURE 12-9

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AECOM

CONCEPT PLAN - INTRUSIVE - CONCEPT PLAN MITIGATION - 3 M/S WIND - DAY

Port Kembla Outer Harbour Development
Environmental Assessment

FIGURE 12-10

12.5 Conclusion

Construction noise impacts associated with the Major Project (Stage 1) have been re-assessed to reflect the additional construction activities that would occur as result of the proposed modification. For example, there would be additional construction activity associated with the rail infrastructure upgrades in the North and South Yard. Similar to the previous Environmental Assessment, it is anticipated that the proposed activities in the South Yard would result in exceedances of the noise management levels. The CNVMP would identify approaches to manage these exceedances, and measures such as temporary acoustic barriers and respite periods have been recommended for the South Yard. A recommendation to modify the blasting condition within the Major Project approval has also been identified. The current wording of the condition means that it cannot be complied with and is overly restrictive. As such, a suggested alternative has been proposed as part of this modification request.

The proposed modification would change noise contributions associated with the operations of the Major Project (Stage 1) and the Concept Plan. For example, the additional train movements, the bulk unloaders and the increased and reconfigured operational footprint under Stage 1 would increase noise levels at nearby sensitive receivers. While the use of enclosed storage sheds and conveyor systems would assist in reducing noise contributions, the assessment of the reasonable worst case scenario has found that exceedances would occur at sensitive receives for the Major Project and Concept Plan. Mitigation measures have been identified for the Major Project, which would reduce noise levels to within the assessment criteria, except at one location where a 2 dB exceedance would occur. The mitigation options would be confirmed through a ONVMP, and would be progressively implemented to reflect the growth in bulk cargo throughput.

For the Concept Plan, under the worst case scenario, there are predicted exceedances at a number of sensitive receivers after the mitigation. This includes an exceedance of up to 10 dB at one receiver during the night time period. While 10 dB is a considerable exceedance it is important to recognise that the development of the Concept Plan would occur over 25 to 30 years. Future assessments would need to consider noise contributions and mitigation strategies, which can feasibly reduce noise contributions from the total Outer Harbour Development. This is consistent with the approvals framework established within the Concept Plan approval, which includes the Cumulative Impact Protocol (Condition 2.29).

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