

<b>To:</b>		<b>At:</b>	Mirvac Projects Pty Ltd
<b>From:</b>	Joshua Ridgway	<b>At:</b>	SLR Consulting Australia Pty Ltd
<b>Date:</b>	27 February 2023	<b>Ref:</b>	610.19127-M01-MOD 3 Revised Results-v0.3-20230227.docx
<b>Subject:</b>	Aspect Industrial Estate MOD 3 Revised Operational Noise Level Predictions		

---

## 1 Introduction

This memo provides a comparison of the predicted operational noise levels for the Aspect Industrial Estate (AIE), with respect to the recent modifications of development consent SSD-10448. Noise levels have been compared for the following noise impact assessments (NIAs):

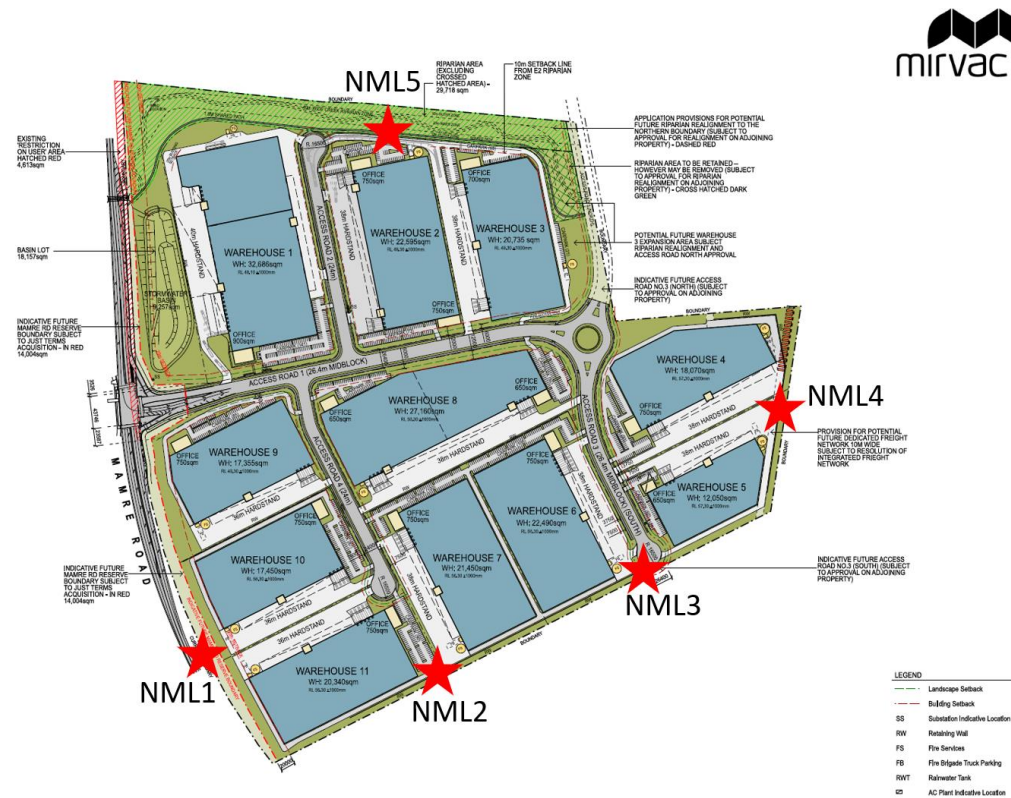
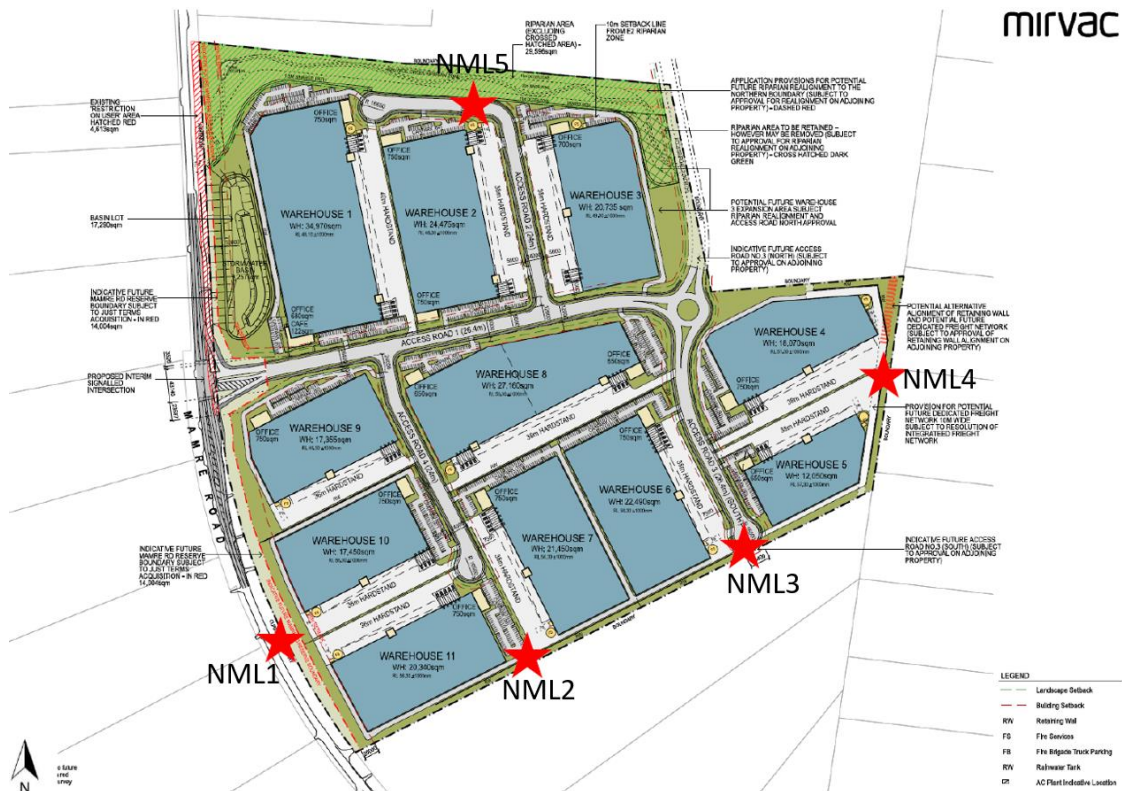
- The SSDA NIA (SLR Report *610.19127-R02-v1.4*, dated February 2021), including addendum report DPE Locations Operational Noise Predictions Report (DPE ONPR) (SLR Report *610.19127-M03-v1.0-20210831*, dated August 2021).
- Modification noise assessment prepared for MOD 2 (MOD 2 NIA).
- Modification noise assessment prepared for MOD 3 (MOD 3 NIA), with updated modelling inputs as revised in this memorandum.

Noise levels have been compared at the following locations:

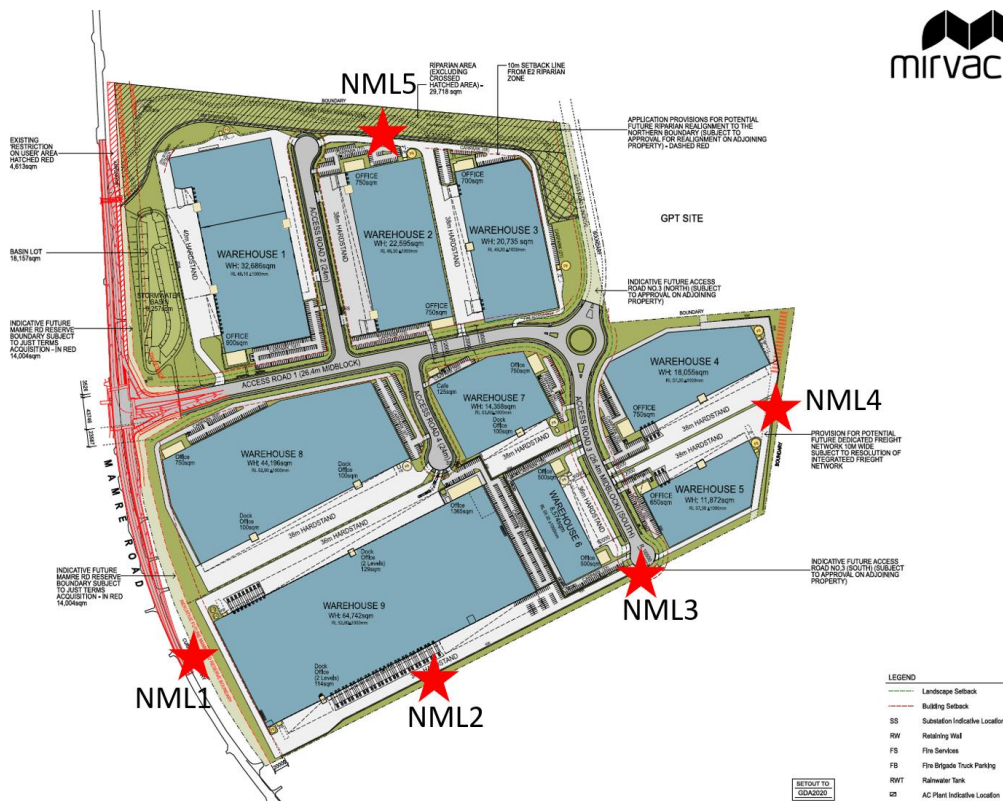
- The site boundary Noise Monitoring Locations (NMLs)
- At the DPE receiver assessment points.

## 2 Development Changes

The site layouts are shown in **Figure 1**, **Figure 2** and **Figure 3** for the SSDA consent approval, MOD 2 and MOD 3, respectively.



**Figure 3 Proposed MOD 3 Masterplan Design (with Noise Monitoring Locations)**



The changes relevant to operational noise are detailed below for each modification:

#### MOD 2:

- Modification to Warehouse 1 including moving the hardstand to the western side of the warehouse and inclusion of temperature control in the northern portion of the warehouse.
- Associated adjustments to Access Road 2 and Lots 2 and 3.

#### MOD 3:

- Substantial changes/consolidation of Warehouses/Lots 6, 7, 8, 9, 10 and 11 (now Warehouses/Lots 6, 7, 8 and 9) and Access Road 4 in the south-western portion of the site.

#### Revised Noise Monitoring Locations

A number of the NMLs are in locations that are likely to be difficult to access to complete attended monitoring or are in locations that are not considered safe (ie in access roads/hardstands at the bottom of retaining walls, etc). The NMLs have been reviewed and repositioned to locations considered safe and accessible.

The revised NMLs are detailed below:

- NML2 and NML4 have been relocated to the top of the adjacent retaining wall.
- NML3 and NML5 have been moved to the edge of the site boundary away from potential vehicle movements.
- No changes to NML1.

The relocated NMLs are within around 5 m of the original locations. The predicted noise levels for MOD 2 use the revised NML5 location, and the predicted levels for MOD 3 use all the revised NML locations.

### 3 MOD 3 Revised Modelling Inputs

The modelling inputs for the MOD 3 operational noise assessment have been updated since the initial MOD 3 noise assessment. The revised modelling inputs are detailed below.

#### 3.1 On-Site Traffic

Hourly vehicle volumes for each warehouse in estate based on warehouse GFA were provided by Mirvac. Hourly volumes specific to the customers' operations have been provided for Warehouse 1 and Warehouse 9. Warehouse 1 volumes are consistent with the MOD 2 NIA.

Additional investigation of the traffic requirements for the development has been completed since the MOD 2 NIA. This has resulted in the following updates to the noise modelling assumptions for MOD 3:

- The majority of heavy vehicle deliveries are expected to be via rigid trucks. The model has therefore been updated to split heavy vehicles between the expected number of medium trucks (ie rigid trucks) and heavy trucks (ie semi-trailers, a-doubles and b-doubles), based on traffic volumes provided by the project traffic consultant.
- The project traffic consultant has advised that average heavy vehicle speeds for hardstands and on-lot truck access of 10 km/h should be adopted.

Based on the provided vehicle information, the peak 1-hour vehicle volumes during the daytime, evening and night-time periods would occur outside the road network morning and evening peak hours. The peak 1-hour site vehicle volumes are detailed in **Table 1**. Heavy vehicles for the estate are anticipated to be around 66% rigid trucks (medium trucks), and 7% semi-trailer trucks, 2% b-double trucks and 25% a-double trucks (heavy trucks). Warehouse 1 and Warehouse 9 have been conservatively modelled only with heavy trucks. Warehouse 9 also has a fleet of transit/sprinter vans which would access the hardstand and on-lot truck access.

**Table 1 Peak 1-Hour Vehicle Volumes**

Lot/Warehouse	Peak 1-Hour Vehicle Volumes					
	Daytime / Evening			Night-time		
	Light Vehicles	Medium Trucks	Heavy Trucks	Light Vehicles	Medium Trucks	Heavy Trucks
1	78	0	3	78	0	3
2	45	11	5	41	7	4
3	40	9	5	36	6	3
4	35	8	4	32	5	3
5	24	5	3	22	4	2
6	18	5	2	17	3	1
7	28	7	3	26	5	2
8	85	20	10	77	13	7
9	45	24 vans	10	27	18 vans	8

Note 1: Daytime is 7 am to 6 pm, Evening is 6 pm to 10 pm, Night-time is 10 pm to 7 am.

The peak 1-hour vehicle volumes in **Table 1** have been assumed to be spread evenly across the 1-hour period, and have been divided by four to model the worst-case 15-minute volumes during the daytime/evening and night-time periods.

The relevant sound power levels (SWLs) and modelling assumptions are detailed in **Table 2**. Medium and heavy trucks have been modelled in hardstands and on-lot truck access. Transit/sprinter vans have been modelled in the Warehouse 9 hardstands and on-lot truck access. An increased sound power level has been applied to all heavy/medium vehicles in areas where they are expected to accelerate, such as at the entrance/exit of each lot. Light vehicles have been modelled in car parks and on-lot light-vehicle access. Vehicle noise sources have been modelled as line sources with SWL per metre.

**Table 2 Vehicle Noise Sources**

Vehicle Type	Location	Sound Power Level (dBA)	Vehicle Speed (km/h)
Heavy trucks	Hardstands and on-lot truck access	106 <sup>1</sup> Slow speed movement	10
		111 <sup>1</sup> Acceleration	10
Medium trucks	Hardstands and on-lot truck access	95 <sup>2</sup> Slow speed movement	10
		100 <sup>2</sup> Acceleration	10
Transit/sprinter vans	Warehouse 9 hardstands and on-lot truck access	91 <sup>3</sup>	10
Light vehicles	Car parks and on-lot light-vehicle access	90 <sup>4</sup>	20

Note 1: Sound power level for 'heavy trucks' taken from the Federal Highway Administration's *Traffic Noise Model* and is representative of trucks with three or more axles.

Note 2: Sound power level for 'medium trucks' based on SLR measurement data.

Note 3: Sound power level for Warehouse 9 transit/sprinter vans measured by SLR at the customers' existing site and takes slow speed movements and acceleration into account.

Note 4: Sound power level for light vehicles based on SLR measurement data.

### 3.2 Loading Docks

The modelled loading dock noise sources are detailed in **Table 3**. Consistent with the MOD 2 NIA, external forklift movements (ie outside of the warehouses) have been modelled in the at-grade dock areas of the hardstands at a rate of one forklift per heavy vehicle onsite, operating continuously during any one 15-minute period.

Warehouse 9 will have electric forklifts, with the other warehouses assumed to have gas forklifts (consistent with the MOD 2 NIA). Compactor operation and skip bin loading/unloading will take place in the south-eastern hardstand area of Warehouse 9 (adjacent to the overflow car park). Compactor operation and skip bin loading/unloading would occur only during the daytime/evening periods (not during the night-time) and would only be for a few minutes at a time, a few times per day.

Refrigerated truck trailers have been modelled for Warehouse 1, operating continuously during any one 15-minute period. Two refrigerated truck trailers have been modelled as operational during the daytime and evening periods, with one refrigerated truck trailer modelled during the night-time period.

Loading dock noise sources have been modelled as area sources with the SWL of all sources operating in that area (scaled up to the number of truck movements) spread across the area (modelled as per unit).

**Table 3 Loading Dock Noise Sources**

Noise Source	Sound Power Level (dBA) <sup>1</sup>	Typical Duration of Use in Worst-case 15-minute Period
Truck reversing alarm <sup>2</sup>	107 <sup>3</sup>	30 seconds
Forklift reversing alarm <sup>2</sup>	102 <sup>3</sup>	90 seconds
Truck air brakes	118	1 second
Gas forklift	93	900 seconds
Electric forklift	84	900 seconds
Refrigerated truck trailer	102 <sup>4</sup>	900 seconds
Compactor	96	300 seconds
Skip bin loading/unloading	96	300 seconds

Note 1: SWL taken from SLR measurement data unless specified otherwise.

Note 2: The NPfI intermittent correction does not apply to short-term events that emerge above the general industrial noise level and is therefore not applicable to industrial or commercial sites that have vehicle or plant movements at night, including audible reversing alarms.

Note 3: SWL includes a -3 dB reduction due to alarms being discrete events.

Note 4: Taken from SLR measurement data and *Sound Power Levels and Directivity Patterns of Refrigerated Transport Trailers*, Roy et al, 2017.

### 3.3 Mechanical Plant

External mechanical plant on Warehouses 2 to 8 has been modelled on the warehouse rooftops with an indicative cumulative SWL of 90 dBA per warehouse (modelled as two point-sources with a SWL of 87 dBA each), consistent with the MOD 2 NIA. Warehouse 1 has seven VPAC units on the roof, modelled as individual point sources with a SWL of 80 dBA each, as detailed in the MOD 2 NIA.

Warehouse 9 will have 18 smoke extraction fans on the warehouse roof and a plant area adjacent to the main office for office air conditioner units. The units have not yet been selected and have been modelled as 18 point-sources on the roof and 6 point-sources adjacent to the main office, each with an indicative SWL of 76 dBA (for a total indicative cumulative SWL of 90 dBA for the 24 units).

### 3.4 Noise Sources with Potential for Sleep Disturbance

As the development would operate 24-hours a day, noise emissions during the night-time require assessment for potential sleep disturbance at the nearest residential receivers. The details of typical activities with the potential to cause sleep disturbance are shown in **Table 4**.

#### Table 4 Sleep Disturbance Noise Events – L<sub>Amax</sub> Sound Power Levels

Noise Source	Sound Power Level L <sub>Amax</sub> (dBA)
Accelerating trucks in hardstands and on-lot truck access	111
Truck air brakes in hardstands	118
Truck reversing alarm in recessed docks	110
Forklift reversing alarm in hardstands	105
Light vehicle movements in car parks and on-lot light-vehicle access	100

### 3.5 Noise Barriers

Several noise barriers have been modelled in the western area of the site to help minimise noise levels to the west and south of the development. The barriers have been modelled along the western edge of the Lot 1, parts of the northern and western edges of Lot 8, and parts of the western and southern edges of Lot 9, as shown in green in **Figure 4**. Extending the barrier further along the southern edge of Lot 9 or further along the northern edges of Lot 1 or Lot 8 does not result in any significant additional acoustic benefit.

The barriers were modelled with a height of 2 m. Increasing the barrier height up to 5 m did not have significant additional acoustic benefit compared to 2 m.

It is noted that the barrier locations are indicative and would be confirmed as designs are finalised during detailed design.

### Figure 4 Modelled Noise Barriers



Note 1: Indicative noise barrier locations shown in green.

## 4 Noise Predictions

### 4.1 Boundary Noise Monitoring Locations

The masterplan operational noise levels for the various assessments are compared in **Table 5** for the site boundary Noise Monitoring Locations (NMLs).

**Table 5 Predicted Operational Noise Levels – Boundary Noise Monitoring Locations**

Noise Monitoring Location	Period (weather)	LAeq(15 minutes) Noise Level (dBA)				LAmix Noise Level (dBA)			
		Original Noise Limit	DPE ONPR Predicted	MOD 2 Predicted	MOD 3 Predicted	Original Noise Limit	DPE ONPR Predicted	MOD 2 Predicted	MOD 3 Predicted
NML 1	Daytime (standard)	50	50	50	48	n/a	n/a	n/a	n/a
	Evening (standard)	50	50	50	48	n/a	n/a	n/a	n/a
	Night-time (standard)	47	47	47	47	63	63	63	63
	Night-time (noise-enhancing)	n/a	50	50	49	n/a	64	64	66
NML 2	Daytime (standard)	62	62	62	58	n/a	n/a	n/a	n/a
	Evening (standard)	62	62	62	58	n/a	n/a	n/a	n/a
	Night-time (standard)	60	60	60	57	79	79	79	84
	Night-time (noise-enhancing)	n/a	62	62	58	n/a	80	80	84
NML 3	Daytime (standard)	64	64	64	60	n/a	n/a	n/a	n/a
	Evening (standard)	64	64	64	60	n/a	n/a	n/a	n/a
	Night-time (standard)	61	61	61	58	79	79	79	80
	Night-time (noise-enhancing)	n/a	62	62	59	n/a	80	80	80
NML 4	Daytime (standard)	65	65	65	59	n/a	n/a	n/a	n/a
	Evening (standard)	65	65	65	59	n/a	n/a	n/a	n/a
	Night-time (standard)	62	62	62	58	82	82	82	80
	Night-time (noise-enhancing)	n/a	64	64	60	n/a	82	82	80
NML 5	Daytime (standard)	66	66	66	59	n/a	n/a	n/a	n/a
	Evening (standard)	66	66	66	59	n/a	n/a	n/a	n/a
	Night-time (standard)	64	64	61	57	82	82	82	82
	Night-time (noise-enhancing)	n/a	65	62	58	n/a	83	82	82

Note: Predictions for MOD 2 and MOD 3 include revised NML locations and modelling assumptions as detailed in **Section 2** and **Section 3**, respectively.

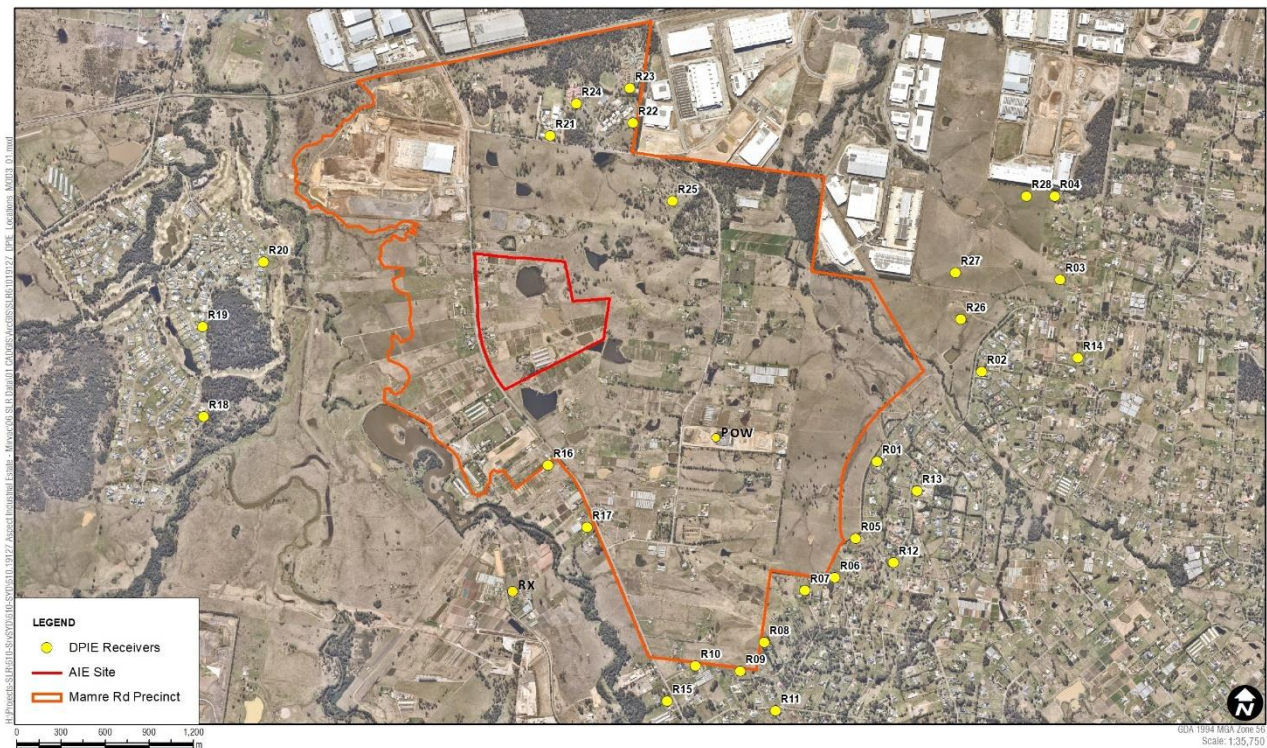
### 4.2 DPE Receiver Points

The DPE receiver points are shown in **Table 6** and **Figure 5**. An additional receiver (RX) on Clifton Avenue, Kemps Creek, has been added as the next closest receiver to the south now that R16 and R17 are zoned industrial. The place of worship (POW) within the Mamre Road Precinct has also been added.

**Table 6 Receiver Details**

Receiver ID	Coordinates	Direction from Site
R01	-33.852352, 150.810442	Southeast
R02	-33.846976, 150.818277	East
R03	-33.841444, 150.824180	East
R04	-33.836337, 150.823928	East
R05	-33.857030, 150.808758	Southeast
R06	-33.859400, 150.807159	Southeast
R07	-33.860122, 150.804938	Southeast
R08	-33.863238, 150.801886	Southeast
R09	-33.864984, 150.800089	Southeast
R10	-33.864609, 150.796779	Southeast
R11	-33.867462, 150.802610	Southeast
R12	-33.858562, 150.811526	Southeast
R13	-33.854177, 150.813355	Southeast
R14	-33.846255, 150.825344	East
R15	-33.866712, 150.794671	Southeast
R16 (now zoned industrial)	-33.852140, 150.786278	South
R17 (now zoned industrial)	-33.855995, 150.789059	South
R18	-33.848685, 150.761068	West
R19	-33.843199, 150.761143	West
R20	-33.839325, 150.765713	West
R21 childcare (now zoned industrial)	-33.831984, 150.786967	North
R22 school (now zoned industrial)	-33.831286, 150.793061	North
R23 school (now zoned industrial)	-33.829165, 150.792879	North
R24 school (now zoned industrial)	-33.830045, 150.788925	North
R25 (removed due to SSDA on land)	-33.836221, 150.795958	Northeast
R26	-33.843740, 150.816836	East
R27	-33.840898, 150.816493	East
R28	-33.836299, 150.821836	East
RX	-33.859843, 150.783450	South
POW place of worship	-33.850780, 150.798593	Southeast

**Figure 5 Receiver Locations**



The masterplan operational noise levels for the various assessments are compared in **Table 7** at the DPE receiver locations, with the difference between the original DPE ONPR assessment and the MOD 3 predictions shown in **Table 8**.

A correction of 10 dB has been subtracted from the predicted noise levels to account for screening from future warehouse structures on other estates between the AIE site and the receivers, consistent with the approved NIAs.

**Table 7 Predicted Operational Noise Levels**

Rec. ID	LAeq(15 minutes) Noise Level (dBA)												LAmx Noise Level (dBA)							
	Daytime/Evening (standard weather)				Night-time (standard weather)				Night-time (noise-enhancing weather)				Night-time (standard weather)				Night-time (noise-enhancing weather)			
	Criteria <sup>1</sup>	DPIE ONPR	MOD 2	MOD 3	Criteria <sup>1</sup>	DPIE ONPR	MOD 2	MOD 3	Criteria <sup>1</sup>	DPIE ONPR	MOD 2	MOD 3	Criteria <sup>1</sup>	DPIE ONPR	MOD 2	MOD 3	Criteria <sup>1</sup>	DPIE ONPR	MOD 2	MOD 3
R01	43/38	11	11	7	33	9	9	6	33	16	16	13	56	23	23	23	56	30	30	30
R02	43/38	10	10	6	33	8	8	5	33	15	15	11	56	22	22	22	56	29	29	29
R03	43/38	10	10	3	33	7	7	2	33	14	14	9	56	18	18	18	56	25	25	25
R04	43/38	11	10	7	33	7	7	6	33	14	14	12	56	18	16	20	56	25	23	27
R05	43/38	11	11	7	33	9	10	7	33	16	17	14	56	24	24	22	56	31	31	29
R06	43/38	13	14	10	33	11	13	10	33	18	19	16	56	25	25	24	56	32	32	32
R07	43/38	15	15	11	33	13	14	11	33	20	21	17	56	25	25	25	56	33	33	32
R08	43/38	1	1	<0	33	0	0	<0	33	5	5	1	56	6	6	5	56	13	13	12
R09	43/38	2	2	<0	33	0	0	<0	33	6	7	2	56	7	7	7	56	15	15	15
R10	43/38	16	16	10	33	13	14	9	33	20	21	16	56	24	24	23	56	31	31	30
R11	43/38	8	8	0	33	5	6	0	33	12	13	7	56	16	16	12	56	23	23	19
R12	43/38	11	12	8	33	9	10	7	33	16	17	14	56	23	23	23	56	31	31	30
R13	43/38	12	12	8	33	10	10	7	33	17	17	14	56	23	23	23	56	31	31	30
R14	43/38	7	8	3	33	6	6	2	33	12	13	9	56	21	21	18	56	28	28	25
R15	43/38	13	13	7	33	10	11	7	33	17	18	13	56	22	22	20	56	29	29	27
R16	43/38	23	23	20	33	22	22	19	33	27	28	25	56	33	33	32	56	39	39	39
R17	43/38	18	18	14	33	16	16	14	33	23	23	20	56	27	27	26	56	34	34	33
R18	42/38	19	19	13	33	16	17	11	33	23	24	18	52	26	26	24	52	33	33	32
R19	42/38	18	19	12	33	14	17	9	33	21	24	16	52	23	24	24	52	31	31	31
R20	42/38	21	23	17	33	17	21	14	33	24	28	21	52	28	30	29	52	35	37	36
R21	42	19	19	12	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-
R22	42	16	16	12	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-
R23	42	11	11	7	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-
R24	42	19	19	12	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-
R25	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-
R26	43/38	8	9	4	33	7	7	3	33	14	14	9	56	23	23	19	56	30	30	27
R27	43/38	13	13	6	33	9	9	5	33	16	16	11	56	19	19	20	56	26	26	27
R28	43/38	11	11	6	33	7	7	5	33	14	14	12	56	17	17	18	56	24	24	25
RX	43/38	-	19	15	33	-	18	12	33	-	25	19	56	-	40	30	56	-	47	37
POW	42	-	18	16	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-	n/a	-	-	-

Note 1: Criteria for DPE receiver locations were not determined in the previous assessments. Criteria for R18, R19 and R20 taken from 'receivers to the west' in MOD 2 NIA. Criteria for POW, R21, R22, R23 and R24 taken from 'place of worship' in MOD 2 NIA. Criteria for all other receivers taken from 'receivers to the south' in MOD 2 NIA.

**Table 8 Predicted Change Operational Noise Levels between DPE ONPR and MOD 4**

Rec. ID	LAeq(15 minutes) Noise Level (dBA)									LAmx Noise Level (dBA)					
	Daytime/Evening (standard weather)			Night-time (standard weather)			Night-time (noise-enhancing weather)			Night-time (standard weather)			Night-time (noise-enhancing weather)		
	DPE ONPR	MOD 3	Change	DPE ONPR	MOD 3	Change	DPE ONPR	MOD 3	Change	DPE ONPR	MOD 3	Change	DPE ONPR	MOD 3	Change
R01	11	7	-4	9	6	-3	16	13	-3	23	23	0	30	30	0
R02	10	6	-4	8	5	-3	15	11	-4	22	22	0	29	29	0
R03	10	3	-7	7	2	-5	14	9	-5	18	18	0	25	25	0
R04	11	7	-4	7	6	-1	14	12	-2	18	20	+2	25	27	+2
R05	11	7	-4	9	7	-2	16	14	-2	24	22	-2	31	29	-2
R06	13	10	-3	11	10	-1	18	16	-2	25	24	-1	32	32	0
R07	15	11	-4	13	11	-2	20	17	-3	25	25	0	33	32	-1
R08	1	-5	-6	0	-6	-6	5	1	-4	6	5	-1	13	12	-1
R09	2	-4	-6	0	-5	-5	6	2	-4	7	7	0	15	15	0
R10	16	10	-6	13	9	-4	20	16	-4	24	23	-1	31	30	-1
R11	8	0	-8	5	0	-5	12	7	-5	16	12	-4	23	19	-4
R12	11	8	-3	9	7	-2	16	14	-2	23	23	0	31	30	-1
R13	12	8	-4	10	7	-3	17	14	-3	23	23	0	31	30	-1
R14	7	3	-4	6	2	-4	12	9	-3	21	18	-3	28	25	-3
R15	13	7	-6	10	7	-3	17	13	-4	22	20	-2	29	27	-2
R16	23	20	-3	22	19	-3	27	25	-2	33	32	-1	39	39	0
R17	18	14	-4	16	14	-2	23	20	-3	27	26	-1	34	33	-1
R18	19	13	-6	16	11	-5	23	18	-5	26	24	-2	33	32	-1
R19	18	12	-6	14	9	-5	21	16	-5	23	24	+1	31	31	0
R20	21	17	-4	17	14	-3	24	21	-3	28	29	+1	35	36	+1
R21	19	12	-7	-	-	-	-	-	-	-	-	-	-	-	-
R22	16	12	-4	-	-	-	-	-	-	-	-	-	-	-	-
R23	11	7	-4	-	-	-	-	-	-	-	-	-	-	-	-
R24	19	12	-7	-	-	-	-	-	-	-	-	-	-	-	-
R25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R26	8	4	-4	7	3	-4	14	9	-5	23	19	-4	30	27	-3
R27	13	6	-7	9	5	-4	16	11	-5	19	20	+1	26	27	+1
R28	11	6	-5	7	5	-2	14	12	-2	17	18	+1	24	25	+1
RX	-	15	-	-	12	-	-	19	-	-	30	-	-	37	-
POW	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-

## 5 Mitigation and Management Measures

All potential feasible and reasonable mitigation measures that have been considered during the various approvals assessments are summarised in **Table 9**.

**Table 9 Feasible and Reasonable Mitigation Options**

Ref.	Mitigation Option	Noise Impact/Benefit	Reasonable and Feasible to Apply
<b>Source Control</b>			
S1	Optimised site layout to minimise noise emissions from the site	Where possible, the site layout has been designed so that the warehouse buildings screen the noisier areas of the development (ie hardstands and truck routes) from the nearest receivers.	Yes – applied during design of the masterplan
S2	Limit vehicle movements	A reduction in concurrent vehicle movements across the site by staggering delivery/pickup times and/or employee shift change times could reduce noise emissions. In practice, this would occur naturally across the estate due to operational requirements of the different tenants.	No – vehicle volumes used in this assessment are likely needed to meet tenant’s requirements. Placing restrictions on allowable vehicle movements across the different tenancies is unlikely to be feasible and reasonable.
S3	Use broadband and/or ambient sensing alarms on trucks and forklifts where they are required to reverse during the night-time.	Reduce potential for annoying noise emissions during the night-time from forklifts and trucks.	Yes – use broadband and/or ambient sensing alarms on forklifts and trucks where they are required to reverse during the night-time.
S4	Appropriate design of site layout to minimise the need for trucks to stop or brake outside of loading docks with line of sight to residential receivers.	Minimise noise emissions, particularly from truck airbrakes.	Yes – applied during design of the concept masterplan
S5	Production of an Operational Noise Management Plan.	This would detail the measures that could be used by the various tenants to minimise general noise emissions from the site. Reference can be made to the Best Management Practice (BMP) and Best Available Technology Economically Available (BATEA) measures listed in the NPfI.	Yes – can form part of consent conditions
<b>Path Control</b>			
P1	Noise barriers	Construction of noise barriers along boundary fence locations or other strategic locations could be used to reduce noise levels where plant or equipment are in line of sight of the nearest receivers.	Yes - Noise barriers have been included in the noise model as detailed in <b>Section 3.5</b> . It is noted that the height and location of these barriers are indicative and would be confirmed during detailed design.
<b>Receiver Control</b>			
R1	Not required	n/a	n/a

Ref.	Mitigation Option	Noise Impact/Benefit	Reasonable and Feasible to Apply
<b>Verification Monitoring</b>			
V1	Noise monitoring	Verify post-construction operational noise levels are in-line with predictions.	Yes – verification monitoring would be completed within three months of commencement of operation, as per the requirements of SSD-10448 Consent Condition D53.

Further discussion regarding specific mitigation measures for Warehouse 9 is provided below:

- **Layout:** Due to Winnings requiring a 66,350 sqm warehouse with dual sided hardstand, and dimensions of around 160 m by 405 m, the AIE Concept Plan can only accommodate the proposed facility in the location and orientation proposed in MOD 3. Relocation of Warehouse 9 to further reduce noise emissions from the site is not feasible.
- **Number of loading docks:** Winnings operations require a large amount of recessed and on-grade docks. This is because they receive and dispatch a number of containers, and need the flexibility to utilise docks for slow moving loading and unloading of receipt and dispatch container changes, with also fast moving receipt and dispatch van delivery changes. Therefore a reduction in loading docks is not feasible for Winnings operations.
- **Type of equipment:** The primary equipment on site are forklifts which are electric (and have lower noise emissions than gas forklifts), and only operate externally under the canopy adjacent to the on-grade door areas for side loading and unloading. The use of the forklifts are essential for Winning operations. Use of alternative loading equipment is not feasible.
- **Type mix and frequency of vehicles:** As detailed in the Traffic Impact Assessment:
  - Warehouse hours: 24 hours, 7 days a week. Warehouse staff and shifts are to be as follows:
    - Shift 1 – 6:00 am - 2:00 pm, with 50 warehouse staff and 100 drivers (working between 5:00 am and 8:00 am)
    - Shift 2 – 2:00 pm - 10:00 pm, with 10 warehouse staff
    - Shift 3 – 10:00 pm - 6:00 am, with 5 warehouse staff
    - Shift 1 would be slightly staggered, so not all staff arrive / depart in the 15 minutes before and after shift.
  - The proposed shifts are required for Winnings to be able to service retail outlets and customers in business house. Changing the shift times would not be feasible for Winnings' operations.
  - It is noted Winnings' operations are primarily in the daytime and evening hours (7am to 8pm) as detailed in the TIA, with movements during the more sensitive night-time period minimised as far as practicable.
- **Additional Noise Mitigation and Management Measures considered:**
  - Noise baffles – The dominant noise sources for Warehouse 9 are the heavy vehicle movements, not the hardstand and loading dock activities. As such, noise baffles on the understand of the awnings would be unlikely to have significant benefit and are not considered reasonable.
  - Use of broadband and/or ambient sensing reverse alarms – this has been noted as a feasible and reasonable mitigation measure in **Table 9**.

- Production of an Operational Noise Management Plan (ONMP) – this would detail the measures that could be used by the various tenants to minimise general noise from the site, including reference to Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) – this has been noted as a feasible and reasonable mitigation measure in **Table 9**.
- Noise barriers – noise barriers have been investigated as detailed in **Section 3.5** – this has been noted as a feasible and reasonable mitigation measure in **Table 9**.
- Verification noise monitoring – verification of operational noise levels would be completed following commencement of operations to confirm noise levels are in-line with predictions – this has been noted as a feasible and reasonable mitigation measure in **Table 9**.

Checked/ Authorised by: AW
-------------------------------