

Memorandum

To	Port of Newcastle	From	Yogi Kalkunte
Copy	Jack Rixon	Reference	506464
Date	2020-02-14	Pages (including this page)	4
Subject	Mayfield Cargo Storage Facility Modifications – Acoustic Impacts		

1 Introduction

Aurecon have been engaged by The Port of Newcastle (PON) to assist in the application for modification of existing development consent (DA 8137), which applies to an existing hardstand laydown area (Mayfield Cargo Storage Facility, MCSF) located within the Mayfield Concept Plan (MCP) area.

This memo addresses the potential acoustic impacts associated with the modification.

2 Site Location and Proposed Modification

The site is situated in an industrial suburb of Mayfield North, 7 kilometres north-west of Newcastle CBD and has direct access to the south channel of the Hunter River. The official address of the subject site (overall shape in Figure 1) is 189 Selwyn Street, Mayfield North and is located across three lot boundaries Lot 51/DP 1229869, Lot 54/DP1229869 and Lot 42/DP1191982. The site consists of mostly hardstand land areas with a portion of it currently used as a cargo storage facility.

It is proposed to extend the cargo storage facility to north-west and north-east as illustrated in Figure 1, with the intended use to remain the same i.e. port facilities for the storage of freight, including the loading and unloading of freight.. The extended area will result in a collective increase in the hardstand area by approximately 6.6 hectares, resulting in an overall area of 18.6 hectares.



Figure 1 – Subject site | **Purple**: Existing storage site | **Green**: Proposed expansion of the storage site
Source: NSW Data Portal, Aurecon. Imagery: NSW DFSI

3 Existing Licenses and Approvals

3.1 Development Consent (DA 8137)

Section B2 of the Development Consent (DA 8137) presents the operational noise limits that apply to the MCSF and is reproduced in Table 1.

Table 1 | Operational Noise Limits

No.	MCP Receiver	Location	Day	Evening	Night		
			L _{Aeq} (15min)	L _{Aeq} (15min)	L _{Aeq} (15min)	L _{Aeq} (9hr)	L _{A1} (1min)
R1	A	1 Arthur Street, Mayfield	35	35	35	35	46
R2	B	2 Crebert Street, Mayfield	39	39	39	35	51
R3	-	24 Crebert Street, Mayfield	40	39	39	35	52
R4	C	32 Elizabeth Street, Carrington	35	35	35	35	41
R5	D	186 Fullerton Road, Mayfield	35	35	35	35	40

3.2 Mayfield Concept Plan Approval (09_0096 MOD 2)

As the facility is located within the Mayfield Concept Plan (MCP) area, it is also subject to the noise requirements of the concept approval MCP Approval (09_0096MOD 2).

- Conditions 2.16 – 2.20 of the MCP approval outlines the operational noise and vibration requirements related to projects sites that are situated within the MCP area.
- Condition 2.17 sets out noise limits for the cumulative noise impact of all projects associated with MCP. The MCP approval aims to address the cumulative noise impacts from all sites that will operate within the MCP area. It aims to prevent any individual site being designed to use up all of the MCP approval noise limits, which will then result in all other developments having overly stringent noise requirements, and development other areas of the MCP constrained.
- Noise quotas have also been allocated for individual sites in the MCP area, to assist in the assessment of cumulative noise impacts.

The MCP noise quota and cumulative noise limits are reproduced below.

Table 2 | MCP Approval Cumulative Noise Goals

Receiver	Project Specific Noise Goals, dB(A) _{Leq} (period)		
	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
A – 1 Arthur Street, Mayfield (Urban)	60	49	43
B – 2 Crebert Street, Mayfield (Urban)	60	50	43
C – 32 Elizabeth Street, Carrington (Urban)	57	44	45
D – Stockton (Suburban)	55	37	37

Table 3 | MCP Noise Quota for Cargo Storage Facility

Receiver	Applicable facility specific MCP noise quota, dB(A) _{Leq(period)}		
	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
A – 1 Arthur Street, Mayfield (Urban)	51	40	34
B – 2 Crebert Street, Mayfield (Urban)	51	41	34
C – 32 Elizabeth Street, Carrington (Urban)	46	33	34
D – Stockton (Suburban)	45	27	27

4 Acoustic Impacts

- To comply with the requirements of condition 2.20 of the MCP Approval, a Noise Verification Monitoring Plan (NVMP) was developed by AECOM for the PON.
- As per the recommendations of the NVMP, annual operational noise compliance assessments are required for any projects located within the MCP area. The most current assessment was conducted by AECOM in December 2019 (reference: 60620229-RPNV-02_0, dated 19 December 2019) (the Report) and concluded the following;
 - Attended noise measurements of typical operations were undertaken at the Facility in order to develop the noise model used for this noise compliance assessment.
 - Attended noise measurements of typical operations associated with the facility were undertaken at receiver locations R1 – R5 and detailed in section 3.1.2 of the Report. All the measurement locations exceeded the noise limits; however, it was not possible to quantify the noise contribution from the Facility from the other industrial sources in the surrounding area at all receiver locations. Thus, it was not possible to determine the noise contribution through direct measurement.
 - A noise model was developed to confirm the noise impacts associated with the facility. This model was based on reference activity measurements conducted on site (from typical operations) with modelling parameters (noise levels, worst case operational scenarios) detailed in section 3.3 of the noise compliance assessment report. PON has advised us that the subject extended land use area, is already in use under a temporary storage provision under the Three Ports SEPP. Hence, the reference activity noise measurements and operational scenarios (location, frequency etc.) used in the noise model would have already included noise impacts from part of the subject proposal.
 - Predicted noise levels from the model (section 3.4 of the noise compliance assessment report) indicates compliance with both the development approval (DA 8137) (Table 1) and MCP noise quota (Table 3) criteria.

4.1 Additional Impacts associated with proposed Hardstand Extension

PON have advised that the proposed modification proposes no significant changes to the existing activities and operational methodology detailed in section 3.3 of the Report.

In relation to additional heavy vehicle traffic movements;

- The Report assumed the following 'reasonable' worst case heavy vehicle operations (Table 11 of the Report);
 - Daytime – 88 truck movements with maximum of 8 trucks per hour,
 - Evening – 16 truck movements with maximum 4 trucks per hour, and
 - Night-time – 36 truck movements with maximum 4 trucks per hour.
- However, based on actual traffic flows monitored as part of Traffic Monitoring and Review Plan (TMRP), traffic flows associated with the current operation of the existing hardstand laydown area (illustrated in purple in Figure 1) are significantly lower.
 - On average, daily truck flow does not exceed 10 vehicle movements and since the start of operations in 2017, not a single day generated more than 20 truck movements.
 - This is well below the 'reasonable' worst case assumption of 140 truck movements per day, in the Report. It is understood that the site was fully operational during this period.
 - Additionally, part of the expansion site (approx. 2.3ha) circled in red in Figure 1, was temporarily used (under schedule 1 of Three Ports SEPP) as a port facility in late 2019, which resulted in negligible variances to the overall vehicle movements.
- We have been informed by the Traffic Consultant (Traffic Requirements memo, Aurecon 2020) that given actual daily truck movements generated by the existing hardstand appears to be less than 10% of the predicted worst-case truck movements (based on the 2016 Traffic Impact Assessment for the MCSF), the maximum predicted increase of traffic flow due to the proposed extension would be approximately 0.2% of total traffic at the main intersection from the strategic road network during peak flow (Industrial Drive – George Street).
- This additional traffic is considered acoustically insignificant and will not impact on the existing heavy vehicle operational noise emission levels.

Hence, noise emissions from the proposed modification is likely to be consistent with the noise emission predictions detailed in section 3.4 of the Report. To ensure the existing acoustic amenity for surrounding affected receivers is maintained, and eliminate the possibility of any additional noise contributions from the subject proposal, all cumulative noise emissions associated with the extended Mayfield Cargo Storage Facility, must comply with the noise provisions outlined in the original development approval (DA 8137) (Table 1) and MCP noise quota (Table 3) criteria.

Attachments

Mayfield Cargo Storage Facility, Mayfield Operation Noise Compliance Assessment (2019)

Mayfield Cargo Storage Facility, Mayfield

Operational Noise Compliance Assessment (2019)

Mayfield Cargo Storage Facility, Mayfield

Operational Noise Compliance Assessment (2019)

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1.0 Introduction

Port of Newcastle Operations Pty Ltd (PON) commissioned AECOM Australia Pty Ltd (AECOM) to carry out noise compliance measurements associated with operations at the Mayfield Cargo Storage Facility (the Facility) operated by PON at Mayfield, NSW.

The facility has two relevant approval/licence documents that control its operations. These documents are:

- Department of Planning and Environment issued *Development Consent (DA 8137)*, dated 30 June 2017; and
- Mayfield Concept Approval (MCP) (Application 09_0096) dated 16 July 2012 (latest modification 12 December 2014).

This acoustic assessment was conducted to determine compliance with the requirement of Development Consent (DA 8137).

As the Facility lies within the MCP approval area, it requires noise emissions from the site to be consistent with the environmental assessment requirements of the MCP Approval. Consistency with the MCP Approval requirements has also been addressed in this report.

Section B1, B2 and B3 of Development Consent (DA 8137) outline the methods to determine compliance with the noise limits.

The Facility's noise emissions has achieved compliance with the applicable noise limits as documented in two previous operational noise compliance assessments undertaken by AECOM:

1. Mayfield Cargo Storage Facility, Mayfield - Operational Noise Compliance Assessment (2017), 60553318-RPNV-01_0, dated 20 December 2017.
2. Mayfield Cargo Storage Facility, Mayfield - Operational Noise Compliance Assessment (2018), 60553318-RPNV-02_B, dated 15 February 2019.

Attended noise measurements were undertaken between 6 and 7 December 2019 at the closest nearby residential receiver locations in accordance with Development Consent (DA 8137). However, during this time the Facility was idle and therefore it was not possible to conduct nearfield measurements of operational activities on-site. Therefore for the purpose of this assessment, previous years' noise measurements were used to demonstrate compliance with the Facility's noise limits.

As presented in previous years' operational noise compliance assessments, it is not possible to directly measure the impact of noise arising from operations at the Facility due to the influence from extraneous noise sources at nearby receiver locations. The compliance assessment was therefore carried out using SoundPLAN noise modelling software.

As mentioned above, it is not possible to directly measure the noise arising from operations at the Facility due to the influence from extraneous noise sources, i.e. existing industrial noise from other industrial areas unrelated to the Facility and traffic noise on Industrial Drive. In accordance with the NSW Environment Protection Authority (EPA) NSW Industrial Noise Policy (INP), an alternative method was employed to demonstrate the compliance noise levels. The compliance assessment was carried out using SoundPLAN noise modelling software.

This method of noise compliance assessment is in accordance of the Chapter 11 of the INP. In order to determine compliance of the Facility operational noise emissions with the required noise limits, 'reasonable' worst case operational scenarios were determined based upon the on-site attended noise measurements undertaken during last year (2018) noise compliance assessment.

AECOM has been advised by PON that no noise complaints have been received to date in relation to noise from the operation of the Facility.

A glossary of acoustic terminology used in this report can be found in Appendix A.

1.1 EPA Noise Policy for Industry

The *NSW Industrial Noise Policy* (EPA 2000) was withdrawn in November 2017 and replaced by the *Noise Policy for Industry* (EPA 2017) except as describe in the EPA document *Implementation and transitional arrangements for the Noise Policy for Industry (2017)*, point 8, as presented below:

8. *The NSW Industrial Noise Policy (2000) will continue to apply where it is referenced in existing statutory instruments (such as consents and licences), except for the NSW Industrial Noise Policy Section 4 modifying factors, which will be transitioned to the Noise Policy for Industry (2017) Fact Sheet C through a NSW Industrial Noise Policy application note. This approach has been taken because the Noise Policy for Industry (2017) modification factor approach reflects more recent understanding of the impact of tonal and low-frequency noise on the community.*

1.2 Mayfield Cargo Storage Facility description

1.2.1 Location

The Facility is located on the former BHP steelworks site in Mayfield North, adjacent to the Hunter River, approximately 5 kilometres north-west of Newcastle CBD.

The nearest residential areas to the site are located to the south-west of the Facility site at Mayfield, with the closest receptors in Crebert Street, approximately 800 metres from the nearest boundary of the Facility. To the south-east there are residential receivers located in Carrington, approximately 2 kilometres away.

The Facility location and key sensitive receivers are shown in Figure 1.

1.2.2 Operational activities and facilities

The Facility comprises the operation of an approximately 12 hectares Port storage facility within the Mayfield Concept Plan precinct. The Facility provides for the storage of a range of freight and cargo, including but not limited to, project cargo such as wind turbine and tunnel boring machine components, large industrial components, luxury boats, electrical transformers and machinery, general cargo such as farm machinery, excavators, and construction machinery, breakbulk such as steel or timber products, and containerised cargo.

Freight is unloaded via 'ships gear' (ship mounted cranes and cargo handling equipment) onto trucks at Mayfield No. 4 Berth or other berths within the Port, and transported to the Storage Area for unloading. Distribution of cargo is then via truck to its final destination. Cargo may also be trucked from its point of origin, to the storage facility for consolidation and export via Mayfield No. 4 Berth or another berth within the Port.

General day-to-day activities, include moving or stacking of cargo. Plant and machinery used include reach stackers and forklifts for unloading, moving, stacking and loading cargo.

1.2.3 Operational noise sources

Operations at the site consist of the following activities:

- Internal private access**
- moving trucks, idling trucks.
- Roads**
- Industrial noise sources**
- reach stackers
 - forklifts

Sound power levels of the different operations at the Facility were determined through on-site measurements.

1.2.4 Hours of operation

The operational hours for the Facility are Monday to Sunday, 24 hours per day.



Figure 1 Site location, assessment receiver locations and measurement locations

2.0 Compliance Assessment Criteria

2.1 Development Consent (DA 8137)

2.1.1 Operational noise limits

Section B2 of the Development Consent (DA 8137) presents the operational noise limits that apply to the Facility, and are reproduced in Table 1.

Table 1 Operational noise limits

No.	MCP Receiver	Location	Day	Evening	Night		
			L _{Aeq} (15min)	L _{Aeq} (15min)	L _{Aeq} (15min)	L _{Aeq} (9hr)	L _{A1} (1min)
R1	A	1 Arthur Street, Mayfield	35	35	35	35	46
R2	B	2 Crebert Street, Mayfield	39	39	39	35	51
R3	-	24 Crebert Street, Mayfield	40	39	39	35	52
R4	C	32 Elizabeth Street, Carrington	35	35	35	35	41
R5	D	186 Fullerton Road, Mayfield	35	35	35	35	40

Notes:

1. Refer to Figure 1 to identify noise receiver locations.
2. Noise generated by the development is to be assessed in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the EPA's NSW Industrial Noise Policy.

Sleep disturbance requirements

Section B2 of the Development Consent (DA 8137) presented sleep disturbance criteria which are also provided in Table 1 as the L_{A1} criteria.

2.1.2 Mayfield Concept Plan Noise Quota

Section B3 of the Development Consent (DA 8137) provides the following with respect to MCP noise quota:

- "B3. The Applicant must:
- a. ensure noise from the site does not exceed the noise quotas provided by the PON in accordance with the Site Noise Model; and
 - b. comply with the directions of the PON in relation to the management of noise from the Site."

2.1.3 Amenity noise requirements – Mayfield Concept Plan (MCP)

As the Facility is located within the MCP area, it is also subject to the noise requirements of the concept approval MCP Approval (09_0096MOD 2) (MCP approval).

Conditions 2.16 – 2.20 of the MCP approval outlines the operational noise and vibration requirements related to projects sites that are situated with the MCP area.

Condition 2.17 sets out noise limits for the cumulative noise impact of all projects associated with MCP. The MCP approval aims to address the cumulative noise impacts from all sites that will operate within the MCP area. It aims to prevent any individual site being designed to use up all of the MCP approval noise limits, which will then result in all other developments having overly stringent noise requirements, and development other areas of the MCP constrained.

PON has developed an approach for addressing the cumulative noise impacts by allocating noise quota to individual sites within the MCP area, in order for the entire site once fully developed to meet the overall noise limits set out in the MCP Approval. These overall noise criteria for the entire MCP site are presented in Table 2, and the noise quota for the Facility is outlined in Section 2.1.4. The MCP overall noise limits and quotas apply over the amenity assessment periods.

PON has developed a Cumulative Environmental Noise Management Tool (CENMT), which includes the development of a Site Noise Model as required by Condition 2.16 to address those matters listed in Condition 2.19. A copy of this master site model has been used as the basis to undertake the noise modelling for this assessment.

MCP noise quota for the purposes of this assessment have been provided by PON. These quotas have been derived using the *MCP noise quota distribution tool (GIS Budget model)* which was developed for assessment of proposed sites within the MCP.

PON has developed a 'User guide' (reference AECOM report 60289391.RPT01.01, latest version dated 15 July 2015) that provides guidance to future proponents on how to assess noise impacts from Project site that fall within the MCP area.

Table 2 Mayfield Concept Plan amenity noise goals

Location	MCP overall approval noise limits, L _{Aeq, period} , dB(A)		
	Day (7.00 am to 6.00 pm)	Evening (6.00 pm to 10.00 pm)	Night (10.00 pm to 7.00 am)
A – 1 Arthur Street, Mayfield (Urban)	60	49	43
B – 2 Crebert Street, Mayfield (Urban)	60	50	43
C – 32 Elizabeth Street, Carrington (Urban)	57	44	45
D – Stockton (Suburban)	55	37	37

2.1.4 Cargo Storage Facility, specific MCP requirements

MCP Cargo Storage Facility specific amenity noise quota derived using the MCP CENMT is presented in Table 3. The quotas are based upon the Facility area presented in Figure 2.

Table 3 Summary of MCP noise quota for Cargo Storage Facility

Location	Cargo Storage Facility specific MCP noise quota, L _{Aeq, period} , dB(A)		
	Day (7.00 am to 6.00 pm)	Evening (6.00 pm to 10.00 pm)	Night (10.00 pm to 7.00 am)
A – 1 Arthur Street, Mayfield	51	40	34
B – 2 Crebert Street, Mayfield	51	41	34
C – 32 Elizabeth Street, Carrington	46	33	34
D – 186 Fullerton Road, Stockton	45	27	27



Figure 2 Facility site operational area for derivation of MCP noise quota

3.0 Measurement Methodology and Results

As discussed in Section 1.0, during this year's site visit, the Facility was idle and therefore it was not possible to conduct nearfield measurements of operational activities on-site. Therefore, for the purpose of this assessment previous years' noise measurements were used to demonstrate compliance with the Facility's noise limits.

3.1 Compliance measurements

Attended monitoring was conducted at the Facility on 30 November 2018. During the measurements the sky was mostly clear and conditions were calm with light winds during both daytime and night-time measurements. The purpose of the measurements was to determine the sound power levels of plant equipment in operation at the Facility,

Attended noise measurements were conducted, on 6 and 7 December 2019, at each of the key receiver locations as outlined in the Development Consent (DA 8137), refer to Table 1.

3.1.1 Instrumentation

Attended noise measurements were conducted using the equipment presented in Table 4.

Table 4 Measurement instruments

Equipment	Serial Number
Attended noise measurements	
Brüel and Kjaer Type 2250	3009330

The instrument presented in Table 4 is designated as Class 1 instrument. The sound level meter was calibrated before and after the measurements using a calibrator (Rion NC-74 Serial Number 34283659) with a drift in calibration not exceeding ± 0.5 dB.

The acoustic instrument that was employed during the noise measurements comply with the requirements of Australian/New Zealand Standard AS/NZS IEC 61672.1-2019 *Electroacoustics - Sound level meters – Part 1: Specifications*.

All equipment used for this compliance assessment have valid calibration certificates.

3.1.2 Attended measurement results and discussion

Attended noise measurements of typical operations were undertaken at the Facility in 2018, in order to develop the noise model used for this noise compliance assessment.

Attended noise measurements were undertaken at receiver locations R1 – R5, on 6 and 7 December 2019, as presented in Table 5. All the measurement locations exceeded the noise limits. However, as presented in previous years' operational noise compliance assessments, noise emissions from the Facility cannot be clearly distinguishable or quantifiable at any of the receiver locations due to the influence from extraneous noise sources.

The INP provides guidance in Chapter 11 as to how to review the noise emissions of a site where the existing noise levels are already high.

The results of the attended measurements are presented in Table 5.

Table 5 Attended measurements at assessment receiver locations on 6 to 7 December 2019

Receiver		Time of measurement	Monitored noise levels			Operators comments
			L _{A1} , dB(A)	L _{Aeq} , dB(A)	L _{A90} , dB(A)	
R1	1 Arthur Street, Mayfield	6/12/2019 22:00	56	45	38	INDUSTRIAL CONTRIBUTION: Background constant broadband industrial hum from north/north east (controls background), difficult to distinguish from distant road traffic noise. Occasional banging also audible from the north as well as a faint plant alert siren at times. No distinguishable noise sources in the direction of the Cargo Storage Facility. TRAFFIC CONTRIBUTION: Trucks on industrial drive clearly audible. Car pass-by on Crebert Street ~ 49-52 dB(A). OTHER: Crickets, dog barking at times, people from houses occasionally audible. Average Wind – Slight breeze, scattered clouds
R2	2 Crebert Street, Mayfield	6/12/2019 22:43:12	71	61	44	INDUSTRIAL CONTRIBUTION: Background constant broadband industrial hum from the east/south east audible in the absence of traffic but unable to determine if it is coming from the Storage Cargo Facility No distinguishable noise sources in the direction of the Cargo Storage Facility TRAFFIC CONTRIBUTION: Almost constant traffic on Industrial Drive was the main noise source (never more than 30 seconds without a pass by). Trucks engine braking ~ 73-75 dB(A), car pass-by ~ 62-71 dB(A). OTHER: Crickets, bats. Average Wind – Slight breeze, scattered clouds.
R3	24 Crebert Street, Mayfield	6/12/2019 23:00:31	74	64	43	INDUSTRIAL CONTRIBUTION: Background constant broadband industrial hum from the north east. Some horns heard from the east and south east. No distinguishable noise sources in the direction of the Cargo Storage Facility. TRAFFIC CONTRIBUTION: Almost constant traffic on Industrial Drive was the main noise source (never more than 30 seconds without a pass by). Truck pass-by ~ 74-77 dB(A), car pass-by ~ 62-68. OTHER: Bats. Average Wind – Light to mild, scattered clouds.
R4	32 Elizabeth	7/12/2019	49	41	37	INDUSTRIAL CONTRIBUTION: Constant broadband industrial hum, cannot

Receiver		Time of measurement	Monitored noise levels			Operators comments
			L _{A1} , dB(A)	L _{Aeq} , dB(A)	L _{A90} , dB(A)	
	Street, Carrington	00:03:26				determine which direction it is from. Machinery hum coming from the west can be faintly heard in the first half of the measurement. A reverse siren was heard, however it could not be determined where it was from. No distinguishable sources in the direction of the Cargo Storage Facility. TRAFFIC CONTRIBUTION: traffic noise audible from the west. OTHER: Crickets. Average Wind – Light to moderate, scattered clouds.
R5	186 Fullerton Road, Mayfield	6/12/2019 23:30:56	73	60	45	INDUSTRIAL CONTRIBUTION: Strong constant broadband industrial hum from Kooragang Island (controls background). Occasional banging of metal from Kooragang Island. Ship horn from south west ~ 63 dB(A). Humming in same direct as ship horn could be heard at times, possibly a tug boat. No distinguishable sources in the direction of the Cargo Storage Facility. TRAFFIC CONTRIBUTION: Local traffic on Fullerton Road with car pass-by ~ 67-80 dB(A). OTHER: Bats dog barking in distance. Average Wind – Moderate, scattered clouds.

Section 11.1.2 of the INP **Notes on noise monitoring** states:

Where existing noise levels are high

“When compliance is being measured it may be found that, in many cases, existing noise levels are higher than noise level from the source, making it difficult to separate out the source noise level. When this happens, it may not be feasible to measure compliance at the specified location, and other methods will be needed. In these cases, measurements may be taken closer to the source and then calculated back to the specified location.”

Accordingly, on-site measurements of individual plant items and typical operations were undertaken on 30 November 2018 at the Facility.

It was noted during all measurements that the specific noise source being measured was the dominant noise source throughout the measurement period. Observations were made of the onsite operations, which have then been reviewed in conjunction with the Facility operational data to model ‘reasonable’ worst case operational scenarios over the assessment periods. These scenarios are described in Section 3.2. The noise model was validated using the attended noise measurements, refer to Section 3.2 for noise model calibration. Key on-site attended measurement results are summarised in Table 6.

Table 6 On-site attended measurements at the Facility on 30 November 2018

Operation	Time of measurement	Monitored noise levels				Operator’s comments
		L _{A1(t)} , dB(A)	L _{A10(t)} , dB(A)	L _{Aeq(t)} , dB(A)	L _{A90(t)} , dB(A)	
Reach stacker lifting	1:25 PM - 1:33 PM	86	85	84	83	Reach stacker lifting boom, measured at approximately 5 m from a number of positions
Reach stacker lowering	1:26 PM - 1:34 PM	84	83	83	82	Reach stacker lowering boom, measured at approximately 5 m from a number of positions
Reach stacker idling	1:28 PM - 1:31 PM	76	76	75	75	Reach stacker while waiting to load at 5 m from closest point of Reach stacker.
Reach stacker reversing	1:35 PM	81	80	78	75	Reach stacker reversing, measured at approximately 10 metres.
Reach stacker pass by	1:35 PM - 1:36 PM	81	79	77	74	Reach stacker pass-by (accelerating through the site) at 10 m from closest point of Reach stacker pass-by.
Reach stacker take off	1:37 PM - 1:39 PM	85	84	81	76	Reach taking off from stop (accelerating through the site) at 5 m from closest point of Reach stacker pass-by.
Truck take off	2:17 PM	79	77	74	71	Truck taking off from stop (accelerating through the site) at 5 m from closest point of truck cab pass-by.
Truck idling	2:14 PM - 2:16 PM	69	69	68	67	Truck idling while waiting to take off at 5 from side and front of truck cab.
Truck air brake	2:17 PM	80	77	73	70	Truck release air brake at 5 m from side of cab.

Operation	Time of measurement	Monitored noise levels				Operator's comments
		L _{A1(t)} , dB(A)	L _{A10(t)} , dB(A)	L _{Aeq(t)} , dB(A)	L _{A90(t)} , dB(A)	
16 tonne forklift pass by	2:03 PM	84	83	80	75	Forklift pass by (accelerating moving around the site) at 5 m from closest point of forklift pass by.
16 tonne forklift pass by	2:05 PM	78	77	74	70	Forklift pass by (coasting around the site) at 5 m from closest point of forklift pass by.
16 tonne forklift raising and lowering tines	1:57 PM	65	64	63	61	Forklift raising and lowering tines at 10 m.
16 tonne forklift idling	2:07 PM – 2:10 PM	69	69	68	68	Forklift idling at 5 m from front, side and rear.
16 tonne forklift air brake	2:06 PM	94	86	82	68	Forklift approach and release air brake at 2 m from side of closest point of fork lift.
16 tonne forklift reverse with siren	2:00 PM	93	91	85	70	Forklift reversing with siren, at 10 m from side of closest point of fork lift.

3.2 Modelled operational scenarios

3.2.1 Noise model validation

A validation noise model was developed to confirm the noise predictions on site and predict noise levels at the sensitive receiver locations.

The noise model included two of the highest noise generating scenarios:

- One reach stacker lifting tunnel boring machine parts and moving; and
- One reach stacker loading a truck.

A noise model was developed using SoundPLAN software which represented the noise measurements on site. Provided below in Table 7 is a summary of the included noise sources.

Table 7 Modelled plant and equipment sound power levels

Plant item/operation	Sound power level, dB(A)
Reach stacker moving	104
Reach stacker loading truck	105

The differences identified in Table 8 are within the accuracy of the modelling algorithm and considered suitable for this assessment. The results from the validation of the model show that the model is suitable for determining the compliance noise levels for this assessment.

Table 8 Noise validation results

Scenario	Measured L _{Aeq} , dB(A)	Predicted L _{Aeq} , dB(A)	Difference, dB
One reach moving	79	81	2
One reach stacker loading a truck	86	84	2

3.3 Modelling methodology

3.3.1 General modelling assumptions

Noise levels due to the operational activities shown in Section 3.2 were predicted to nearby noise sensitive receivers using SoundPLAN (Version 8.0) noise modelling software. The base noise model was based upon the current version of the *MCP Master SoundPlan model*.

The CONCAWE method was originally developed for predicting the long-distance propagation of noise from petrochemical complexes. It is especially suited to predicting noise propagation over large distances because it accounts for a range of atmospheric conditions that can significantly influence the propagation of noise over large distances.

Noting that the closest receptors in the vicinity of the proposed Facility are at least 500 m from the site, the CONCAWE environmental noise prediction method is an appropriate method for predicting the noise propagation. Whilst the General Prediction Method algorithm more accurately predicts at closer receiver locations, and was used for modelled receiver locations less than 100 m, as part of the model validation. The noise modelling includes:

- Ground topography;
- Buildings and structures;
- All sources behave as point, or moving point sources;
- Ground Absorption; and
- Representative operational noise sources as required.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment.

3.3.2 Predictions of operational activities on the day of measurements

On the day of measurements (30 November 2018) two trucks arrived on site, were then loaded with tunnel boring machine parts using reach stackers and then moved to a location on site where they would wait until night-time before departing the site. A SoundPLAN model was developed to calculate noise levels during the attended measurements at sensitive receiver locations.

Provided below in Table 9 is a comparison between the predictions, based on measurements and observations conducted on site on 30 November 2018, and the most stringent project noise limits (i.e. the Development Consent (DA 8137) night-time amenity noise limits).

Table 9 Predictions of operational activities on the day of measurements (30 November 2018)

ID	Receiver	Sound Pressure Level, L_{Aeq} , dB(A)		Compliant
		Criteria	Prediction	
R1	1 Arthur Street, Mayfield	35	30	Yes
R2	2 Crebert Street, Mayfield	35	34	Yes
R3	24 Crebert Street, Mayfield	35	34	Yes
R4	32 Elizabeth Street, Carrington	35	25	Yes
R5	186 Fullerton Road, Mayfield	35	23	Yes

The results in Table 9 indicate that the noise levels at the time of measurements were compliant with the noise criteria. They are also significantly below the measured noise levels at the assessment receivers (refer to Table 5), indicating that noise from the site would likely to be inaudible at the time of measurements.

3.3.3 Worst-case noise predictions

While the day of noise measurements can be considered typical, they are unlikely to be worst case. A detailed noise assessment of a reasonable worst-case scenario was undertaken to ensure compliance with the applicable noise criteria .

Table 10 Modelled plant and equipment sound power levels

Plant item/operation	Sound power level, dB(A)
L_{Aeq} Sound power levels	
Forklift loading/unloading/dropping onto dock	113 ¹
Reach stacker	106
Containers hitting dock when being unloaded (2 impacts for the joining/attaching and the base impact) (Adjusted for 15 minute period)	89 ²
Truck Idle	95
Truck airbrake event	104 ^{3,7}
Truck accelerating	100 ⁷
Lighting tower	85 ⁵
Temporary office plant (individual item)	70
L_{A1} Sound power levels	
Full Container Bang	117 ⁶

Plant item/operation	Sound power level, dB(A)
Empty Container Bang	119 ⁶
Trucks approaching/leaving site - Accelerating	105 ⁷
Truck airbrake event	120 ⁷

Notes:

1. Based upon AECOM attended measurements at the Mayfield Cargo Storage Facility on 28 November 2017
2. Based upon AECOM attended measurements at Mayfield No. 4 Berth.
3. This has been based upon an 20 second measurement, and has been modelled accordingly.
4. This value has then been used to model a dB(A)/m value for the truck movements.
5. This has been limited based upon the results of the noise impact assessment.
6. Based upon AECOM attended measurements at Port Botany on 9 December 2014.
7. Based on measurements at Stolthaven Bulk Lioquid Fuel Storage Facility on 29/30 November 2018.

3.3.4 Recommendations and discussion of noise source levels

Lighting towers

Temporary lighting towers may be brought in for night-time operations. As these may be operating continuously throughout the evening or night period they are also considered a key noise source on-site, following a review of the noise model. It is recommended that the temporary lighting towers are selected with a maximum SWL of 85 dB(A). This has been the basis of the noise modelling in this assessment.

3.3.5 Reasonable worst case operational scenarios

The following are the modelled operating scenarios which have been developed to represent a 'reasonable' worst case operational scenario for each of the assessment periods. All noise sources in the model were assumed to operate as per the points below.

Table 11 Operational assumptions for 'reasonable' worst case assessments

Operation	Day period	Evening period	Night period
Amenity			
Trucks movements through the facility	88 trucks ¹	16 trucks ²	36 trucks ²
	Trucks approaching and leaving the site via MCP internal roads and Selwyn Street at approximately 40 km/h.		
	Each truck idles for a total of 1 minute on site at gate.		
	Air-break releases occur when the trucks arrive on-site and are stopped prior entering at the gate and after moving to the unloading location (worst case – north west corner of the site).		
	Each truck takes 10 minutes to unload, and idles throughout the unloading period.		
Unloading/loading operations	Each truck is associated with an unloading operation of the reach stacker/forklift operation.		
	Reach stacker/forklifts will operate throughout the day, even when trucks are not present moving freight and cargo.	For each truck the reach stacker/forklift will operate up to 10 minutes for each truck movement.	
Other	-	During the evening and night periods it is assumed that up to six day makers are located along the north-western boundary operating continuously throughout the assessment period.	
Intrusive			
Trucks through the facility	2 trucks arrive 2 trucks leave 4 trucks waiting onsite 4 trucks unloaded in site	1 truck arrive 1 truck leave 2 trucks waiting onsite 2 trucks unloaded onsite	1 trucks arrive 1 trucks leave 2 trucks waiting onsite 2 trucks unloaded in site
	Trucks approaching and leaving the site via MCP internal roads and Selwyn Street at approximately 40 km/h.		
	Each truck idles for a total of 1 minute on site at gate.		
	Air-break releases occur when the trucks arrive on-site and are stopped prior entering at the gate, and also when they are stopped at the unloading location (worst case – north west corner of the site).		
	Trucks that have arrived wait 10 minutes idling for a previous truck to move on		
	Each truck takes approximately 15 minutes to unload, and idles throughout the unloading period.		
Unloading/loading operations	Both reach stackers/forklifts will operate for the entire 15 minutes loading or unloading		
Other	-	During the evening and night periods it is assumed that up to six day makers are located along the north-western boundary operating continuously throughout the assessment period.	
Office plant	Office plant is operating throughout the entire period, 3 condenser units located on the northern façade of the demountable office building.		

Notes:

1. Based upon 8 trucks per hour throughout the assessment period.
2. Based upon 4 trucks per hour throughout the assessment period.

3.4 Predicted operational noise levels

This section presents the predicted noise emissions to the nearby assessment locations, with consideration of the prevailing meteorological conditions, for each of the project approval requirements:

1. Development Consent (DA 8137); and
2. Mayfield Concept Plan Noise Quota.

3.4.1 Development Consent (DA 8137) assessment

Intrusiveness period noise assessment

The following are the modelled results for the reasonable worst case intrusiveness scenario (15 minute period). The modelling scenarios are presented in Section 3.2.

Table 12 Predicted noise levels reasonable worst case operational scenarios intrusiveness assessment

Receiver	Noise limits, L _{Aeq,15min} dB(A)	Predicted noise level, L _{Aeq,15min} dB(A)		Compliance
		Neutral weather	Adverse weather	
Daytime				
R1	35	27	33	Yes
R2	39	34	38	Yes
R3	40	34	39	Yes
R4	35	22	27	Yes
R5	35	20	26	Yes
Evening				
R1	35	27	32	Yes
R2	39	33	38	Yes
R3	39	33	38	Yes
R4	35	22	27	Yes
R5	35	20	26	Yes
Night-time				
R1	35	27	32	Yes
R2	39	33	38	Yes
R3	39	33	38	Yes
R4	35	22	27	Yes
R5	35	20	26	Yes

Amenity period noise assessment

The predicted noise levels presented in Table 13 have been assessed against the Development Consent (DA 8137) night-time amenity noise limits.

Table 13 Predicted noise levels reasonable worst case operational scenarios amenity assessment (night-time)

Receiver	Noise limits, $L_{Aeq(9hr)}$ dB(A)	Predicted noise level, $L_{Aeq(9hr)}$ dB(A)		Compliance
		Neutral weather	Adverse weather	
Night-time				
R1	35	23	28	Yes
R2	35	29	33	Yes
R3	35	29	34	Yes
R4	35	19	24	Yes
R5	35	17	23	Yes

Sleep disturbance

The predicted noise levels presented in Table 14 have been assessed against the Development Consent (DA 8137) night-time amenity noise limits.

The night-time sleep disturbance assessment has been undertaken against the most stringent meteorological condition. As such predicted noise levels for 3 m/s source to receiver winds and F-Class temperature inversion have been predicted for all receiver locations and as the noise levels are generally higher for the 3 m/s source to receiver winds situation, only these results have been presented.

Table 14 Predicted noise levels reasonable worst case operational scenarios, night-time $L_{A1(1min)}$

Receiver	Noise limits, $L_{A1(1min)}$ dB(A)	Predicted noise level, $L_{A1(1min)}$ dB(A)	Compliance
		Adverse weather	
Night-time			
R1	46	46	Yes
R2	51	51	Yes
R3	52	52	Yes
R4	41	41	Yes
R5	40	40	Yes

3.4.2 Mayfield Concept Plan noise quotas assessment

As outlined in Section 2.1.4, as the Project lies within the MCP site, the Project site is required to demonstrate compliance with the requirements of the MCP approval. The MCP approval aims to address cumulative noise impacts from all sites that make up the entire MCP area, with a purpose of addressing cumulative noise impacts as the concept area is developed over time.

PON has developed a Cumulative Environmental Noise Management Tool (CENMT) for the MCP, as such the assessment quotas provided in Table 3 are for assessment purposes only.

Table 15 presents the predicted noise levels against the MCP noise quota.

These noise quotas were assessed under winds of up to 3 metres/second (measured at 10 metres above the ground level) and Pasquill stability class from A to F as required by the MCP Approval (09_0096MOD 2). As such the highest predicted noise level out of these conditions were included in Table 15, which is with a 3 m/s source to receiver wind.

Table 15 Predicted noise levels, MCP noise quota

Receiver	MCP noise quota L _{Aeq, period} dB(A)	Predicted noise level, L _{Aeq, period} dB(A)		Compliance
		Neutral weather	Adverse weather	
Daytime				
A	51	25	30	Yes
B	51	31	36	Yes
C	46	20	26	Yes
D	45	19	25	Yes
Evening				
A	40	23	28	Yes
B	41	29	33	Yes
C	33	19	24	Yes
D	27	17	23	Yes
Night-time				
A	34	23	28	Yes
B	34	29	33	Yes
C	34	19	24	Yes
D	27	17	23	Yes

4.0 Conclusion

Port of Newcastle Operations Pty Ltd (PON) commissioned AECOM Australia Pty Ltd (AECOM) to carry out noise compliance measurements associated with operations at the Mayfield Cargo Storage Facility (the Facility) operated by PON at Mayfield, NSW.

The facility has two relevant approval/licence documents that control its operations. These documents are:

- Department of Planning and Environment issued *Development Consent (DA 8137)*, dated 30 June 2017; and
- Mayfield Concept Approval (MCP) (Application 09_0096) dated 16 July 2012 (latest modification 12 December 2014).

This acoustic assessment was conducted to determine compliance with the requirement of Development Consent (DA 8137).

As the Facility lies within the MCP approval area, it requires noise emissions from the site to be consistent with the environmental assessment requirements of the MCP Approval. Consistency with the MCP Approval requirements has also been addressed in this report.

Attended noise measurements were undertaken between 6 and 7 December 2019 at the closest nearby residential receiver locations in accordance with Development Consent (DA 8137). However, during this time the Facility was idle and therefore it was not possible to conduct nearfield measurements of operational activities on-site. Therefore for the purpose of this assessment previous years' noise measurements were used to demonstrate compliance with the Facility's noise limits.

As presented in previous years' operational noise compliance assessments, it is not possible to directly measure the impact of noise arising from operations at the Facility due to the influence from extraneous noise sources at nearby receiver locations. The compliance assessment was therefore carried out using SoundPLAN noise modelling software.

This method of noise compliance assessment is in accordance of the Chapter 11 of the INP. In order to determine compliance of the Facility operational noise emissions with the required noise limits 'reasonable' worst case operational scenarios were determined based upon the on-site attended noise measurements undertaken on 30 November 2018 .

Daytime, evening and night-time noise emissions were predicted to each of the required assessment locations and compared against the site noise limits for all scenarios. The Project approval requires that the noise emissions be assessed under worst case prevailing wind and temperature inversion conditions.

Development Consent (DA 8137)

The operational noise compliance assessment indicates compliance with Development Consent (DA 8137) noise limits under neutral and adverse meteorological conditions at all assessment locations during the daytime, evening and night-time periods.

Mayfield Concept Plan Noise Quota

As part of the MCP Cumulative Environmental Noise Management Tool (CENMT) noise quotas are issued for sites proposed within the MCP, in order to address future cumulative noise from all sites within the MCP. The operational noise compliance assessment indicates compliance with the MCP noise quota under neutral and adverse meteorological conditions at all assessment locations during the daytime, evening and night-time periods.

Appendix A

Acoustic Terminology

Appendix A Acoustic Terminology

The following is a brief description of acoustic terminology that may have been used in this report.

<i>Sound power level</i>	The total sound emitted by a source																						
<i>Sound pressure level</i>	The amount of sound at a specified point																						
<i>Decibel [dB]</i>	The measurement unit of sound																						
<i>A Weighted decibels [dB(A)]</i>	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).																						
<i>Decibel scale</i>	<p>The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:</p> <table> <tr> <td>0dB(A)</td> <td>Threshold of human hearing</td> </tr> <tr> <td>30dB(A)</td> <td>A quiet country park</td> </tr> <tr> <td>40dB(A)</td> <td>Whisper in a library</td> </tr> <tr> <td>50dB(A)</td> <td>Open office space</td> </tr> <tr> <td>70dB(A)</td> <td>Inside a car on a freeway</td> </tr> <tr> <td>80dB(A)</td> <td>Outboard motor</td> </tr> <tr> <td>90dB(A)</td> <td>Heavy truck pass-by</td> </tr> <tr> <td>100dB(A)</td> <td>Jackhammer/Subway train</td> </tr> <tr> <td>110 dB(A)</td> <td>Rock Concert</td> </tr> <tr> <td>115dB(A)</td> <td>Limit of sound permitted in industry</td> </tr> <tr> <td>120dB(A)</td> <td>747 take off at 250 metres</td> </tr> </table>	0dB(A)	Threshold of human hearing	30dB(A)	A quiet country park	40dB(A)	Whisper in a library	50dB(A)	Open office space	70dB(A)	Inside a car on a freeway	80dB(A)	Outboard motor	90dB(A)	Heavy truck pass-by	100dB(A)	Jackhammer/Subway train	110 dB(A)	Rock Concert	115dB(A)	Limit of sound permitted in industry	120dB(A)	747 take off at 250 metres
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30dB(A)	A quiet country park																						
40dB(A)	Whisper in a library																						
50dB(A)	Open office space																						
70dB(A)	Inside a car on a freeway																						
80dB(A)	Outboard motor																						
90dB(A)	Heavy truck pass-by																						
100dB(A)	Jackhammer/Subway train																						
110 dB(A)	Rock Concert																						
115dB(A)	Limit of sound permitted in industry																						
120dB(A)	747 take off at 250 metres																						
<i>Frequency [f]</i>	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.																						
<i>Equivalent continuous sound level [L_{eq}]</i>	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.																						
<i>L_{max}</i>	The maximum sound pressure level measured over the measurement period																						
<i>L_{min}</i>	The minimum sound pressure level measured over the measurement period																						
<i>L₁₀</i>	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L ₁₀ .																						

<i>L₉₀</i>	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L ₉₀ .
<i>Ambient noise</i>	The all-encompassing noise at a point composed of sound from all sources near and far.
<i>Background noise</i>	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L ₉₀ sound pressure level is used to quantify background noise.
<i>Traffic noise</i>	The total noise resulting from road traffic. The L _{eq} sound pressure level is used to quantify traffic noise.
<i>Day</i>	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
<i>Evening</i>	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
<i>Night</i>	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
<i>Assessment background level [ABL]</i>	The overall background level for each day, evening and night period for each day of the noise monitoring.
<i>Rating background level [RBL]</i>	The overall background level for each day, evening and night period for the entire length of noise monitoring.
<i>Weighted sound reduction index [R_w]</i>	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 "Acoustics – Glossary of terms and related symbols", the EPA's NSW Industrial Noise Policy, Noise Policy for Industry and the EPA's NSW Road Noise Policy.