

Appendix I  
Port noise maps

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## I. 1 Overview

The noise maps in this Appendix have been developed in accordance with the Port Noise Policy, the Vessel Noise Guideline (Appendix F) and the Landside Precinct Noise Guideline (Appendix G). The noise emissions from the port at White Bay and Glebe Island comprise the following noise sources:

- vessels
- landside activities

Noise maps for vessels have been prepared for the following scenarios over the most sensitive night time period:

- historical, current and future annual exposure levels
- current and future summer and winter seasonal exposure levels

The seasons are defined through the following months:

- summer – December to February
- winter – June to August

The vessel noise exposure maps may be used to compare relative noise exposure at different locations around the port over a year or the summer and winter season. They may also be used to compare the noise exposure between different years. The exposure maps show the combined effect of how busy the port is and how noisy the vessels are.

To compare the noise levels at different locations, the noise levels from each berth are given in the accompanying table. The tables also show vessel's length of stay at each berth and the number of days per year the berth is occupied.

Other noise maps show representative worst case day and night time noise levels. These differ from the exposure maps and assume that multiple vessels are using the port simultaneously and do not consider the length of time each vessel is in the port. They have been prepared for the following noise sources:

- landside activities
- vessels
- both vessels and landside activities

The representative worst case reflects the port operating with simultaneous activities being undertaken by all regular port users where berth allocation permits. In contrast the worst case reflects the port operating with 100% utilisation with a vessel and landside activity occurring at every berth including currently unused berths. Where there is more than one regular user of a berth, the noisiest user has been included in the scenario.

Collectively the noise maps communicate historical, current and future potential noise impacts by the port on nearby land.

The vessel movements used to generate the exposure noise maps were obtained by averaging 2 years of data to provide representative vessel movements. Maps were produced in 5 year time intervals as this has sufficient resolution to show the slowly changing cycles of port activity which is continually either building up or slowing down. Vessel source noise levels used in each scenario are presented in Section I. 5.

The accompanying tables show the inputs used to produce the noise maps. For each vessel noise map a vessel has been located at each berth which produces the noise level indicated in the table at the nearest receiver. For the exposure noise maps, the noise levels are then corrected for exposure based on the number of days when a vessel was present at each berth during the night time period for at least 1 hour. The adjusted levels from vessels at all berths are then combined to produce the noise exposure maps.

The tables also show the total number of days per year each berth was occupied and also the median and range in consecutive number of days a vessel was berthed each time the berth was occupied.

Note that this Appendix contains a map for vessel noise exposure 10 years into future, which has been prepared for indicative purposes for consultation (Section 2.1). Maps in Sections 2.2 with landside components are interim until further work is undertaken on landside noise levels under this Policy.

The worst case representative noise level noise maps for landside activities show the Benchmark Noise Level which is outlined in the Port Noise Policy and Appendix H. The Benchmark Noise Level is the sum of all Maximum Permissible Noise Levels which are the existing noise limits for each individual operator's landside activities. Noise maps where landside noise is included are interim, and will be updated based on final agreed Noise Standard for each tenant's operation. These noise maps will be prepared following a review of landside noise levels and noise limits under the Port Noise Policy.

Figure 1: Location of berths and nearest receivers to each berth



Source: SixMaps

# I. 2 Annual exposure levels

## 2.1 Projected exposure levels for 10 years in future

Figure 2: Night exposure level –10 years into future



**Table 1:** Statistical summary for vessels at berth –10 years into future

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<b>Vessel noise level<sup>1</sup></b>								
At nearest receiver (dBA)	55	55	55	55	55	55	55	55
<b>Exposure<sup>2</sup></b>								
Percentage of nights with a vessel present for at least 1 hour	27%	27%	47%	18%	1%	16%	37%	0%
Exposure adjustment for noise level based on percentage (dBA)	-5.6	-5.6	-3.3	-7.5	-18.6	-7.8	-4.3	
Exposure level at nearest receiver (dBA)	49	49	52	48	36	47	51	
<b>Consecutive occupied days per year<sup>3</sup></b>								
Median	1	1	4	3	3	2	2	0
10 <sup>th</sup> percentile	1	1	3	2	1	1	1	0
90 <sup>th</sup> percentile	2	2	11	4	4	3	6	0
<b>Total number of days occupied per year<sup>3</sup></b>								
Average	100	100	170	65	5	60	135	0

Note 1: The vessel noise levels selected are the Vessel Trigger Noise Levels for each berth.

Note 2: The exposure parameters have been derived from the projected consecutive occupied days per year.

Note 3: The number of days occupied per year from all vessel calls has been estimated based historical unloading times and unloading times under this policy. The assumed number of vessel calls have been generated based on assumptions around future trade volumes and future passenger vessel visits, using current knowledge of operations in the port and applying assumed growth forecasts. The actual number of calls may be higher or lower. In the event that significantly higher calls are anticipated (for example a new operator enters the port resulting in greater number of days berth occupied), re-modelling of noise maps will be undertaken.

## 2.2 Exposure level for 2018-2019

Figure 3: Night exposure level - 2018-2019





**Table 2:** Statistical summary for vessels at berth – 2018-2019

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<b>Vessel noise level<sup>1</sup></b>								
At nearest receiver (dBA)	54	55	54	55	50	54	57	
<b>Exposure<sup>2</sup></b>								
Percentage of nights with a vessel present for at least 1 hour	4%	0%	40%	23%	1%	13%	30%	0%
Exposure adjustment for noise level based on percentage (dBA)	-13.6		-4.0	-6.3	-19.6	-8.8	-5.3	
Exposure level at nearest receiver (dBA)	410		50	51	30	45	52	
<b>Consecutive occupied days per year<sup>3</sup></b>								
Median	7	0	5	3	3	2	2	0
10th percentile	1	0	4	2	1	1	1	0
90th percentile	8	0	13	4	4	3	6	0
<b>Total number of days occupied per year<sup>3</sup></b>								
Average	17	0	144	91	4	50	133	0

Note 1: The vessel noise levels selected are the measured worst case noise levels for each berth (excluding vessels that have exceeded the Port Authority's Noise Impact Mitigation Strategy at White Bay Cruise Terminal which are not representative).

Note 2: The exposure parameters have been derived from the consecutive occupied days per year.

Note 3: The number of days occupied per year has been obtained from ship movement records in the Port Authority's SHIPs database.

### 2.3 Exposure level for 2014-2015

Figure 4: Night exposure level - 2014-2015



**Table 3:** Statistical summary for vessels at berth –2014-2015

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<b>Vessel noise level<sup>1</sup></b>								
At nearest receiver (dBA)	55	55	54	55	50	54	57	
<b>Exposure<sup>2</sup></b>								
Percentage of nights with a vessel present for at least 1 hour	12%	0%	35%	19%	1%	17%	30%	0%
Exposure adjustment for noise level based on percentage (dBA)	-9.3	-20.2	-4.6	-7.2	-19.6	-7.7	-5.2	
Exposure level at nearest receiver (dBA)	46	35	49	50	30	46	52	
<b>Consecutive days per year<sup>3</sup></b>								
Median	5	7	5	2	8	2	2	0
10th percentile	4	7	4	1	8	1	1	0
90th percentile	11	7	12	3	8	6	5	0
<b>Total number of days occupied per year<sup>3</sup></b>								
Average	43	4	126	71	4	63	133	0

Note 1: The vessel noise levels selected are the measured worst case noise levels for each berth. Where data was not available for individual vessels, the noise levels were estimated by comparing the IMO registered tonnage and class of vessels that had used the berth with noise data for similar vessels.

Note 2: The exposure parameters have been derived from the consecutive occupied days per year.

Note 3: The number of days occupied per year has been obtained from ship movement records in the Port Authority's SHIPs database.

## 2.4 Exposure level for 2009-2010

Figure 5: Night exposure level - 2009-2010



**Table 4:** Statistical summary for vessels at berth –2009-2010

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<b>Vessel noise level<sup>1</sup></b>								
At nearest receiver (dBA)	57	58	54	55	49	54	57	50
<b>Exposure<sup>2</sup></b>								
Percentage of nights with a vessel present for at least 1 hour	34%	73%	29%	15%	43%	13%	26%	18%
Exposure adjustment for noise level based on percentage (dBA)	-4.7	-1.3	-5.4	-8.3	-3.7	-8.7	-5.9	-7.4
Exposure level at nearest receiver (dBA)	52	57	49	49	45	45	51	43
<b>Consecutive days per year<sup>3</sup></b>								
Median	4	1	5	2	2	2	6	1
10th percentile	1	1	3	1	1	1	2	1
90th percentile	8	1	9	3	4	3	19	1
<b>Total number of days occupied per year<sup>3</sup></b>								
Average	124	268	107	51	156	49	95	67

Note 1: The vessel noise levels selected are the measured worst case noise levels for each berth. Where data was not available for individual vessels, the noise levels were estimated by comparing the IMO registered tonnage and class of vessels that had used the berth with noise data for similar vessels.

Note 2: The exposure parameters have been derived from the consecutive occupied days per year.

Note 3: The number of days occupied per year has been obtained from ship movement records in the Port Authority's SHIPs database.

## 2.5 Exposure level for 2004-2005

Figure 6: Night exposure level - 2004-2005



**Table 5:** Statistical summary for vessels at berth – 2004-2005

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<b>Vessel noise level<sup>1</sup></b>								
At nearest receiver (dBA)	64	63	54	55	55	54	57	54
<b>Exposure</b>								
Percentage of nights with a vessel present for at least 1 hour	55%	23%	36%	35%	13%	7%	2%	6%
Exposure adjustment for noise level based on percentage (dBA)	-2.6	-6.3	-4.4	-4.6	-8.8	-11.3	-17.2	-12.2
Exposure level at nearest receiver (dBA)	61	57	50	52	46	43	40	42
<b>Consecutive days per year<sup>2</sup></b>								
Median	2	2	5	3	3	2	2	3
10th percentile	1	1	3	2	2	2	1	2
90th percentile	5	3	10	6	5	6	3	4
<b>Total number of days occupied per year<sup>3</sup></b>								
Average	209	98	128	131	49	28	8	24

Note 1: The vessel noise levels selected are the measured worst case noise levels for each berth. Where data was not available for individual vessels, the noise levels were estimated by comparing the IMO registered tonnage and class of vessels that had used the berth with noise data for similar vessels.

Note 2: The exposure parameters have been derived from the consecutive occupied days per year.

Note 3: The number of days occupied per year has been obtained from ship movement records in the Port Authority's SHIPs database.

## 2.6 Exposure level for 1999-2000

Figure 7: Night exposure level - 1999-2000





**Table 6:** Statistical summary for vessels at berth - 1999-2000

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<b>Vessel noise level<sup>1</sup></b>								
At nearest receiver (dBA)	64	63	54	55	50	54	56	54
<b>Exposure<sup>2</sup></b>								
Percentage of nights with a vessel present for at least 1 hour	18%	35%	28%	16%	8%	42%	29%	9%
Exposure adjustment for noise level based on percentage (dBA)	-7.5	-4.6	-5.5	-8.1	-10.9	-3.8	-5.4	-10.4
Exposure level at nearest receiver (dBA)	57	58	49	49	39	50	51	44
<b>Consecutive days per year<sup>3</sup></b>								
Median	2	2	3	4	2	3	3	2
10th percentile	1	1	2	2	2	2	2	1
90th percentile	3	4	6	7	5	8	6	4
<b>Total number of days occupied per year<sup>3</sup></b>								
Average	70	125	98	58	30	152	112	35

Note 1: The vessel noise levels selected are the measured worst case noise levels for each berth. Where data was not available for individual vessels, the noise levels were estimated by comparing the IMO registered tonnage and class of vessels that had used the berth with noise data for similar vessels.

Note 2: The exposure parameters have been derived from the consecutive occupied days per year.

Note 3: The number of days occupied per year has been obtained from ship movement records in the Port Authority's SHIPs database.

## 2.7 Exposure level for October 1995-February 1996 (limited data available)

Figure 8: Night exposure level - October 1995-February 1996



**Table 7:** Statistical summary for vessels at berth - October 1995-February 1996<sup>1</sup>

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<b>Vessel noise level<sup>1</sup></b>								
At nearest receiver (dBA)	64	63	54	55	51	54	57	53
<b>Exposure<sup>2</sup></b>								
Percentage of nights with a vessel present for at least 1 hour	33%	38%	24%	15%	18%	63%	55%	21%
Exposure adjustment for noise level based on percentage (dBA)	-4.8	-4.2	-6.1	-8.2	-7.5	-2.0	-2.6	-6.7
Exposure level at nearest receiver (dBA)	59	59	48	49	43	52	54	46
<b>Consecutive days per year<sup>3</sup></b>								
Median	0	2	3	0	4	4	3	2
10th percentile	1	1	2	2	1	1	2	1
90th percentile	5	4	6	0	0	9	7	4
<b>Total number of days occupied per year<sup>3</sup></b>								
Average	62	71	43	28	32	114	101	33

Note 1: Limited data is available outside of the October 1995-February 1996 time period. Percentages are based on the limited time period rather than a full year.

Note 2: The vessel noise levels selected are the measured worst case noise levels for each berth. Where data was not available for individual vessels, the noise levels were estimated by comparing the IMO registered tonnage and class of vessels that had used the berth with noise data for similar vessels.

Note 3: The exposure parameters have been derived from the consecutive occupied days per year.

Note 4: The number of days occupied per year has been obtained from ship movement records in the Port Authority's SHIPs database.

# I. 3 Seasonal exposure levels

## 3.1 Projected seasonal exposure levels for 10 years into future

Figure 9: Night exposure level - Summer 10 years into future



Figure 10: Night exposure level - Winter 10 years into future



**Table 8:** Statistical summary for vessels at berth – Summer and winter 10 years into future

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<i>Vessel noise level<sup>1</sup></i>								
At nearest receiver (dBA)	55	55	55	55	55	55	55	
<i>Exposure summer<sup>2</sup></i>								
Percentage of nights with a vessel present for at least 1 hour	27%	27%	45%	15%	2%	28%	63%	
Exposure adjustment for noise level based on percentage (dBA)	-5.6	-5.6	-3.5	-8.2	-16.6	-5.6	-2.0	
Exposure level at nearest receiver (dBA)	49	49	51	47	38	49	53	
<i>Exposure winter<sup>2</sup></i>								
Percentage of nights with a vessel present for at least 1 hour	27%	27%	34%	20%	1%	9%	9%	
Exposure adjustment for noise level based on percentage (dBA)	-5.6	-5.6	-4.7	-7.0	-22.6	-10.4	-10.5	
Exposure level at nearest receiver (dBA)	49	49	50	48	32	45	44	

Note 1: The vessel noise levels selected are the Vessel Trigger Noise Levels for each berth.

Note 2: The exposure parameters have been estimated based on estimated future cargo and passenger volumes and unloading times under this policy

### 3.2 Seasonal exposure levels for 2018-2019

Figure 11: Night exposure level - Summer 2018-2019

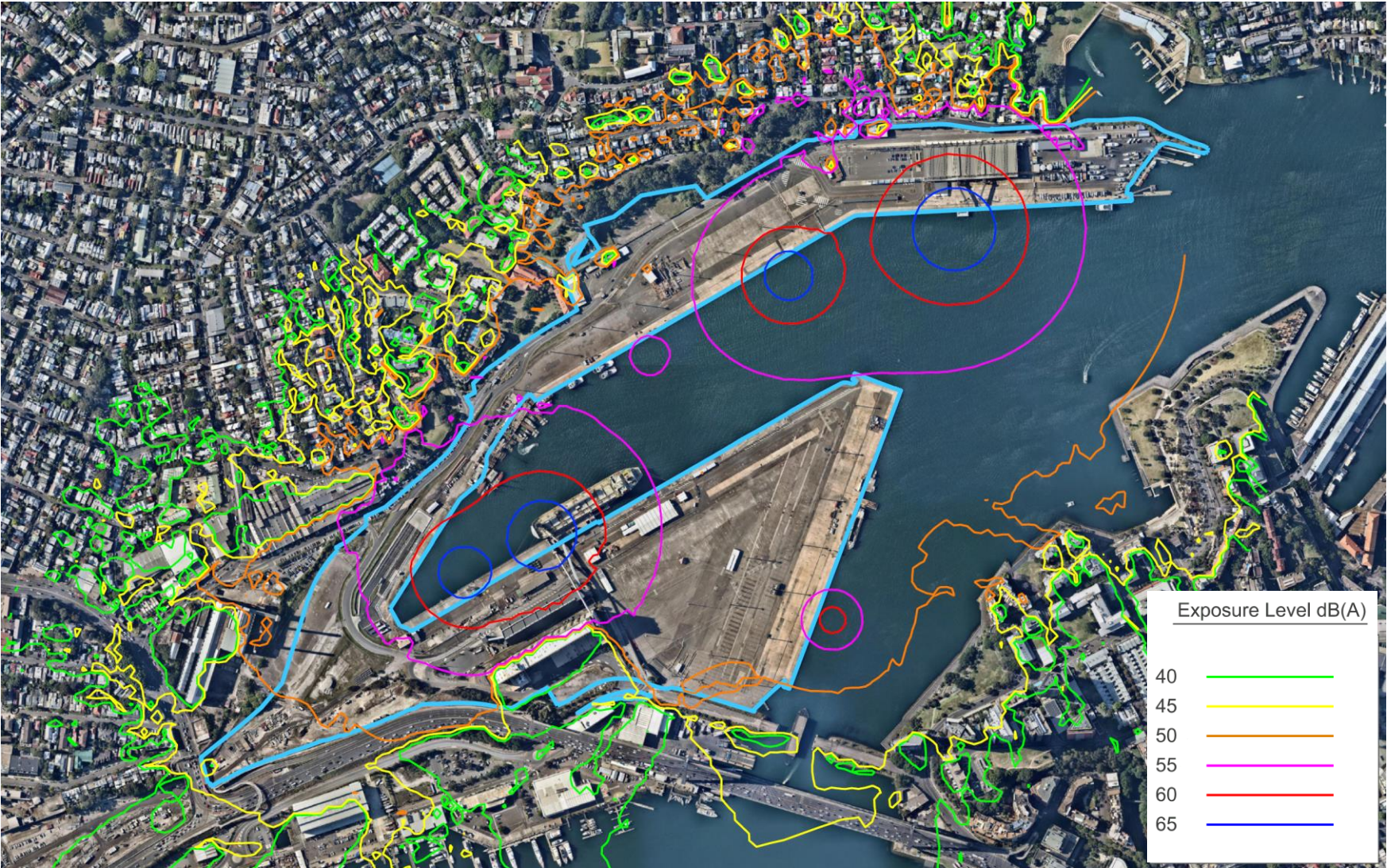


Figure 12: Night exposure level - Winter 2018-2019





**Table 9:** Statistical summary for vessels at berth – Summer and winter 2018-2019

Parameter	Glebe Island				White Bay			
	1	2	7	8	3	4	5	6
<b>Vessel noise level<sup>1</sup></b>								
At nearest receiver (dBA)	54	55	54	55	50	54	57	
<b>Exposure summer<sup>2</sup></b>								
Percentage of nights with a vessel present for at least 1 hour	4%	0%	39%	21%	2%	23%	62%	0%
Exposure adjustment for noise level based on percentage (dBA)	-13.6		-4.1	-6.7	-16.6	-6.4	-2.0	
Exposure level at nearest receiver (dBA)	40		50	50	33	48	55	
<b>Exposure winter<sup>2</sup></b>								
Percentage of nights with a vessel present for at least 1 hour	3%	0%	30%	28%	1%	8%	9%	0%
Exposure adjustment for noise level based on percentage (dBA)	-14.8		-5.2	-5.5	-22.6	-11.2	-10.6	
Exposure level at nearest receiver (dBA)	39		49	51	27	43	46	

Note 1: The vessel noise levels selected are the measured worst case noise levels for each berth (excluding vessels that have exceeded the Port Authority's Noise Impact Mitigation Strategy at White Bay Cruise Terminal which are not representative).

Note 2: The exposure parameters have been derived from the consecutive occupied days per year which were obtained from ship movement records in the Port Authority's SHIPs database.

# I. 4 Representative worst case noise levels

## 4.1 Projected representative worst case noise levels for 10 years into future

Figure 13: Landside representative worst case noise level – Day and evening 10 years into future

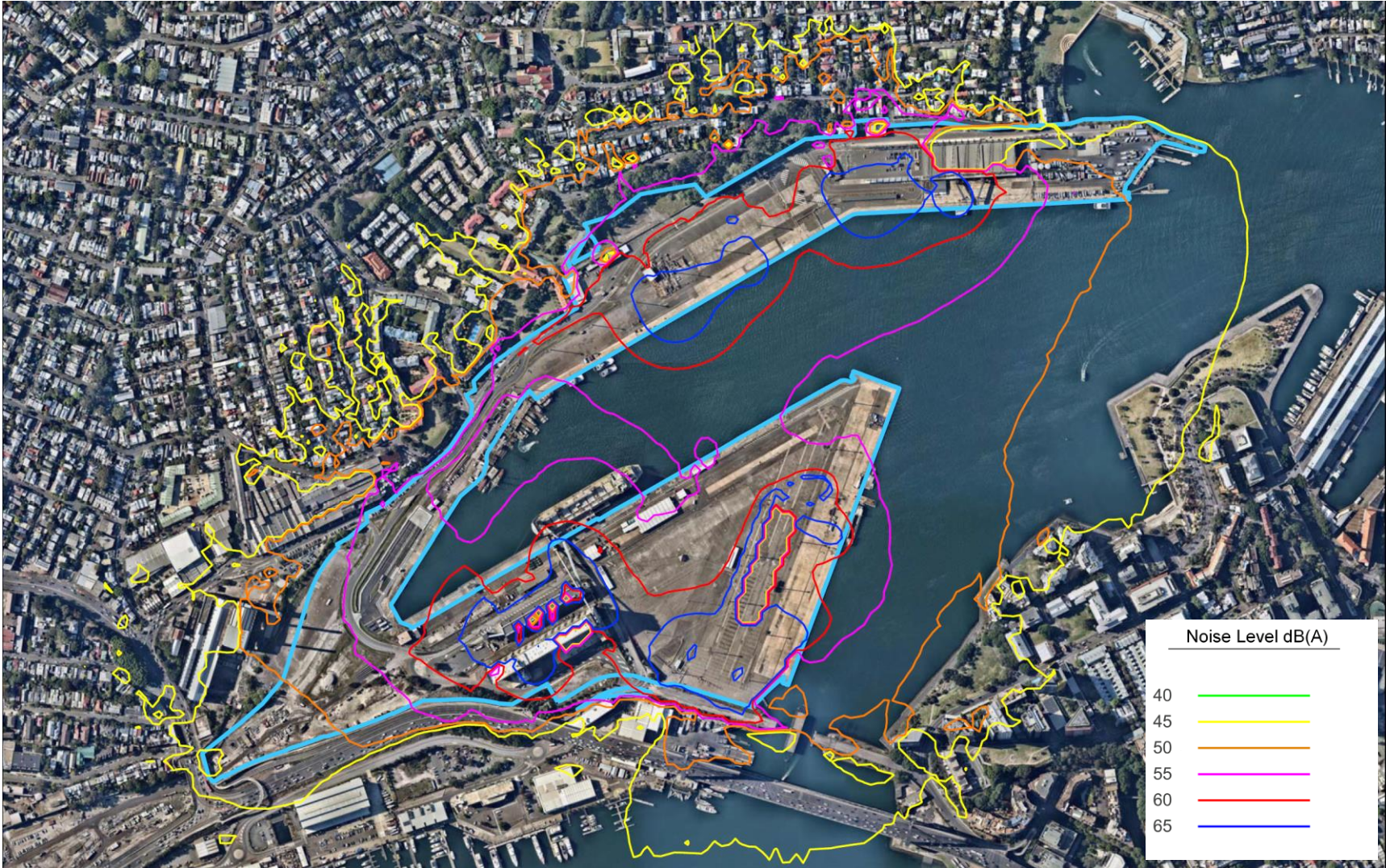


Figure 14: Vessel representative worst case noise level - Daytime (evening is included) 10 years in future



Figure 15: Vessel and landside representative worst case noise level – Daytime (evening is included) 10 years into future



Figure 16: Landside representative worst case noise level – Night time 10 years into future

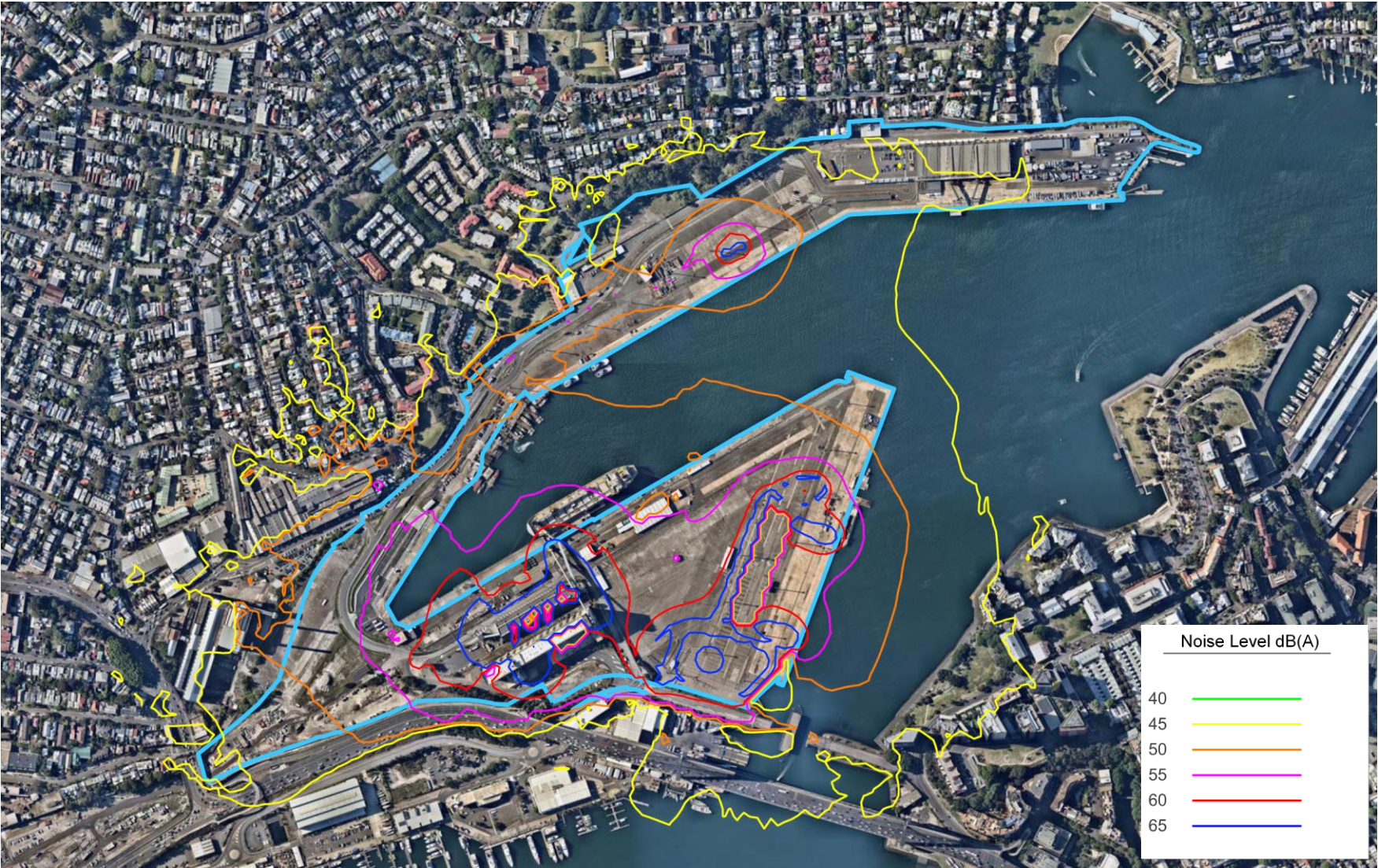


Figure 17: Vessel representative worst case noise level - Night time 10 years into future



Figure 18: Vessel and landside representative worst case noise level – Night time 10 years into future



The following activities were assumed for landside with a vessel at each operational berth:

**Table 10:** Assumed representative worst case activities – 10 years into future

<b>Glebe Island 1</b>	<b>Hanson Batching Plant with all operations (Based on the EIS noise predictions, 2018).</b>
<b>Glebe Island 2</b>	Multi-User Facility with all operations including two conveyors handling aggregate (Based on the REF noise predictions, 2018).
<b>Glebe Island 7</b>	Sugar with all operations including the conveyor (Based on attended measurements by Spoke Acoustics 4 <sup>th</sup> quarter 2020); GRA with all operations excluding the conveyor and hoppers (Based on attended measurements by Spoke Acoustics 4 <sup>th</sup> quarter 2020).
<b>Glebe Island 8</b>	Cement Australia with all operations (Based on attended measurements by Spoke Acoustics 4 <sup>th</sup> quarter 2020).
<b>White Bay 3</b>	Truck movements and onshore handling of materials.
<b>White Bay 4</b>	Cruise with all operations (Scenario based on attended measurements by Spoke Acoustics, November 2017) Tallow operations after cruise vessel leaves (Based on SLR reports <a href="#">White Bay 4 noise monitoring reports   Port Authority New South Wales (portauthoritynsw.com.au)</a> ).
<b>White Bay 5</b>	Cruise with all operations (Scenario based on attended measurements by Spoke Acoustics, November 2017).
<b>White Bay 6</b>	Bailey's Marine Fuel Australia with all operations (Based on EMM letter dated 17 February 2015).



## 4.2 Representative worst case noise levels for 2018-2019

Figure 19: Landside representative worst case noise level – Daytime and evening 2018-2019



Figure 20: Vessel representative worst case noise level - Daytime (evening is included) 2018-2019



Figure 21: Vessel and landside representative worst case noise level – Daytime and evening 2018-2019



Figure 22: Landside representative worst case noise level – Night time 2018-2019

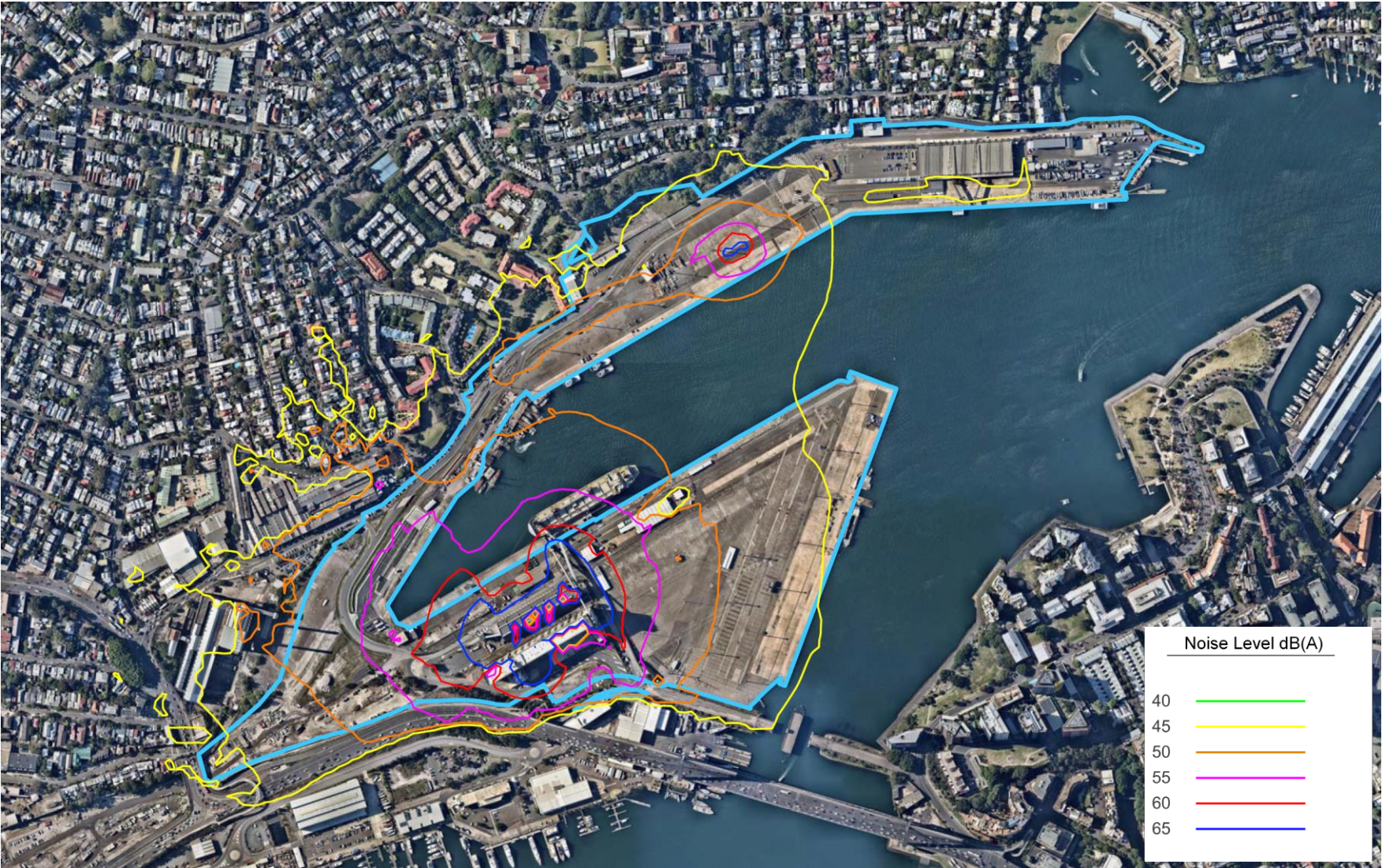


Figure 23: Vessel representative worst case noise level - Night time 2018-2019



Figure 24: Vessel and landside representative worst case noise level – Night time 2018-2019



The following activities were assumed for landside with a vessel at each operational berth excluding Glebe Island 2:

**Table 11:** Assumed representative worst case activities – 2018-2019

<b>Glebe Island 1</b>	<b>Hanson's Batching Plant with all operations (Based on the EIS noise predictions, 2018).</b>
<b>Glebe Island 2</b>	Multi-User Facility with all operations including two conveyors handling aggregate (Based on the REF noise predictions, 2018).
<b>Glebe Island 7</b>	Sugar with all operations including the conveyor (Based on attended measurements by Spoke Acoustics 4 <sup>th</sup> quarter 2020). GRA with all operations excluding the conveyor and hoppers (Based on attended measurements by Spoke Acoustics 4 <sup>th</sup> quarter 2020).
<b>Glebe Island 8</b>	Cement Australia with all operations (Based on attended measurements by Spoke Acoustics 4 <sup>th</sup> quarter 2020).
<b>White Bay 3</b>	Truck movements and onshore handling of materials.
<b>White Bay 4</b>	Cruise with all operations (Scenario based on attended measurements by Spoke Acoustics, November 2017). Tallow operations after cruise vessel leaves (Based on SLR reports <a href="http://portauthoritynsw.com.au">White Bay 4 noise monitoring reports   Port Authority New South Wales (portauthoritynsw.com.au)</a> ).
<b>White Bay 5</b>	Cruise with all operations (Scenario based on attended measurements by Spoke Acoustics, November 2017).
<b>White Bay 6</b>	Bailey's Marine Fuel Australia with all operations (Based on EMM letter dated 17 February 2015).

## I. 5 Vessel source noise levels

**Table 12:** Assumed vessel source levels

Year	Location	Berth	Sound Power Level, L <sub>Aeq</sub>	Vessel Type
<b>1995<sup>1</sup></b>	Glebe Island	1	119	Car Ship
		2	119	Car Ship
		7	111	Sugar Ship
		8	111	Cement Ship
	White Bay	3	106	Container Ship
		4	110	RORO Ship
		5	110	RORO Ship
		6	110	RORO Ship
<b>2000<sup>1</sup></b>	Glebe Island	1	119	Car Ship
		2	119	Car Ship
		7	111	Sugar Ship
		8	111	Cement Ship
	White Bay	3	106	Container Ship
		4	110	RORO Ship
		5	110	RORO Ship
		6	110	RORO Ship
<b>2005<sup>1</sup></b>	Glebe Island	1	119	Car Ship
		2	119	Car Ship
		7	111	Sugar Ship
		8	111	Cement Ship
	White Bay	3	105	Oil Ship Tallow
		4	110	RORO Ship
		5	110	RORO Ship
		6	112	Oil Ship
<b>2010<sup>2</sup></b>	Glebe Island	1	112	Bulk Conveyor
		2	114	Salt Ship
		7	111	Sugar Ship
		8	111	Cement Ship
	White Bay	3	105	Oil Ship Tallow
		4	105	Oil Ship Tallow
		5	111	Cruise Ship
		6	112	Oil Ship
<b>2015<sup>2</sup></b>	Glebe Island	1	109	Sugar Ship
		2	114	Salt Ship
		7	111	Sugar Ship
		8	111	Cement Ship
	White Bay	3	105	Oil Ship Tallow
		4	111	Cruise Ship
		5	111	Cruise Ship
<b>2019<sup>2</sup></b>	Glebe Island	1	109	Salt Ship
		2	110	Bulk Conveyor
		7	111	Sugar Ship



		8	111	Cement Ship
	White Bay	3	105	Oil Ship Tallow
		4	111	Cruise Ship
		5	111	Cruise Ship
<b>10 years into future<sup>2</sup></b>	Glebe Island	1	108	VTNL
		2	110	VTNL
		7	111	Sugar Ship
		8	111	Cement Ship
	White Bay	3	105	Oil Ship Tallow
		4	111	Cruise Ship
		5	111	Cruise Ship

Note 1: Noise levels were sourced from Wilkinson Murray noise report 94110-1, Appendix F (1994) and current levels verified by Spoke Acoustics where possible.

Note 2: Noise levels were sourced from <https://www.portauthoritynsw.com.au/sustainability-and-environment/air-and-noise-emissions/> and current levels verified by Spoke Acoustics where possible.