Ethos Urban

FKC Estate
200 Aldington Road
Kemps Creek

Noise Impact Assessment

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Document Control

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1 Introduction

White Noise Acoustics has been engaged to undertake the Noise Impact Assessment of the proposed FKC warehouse development located at 200 Aldington Road, Kemps Creek including the site wide concept plan and the proposed Lot F Development.

The proposed project includes the following

1. 14 buildings with a number of warehouses.
2. Associated parking and truck loading areas.

This assessment includes the acoustic investigation into the potential for noise impacts from the operation of the completed project as well as potential noise impacts from traffic movements on surrounding streets.

Additionally, construction noise management strategies are included in this report.

The proposed development is detailed in SBA Architects drawings, which include the typal floor plan for the development which is included below.

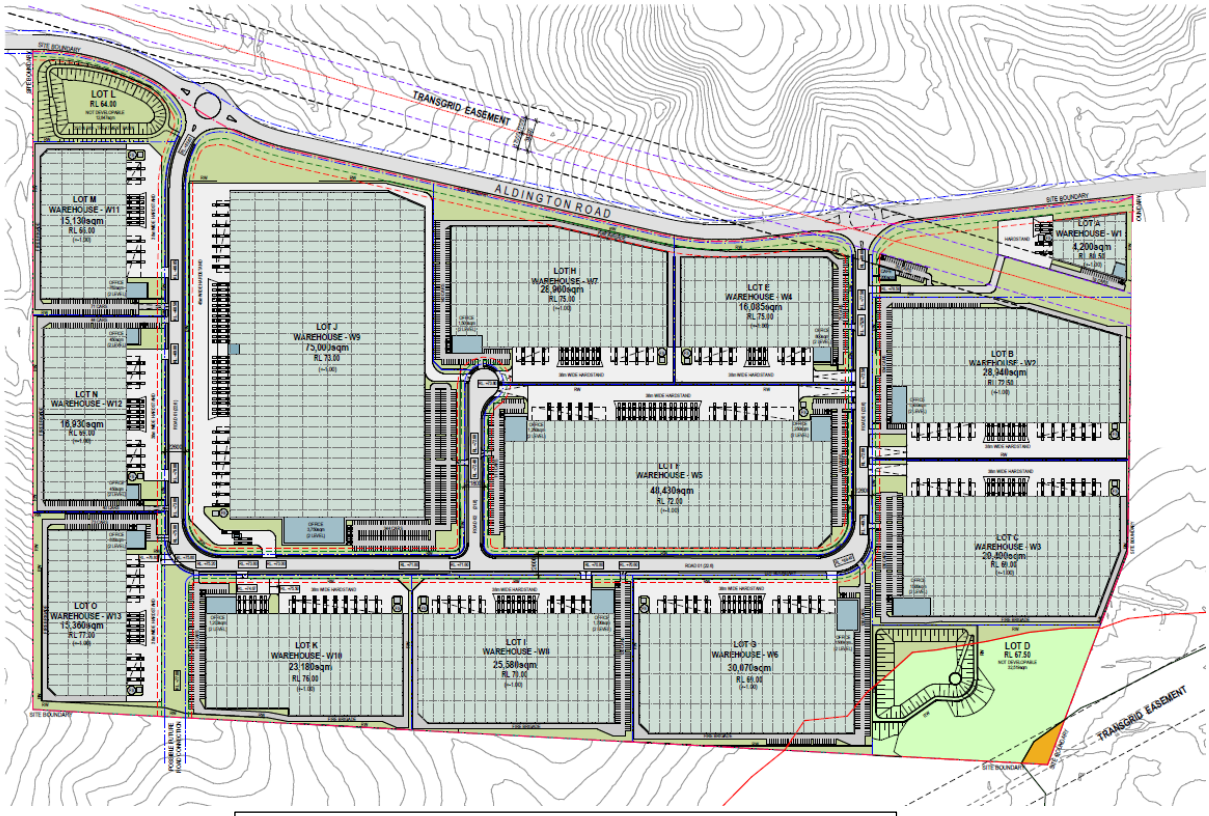


Figure 1 – Proposed development site plan

1.1 Development Description

The site is located on the eastern side of Aldington Road which carries traffic accessing the local residential areas. The surrounding area includes the following:

1. Existing properties located within the Rural area including residential properties surrounding the site. The surrounding land has been rezoned as IN1 including residential use and expected to be progressively redeveloped.
2. The potential future land use to the south of the site which may include a place of worship.

The site location is detailed in Figure 2 below.

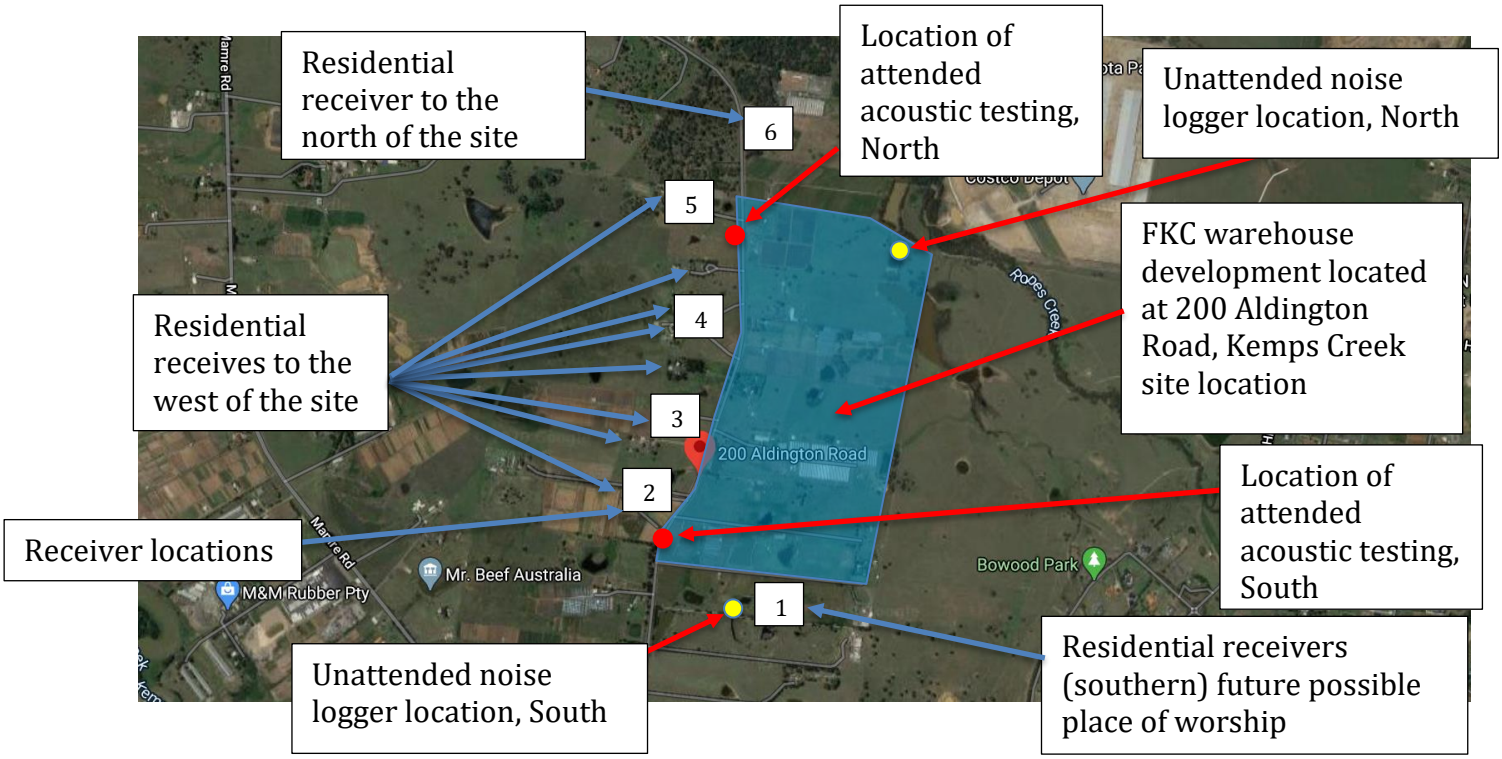


Figure 2 – FKC warehouse development located at 200 Aldington Road, Kemps Creek site location

The surrounding receives to the site include the following:

1. Receiver to the south – Currently includes a residential receiver, may include a future place of residence including the Hindu Temple. Distance of 60m from the site.
2. Residential receiver to the west of the site opposite on Aldington Road. Distance of 150m from the site.
3. Residential receiver to the west of the site opposite on Aldington Road. Distance of 180m from the site.
4. Residential receiver to the west of the site opposite on Aldington Road. Distance of 200m from the site.
5. Residential receiver to the west of the site opposite on Aldington Road. Distance of 200m from the site.
6. Residential to the north of the site on Aldington Road. Distance of 230m from the site.

The proposed development includes the following:

- A concept masterplan with an indicative total building area of 375,755 sqm, comprising:
  - 357,355 sqm of warehouse gross floor area (GFA);
  - 18,200 sqm of ancillary office GFA;
  - 200 sqm of café GFA;
  - 13 individual development lots for warehouse buildings with associated hardstand areas;
  - Internal road layouts and road connections to Aldington Road;
  - Provision for 1700 car parking spaces; and
  - Associated site landscaping.

- Detailed consent for site preparation, earthworks and infrastructure works (i.e. Stage 1 works) on the site, including:
  - Demolition and clearing of all existing built form structures;
  - Drainage and infill of existing farm dams and any ground dewatering;
  - Clearing of all existing vegetation;
  - Construction of a warehouse building with a total of 50,930 sqm of GFA, including:
    - 48,430 sqm of warehouse GFA;
    - 2,500 sqm of ancillary office GFA; and
    - 231 car parking spaces.
  - Bulk earthworks including 'cut and fill' to create flat development platforms for the warehouse buildings, and topsoiling and grassing / site stabilisation works;
  - Roadworks and access infrastructure;
  - Stormwater and drainage works including stormwater basins, diversion of stormwater lines, gross pollutant traps and associated swale works;
  - Sewer and potable water reticulation; and
  - Inter-allotment, road and boundary retaining walls.

The proposed warehouses are to include spaces for storage, distribution, and the like. The proposed warehouses are not designed for manufacturing or the like.

The site is located within the Penrith City Council region.

2 Existing Acoustic Environment

The site is located to the eastern side of Aldington Road which carries low traffic numbers associated with carrying local traffic.

The site is located within an area which is classified as a currently *Rural* area as defined in EPA's Noise Policy for Industry and includes the following (it is noted that the land and surrounds has now been rezoned to IN1 compared with existing rural residential):

1. An area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse.

The site is located in an area which would be defined as an *Industrial Interface* and defined within the EPA *Noise Policy for Industry INPfI).* The NPfI includes the following regarding these areas.

> *The industrial interface assessment provisions recognise that a marginally reduced acoustic amenity is acceptable for existing residences co-located with existing industry, and that the availability of noise mitigation measures might be limited in these circumstances.*
>
> *The industrial interface assessment generally applies only for existing situations (that is, an existing residential receiver near an existing industry that is proposing expansion or modification) and generally only for those residential receivers that are:*
>
> > • *in the immediate area surrounding the existing industry (that is, the region that extends from the boundary of the existing industry to the point where the noise level of the existing industry, measured at its boundary, has fallen by 5 dB or as agreed between the proponent and the relevant authority at the commencement of a noise impact assessment or related study), and*
> > • *where existing industrial noise levels (including noise from the premises under consideration) are above the relevant rural, suburban or urban recommended amenity noise levels.*

As part of this assessment an acoustic survey of the existing acoustic environment at the site was undertaken. The survey included attended noise level measurements at the site, during various times of the day on the 17th August 2020 as well as long term unattended noise logging at two locations which was undertaken between the 11th and 17th August 2020. During the testing periods of inclement weather have not been included in the assessment.

Noise logging was undertaken using a Rion NL-42EX type noise monitors with the following serial numbers and calibrations:

1. Logger 1 – Serial number 998079 and calibration number C19678
2. Logger 2 - Serial number 998081 and calibration number C19677

The noise logger locations include representative locations to the north and south of the site to obtain existing noise levels on the site as detailed in Figure 2 above. Both loggers were positioned such that it did not include façade corrects.

Attended noise level testing was conducted using a Bruel and Kjaer 2236C type meter. The meter was calibrated before and after testing and no significant drift was recorded.

2.1 Noise Survey Results

The attended and unattended noise locations were selected to obtain suitable noise levels for the assessment of background noise levels ($L_{90\,(t)}$) as well as the impact from traffic movements ($Leq_{(t)}$). The results of the acoustic survey are detailed in the tables below which have been used as the basis of this assessment.

Table 1 – Results of the Attended Noise Survey at the Site

Measurement Location	Time of Measurement	$L_{Aeq,\ 15min}$ dB(A)	$L_{A90,\ 15min}$ dB(A)	Comments
Attended noise measurement location, Northern Location	9.05am to 9.20am	58	39	Noise level at the site dominated by vehicle movements on Aldington Road, surrounding land uses and natural sources
Attended noise measurement location, Southern Location	9.25am to 9.40am	56	41	

Table 2 – Results of the Noise Logging at the Site

Measurement Location	Time of Measurement	Maximum Repeatable $L_{Aeq, 15min}$ dB(A)	Representative Background noise Level (RBL) $L_{A90, 15min}$ dB(A)	Minimum assumed Representative Background Noise Levels $L_{A90, 15min}$ dB(A)[1]
Northern noise logger location, see figure 2 above	Day	42	30	35
	Evening	40	29	30
	Night	33	25	30
Southern noise logger location, see figure 2 above	Day	50	32	35
	Evening	35	31	30
	Night	35	30	30

Note 1: Where background noise levels have been recorded below the minimum assumed representative background noise levels , the minimum RBL's have been used for the basis of the assessment as defined in the EPA Noise Policy for Industry

3 Internal Noise Level Criteria

Internal noise levels within the future development have been based on the relevant noise levels as detailed within the Australian Standard AS2107:2000 *Acoustics - Recommended design sound levels and reverberation times for building interiors*.

The recommended levels for various areas of the project are detailed in the following table. The recommended noise levels for packing and delivery areas of industrial developments detailed within AS2107:2016 have been used as the basis of this assessment.

Table 3 - design Recommended design sound levels

Type of Occupancy/Activity	Design sound level maximum ($L_{Aeq,t}$)
Industrial packaging and delivery areas	60
Note: The relevant time period (t) for all areas detailed is 15 minutes.	

4 Environmental Noise Intrusion Assessment

This section of the report details the assessment of environmental noise intrusion into the proposed development and the recommended acoustic treatments to ensure the recommended internal noise levels detailed in the Sections above are achieved.

Internal noise levels within the future areas of the development will result from the noise intrusion into the building through the external façade including glass, and other façade elements. Typically, the acoustic performance of building elements including the relatively light weight elements of the building façade, including glass and/or plasterboard constructions, will be the determining factors in the resulting internal noise levels.

Calculations of internal noise levels have been undertaken based on the measured environmental noise levels at the site and the characteristics of the building, including window openings, buildings constructions and the like.

4.1 External Glass Elements

The recommended acoustic constructions to the buildings external façade glass elements are detailed in the table below to ensure the recommended internal noise levels detailed above are achieved, with the façade building openings closed.

Table 4 – External Glass Acoustic Requirements

Façade Orientation	Level	Room Type	Recommended Glass Construction	Minimum Façade Acoustic Performance[1]
All Façade Orientation	All Levels	All Areas	4mm Float/Toughened	Rw 28
Note 1: *The acoustic performance of the external façade includes the installed glazing and frame including (but not limited to) the façade systems seals and frame. All external glazing systems are required to be installed using acoustic bulb seals.*				

The recommended glass constructions detailed in the table above include those required to ensure the acoustic requirements of the project are achieved. Thicker glazing may be required to achieve other project requirements such as structural, thermal, safety or other requirements and is to be advised by others.

4.2 External Building Elements

The proposed external building elements including standard light weight walls and roof construction are acoustically acceptable without additional acoustic treatment including metal sheeting or solid external wall cladding.

4.3 External Roof

The proposed standard light weight metal deck roof is acoustically acceptable to ensure internal noise levels are achieved without additional treatments.

5 External Noise Emission Assessment

This section of the report details the relevant noise level criteria for noise emissions generated on the site once completed.

The relevant authority which provides the required noise level criteria for noise levels generated on the site includes the NSW Environmental Protection Authority's (EPA) Noise Policy for Industry (NPfI).

5.1 NSW Environmental Protection Authority, Noise Policy for Industry

The NSW Environmental Protection Authority (EPA) Noise Policy for Industry (NPfI), previously Industrial Noise Policy, details noise criteria for the control of noise generated from the operation of developments and the potential for impact on surrounding receivers.

The NPI includes both intrusive and amenity criteria which are summarised below.

1. Intrusive noise level criteria, The NPfI states the following:

   'The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the LAeq descriptor), measured over a 15minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.'

2. Amenity noise level criteria, The NPfI states the following:

   'To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance.'

   Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)

   Where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.

The LAeq is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the LAeq,15min will be taken to be equal to the LAeq, period + 3 decibels (dB), unless robust evidence is provided for an alternative approach for the particular project being considered.

Project amenity noise level (ANL) is urban ANL (Table 2.1) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level (dB = decibel; dB[A] = decibel [A-weighted]; RBL = rating background noise level).

Noise level used in the assessment of noise emission from the site have been based on the noise level survey conducted at the site and detailed in this section of the report.

Consequently, the resulting noise level criteria are summarised in the table below. The criteria are nominated for the purpose of determining the operational noise limits for the operation of the site including mechanical plant associated with the development which can potentially affect noise sensitive receivers and operational noise levels from the future tenancies. For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive criteria are adopted. The calculated *Project Amenity Noise Level* includes either the Recommended Amenity Noise Level minus 5 dB(A) plus 3 dB(A) (for a 15minum period) or the measured existing Leq noise level – 10 dB if this is greater as determined by the NPfI.

Table 5 – External Noise Level Criteria in Accordance with the NSW NPfI

Location	Time of Day	Project Amenity Noise Level, $L_{Aeq, period}$ [1] (dBA)	RBL $L_{A90, 15\ min}$ dBA[2]	Measured $L_{Aeq, period}$ Noise Level (dBA)	Intrusive $L_{Aeq, 15\ min}$ Criterion for New Sources (dBA)
Rural residences Northern Locations	Day	48	35	42	**40**
	Evening	43	30	40	**35**
	Night	38	30	33	**35**
Rural residences Western Locations	Day	48	35	50	**40**
	Evening	43	30	35	**35**
	Night[4]	38	30	35	**35**
Rural residences Southern Locations	Day	48	40	50	**40**
	Evening	43	35	35	**35**
	Night	38	35	35	**35**

Note 1: Project Amenity Noise Levels corresponding to "Rural" areas, recommended noise levels.
Note 2: L_{A90} Background Noise or Rating Background Level based on the assumed minimum rating of the EPA NPfI.
Note 3: Project Noise Trigger Levels are shown in bold

5.2 Sleep Disturbance

This section of the report details the relevant sleep disturbance noise level criteria for the assessment of noise emissions from the site during night-time hours. The assessment of sleep disturbance includes intermittent noise levels from operations such as deliveries and vehicle movements on the site during night-time periods.

The EPA's *Industrial Noise Policy for Industry* (NPfI) and the *NSW Road Noise Policy (RNP)* includes suitable criteria for the assessment of potential sleep awakening events, which have been used as the basis of this report.

The NPfI includes the following commentary regarding possible sleep awakening events:

> ***2.5 Maximum noise level event assessment***
>
> *The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.*
> *Where the subject development/premises night-time noise levels at a residential location exceed:*
> - *$L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*

- *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*

A detailed maximum noise level event assessment should be undertaken. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy.

The RNP includes the following comments regarding sleep disturbance:

From the research on sleep disturbance to date it can be concluded that:
- *maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep*
- *one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are*

not likely to affect health and wellbeing significantly.

Based on the details of the relevant standards detailed above a summary of the sleep disturbance noise level criteria is detailed in the following table.

Table 6 – Sleep Disturbance Criteria

Type of Receiver	Location	Policy	Description	Noise Level
Residential Receiver	Within the residential dwelling	Road Noise Policy	1 or 2 events unlikely to awaken people from sleep	65-70 dB(A) Lmax
			Maximum internal noise unlikely to awaken people from sleep	50-55 dB(A) Lmax
	External Noise levels	Noise Policy for Industry	The potential for sleep disturbance from maximum noise level events	$L_{Aeq,15min}$ 40 dB(A)
				L_{AFmax} 52 dB(A) Or L_{AFmax} 55 dB(A)

Based on the details included within the NPfI and the RNP in the event a noise level of 55-59 dB(A) Lmax or 49 $L_{Aeq\ 15\ min}$ does not occur as a result of the use of the operation of the property (internally within the residential receiver) then noise levels are *unlikely to awaken people from sleep* and compliance with the requirements of the NPfI and the RNP regarding sleep disturbance would be achieved.

6 Noise Impact Assessment

An assessment of noise generated on the site has been undertaken on this section of the report. The assessment of noise levels generated on the site are summarised below:

1. **Mechanical Services Equipment** – At this stage of the project, the location of major plant items have been selected, however the exact selection to be installed is not known. As such a detailed assessment of noise associated from engineering services cannot be undertaken.

   To ensure that future selections of plant items meet external noise levels at neighbouring properties a proof of concept approach has been considered.

   In our experience, for this type of development the following mechanical systems may be installed, and their associated sound power levels are outlined below.
   - Ventilation fans – 80dB(A) (Lw)
   - Toilet exhaust fans – 45dBA (Lw)
   - Air Conditioning Condensers – 80dBA (Lw)

   For the proposed ventilation systems, it is anticipated that the physical fans would be installed on a plant area of the roof of the project with mechanical ductwork moving air from the warehouses areas to the roof as required. A dedicated plant deck area will be provided on the roof of each warehouse.

   On the assumption of the Sound Power Level above and the ductwork that is installed is acoustically treated with 50mm internal lining or attenuators (depending on the exact location), compliance would be achieved.

   Toilet exhaust fans for the units will individually discharge from the amenity areas of the future warehouses using in ceiling or roof top mounted fans. It is recommended that 1m with acoustic flexible ducting is used on the intake and discharge side of the fan or a section of internally lined ductwork, on this assumption compliance would be achieved.

   Roof op plant areas for individual warehouse amenities (office areas) would be provided using condensers located on the roof or ground level. It is expected that each warehouse will include a number of administration areas which will require condenser equipment. Providing this equipment is located on ground level with a line of sight barrier to neighbouring residential properties if located within 25m, or an acoustic screen is included to any condenser equipment located on the roof then the resulting noise emissions will comply with the relevant noise emission criteria.

Details of the required mechanical services equipment and acoustic treatments to ensure the relevant noise level criteria is achieved will be provided as part of the *Construction Certificate* submission of the project.

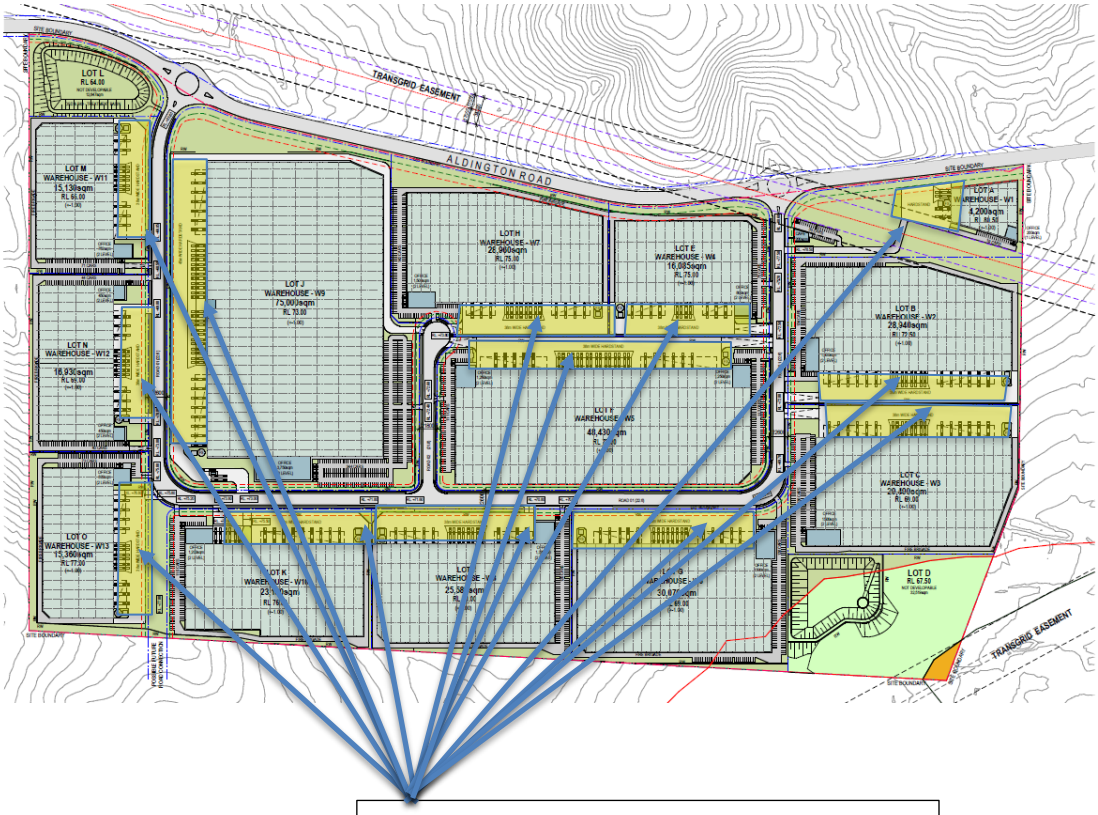
Experience with similar projects confirms that the acoustic treatment of mechanical services is both possible and practical to ensure noise emission criteria is achieved.

Expected noise levels from the operation of mechanical plant are detailed in the *Predicted Noise Emissions* section of this report below.

2. **Use of the Warehouses, Internally** – The proposed future use of the warehouses will include spaces with the potential for materials movement and storage. The future use of each warehouse will include the potential for the following equipment of the site, including expected noise levels:
    - Material handling equipment (forklifts) for each warehouse, with a noise levels of up to 90 dB(A) (SWL).
    - Heavy and light vehicle movements to each warehouse with a noise level of up to 95 dB(A).

   Expected noise levels from the internal use of warehouses are detailed in the *Predicted Noise Emissions* section of this report below.

3. **Use of the Warehouses, Externally -** For the purpose of this assessment it has been assumed that the use of the external hardstand areas of the project will be used at all times. The proposed hard stand areas for the warehouse areas is included in the figure below.



Proposed external hard stand areas

Figure 4 – Proposed Hardstand External Areas

The assessment of noise emissions from the use of the external areas of the project has been undertaken based on the following assumptions:

1. During daytime and evening periods area each hard stand can be used simultaneously by up to 5 trucks and 2 forklifts at any one time for each warehouse.
2. During night-time hours the hard stands can be used simultaneously including 1 truck and 1 forklift for each warehouse.
3. The noise levels resulting from the use of the external areas will include a source noise (sound power levels) of 90 dB(A) for forklifts and 105 dB(A) for trucks.

It is noted that the proposed layout of the proposed facility may include the future warehouses which may result in an acoustic screening from the use of the hardstand areas to the potentially worst affected residential receivers within the vicinity of the site.

Expected noise levels from the external use of warehouses are detailed in the *Predicted Noise Emissions* section of this report below.

4. **Traffic Movements on the Site -** An assessment of the resulting noise levels from traffic movements within the development has been undertaken. The assessment has included the expected parking numbers for the future development, including parking numbers as detailed in the table below and included in Appendix D.

Table 7 – Proposed Parking Numbers

Warehouse Number	Proposed Car parking Numbers
Lot A	49
Lot B	134
Lot C	136
Lot D	Not developed
Lot E	75
Lot F	224
Lot G	138
Lot H	142
Lot I	120
Lot J	344
Lot K	110
Lot L	Not Developed
Lot M	71
Lot N	84
Lot O	73
Total	1711

For the purpose of this assessment the following assumptions regarding the use of the carparking has been included as part of this assessment:

1. During day time periods the maximum use of the carparking areas will include all car parking spaces being used in any 1 hour period.
2. During night time hours 20% of the carparking spaces will be use in any 1 hour period.
3. The assessment include predicted noise levels resulting from the use of the carparking areas using a FHWA model, results are included in *Predicted Noise Emissions* section of this report below.

6.1 Predicted Noise Emissions

This section of the report details the resulting predicted noise emissions from the operation of the proposed site to the surrounding receivers, including the sources detailed in the section above and the receiver locations detailed in Figure 2 of this report.

The receiver locations have been selected as the potentially worst affected locations and compliance at these locations represents compliance at all surrounding locations.

The assessment includes the potentially worst-case periods including the following the use of all warehouses simultaneously including the conditions detailed in the section above.

Predictions have been undertaken for the contribution of noise from the proposed development for the various are which are detailed in the following tables.

Table 8 – External Noise Emission Predictions – Mechanical Services Equipment

Receiver Location	Time of Day	Predicted Noise Emissions $L_{Aeq, 15min}$ (dBA)													Cumulative Predicted Noise Levels $L_{Aeq, 15min}$ (dBA)	Project Noise Level Criteria $L_{Aeq, 15min}$ (dBA)
		Warehouse Source														
		A	B	C	E	F	G	H	I	J	K	M	N	O		
1	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21	23.9	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21	23.9	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21	23.9	35
2	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
3	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
4	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
5	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
6	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21.1	35

Table 9 – External Noise Emission Predictions – Internal Warehouse Noise Activities

Receiver Location	Time of Day	Predicted Noise Emissions $L_{Aeq, 15min}$ (dBA) Warehouse Source													Cumulative Predicted Noise Levels $L_{Aeq, 15min}$ (dBA)	Project Noise Level Criteria $L_{Aeq, 15min}$ (dBA)
		A	B	C	E	F	G	H	I	J	K	M	N	O		
1	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	18	20	24.4	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	18	20	24.4	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	18	20	24.4	35
2	Day	<10	<10	<10	<10	<10	<10	<10	<10	20	<10	19	<10	<10	24.6	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	20	<10	19	<10	<10	24.6	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	20	<10	19	<10	<10	24.6	35
3	Day	<10	<10	<10	<10	<10	<10	20	<10	<10	<10	<10	<10	<10	23.4	40
	Evening	<10	<10	<10	<10	<10	<10	20	<10	<10	<10	<10	<10	<10	23.4	35
	Night	<10	<10	<10	<10	<10	<10	20	<10	<10	<10	<10	<10	<10	23.4	35
4	Day	<10	<10	<10	<10	<10	<10	20	<10	<10	<10	<10	<10	<10	23.4	40
	Evening	<10	<10	<10	<10	<10	<10	20	<10	<10	<10	<10	<10	<10	23.4	35
	Night	<10	<10	<10	<10	<10	<10	20	<10	<10	<10	<10	<10	<10	23.4	35
5	Day	20	19	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	23.4	40
	Evening	20	19	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	23.4	35
	Night	20	19	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	23.4	35
6	Day	20	19	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	24.6	40
	Evening	20	19	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	24.6	35
	Night	20	19	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	24.6	35

Table 10 – External Noise Emission Predictions – External (Hard Stand) Warehouse Noise Activities

Receiver Location	Time of Day	Predicted Noise Emissions $L_{Aeq, 15min}$ (dBA) Warehouse Source													Cumulative Predicted Noise Levels $L_{Aeq, 15min}$ (dBA)	Project Noise Level Criteria $L_{Aeq, 15min}$ (dBA)
		A	B	C	E	F	G	H	I	J	K	M	N	O		
1	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	25	30	31.5	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	25	30	31.5	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	23	28	29.7	35
2	Day	<10	<10	<10	<10	<10	<10	<10	<10	28	<10	28	<10	<10	31.4	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	28	<10	28	<10	<10	31.4	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	26	<10	26	<10	<10	29.6	35
3	Day	<10	<10	<10	21	<10	<10	21	<10	15	<10	17	<10	<10	26.3	40
	Evening	<10	<10	<10	21	<10	<10	21	<10	15	<10	17	<10	<10	26.3	35
	Night	<10	<10	<10	19	<10	<10	19	<10	13	<10	15	<10	<10	25.4	35
4	Day	23	21	<10	21	19	<10	21	<10	<10	<10	<10	<10	<10	28.7	40
	Evening	23	21	<10	21	19	<10	21	<10	<10	<10	<10	<10	<10	28.7	35
	Night	21	19	<10	19	<10	<10	19	<10	<10	<10	<10	<10	<10	27.1	35
5	Day	30	28	<10	19	15	<10	<10	<10	<10	<10	<10	<10	<10	32.6	40
	Evening	30	28	<10	19	15	<10	<10	<10	<10	<10	<10	<10	<10	32.6	35
	Night	28	26	<10	17	13	<10	<10	<10	<10	<10	<10	<10	<10	30.8	35
6	Day	25	30	29	17	17	<10	<10	<10	<10	<10	<10	<10	<10	33.6	40
	Evening	25	30	29	17	17	<10	<10	<10	<10	<10	<10	<10	<10	33.6	35
	Night	23	28	27	15	15	<10	<10	<10	<10	<10	<10	<10	<10	31.7	35

Table 11 – External Noise Emission Predictions – External Parking

Receiver Location	Time of Day	Predicted Noise Emissions $L_{Aeq, 15min}$ (dBA)													Cumulative Predicted Noise Levels $L_{Aeq, 15min}$ (dBA)	Project Noise Level Criteria $L_{Aeq, 15min}$ (dBA)
		Warehouse Source														
		A	B	C	E	F	G	H	I	J	K	M	N	O		
1	Day	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	37	39	31.5	40
	Evening	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	29	31	31.5	35
	Night	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	29	31	29.7	35
2	Day	<10	<10	<10	<10	<10	<10	23	<10	11	<10	12	<10	<10	31.4	40
	Evening	<10	<10	<10	<10	<10	<10	15	<10	<10	<10	<10	<10	<10	31.4	35
	Night	<10	<10	<10	<10	<10	<10	15	<10	<10	<10	<10	<10	<10	29.6	35
3	Day	<10	<10	<10	<10	<10	<10	27	<10	11	<10	17	<10	<10	26.3	40
	Evening	<10	<10	<10	<10	<10	<10	19	<10	<10	<10	<10	<10	<10	26.3	35
	Night	<10	<10	<10	<10	<10	<10	19	<10	<10	<10	<10	<10	<10	25.4	35
4	Day	15	11	<10	26	<10	<10	16	<10	<10	<10	<10	<10	<10	28.7	40
	Evening	<10	<10	<10	18	<10	<10	<10	<10	<10	<10	<10	<10	<10	28.7	35
	Night	<10	<10	<10	18	<10	<10	<10	<10	<10	<10	<10	<10	<10	27.1	35
5	Day	18	14	<10	18	11	<10	<10	<10	<10	<10	<10	<10	<10	32.6	40
	Evening	11	<10	<10	11	<10	<10	<10	<10	<10	<10	<10	<10	<10	32.6	35
	Night	11	<10	<10	11	<10	<10	<10	<10	<10	<10	<10	<10	<10	30.8	35
6	Day	16	12	<10	11	<10	<10	<10	<10	<10	<10	<10	<10	<10	33.6	40
	Evening	12	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	33.6	35
	Night	12	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	31.7	35

Table 12 – External Noise Emission Predictions – Cumulative Noise Impacts

Location	Time of Day	Predicted Noise Emissions $L_{Aeq, 15min}$ (dBA) - Noise Source				Cumulative Predicted Noise Levels $L_{Aeq, 15min}$ (dBA)	Project Noise Level Criteria $L_{Aeq, 15min}$ (dBA)
		Internal	External	Plant Noise	External Parking		
1	Day	23.9	24.4	31.5	41.2	41.8[1]	40
	Evening	23.9	24.4	29.7	33.4	35.6[2]	35
	Night	23.9	24.4	29.7	33.4	35.6[2]	35
2	Day	21.1	24.6	31.4	25.2	33.3	40
	Evening	21.1	24.6	29.6	21.8	31.7	35
	Night	21.1	24.6	29.6	21.8	31.7	35
3	Day	21.1	23.4	26.3	28.0	31.5	40
	Evening	21.1	23.4	25.4	23.0	29.5	35
	Night	21.1	23.4	25.4	23.0	29.5	35
4	Day	21.1	23.4	28.7	27.6	32.2	40
	Evening	21.1	23.4	27.1	22.6	30.2	35
	Night	21.1	23.4	27.1	22.6	30.2	35
5	Day	21.1	23.4	32.6	24.0	33.9	40
	Evening	21.1	23.4	30.8	21.3	32.2	35
	Night	21.1	23.4	30.8	21.3	32.2	35
6	Day	21.1	24.6	33.6	22.3	34.6	40
	Evening	21.1	24.6	31.7	21.3	33.1	35
	Night	21.1	24.6	31.7	21.3	33.1	35

Based on the assessment of external noise emissions the resulting impact on the surrounding receivers will be comply with the relevant noise emission criteria, with exception to location 1 which include the following notes:

1. Note 1 – Day time noise levels in the event that all operations are conducted simultaneous with the maximum expected noise levels may include a noise level of 41.8 dB(A) Leq which is 1.8 dB above the NPfI noise emission level. The resulting noise level is similar to a magnitude of noise which less than existing noise sources at the site such as wind noise, natural noise sources and other noise levels resulting from activities within the local area. A magnitude of noise of 41.8 dB(A) represents a quiet noise which is similar to a low voice or the like. Based on the predicted noise level the resulting impact will not negatively impact on the amenity of the adjacent residential receiver and is therefore acoustically acceptable.
2. Note 2 – evening and night time noise levels in the event that all operations are conducted simultaneous with the maximum expected noise levels may include a noise level of 35.6 dB(A) Leq which is 0.6 dB above the NPfI noise emission level. The resulting noise level will not be perceivable above the equivalent criteria of 35 dB(A) and will not negatively impact on the amenity of the adjacent residential receiver and is therefore acoustically acceptable.

It is noted that predictions have been based on the possible maximum operating conditions. In the event the future warehouses do not include activities generating maximum noise levels or do not operate simultaneously a reduction in the predicted noise levels above will result.

6.1.1 Sleep Disturbance Assessment

Based on the proposed use of the site an assessment of potential for a sleep disturbance event has been undertaken. The assessment includes the potential for a maximum noise level from a heavy vehicle on the site within the closest proximity of the site to neighbours opposite the site. The sample calculation for potential maximum sleep disturbance noise levels are included below.

Table 13 – Sleep Disturbance Noise Calculation to Residential Receiver

	Noise Level
Noise Source – Vehicle Movement	105 dB(A) Lmax
Distance Correction (120m)	-49.6
Correction for open window of neighbours building	-6
Resulting Noise Level within bedroom	49.4 dB(A) Lmax
unlikely to awaken people from sleep Noise Level	50 dB(A) Lmax

Based on the results of the assessment detailed above the resulting maximum noise level from the operation of the site will comply with the relevant criteria for sleep disturbance and will be acceptable.

The assessment includes the assumption that the is no line of sight barrier and the activity is being used at the closest location from the site. In the event there is an additional distance or a line of sight barrier from activities on the site (including future buildings on the site) then the resulting maximum noise levels will be less than that detailed in the table above.

6.2 Recommended Acoustic Mitigations

The recommended mitigations and management controls should be included in the design, construction and operation of the site (in addition to those included in the sections above) to ensure suitable on-going operation of the site include the following:

1. All external hardstand, driveways and the like should include a surface which does not include speed humps or the like.
2. Any grates or metal drainage points should be securely fixed to prevent movement as vehicles pass over.
3. All external surfaces being used for vehicles and forklifts should be brush finishes (ie not polished or painted).
4. Any expansion joints should include flush finishes including cover plates where vehicles pass over as identified by the acoustic engineer during the detailed design of the building.
5. A site contact should be provided to residence for complaints.

7 Additional Traffic Noise on Surrounding Roadways

This section of the report details the assessment of future traffic noise on surrounding streets as a result of vehicles using the site.

The suitable noise criteria for the assessment of road traffic noise generated by vehicles using the site are set out in the NSW Government's NSW Road Noise Policy (RNP). Table 3 of the standard details the assessment criteria to be applied at residences potentially impacted by additional traffic volumes based on the road category and land use. The relevant noise criteria is detailed in the table below.

Table 3 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from **new** freeway/arterial/sub-arterial road corridors	$L_{Aeq,\ (15\ hour)}$ 55 (external)	$L_{Aeq,\ (9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from **redevelopment** of existing freeway/arterial/sub-arterial roads	$L_{Aeq,\ (15\ hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)
	3. Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments		
Local roads	4. Existing residences affected by noise from **new** local road corridors	$L_{Aeq,\ (1\ hour)}$ 55 (external)	$L_{Aeq,\ (1\ hour)}$ 50 (external)
	5. Existing residences affected by noise from **redevelopment** of existing local roads		
	6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (see **Appendix C10**).

In addition to the table above the RNP includes criteria for sites where existing noise levels exceed those levels detailed in the table above. Section 3.4.1 *Process of applying the criteria* includes the following:

> *For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*

The future form and use of Aldington Road is yet to be confirmed. Aldington Road may connect to a future arterial road way and until this is known there would be limited value in estimating existing traffic numbers as future traffic numbers using the roadway could include an Annual Average Daily Traffic (AADT) of 2,000 to 20,000 AADT. This assessment includes the current conditions of traffic noise at the site.

Based on the exiting noise levels measured at the site and detailed in this report the relevant criteria for additional traffic noise will be based on the 2 dB objective above exiting noise levels and are detailed in the table below.

Table 14 – Additional Traffic Noise Criteria

Measurement Location	Time of Measurement	Maximum Repeatable $L_{Aeq, 15min}$ dB(A)	Sub arterial Road Criteria	Resulting Additional Traffic Noise Criteria
Residence Opposite on Addington Road, Locations 2 detailed in Figure 2 of this report	Day	50	60	60
	Night	35	55	55

Based on the proposed development and potential traffic generated by use of the site the following assumption have been made:

1. Day time Worst 1 hour periods may include all available carparking entering or exiting the site in 1 hour period as well as possible truck movements including the following:
    a. Additional car and small vans using the site – Up to 1783
    b. Heavy trucks and semi reticulated trucks – Up to 30

2. Night time Worst 1 hour periods may include up to 20%of the available carparking entering or exiting the site in 1 hour period as well as possible truck movements including the following:
    a. Additional car and small vans using the site – 356
    b. Heavy trucks and semi reticulated trucks – Up to 15

Based on the expected use of the site the calculated future traffic noise levels are detailed in the table below.

Table 15 – Calculated Future Additional Traffic Noise Levels

Location	Time of Measurement	Additional Traffic Noise Criteria $L_{Aeq, 1 hr}$ dB(A)	Calculated Traffic Noise Levels $L_{Aeq, 1 hr}$ dB(A)
Residence opposite the site on Aldington Road	Day	60	52
	Night	55	45

Based on the results of the additional traffic assessment the proposed development will be compliant with the relevant RNP criteria.

The table below details the sample calculation of the CORTN calculation undertaken for the day time and night-time periods for the potentially impacted receivers west of the site opposite on Aldington Road (see figure 2 above).

It is noted that the future areas of the development will be developed to include industrial use.

Table 16 – CORTN Calculations – Residence to the West on Aldington Road (Location 2)

Descriptor	Day time period	Night Time Period
Number of Vehicle Movements[1]	1900	380
Percentage of Heavy Vehicles	5%	5%
Expected Speed	70 km/h	70 km/h
Receiver Height above ground	1.5m	1.5m
Angle of View	180°	180°
Gradient of Road	Flat	Flat
Façade Corrections	Non	Non
Barrier Corrections	Non	Non
Distance to building façade	100m	100m
Predicted Noise Level	**51.7 dB(A)** $L_{Aeq\ (1\ hour)}$	**44.7 dB(A)** $L_{Aeq\ (1\ hour)}$
Project Criteria	60 dB(A) $L_{Aeq\ (1\ hour)}$	55 dB(A) $L_{Aeq\ (1\ hour)}$
Note 1 – Including future traffic numbers in addition to existing traffic movements.		

Based on the assessment of additional traffic numbers on Aldington Road the resulting noise levels from additional traffic numbers associated with the site will comply with the requirements of the RNP criteria.

8 Construction Noise and Vibration Management Plan

This section of the report details the assessment of noise associated with the proposed demolition activities associated with the development. The assessment has been undertaken to assess the potential noise impacts from construction and demolition on surrounding receivers to the site.

The proposed construction and demolition activities to be undertaken on the site include the removal of the existing buildings and construction of the new development. The development will then be constructed using normal construction processes.

The EPA's Interim Construction Noise Guideline defines normal day time hours as the following:

2.2 Recommended standard hours

The recommended standard hours for construction work are shown in Table 1; however, they are not mandatory. There are some situations, as described below, where construction work may need to be undertaken outside of these hours. The likely noise impacts and the ability to undertake works during the recommended standard hours should be considered when scheduling work.

Table 1: Recommended standard hours for construction work

Work type	Recommended standard hours of work*
Normal construction	Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays
Blasting	Monday to Friday 9 am to 5 pm Saturday 9 am to 1 pm No blasting on Sundays or public holidays

* The relevant authority (consent, determining or regulatory) may impose more or less stringent construction hours.

It is noted that alternative construction hours may be approved for the site and including the projects *Conditions of Consent.*

8.1 Proposed Appliances

The proposed appliances which will be used as part of the demolition required as part of the development are detailed in the table below (including internal strip out/demolition):

Table 17 – Noise Level from Expected Demotion Appliances

Tasks	Equipment	Sound Power Levels per task dB(A) L_{10}	Aggregate Sound Power Level per Task dB(A) L_{10}
Site Demolition and Earth works	Jack hammer mounted on skid steer	118	122
	Hand held jack hammer	111	
	Concrete saw	119	
	Skid steer	110	
	Power hand tools	109	
	Excavators	115	
	Trucks	110	
	Earth Rollers	112	
Construction Works	Piling	115	120
	Welder	101	
	Saw cutter	109	
	Dump truck	109	
	Concrete saw	119	
	Power hand tools	109	
	Cranes	110	

Notes: Noise levels of proposed equipment to be used on the site based on the Australian Standard AS2436-2010 and noise level measurements previously undertaken of similar equipment on construction sites.

8.2 Construction Noise Criteria

This section of the report details the relevant construction noise criteria which is applicable to the site.

8.2.1 Interim Construction Noise Guideline

Noise criteria for construction and demolition activities are discussed in the *Interim Construction Noise Guideline* (ICNG). The ICNG also recommends procedures to address potential impacts of construction noise on residences and other sensitive land uses. The main objectives of the ICNG are summarised as follows:

- Promote a clear understanding of ways to identify and minimise noise from construction works;
- Focus on applying all "feasible" and "reasonable" work practices to minimise construction noise impacts;
- Encourage construction to be undertaken only during the recommended standard hours unless approval is given for works that cannot be undertaken during these hours;
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage; and
- Provide flexibility in selecting site-specific feasible and reasonable work practices in order to minimise noise impacts.

The ICNG contains a quantitative assessment method which is applicable to this project. Guidance levels are given for airborne noise at residences and other sensitive land uses.
The quantitative assessment method involves predicting noise levels at sensitive receivers and comparing them with the Noise Management Levels (NMLs). The NML affectation categories for receivers have been reproduced from the guideline and are listed in the table below.

Table 18 – Noise Management Levels from Construction – Quantitative Assessment

Receiver Type	Time of Day	Noise Management Level LAeq(15minute)1,2	How to Apply
Residential	Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured LAeq(15minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
		Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
	Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Table 18 – Continued

Receiver Type	Time of Day	Noise Management Level LAeq(15minute)1,2	How to Apply
Industrial Receivers	When is use	LAeq (15 min) 75 dB(A)	During construction, the proponent should regularly update the occupants of the commercial and industrial premises regarding noise levels and hours of work.
	Note 1 *Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.*		
	Note 2 *The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Industrial Noise Policy (EPA 2000).*		

Based on the table above the suitable construction noise management levels for works undertaken on the site is detailed in Table 14 below.

Table 19 – Site Construction Noise Management Levels

Noise Source	Time Period	Receiver Type	Construction Noise Management Level	'High Noise Affected' Level
Construction Noise	Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Residential	63 dB(A) LAeq (15min)	75 dB(A) LAeq (15min)
	When in Use	Industrial Receivers	75 dB(A) Leq (15 min)	
Note 1: Construction noise management levels based on the Interim Construction Noise Guideline				

8.3 Construction Vibration Criteria

Effects of ground borne vibration on buildings may be segregated into the following three categories:

- Human comfort – vibration in which the occupants or users of the building are inconvenienced or possibly disturbed. Refer to further discussion in Section 7.3.1.
- Effects on building contents – where vibration can cause damage to fixtures, fittings and other non-building related objects. Refer to further discussion in Section 7.3.2 and 7.3.3.
- Effects on building structures – where vibration can compromise the integrity of the building or structure itself. Refer to further discussion in Section 7.3.2 and 7.3.3.

8.3.1 Vibration Criteria – Human Comfort

Vibration effects relating specifically to the human comfort aspects of the project are taken from the guideline titled *"Assessing Vibration – A Technical Guideline"*. (AVTG) This type of impact can be further categorised and assessed using the appropriate criterion as follows:

- Continuous vibration – from uninterrupted sources (refer to Table 20).
- Impulsive vibration – up to three instances of sudden impact e.g. dropping heavy items, per monitoring period (refer to Table 16).
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (refer to Table 22).

Table 20 Continuous vibration acceleration criteria (m/s2) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
		0.04	0.029	0.080	0.058
Workshops	Day or night-time	0.04	0.029	0.080	0.058

Table 21 Impulsive vibration acceleration criteria (m/s2) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

Table 22 Intermittent vibration impacts criteria (m/s1.75) 1 Hz-80 Hz

Location	Daytime		Night-time	
	Preferred Values	Maximum Values	Preferred Values	Maximum Values
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

8.3.2 Vibration Criteria – Building Contents and Structure

The vibration effects on the building itself are assessed against international standards as follows:

- For transient vibration: British Standard BS 7385: Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration" (BSI 1993); and
- For continuous or repetitive vibration: German DIN 4150: Part 3 – 1999 "Effects of Vibration on Structure" (DIN 1999).

8.3.3 Standard BS 7385 Part 2 - 1993

For transient vibration, as discussed in standard BS 7385 Part 2-1993, the criteria are based on peak particle velocity (mm/s) which is to be measured at the base of the building. These are summarised in Table 23 and illustrated in the Figure below.

Table 23 Transient vibration criteria as per standard BS 7385 Part 2 - 1993

Line in Figure below	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Standard BS 7385 Part 2 – 1993 states that the values in Table 23 relate to transient vibration which does not cause resonant responses in buildings. Where the dynamic loading caused by continuous vibration events is such as that results in dynamic magnification due to resonance (especially at the lower frequencies where lower guide values apply), then the values in Table 23 may need to be reduced by up to 50% (refer to Line 3 in the Figure below).

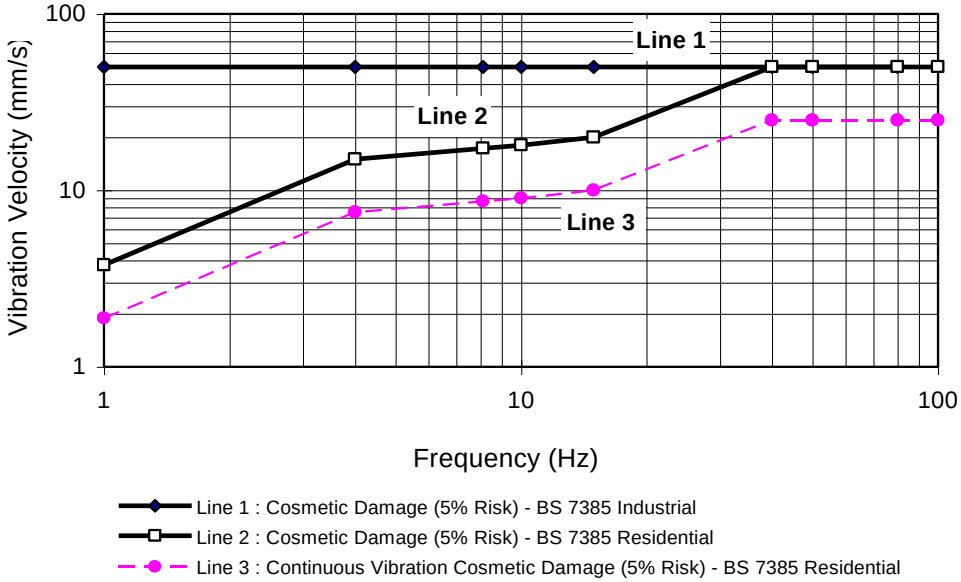


Figure 10 - BS 7385 Part 2 – 1993, graph of transient vibration values for cosmetic damage

In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the recommended values corresponding to Line 2 are reduced. Below a frequency of 4 Hz where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz.
The standard also states that minor damage is possible at vibration magnitudes which are greater than twice those given in Table 23, and major damage to a building structure may occur at values greater than four times the tabulated values.
Fatigue considerations are also addressed in the standard and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the values in Table 23 should not be reduced for fatigue considerations.

8.3.3.1 Standard DIN 4150 Part 3 - 1999

For continuous or repetitive vibration, standard DIN 4150 Part 3-1999 provides criteria based on values for peak particle velocity (mm/s) measured at the foundation of the building; these are summarised in Table 24. The criteria are frequency dependent and specific to particular categories of structures.

Table 24 Structural damage criteria as per standard DIN 4150 Part 3 - 1999

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz[1]	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note 1: For frequencies above 100Hz, at least the values specified in this column shall be applied.

8.4 Construction Noise Management – Qualitative Assessment

Based on the assessment conducted of the expected construction noise levels generated from the construction of the project noise levels are generally expected to require the building contractor to engage in management of activities on the site.

The following management controls are recommended to mitigate construction noise levels on the site:

1. All plant and equipment are to be maintained such that they are in good working order.
2. A register of complaints is to be recorded in the event of complaints being received, including location, time of complaint, nature of the complaint and actions resulting from the complaint.
3. If required a noise level measurement of the offending plant item generating complaints is to be conducted and noise mitigations undertaken to reduce noise levels to within Noise Management levels in the event magnitude of noise levels is found to be above suitable levels.
4. The use of high noise generating equipment including hydraulic hammers, rock cutters or the like should be minimised prior to 8am Monday to Friday or 8.30am Saturdays.
5. The loading of trucks should be conducted such that there is not a requirement to stack truck on the roadways adjacent to the residential receivers.

In addition to the recommended mitigations above details of the proposed construction (including demolition) works to be conducted on the site, including type of activities to be conducted as well as the expected duration of activities should be provided to the neighbouring receivers.

A detailed construction noise and vibration management plan is to be provided by the building contractor as part of the construction certificate.

8.5 Construction Noise Assessment – Quantitative Assessment

A quantitative assessment of the construction noise levels resulting from the proposed works to has been undertaken.

The assessment has been based on the expected noise levels to be generated on the site including those detailed in Section 8.1 above. Calculations of the resulting construction noise levels of the residential receivers within proximity to the site is detailed in the table below.

Table 25 Quantitative Assessment of Construction Noise to Neighboring Residence

Source Noise	Equipment	Sound Power Levels dB(A) L_{10}	Aggregate Sound Power Level dB(A) L_{10}	Calculated Construction Noise Levels
Site Demolition works	Jack hammer mounted on skid steer	118	122	Up to 55 dB(A) when items used externally
	Hand held jack hammer	111		
	Concrete saw	119		
	Skid steer	110		
	Power hand tools	109		
	Excavators	115		
	Trucks	110		
	Earth Rollers	112		
Construction Works	Piling	115	120	Up to 50 dB(A) when items used externally
	Welder	101		
	Saw cutter	109		
	Dump truck	109		
	Concrete saw	119		
	Power hand tools	109		
	Cranes	110		

Based on the qualitative assessment of construction noise suitable management controls and community notifications are required to be conducted.

The required management of construction noise impacts are include in Section 9.4 above.

Subject to the implementation of these management measures, acoustic impacts during construction of the proposal will be acceptable.

8.6 Construction Vibration

Construction vibration may occur during the earthworks particularly if outcrops of dolerite are encountered. Safe working distances for building damage will be complied with at all times and vibration monitoring will be undertaken to ensure acceptable levels of vibration are satisfied.

Based on the location of the site there are significant separation of areas where construction activities will be conducted from surrounding building. Based on the location of works that will be conducted there will be safe working distances relating to continuous vibration from construction equipment. Most construction activities will have intermittent vibration emissions and therefore, higher vibration levels occurring over shorter periods are acceptable for intermittent events.

Construction vibration is not expected to generated magnitudes of vibration with the potential to exceed the criteria applicable for human comfort and therefore the nearest residential receivers are not likely to experience adverse vibration impacts.

9 Conclusion

This report details the Noise Impact Assessment of the proposed development at proposed FKC warehouse development located at 200 Aldington Road, Kemps Creek.

This report details the required acoustic constructions of the building's façade, including external windows, to ensure that the future internal noise levels comply with the relevant noise levels of the Australian Standard AS2107:2016. Providing the recommended constructions detailed in this report are included in the construction of the project the required internal noise levels will be achieved.

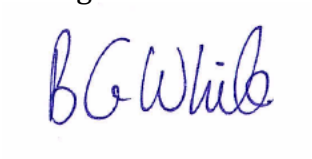
External noise emissions from the site have been assessed and detailed in accordance with the NSW Environmental Protection Authorities Noise Policy for Industry (previously the Industrial Noise Policy). The future design and treatment of all building services associated with the project can be acoustically treated to ensure all noise emissions from the site comply with the EPA NPfI criteria. Details of the equipment and associated acoustic treatments will be provided as part of the CC submission of the project.

An assessment of additional traffic noise generated by vehicles using the site has been undertaken and calculated noise levels comply with the requirements of the EPA's *Road Noise Policy.*

A construction noise and vibration assessment of the expected construction activities required to be used to complete the project has been undertaken and mitigation measures to be applied during the construction stage of the project. Subject to the undertaking these management measures, the project will have acceptable noise levels during the construction period.

For any additional information please do not hesitate to contact the person below.

Regards



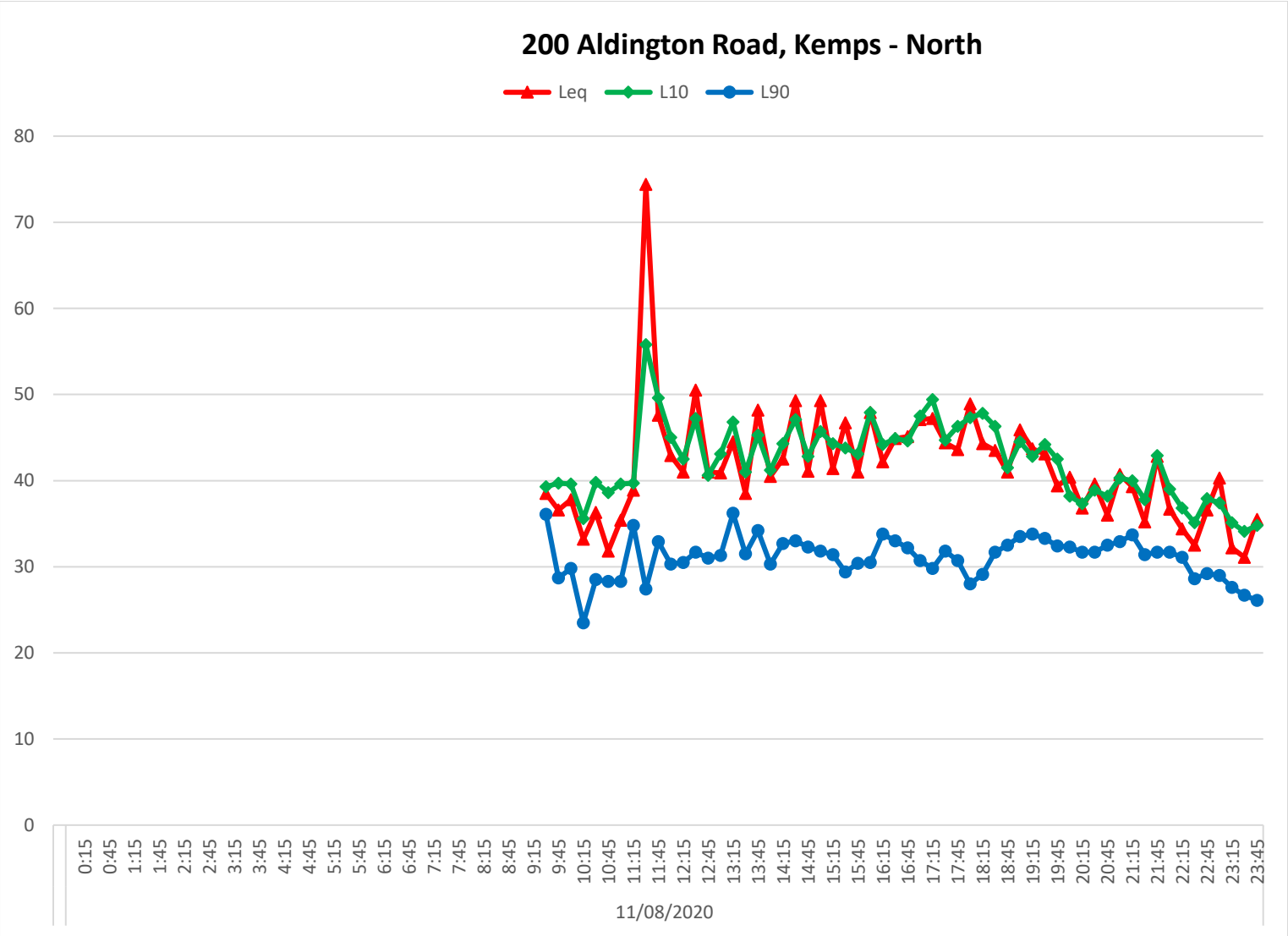
Ben White
Director
White Noise Acoustics

10 Appendix A – Glossary of Terms

Ambient Sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.
Character, acoustic	The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency content (spectrum) dictate a sound's character.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel readings of every day sounds; 0dB the faintest sound we can hear 30dB a quiet library or in a quiet location in the country 45dB typical office space. Ambience in the city at night 60dB Martin Place at lunch time 70dB the sound of a car passing on the street 80dB loud music played at home 90dB the sound of a truck passing on the street 100dB the sound of a rock band 115dB limit of sound permitted in industry 120dB deafening
dB(A)	*A-weighted decibels* The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
Frequency	Frequency is synonymous to *pitch*. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L_{90} noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Background Sound Low	The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted, external ambient noise sources. Usually taken to mean the L_{A90} value
Ctr	A frequency adaptation term applied in accordance with the procedures described in ISO 717.

dB (A)	'A' Weighted overall sound pressure level
Noise Reduction	The difference in sound pressure level between any two areas. The term "noise reduction" does not specify any grade or performance quality unless accompanied by a specification of the units and conditions under which the units shall apply
NR Noise Rating	Single number evaluation of the background noise level. The NR level is normally around 5 to 6 dB below the "A" weighted noise level. The NR curve describes a spectrum of noise levels and is categorised by the level at 1000 Hz ie the NR 50 curve has a value of 50 dB at 1000 Hz. The NR rating is a tangential system where a noise spectrum is classified by the NR curve that just encompasses the entire noise spectrum consideration.
R_w	Weighted Sound Reduction Index - Laboratory test measurement procedure that provides a single number indication of the acoustic performance of a partition or single element. Calculation procedures for Rw are defined in ISO 140-2:1991 "Measurement of Sound Insulation in Buildings and of Building Elements Part 2: Determination, verification and application of precision data".
R'_w	Field obtained Weighted Sound Reduction Index - this figure is generally up to 3-5 lower than the laboratory test determined level data due to flanked sound transmission and imperfect site construction.
Sound Isolation	A reference to the degree of acoustical separation between any two areas. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term "sound isolation" does not specify any grade or performance quality and requires the units to be specified for any contractual condition
Sound Pressure Level, L_P dB	A measurement obtained directly using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the rms sound pressure to the reference sound pressure of 20 micro Pascals.
Sound Power Level, L_W dB	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power levels is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt
Speech Privacy	A non-technical term but one of common usage. Speech privacy and speech intelligibility are opposites and a high level of speech privacy means a low level of speech intelligibility. It should be recognised that acceptable levels of speech privacy do not require that speech from an adjacent room is inaudible.
Transmission Loss	Equivalent to Sound Transmission Loss and to Sound Reduction Index in terminology used in countries other than Australia. A formal test rating of sound transmission properties of any construction, by usually a wall, floor, roof etc. The transmission loss of all materials varies with frequency and may be determined by either laboratory or field tests. Australian Standards apply to test methods for both situations.

11 Appendix B – Noise Logging Results, Northern Logger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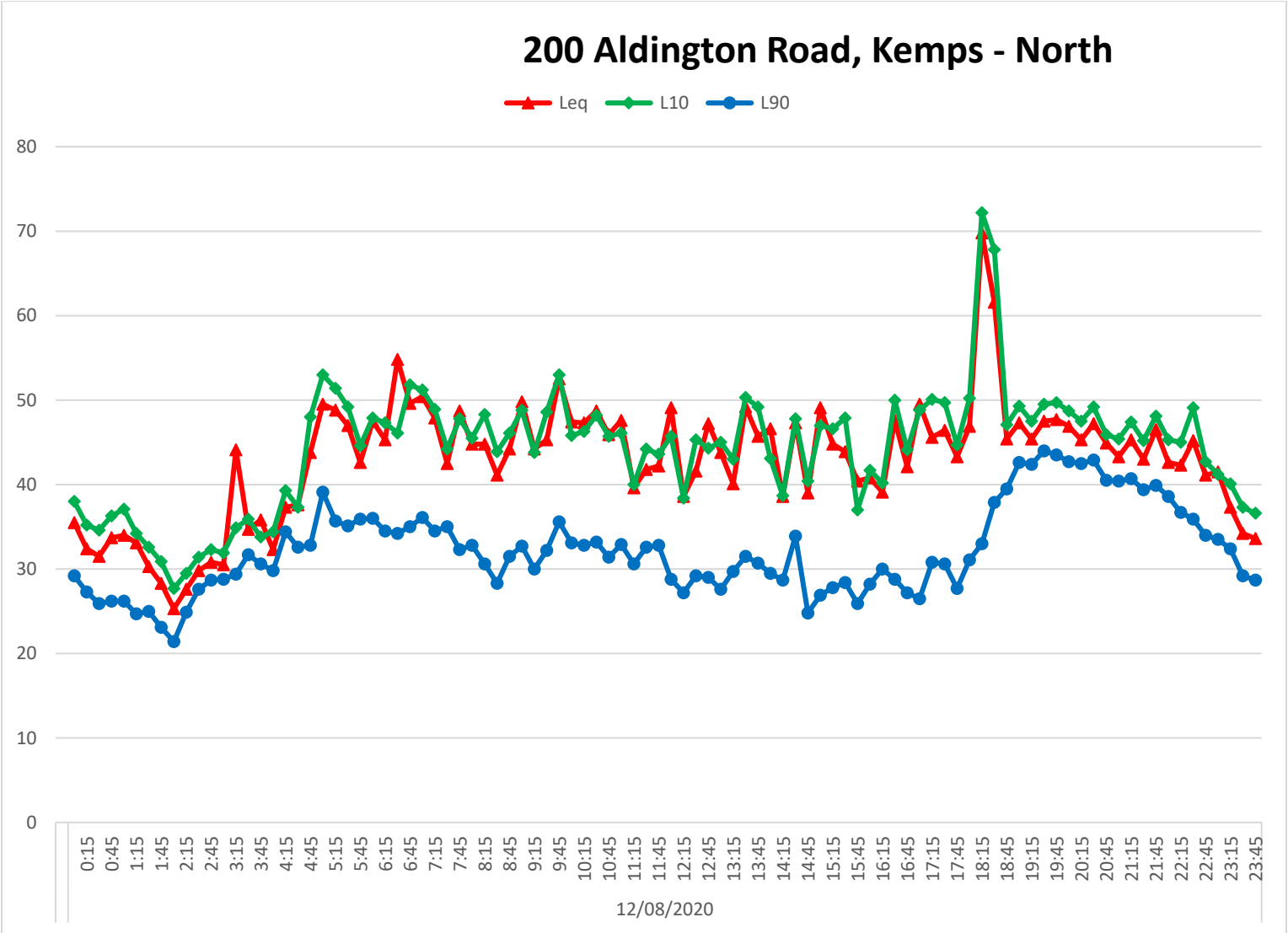
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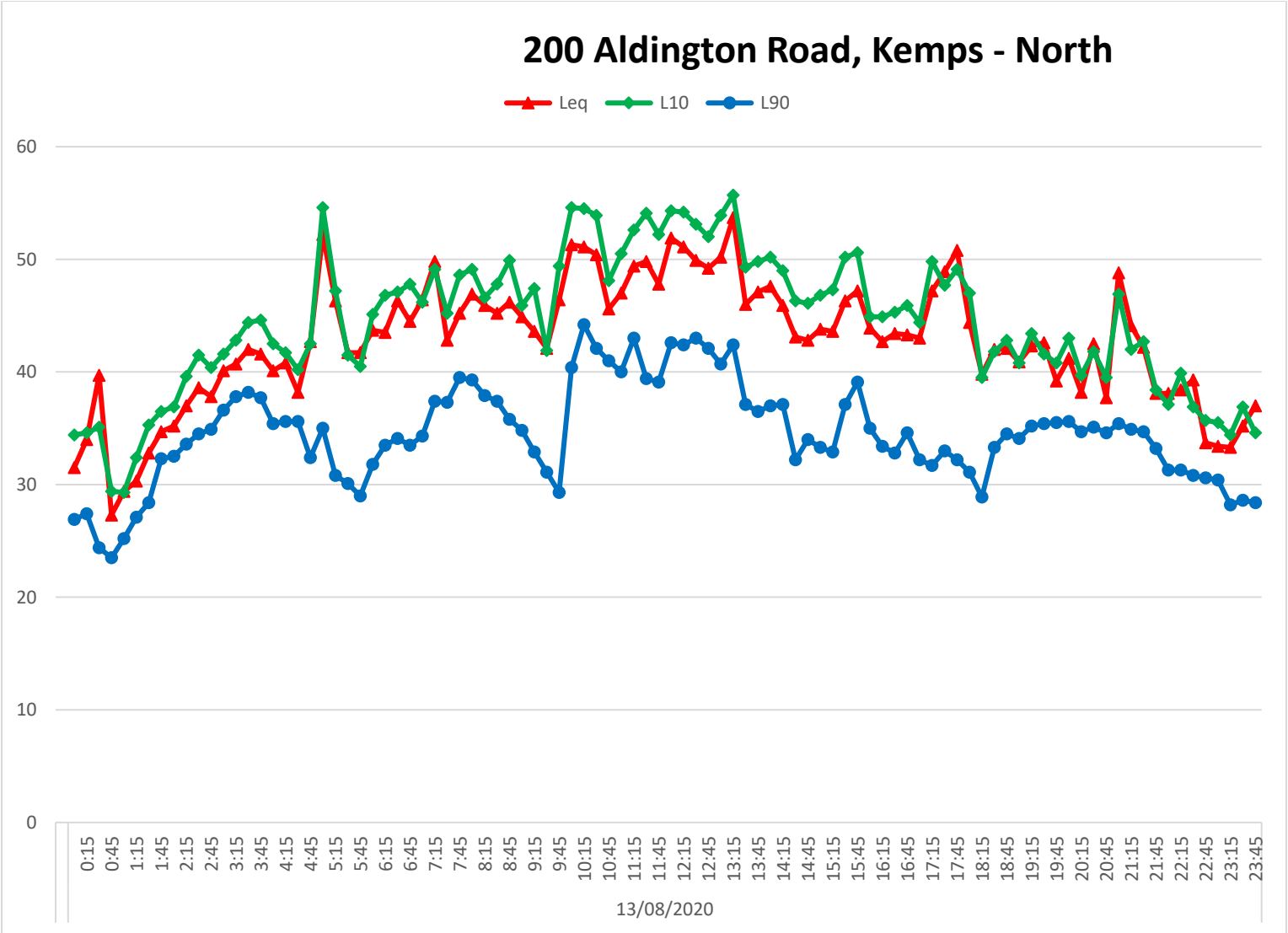
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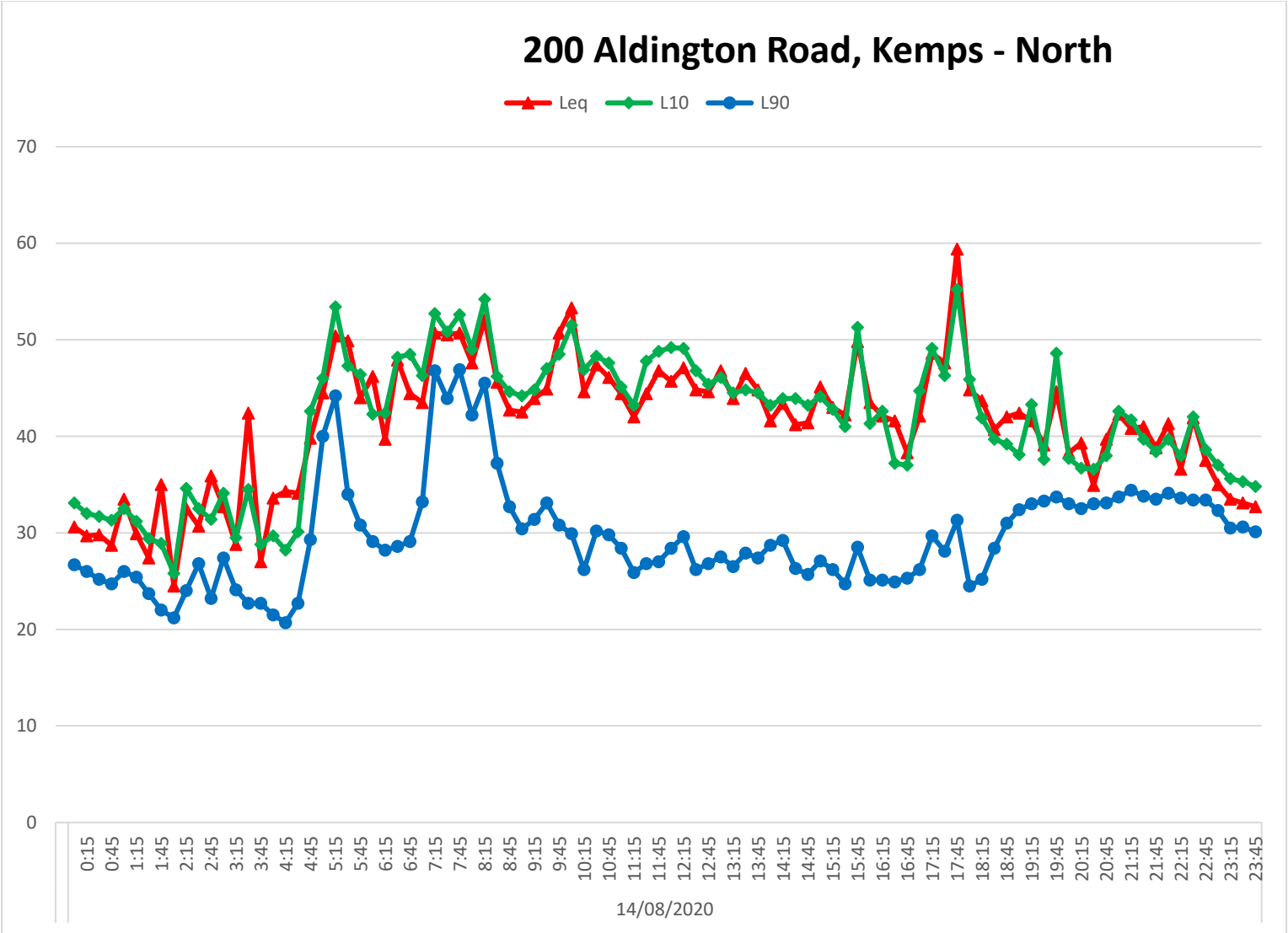
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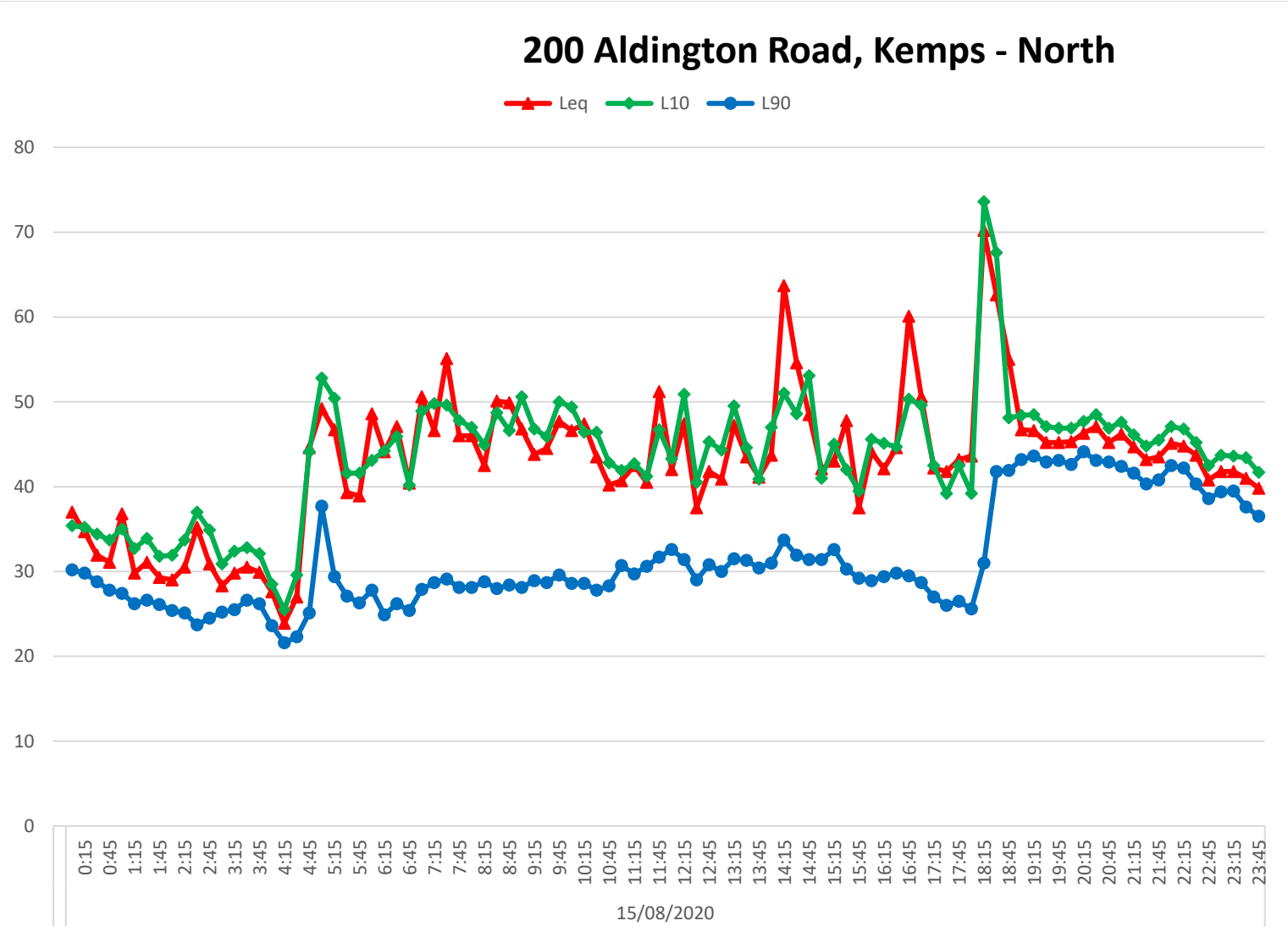
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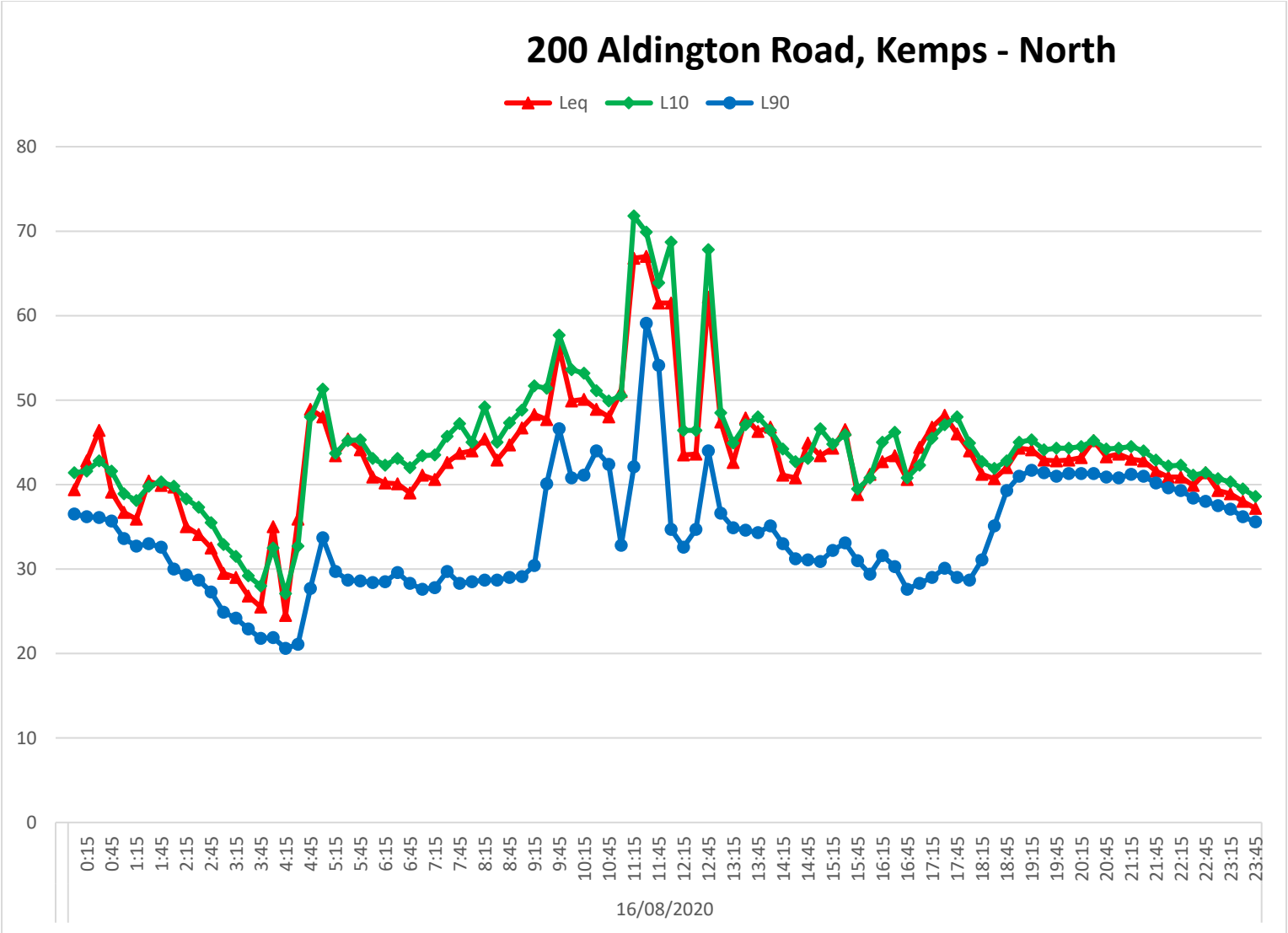
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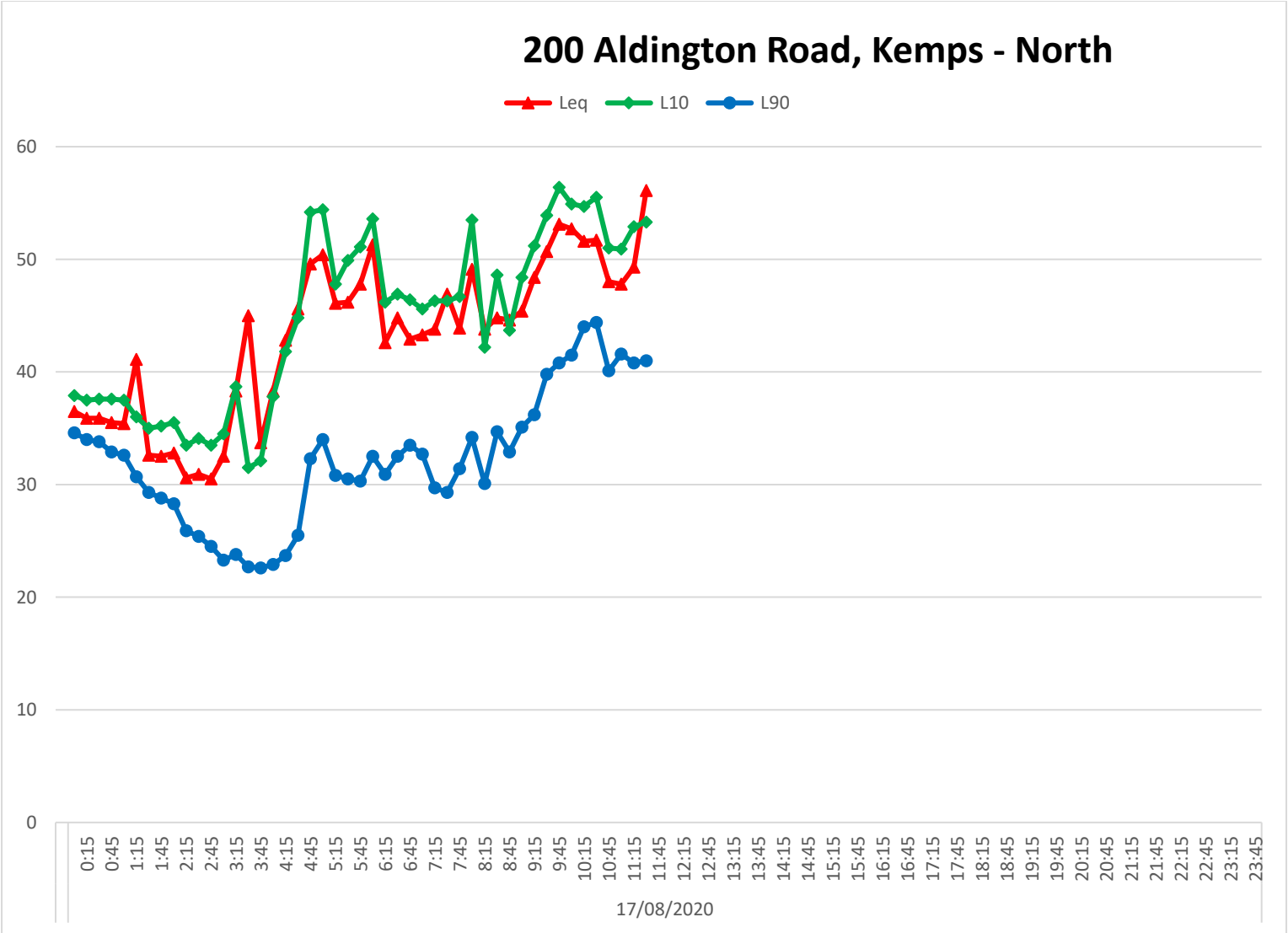
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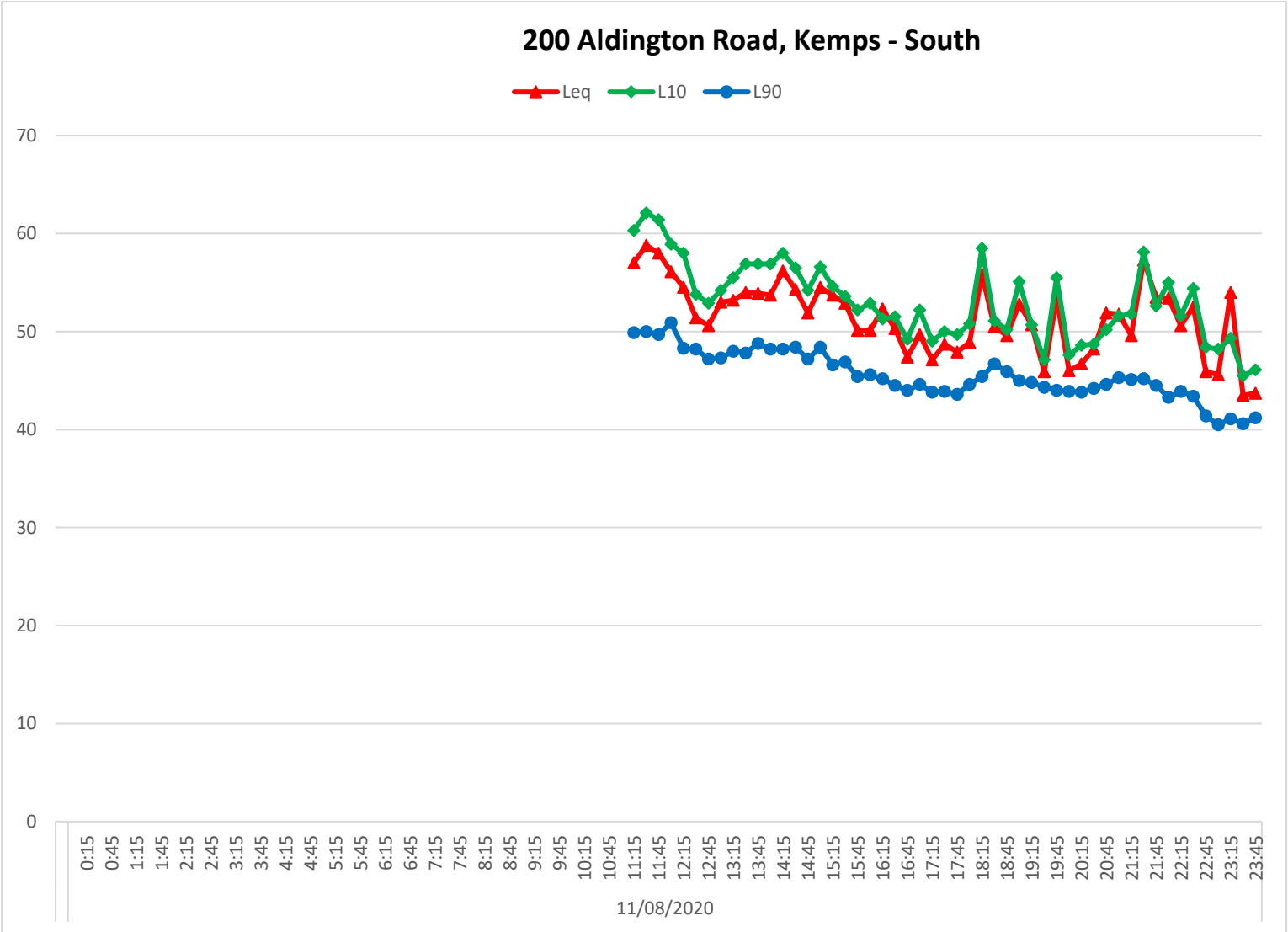
12 Appendix C – Noise Logging Results, Southern Logger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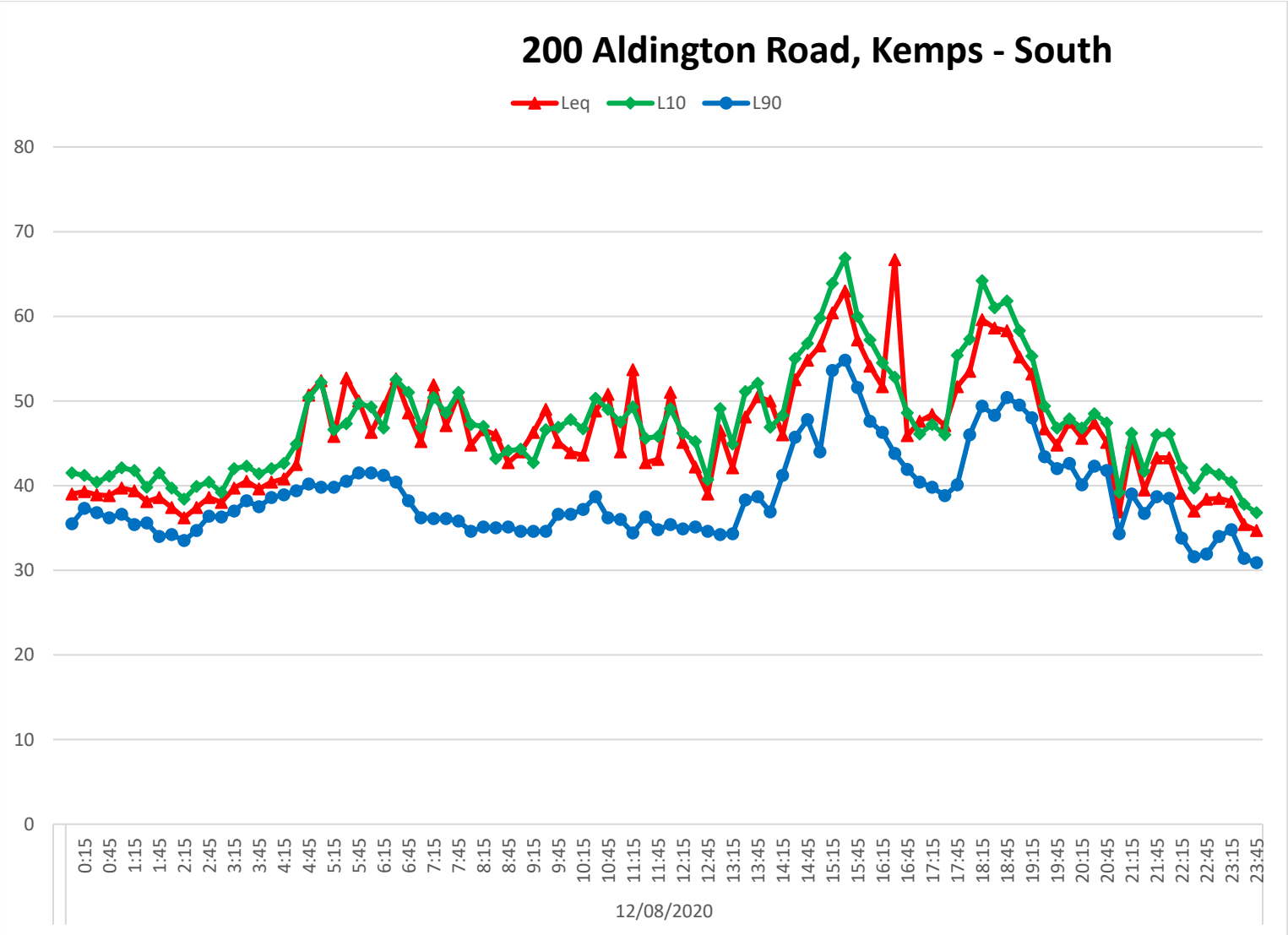
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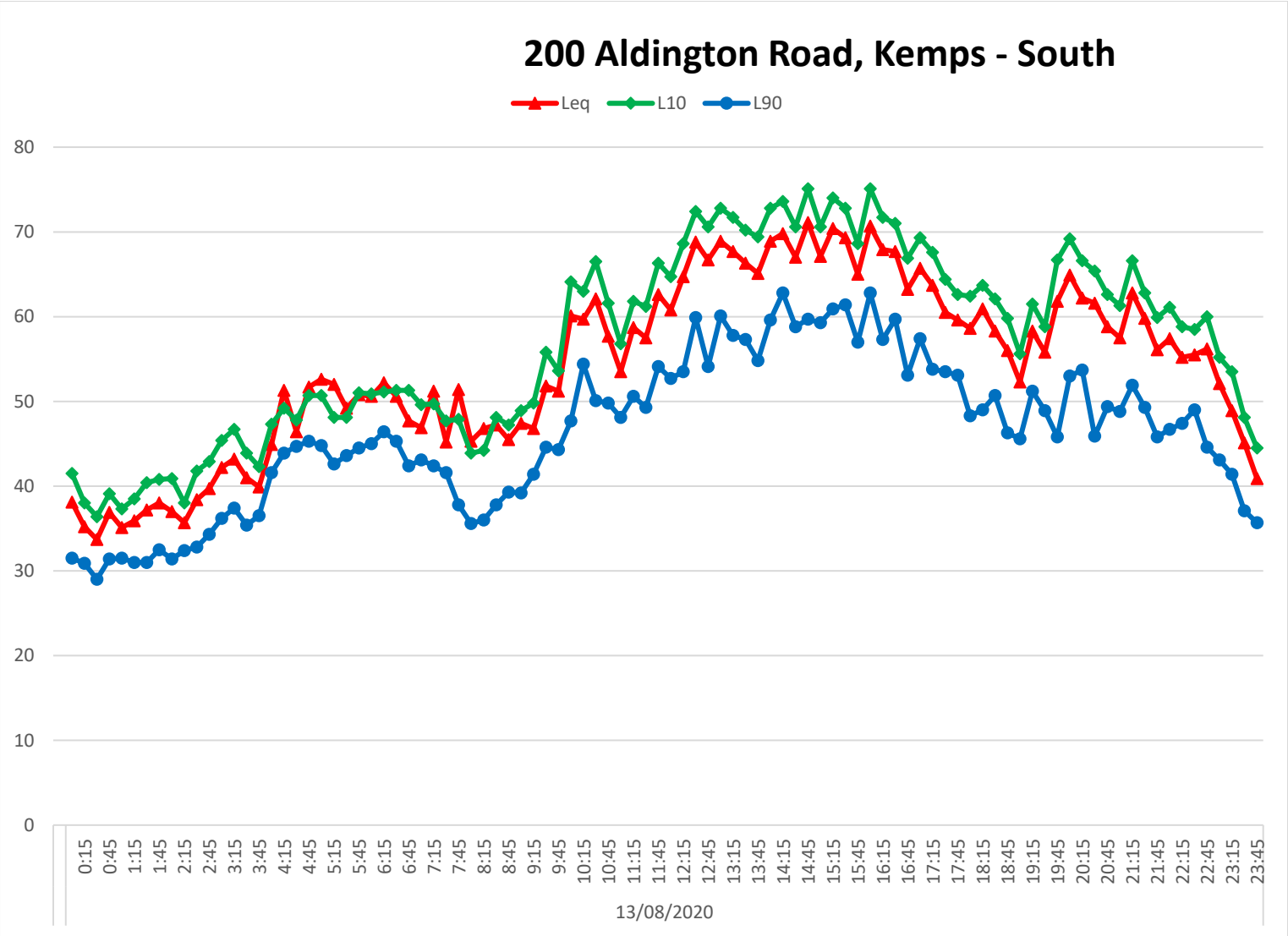
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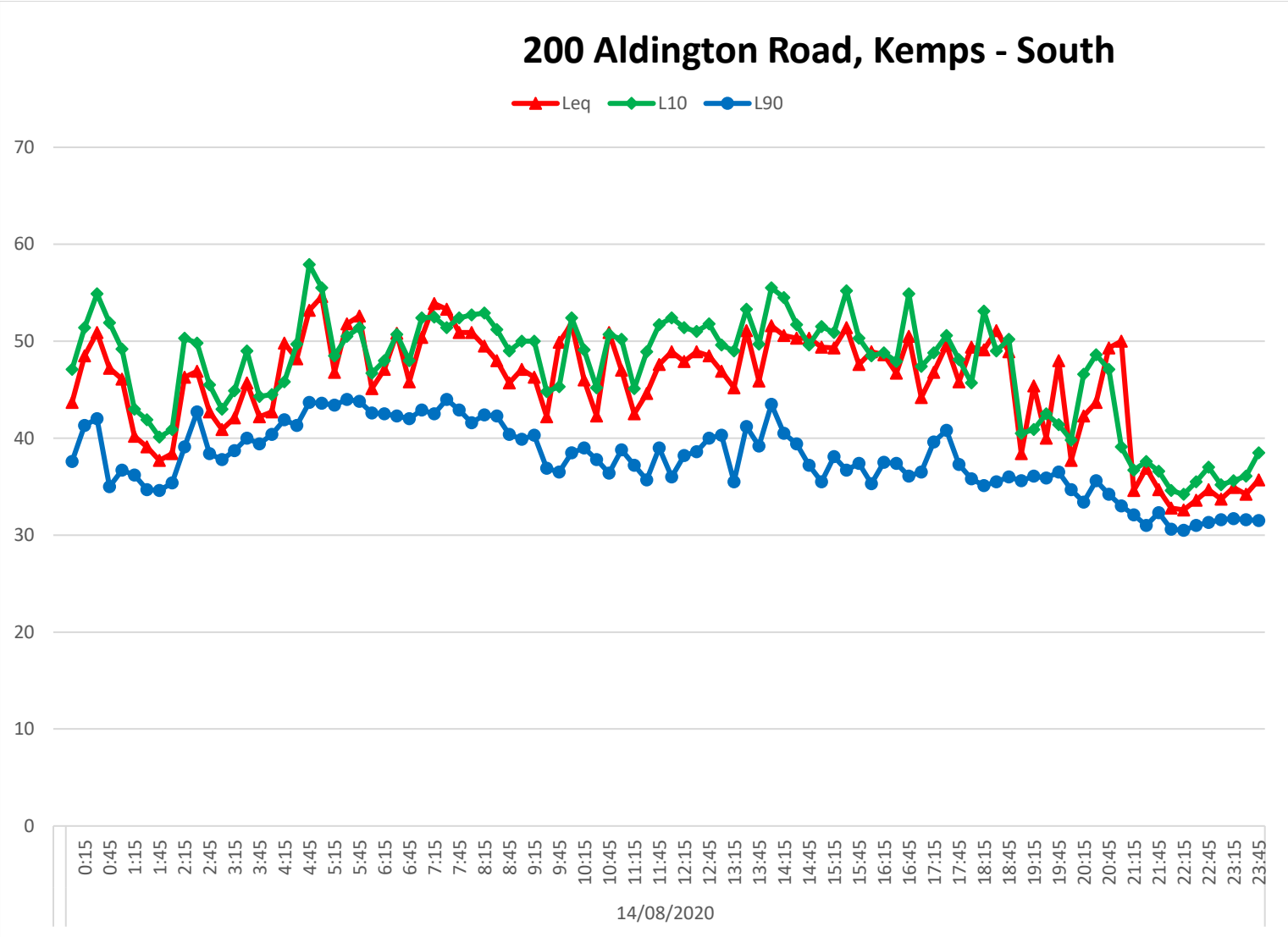
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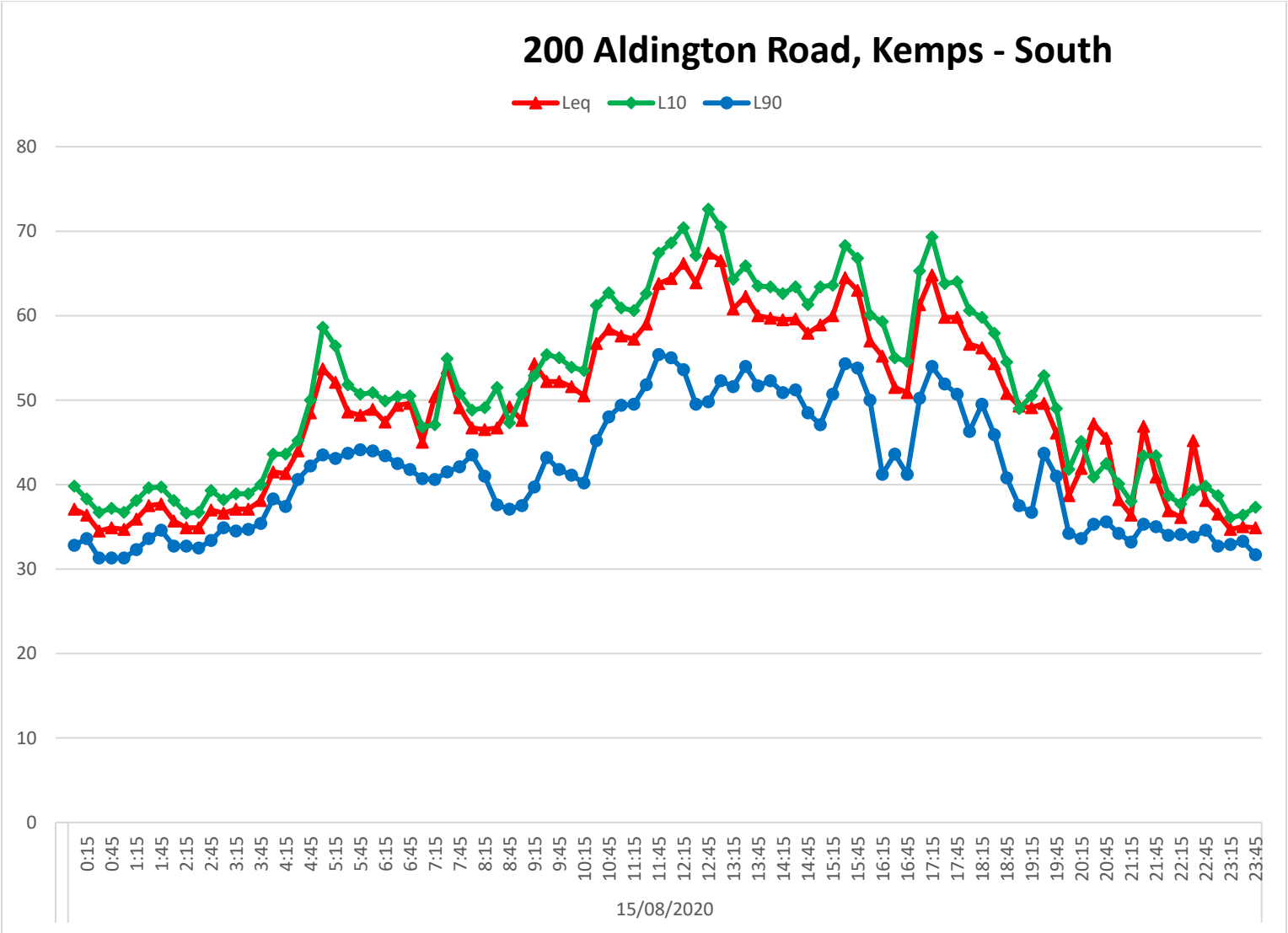
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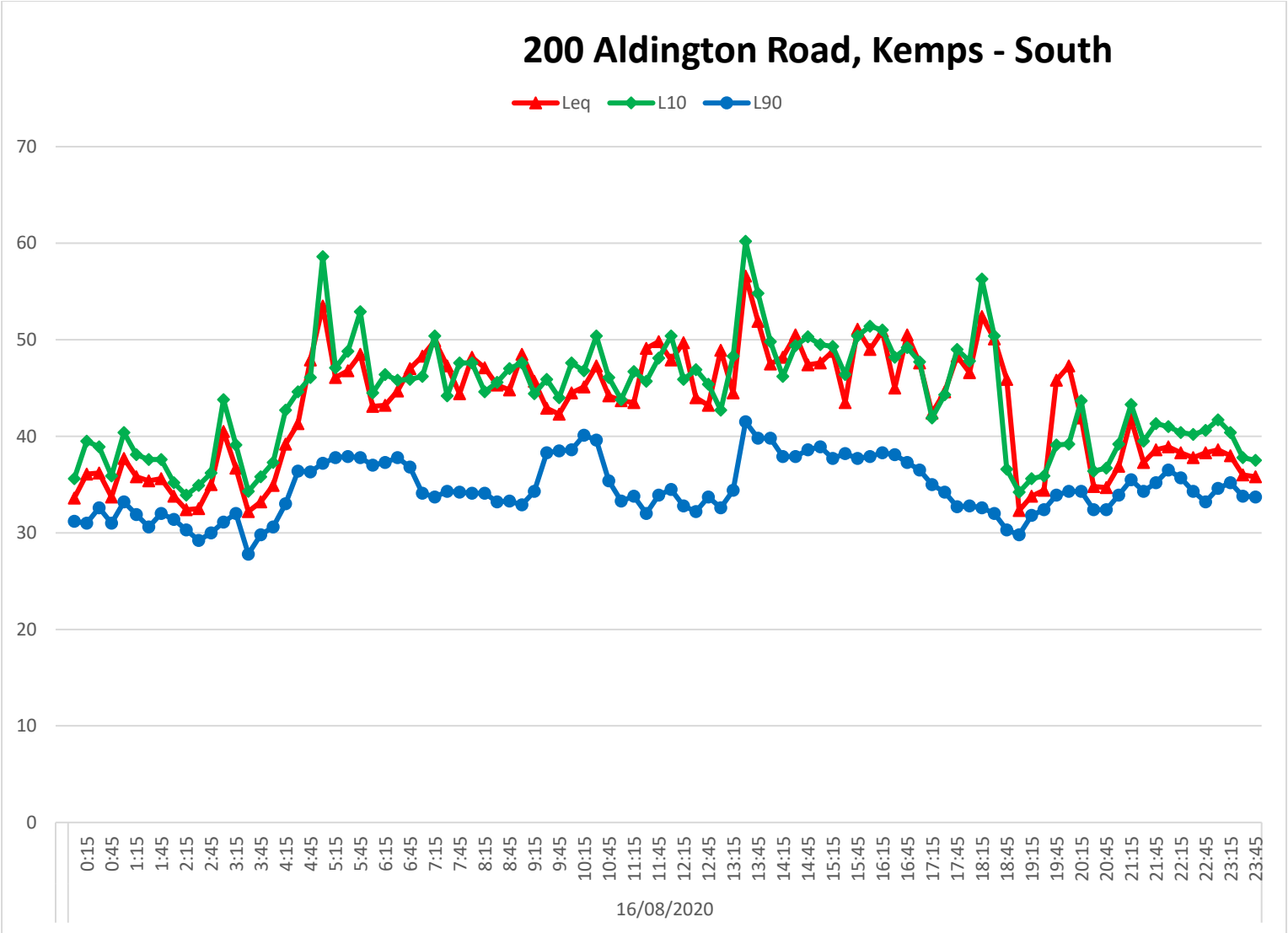
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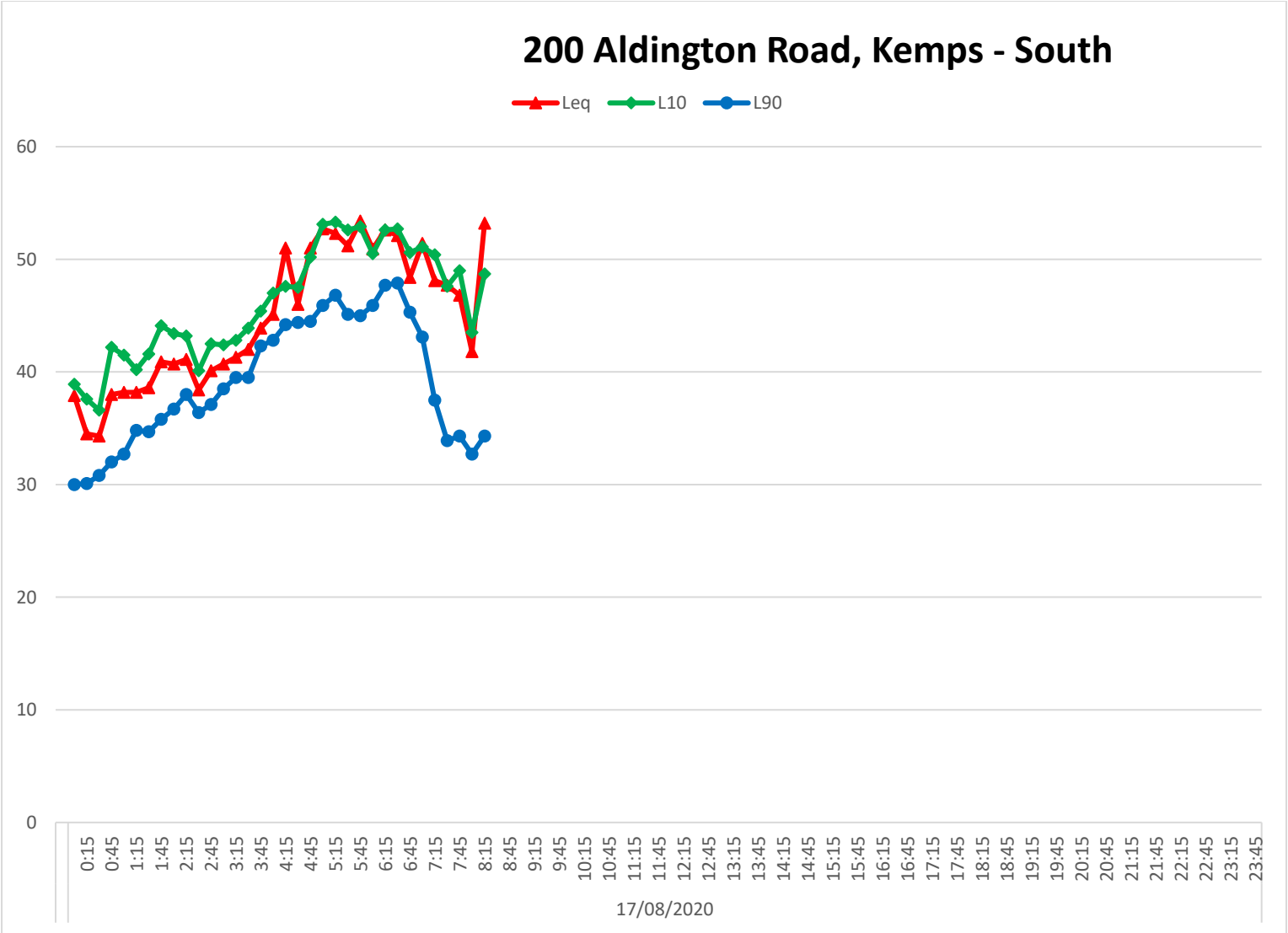
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13 Appendix D – Proposed Car Parking

AREA SCHEDULE
*All areas subject to survey

SITE AREA	720,787sqm
ELECTRICAL EASEMENT	17,705sqm
BASIN LOT L	12,847sqm
FLOOD BASIN LOT D	32,519sqm
ESTATE ROAD RESERVE	42,768sqm
ROAD WIDENING (Aldington Rd)	2,437sqm
FUTURE ROAD CONNECTION	3,875sqm
NET DEVELOPABLE SITE AREA	608,636sqm
TOTAL WAREHOUSE	357,355sqm
TOTAL OFFICE (Aprox. 5% WH)	18,200sqm
CAFE	200sqm
TOTAL BUILDING AREA	375,755sqm
CARPARKING	
REQUIRED (RMS WH1/300 OFFICE1/40)	1,693 CARS
PROVIDED	1,700 CARS
SITE COVERAGE	62%

LOT A

SITE AREA	12,530sqm
OFFICE	200sqm
WAREHOUSE - W1	4,200sqm
CAFE	200sqm
TOTAL GFA	4,600sqm
CARPARKING PROV.	49 CARS

LOT I

SITE AREA	42,460sqm
OFFICE	1,300sqm
WAREHOUSE - W8	25,580sqm
TOTAL GFA	26,880sqm
CARPARKING PROV.	120 CARS

LOT B

SITE AREA	46,604sqm
OFFICE	1,500sqm
WAREHOUSE - W2	28,940sqm
TOTAL GFA	30,440sqm
CARPARKING PROV.	134 CARS

LOT J

SITE AREA	124,463sqm
OFFICE	3,750sqm
WAREHOUSE - W9	75,000sqm
TOTAL GFA	78,750sqm
CARPARKING PROV.	344 CARS

LOT C

SITE AREA	49,495sqm
OFFICE	1,500sqm
WAREHOUSE - W3	29,490sqm
TOTAL GFA	30,990sqm
CARPARKING PROV.	136 CARS

LOT K

SITE AREA	40,232sqm
OFFICE	1,200sqm
WAREHOUSE - W10	23,180sqm
TOTAL GFA	24,380sqm
CARPARKING PROV.	110 CARS

LOT D - Not Developable

SITE AREA	32,519sqm

LOT L - Not Developable

SITE AREA	12,847sqm

LOT E

SITE AREA	29,824sqm
OFFICE	800sqm
WAREHOUSE - W4	16,085sqm
TOTAL GFA	16,885sqm
CARPARKING PROV.	75 CARS

LOT M

SITE AREA	27,596sqm
OFFICE	750sqm
WAREHOUSE - W11	15,130sqm
TOTAL GFA	15,880sqm
CARPARKING PROV.	71 CARS

LOT F

SITE AREA	74,294sqm
OFFICE	2,500sqm
WAREHOUSE - W5	48,430sqm
TOTAL GFA	50,930sqm
CARPARKING PROV.	224 CARS

LOT N

SITE AREA	31,067sqm
OFFICE	900sqm
WAREHOUSE - W12	16,930sqm
TOTAL GFA	17,830sqm
CARPARKING PROV.	84 CARS

LOT G

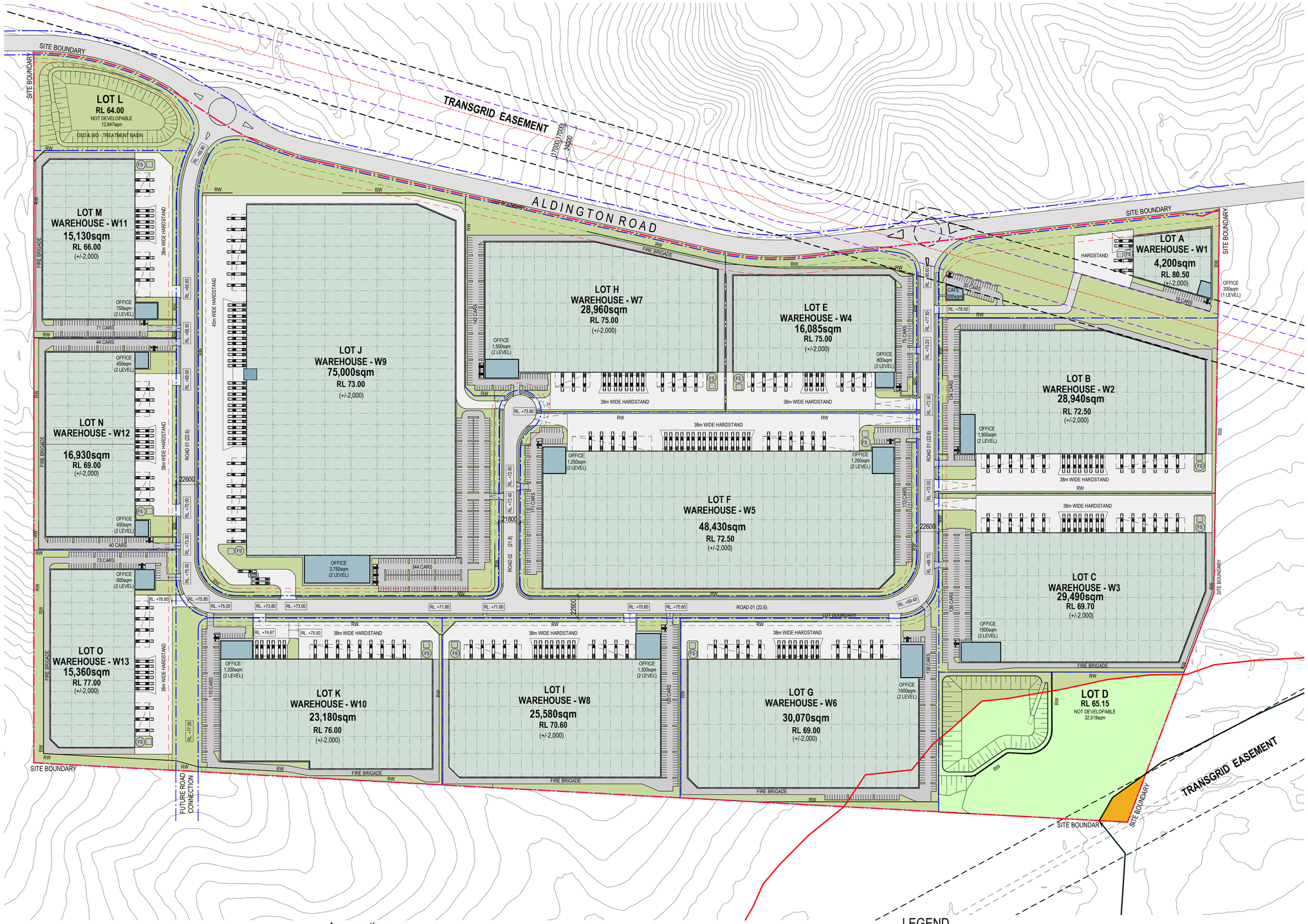
SITE AREA	50,016sqm
OFFICE	1,500sqm
WAREHOUSE - W6	30,070sqm
TOTAL GFA	31,570sqm
CARPARKING PROV.	138 CARS

LOT O

SITE AREA	31,699sqm
OFFICE	800sqm
WAREHOUSE - W13	15,360sqm
TOTAL GFA	16,160sqm
CARPARKING PROV.	73 CARS

LOT H

SITE AREA	48,356sqm
OFFICE	1,500sqm
WAREHOUSE - W7	28,960sqm
TOTAL GFA	30,460sqm
CARPARKING PROV.	142 CARS



Assumptions

01 ALDINGTON RD RESERVE - 24.8m DISTRIBUTOR ROAD
02 INTERNAL ESTATE ROAD 01 RESERVE - 22.6m INDUSTRIAL ROAD
03 INTERNAL ESTATE ROAD 02 RESERVE - 21.8m INDUSTRIAL ROAD
04 PARKING RATE PROVIDED RMS WH 1 SPACE PER 300sqm / OFFICE 1 SPACE PER 40sqm
05 BUILDING SETBACK TO ALDINGTON RD - 15m
06 LANDSCAPE SETBACK TO ALDINGTON RD - 7.5m
07 BUILDING SETBACK FROM ESTATE RD - 7.5m
08 LANDSCAPE SETBACK FROM ESTATE RD - 3.75m

LEGEND

- Site Boundary
- Lot Boundary
- Road Boundary
- Building Setback
- Landscape Setback
- RE2 Zone
- Environmental Conservation zone
- Building Outline
- Building Above Outline
- Easement
- RW Retaining Wall
- FS Fire Services

SBA ARCHITECTS
Commercial Industrial Residential Retail Industrial Design
Suite 702, 83 Mount Street, North Sydney, NSW 2060
T: 02 9929 0966 F: 02 9929 0969
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ISSUE	REV. DESCRIPTION	DATE
P6	LOTS A, B & D CHANGED	31.08.20
P7	UPDATED ACCESS ROAD	04.09.20
P8	UPDATED MASTER PLAN	08.09.20
A	FOR REVIEW	14/09/2020
B	FOR REVIEW	15/09/2020
C	FOR REVIEW	16/09/2020
D	FOR REVIEW	21/09/2020
E	FOR REVIEW	28/09/2020
F	DA ISSUE	01/10/2020

F K C E S T A T E

200 ALDINGTON ROAD, KEMPS CREEK NSW

0m 40m 80m 120m 160m 200m

NORTH

DRAWING TITLE
SSDA Estate Master Plan

DATE	SCALE	JOB NO.	DRAWING NO.	
01/10/2020	1:2000@A1	20111	MP04	F