

NOISE IMPACT ASSESSMENT

PROPOSED MIXED USE DEVELOPMENT

58-66 ABBOTSFORD ROAD

BOWEN HILLS

Prepared for:
Seymour Group

Prepared by:
MWA Environmental

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Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 Adelaide St, Brisbane GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 084

DOCUMENT CONTROL SHEET

MWA Environmental

Level 15 241 Adelaide Street
GPO Box 3137 Brisbane 4001

Telephone: 07 3002 5500
Facsimile 07 3002 5588
Email: mail@mwaenviro.com.au

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Principal Author: Mr Paul King

Client: Seymour Group

Client Address: GPO Box 2478, Brisbane QLD 4001

Client Contact: Mr Ron Van Haren

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1.0 INTRODUCTION

1.1 Study Brief

MWA Environmental has been engaged by Seymour Group to prepare a Noise Impact Assessment for proposed mixed use development at 58-66 Abbotsford Road, Bowen Hills

This report supports an application to Economic Development Queensland (EDQ) for development approval. The report has been prepared to assess noise amenity at the proposed development considering surrounding land uses including:

- Industrial Premises on surrounding lots;
- Vehicular traffic on surrounding roadways; and
- Railway Lines and the Bowen Hills Train Station.

The report also considers the potential impact of the proposed development (e.g.: car parking, mechanical plant, service vehicles) on nearby land uses.

This report has addressed the requirements of the Department of Transport and Main Roads (TMR) *Policy Position Statement: Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure* (Version 2, 10 May 2013) and the Queensland Development Code (QDC) *MP4.4 – Buildings in a Transport Noise Corridor*.

1.2 Site Description

The subject site is located at 58-66 Abbotsford Road and has a real property description of Lot 2 on RP133342, Lot 1 on RP127538 and Lot 1 on RP155441.

The location and extent of the subject site is shown on **Figure 1**. The nature of the existing on-site and surrounding land uses are shown on the aerial photograph included as **Figure 2**.

The subject site currently comprises multiple industrial and commercial sites with the following surrounding land uses:

- | | |
|---------------------|---|
| To the North | To the north of the site exists a number of industrial and commercial sites including training facilities and a coffee shop, beyond which is the Inner City Bypass and a number of railway lines. |
| To the East | The site is bound to the east by Abbotsford road, beyond which lies detached residential dwellings, and the Strikers Social Club and associated sports fields. |
| To the South | Commercial and industrial buildings are located to the south of the site. |
| To the West | The Bowen Hills Train Station and associated train lines border the site to the west, beyond which is the Inner City Bypass. |

1.3 Proposed Development

The proposal is for a twenty five storey, two tower residential development, with a 4 level podium and 4 level basement. The development will include:

Basement 4:	70 residents parking spaces and 11 tandem parking spaces
Basement 3:	70 residents parking spaces and 11 tandem parking spaces
Basement 2:	93 residents parking spaces and 14 tandem parking spaces
Basement 1:	93 residents parking spaces and 14 tandem parking spaces
Plaza Level:	19 residents parking spaces, retail space, lobby entrance, services bay, refuse room, bicycle parking
Level 1:	35 residential parking spaces, 7 tandem parking spaces, lobby, and storage area
Concourse L2:	35 residential parking spaces, 8 tandem parking spaces, retail, lobby/walkway
Level 3:	19 residential units, gym, pool, BBQ area, dining/lounge area, lawn area
Levels 4 – 25:	22 residential units per floor

The proposed Plaza Floor Plan is included as **Figure 3**. The development design drawings are included as **Attachment 1**.

The residential units will incorporate acoustic treatments to account for potential noise impacts from surrounding transportation noise sources.

2.0 EXISTING NOISE ENVIRONMENT

2.1 Existing Noise Sources

The site is located in a commercial area with proximity to two key noise sources, vehicular traffic noise on surrounding roadways including the Inner City Bypass and Abbotsford Road, and railway noise from the Bowen Hills Train Station and associated railway lines.

2.2 Existing Noise Levels

In order to characterise the existing noise environment and determine ambient background noise levels, attended and long term noise measurements were undertaken at the site by MWA Environmental.

The noise data logger was positioned near the boundary of the site and the railway line, and was programmed to provide a statistical noise level analysis based on 15-minute sampling periods. The logger monitored continually for a 7 day period between Friday June 19th and Friday June 26th 2015 at the location shown on **Figure 4**. The data logger recorded noise levels are included as graphical traces of noise level versus time in **Attachment 2**.

The recorded noise levels are presented as statistical components, which are described as:

- L_{max} : The 'maximum' noise level recorded during the measurement period, referred to as the maximum sound pressure level.
- L_1 : Noise level exceeded for 1 percent of the measurement period, referred to as the adjusted maximum sound pressure level.
- L_{10} : Noise level exceeded for 10 percent of the measurement period, referred to as the averaged maximum sound pressure level.
- L_{90} : Noise level exceeded for 90 percent of the measurement period. AS1055.1–1997¹ notes that the L_{90} is described as the background sound pressure level.
- L_{eq} : An "average" measurement, and as per AS1055.1–1997 defined as the value of the sound pressure level of a continuous steady sound state, that within a measurement period, has the same mean square sound pressure as a sound under consideration whose level varies with time.

Table 1 below provides the minimum, maximum and average statistical noise levels recorded by the noise data logger.

¹ Australian Standard AS 1055.1-1997 *Acoustics – Description and measurement of environmental noise, Part 1: General procedures*

**Table 1: Ranges of Datalogger Recorded Noise Levels
19 June to 26 June, 2015**

PARAMETER	PERIOD	RECORDED NOISE LEVELS – dB(A)		
		MINIMUM	MAXIMUM	AVERAGE
L₁	Daytime (7am-6pm)	64.9	75.6	70.7
	Evening (6pm-10pm)	66.3	75.6	69.7
	Night-time (10pm-7am)	61.1	74.5	67.0
L₁₀	Daytime (7am-6pm)	62.7	71.3	67.7
	Evening (6pm-10pm)	64.3	70.9	67.2
	Night-time (10pm-7am)	58.5	70.8	64.4
L₉₀	Daytime (7am-6pm)	57.3	64.9	61.8
	Evening (6pm-10pm)	58.7	67.8	62.0
	Night-time (10pm-7am)	54.9	63.9	60.1
L_{eq}	Daytime (7am-6pm)	60.4	68.5	65.4
	Evening (6pm-10pm)	62.2	69.0	65.1
	Night-time (10pm-7am)	56.8	67.8	62.5

The noise datalogger used was a Rion NL-22 Type 2 Logger, programmed to provide statistical analysis results based on 15-minute sampling periods. The datalogger was pre-calibrated to 94 dB at 1kHz using a Bruel & Kjaer Sound Level Calibrator, Type 4231, and displayed a deviation of less than ± 0.5 dB from this level at post-calibration

The statistical noise level parameters recorded at the noise data logger location included the following:

Avg. Recorded L ₁₀ (18 hour)	=	67.3 dB(A)
Avg. Recorded L _{eq} (24 hour)	=	64.1 dB(A)
Avg. Maximum L _{eq} (1 hour) 7am to 10pm	=	66.5 dB(A)
Avg. Maximum L _{eq} (1 hour) 10pm to 7am	=	65.7 dB(A)
Rating Background Level: Day	=	62.0 dB(A)
Rating Background Level: Evening	=	62.0 dB(A)
Rating Background Level: Night	=	58.0 dB(A)

To assist in the assessment of rail noise and ambient background noise, a short term attended noise survey was undertaken on Friday, 19 June 2015. The attended short term noise monitoring was undertaken with a Rion NL-21 Precision Sound Level Meter pre-calibrated to 94 dB at 1kHz. The instrument displayed less than ± 0.5 dB deviation at post-calibration. The noise measurements are summarised in **Table 2** below with the noise monitoring locations shown on **Figure 4**.

Table 2: Attended Noise Monitoring Results

#	LOCATION	TIME	RECORDED STATISTICAL NOISE LEVEL - dB(A)					COMMENTS
			L ₁	L ₁₀	L ₅₀	L ₉₀	L _{eq}	
1	10 metre from centre of nearest railway track	1545	83.9	72.6	61.2	58.5	68.3	Railway Noise with some traffic noise
2	10 metre from centre of nearest railway track	1600	84.6	74.8	60.5	58	69.3	Railway Noise with some traffic noise

3.0 RAILWAY NOISE IMPACT ASSESSMENT

3.1 Railway Noise Criteria

Under the Building Act 1975 the Queensland Government issued a Gazette (Vol. 369 No. 49) dated Wednesday 1 July 2015 for the Notification of Declaration of a Transport Noise Corridor. As such, the area adjacent to specified railways is declared as a Transport Noise Corridor as at 8 July 2015.

The primary mapped QDC MP4.4 noise category for the site is 'Noise Category 3', with portions of the site mapped as Categories 1 and 2. As such, the development will need to be designed and constructed in accordance with the requirements of QDC MP4.4.

As such, the requirements of QDC MP4.4 apply for the design and construction of residential buildings considering noise emissions from the mapped transport noise corridor.

The Performance Requirement and Acceptable Solutions of QDC MP4.4 are as follows:

PERFORMANCE REQUIREMENTS	ACCEPTABLE SOLUTIONS
<i>Residential buildings</i> P1 <i>Habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupants' health and amenity.</i>	
A1	<i>The external envelope of habitable rooms in a residential building located in a transport noise corridor complies with the minimum R_w for each building component specified in Schedule 1 to achieve a minimum transport noise reduction level for the relevant noise category by:</i> <i>(a) using materials specified in Schedule 2;</i> <i>OR</i> <i>(b) using materials with manufacturer's specifications that, in combination, achieve the minimum R_w value for the relevant building component and applicable noise category.</i>

As such, the Performance Requirement of QDC MP4.4 may be achieved by:

- A. Applying the Acceptable Solutions specified in A1 by adopting the default Noise Category for all building facades;
- B. Applying the Acceptable Solutions specified in A1 based upon a site-specific assessment of the appropriate Noise Category for each building façade i.e. based upon detailed noise modelling;

The EDQ approval conditions are likely to include an advice note that QDC MP4.4 is applicable to the development, EDQ does not regulate the QDC requirements and the ultimate means of achieving the QDC MP4.4 Performance Requirement is a matter to be resolved to the satisfaction of the building certifier.

The applicant may commission an appropriately qualified acoustic consultant to the detailed design stage of the project to provide specifications for the most commercially appropriate methods to achieve the Performance Requirement of QDC MP4.4.

3.2 Railway Noise Levels

In undertaking the noise impact assessment, a noise data logger was located at the site for seven days to record the ambient noise environment for the day, evening and night periods. This unattended noise data logging was supplemented by attended noise monitoring during the daytime period to determine the appropriate L_{max} train bypass levels for assessment at the proposed development.

The datalogger recorded average L_{Aeq} (24 hour) was 64.1 dB(A) at the site. It was not feasible to extract specific train noise events from the monitoring data at the subject site, due to the combined road traffic, rail and industrial noise sources nearby. Given this, and the separation distance to the railway line, attended measurement of rail noise levels was undertaken at a location closer to the railway line in order to determine source rail noise levels.

The attended monitoring was undertaken using a Bruel & Kjaer Type 2250D frequency analysing sound level meter, pre-calibrated to 94 dB at 1kHz. There was no deviation from this level at post-calibration.

Table 3 below summarises the railway noise levels measured at Location 1 on **Figure 4** during attended monitoring on Tuesday, July 7 2015.

**Table 3: Summary of Measured Train Noise Levels – dB(A)
Location 1 (Refer Figure 3)**

Train	Time	Approximate Distance to Track [m]	L _{Amax} [dBA]
EPT-IN	02:41:24 PM	8	74.5
EPT-IN	02:42:39 PM	8	76.2
EPT-IN	02:45:22 PM	8	80.3
EPT-IN	02:50:30 PM	8	82.3
EPT-IN	02:52:47 PM	8	73
EPT-IN	02:55:54 PM	8	80.9
EPT-IN	02:58:35 PM	8	80
EPT-IN	03:00:11 PM	8	80.9
EPT-IN	03:08:35 PM	8	80.7
EPT-IN	03:10:54 PM	8	72
EPT-IN	03:13:21 PM	8	79
EPT-IN	03:15:50 PM	8	75.6
EPT-OUT	02:42:04 PM	8	86
EPT-OUT	02:46:43 PM	8	82.3
EPT-OUT	02:49:17 PM	8	75.1
EPT-OUT	02:51:39 PM	8	72.5
EPT-OUT	02:57:22 PM	8	82.7
EPT-OUT	02:58:41 PM	8	80
EPT-OUT	03:02:22 PM	8	77.7
EPT-OUT	03:04:46 PM	8	74.8
EPT-OUT	03:07:14 PM	8	71.5
EPT-OUT	03:11:57 PM	8	88.8
EPT-OUT	03:17:08 PM	8	78.7
EPT-OUT	03:19:26 PM	8	80.4

The above noise monitoring results are for electric passenger trains pass by events. Measured L_{Amax} train levels averaged 78.5 dB(A) with a range between 71.5 dB(A) and 88.8 dB(A). From the noise monitoring data the following representative 'single event maximum' railway noise source level has been adopted for the purpose of this assessment:

87.5 dB(A) L_{Amax} at 10 metres from the railway tracks

This source level corresponds well with information provided by Queensland Rail for a range of rollingstock. The adopted railway source noise level will be used to determine acoustic treatments required to achieve the relevant internal design noise levels within habitable rooms.

Maximum noise levels from train movements have been calculated at all facades of the proposed residential building. These noise levels are predicted from the 'single event maximum' railway noise source level of 87.5 dB(A) at a distance of 10 metres.

3.3 Predicted Railway Noise Levels

L_{max} noise levels from train movements have been predicted external to the proposed residential building based on a source noise level of 87.5 dB(A) at a distance of 10 metres. The calculated noise levels are presented in **Table 4** and **Table 5** considering distance attenuation.

Table 4: Railway QDC MP4.4 Noise Categories - Tower A

QDC MP4.4 NOISE CATEGORY- TOWER A				
Floor Level	North Façade	South Façade	East Façade	West Façade
1	Category 0	Category 1	Category 0	-
2	Category 1	Category 1	Category 0	-
3	Category 1	Category 2	Category 0	Category 2
4	Category 1	Category 2	Category 0	Category 2
5	Category 2	Category 2	Category 0	Category 2
6	Category 2	Category 2	Category 0	Category 2
7	Category 1	Category 2	Category 0	Category 2
8	Category 1	Category 1	Category 0	Category 2
9	Category 1	Category 1	Category 0	Category 2
10	Category 1	Category 1	Category 0	Category 2
11	Category 1	Category 1	Category 0	Category 1
12	Category 1	Category 1	Category 0	Category 1
13	Category 1	Category 1	Category 0	Category 1
14	Category 1	Category 1	Category 0	Category 1
15	Category 1	Category 1	Category 0	Category 1
16	Category 1	Category 1	Category 0	Category 1
17	Category 1	Category 1	Category 0	Category 1
18	Category 1	Category 1	Category 0	Category 1
19	Category 1	Category 1	Category 0	Category 1
20	Category 1	Category 1	Category 0	Category 1
21	Category 1	Category 1	Category 0	Category 1
22	Category 1	Category 1	Category 0	Category 1
23	Category 1	Category 1	Category 0	Category 1
24	Category 1	Category 1	Category 0	Category 1
25	Category 1	Category 1	Category 0	Category 1

Table 5: Railway QDC MP4.4 Noise Categories - Tower B

QDC MP4.4 NOISE CATEGORY- TOWER B				
Floor Level	North Façade	South Façade	East Façade	West Façade
3	Category 3	Category 3	Category 1	Category 3
4	Category 3	Category 3	Category 1	Category 3
5	Category 3	Category 3	Category 1	Category 3
6	Category 3	Category 3	Category 1	Category 3
7	Category 3	Category 3	Category 1	Category 3
8	Category 3	Category 3	Category 1	Category 3
9	Category 2	Category 3	Category 1	Category 3
10	Category 2	Category 2	Category 1	Category 3
11	Category 2	Category 2	Category 1	Category 2
12	Category 2	Category 2	Category 1	Category 2
13	Category 2	Category 2	Category 1	Category 2
14	Category 2	Category 2	Category 1	Category 2
15	Category 2	Category 2	Category 1	Category 2
16	Category 2	Category 2	Category 1	Category 2
17	Category 2	Category 2	Category 1	Category 2
18	Category 2	Category 2	Category 1	Category 2
19	Category 2	Category 2	Category 1	Category 2
20	Category 1	Category 2	Category 1	Category 2
21	Category 1	Category 1	Category 1	Category 1
22	Category 1	Category 1	Category 1	Category 1
23	Category 1	Category 1	Category 1	Category 1
24	Category 1	Category 1	Category 1	Category 1
25	Category 1	Category 1	Category 1	Category 1

The railway noise monitoring and assessment demonstrates that:

1. Façade construction types in accordance with QDC MP4.4 ranging from Category 0 to Category 3 will be required for the two residential towers.
2. Category 3 may require double glazing for window/sliding glass door elements.
3. The architectural design for the western units nearest the rail line provides for Wintergarden style balconies which enable ready achievement of a double glazed acoustic outcome. The windows on the Western façade have been design to be smaller on the lower, more rail noise exposed levels to maintain amenity in these units.

4.0 TRAFFIC NOISE IMPACT ASSESSMENT

4.1 Traffic Noise Criteria

Mapping indicates that the subject site is affected by the 'Transport Noise Corridor' overlay. The mapped Queensland Development Code MP4.4 ("**QDC MP4.4**") noise category for the site is 'Noise Category 3' (refer **Figure 3**).

As such, the requirements of QDC MP4.4 apply for the design and construction of residential buildings considering noise emissions from the mapped roadway(s) (Abbotsford Road and Inner City Bypass).

The Performance Requirement and Acceptable Solutions of QDC MP4.4 are as follows:

PERFORMANCE REQUIREMENTS		ACCEPTABLE SOLUTIONS	
<i>Residential buildings</i>			
P1	<i>Habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupants' health and amenity.</i>	A1	The external envelope of habitable rooms in a residential building located in a transport noise corridor complies with the minimum R_w for each building component specified in Schedule 1 to achieve a minimum transport noise reduction level for the relevant noise category by: (a) using materials specified in Schedule 2; OR (b) using materials with manufacturer's specifications that, in combination, achieve the minimum R_w value for the relevant building component and applicable noise category.

As such, the Performance Requirement of QDC MP4.4 may be achieved by:

- C. Applying the Acceptable Solutions specified in A1 by adopting the default CityPlan 2014 mapping Noise Category for all building facades;
- D. Applying the Acceptable Solutions specified in A1 based upon a site-specific assessment of the appropriate Noise Category for each building façade i.e. based upon detailed noise modelling; or
- E. Undertaking detailed assessment using AS3671 to specify acoustic ratings for individual building elements to achieve the design indoor noise levels of AS2107:2000.

It is considered that EDQ approval conditions are likely to include an advice note that QDC MP4.4 is applicable to the development, EDQ does not regulate the QDC requirements and the ultimate means of achieving the QDC MP4.4 Performance Requirement is a matter to be resolved to the satisfaction of the building certifier.

The applicant may commission an appropriately qualified acoustic consultant to the detailed design stage of the project to provide specifications for the most commercially appropriate methods to achieve the Performance Requirement of QDC MP4.4.

4.2 Road Traffic Data

In order to determine the relevant QDC MP4.4 noise categories for each proposed residential unit façade, ultimate horizon traffic noise predictions have been made external to each proposed building facade. The future traffic noise model was developed representing the proposed building location and finished floor levels as per the architectural drawings included in **Attachment 1**. The modelling considered receivers at finished floor level plus 1.5 metres.

In order to provide appropriate acoustic amenity outcomes for all residential building facades the road traffic noise modelling has considered Abbotsford Road and Inner City Bypass. Existing and ultimate traffic data for roadways in proximity to the subject site was supplied by Brisbane City Council Transport Engineering by fax on 10 July 2015 and are summarised in **Table 6** below.

The daily traffic flow data has been scaled by a factor 0.94 to represent the 18 hour traffic flow data necessary to predict the L_{10} (18 hour) traffic noise levels. Traffic flow data for the surrounding roadways is displayed in **Table 6** below.

Table 6: Existing and Ultimate Design Horizon Traffic Volumes

ROADWAY	VPD		VP18hr		%CV
	Existing	Ultimate	Existing	Ultimate	
Abbotsford Road	29,000	32,000	27,260	30,080	4.0
Inner City Bypass	60,000	65,000	56,400	61,100	9.0

4.3 Road Traffic Noise Model Validation

The first step in the predictive traffic noise process is to validate the model to the recorded noise levels, i.e. the aim being to predict within +2dB of the recorded level, with selected parameters used in the future (ultimate) traffic noise modelling scenarios.

The model used in the traffic noise modelling process was SoundPLAN 7.3. This model uses the CoRTN methodology for traffic noise prediction, a method accepted by regulatory bodies in Queensland. The SoundPLAN 7.3 model was setup to predict the external L_{10} (18 hour) traffic noise levels under ultimate traffic flow conditions.

The existing level of traffic noise exposure at the noise datalogger location was recorded to be 67.3 dB(A) as the free-field L_{10} (18 hour).

The model prediction for the monitoring location was an L_{10} (18 hour) of 66.1 dB(A), hence within the 2dB(A) tolerance applied. The higher measured L_{10} (18 hour) is influenced by other noise sources in the area such as railway and industrial noise. Thus the model is considered suitably validated for prediction of future traffic noise levels.

The results of the SoundPLAN validation model are provided in **Attachment 3**.

4.4 Predicted Ultimate Road Traffic Noise Levels

The SoundPLAN 7.3 model was setup to predict the external L_{10} (18 hour) traffic noise levels under ultimate traffic flow conditions. The model layout and predicted results for the ultimate planning horizon including the noise contour maps are presented in **Attachment 3**.

A summary of the predicted ultimate L_{10} (18 hour) noise levels external to the representative residential facades of the proposed development buildings and the corresponding QDC MP4.4 Noise Categories are provided in **Table 7** and **Table 8** below.

Table 7: Ultimate Traffic QDC MP4.4 Noise Categories - Tower A

QDC MP4.4 NOISE CATEGORY- TOWER A				
Floor Level	North Façade	South Façade	East Façade	West Façade
1	Category 3	Category 3	Category 4	-
2	Category 3	Category 3	Category 4	-
3	Category 3	Category 3	Category 4	Category 0
4	Category 2	Category 3	Category 3	Category 0
5	Category 3	Category 3	Category 3	Category 1
6	Category 3	Category 3	Category 3	Category 1
7	Category 3	Category 3	Category 3	Category 1
8	Category 3	Category 3	Category 3	Category 1
9	Category 3	Category 3	Category 3	Category 2
10	Category 3	Category 3	Category 3	Category 2
11	Category 3	Category 3	Category 3	Category 2
12	Category 3	Category 3	Category 3	Category 2
13	Category 3	Category 3	Category 3	Category 2
14	Category 3	Category 3	Category 3	Category 2
15	Category 3	Category 3	Category 3	Category 2
16	Category 3	Category 3	Category 3	Category 2
17	Category 3	Category 3	Category 3	Category 2
18	Category 3	Category 3	Category 3	Category 2
19	Category 3	Category 3	Category 3	Category 2
20	Category 3	Category 3	Category 3	Category 2
21	Category 3	Category 3	Category 3	Category 2
22	Category 3	Category 2	Category 3	Category 2
23	Category 3	Category 2	Category 3	Category 2
24	Category 3	Category 2	Category 2	Category 2
25	Category 3	Category 2	Category 2	Category 2

Table 8: Ultimate Traffic QDC MP4.4 Noise Categories - Tower B

QDC MP4.4 NOISE CATEGORY- TOWER B				
Floor Level	North Façade	South Façade	East Façade	West Façade
3	Category 2	Category 2	Category 1	Category 2
4	Category 2	Category 2	Category 1	Category 2
5	Category 2	Category 2	Category 2	Category 3
6	Category 3	Category 2	Category 2	Category 3
7	Category 3	Category 2	Category 2	Category 3
8	Category 3	Category 2	Category 2	Category 3
9	Category 3	Category 3	Category 2	Category 3
10	Category 3	Category 3	Category 2	Category 3
11	Category 3	Category 3	Category 2	Category 3
12	Category 3	Category 3	Category 2	Category 3
13	Category 3	Category 3	Category 2	Category 3
14	Category 3	Category 3	Category 2	Category 3
15	Category 3	Category 3	Category 2	Category 3
16	Category 3	Category 3	Category 2	Category 3
17	Category 3	Category 3	Category 2	Category 3
18	Category 3	Category 2	Category 2	Category 3
19	Category 3	Category 2	Category 2	Category 3
20	Category 3	Category 2	Category 2	Category 3
21	Category 3	Category 2	Category 2	Category 3
22	Category 3	Category 2	Category 2	Category 3
23	Category 3	Category 2	Category 2	Category 3
24	Category 3	Category 2	Category 2	Category 3
25	Category 3	Category 2	Category 2	Category 3

4.5 Outdoor Road Traffic Noise Requirements

The Brisbane CityPlan 2014 Transport Noise Corridor Overlay Code also includes the following requirements for outdoor recreation space which are considered appropriate to apply to the proposed development:

Performance outcomes	Acceptable outcomes
PO1 Development provides outdoor space for passive recreation in a manner where transport noise has been minimised.	AO1 Development ensures that each dwelling: (a) has a balcony or outdoor recreation area shielded by the building from direct road traffic noise; or (b) with a balcony exposed to road traffic noise has a solid gap-free balustrade.

Unit balconies on all building facades have line-of-sight to a transportation noise source and therefore should incorporate solid balustrades to balconies. Solid balustrades may be constructed of appropriate materials to achieve a minimum surface density of 10 kg/m² and be gap-free (minimum leakage of 1% total balustrade area) using materials such as glass and/or masonry.

The development provides a outdoor recreation area that comprises of pool, dining/lounge area and lawn areas on Level 3, which given its elevation and location, is generally is screened from surrounding transportation noise sources and supplements the provision of private balconies with solid balustrades as per Acceptable Outcome A01.

5.0 OVERALL ACOUSTIC SPECIFICATIONS

Based upon the assessment presented in **Sections 3.0 and 4.0** considering road traffic noise and rail noise it is determined that 'Noise Category 1 to 4' of the QDC MP4.4 is the maximum required acoustic treatment of external façade of habitable rooms on the basis of this preliminary assessment.

QDC MP4.4 in **Attachment 4** provides acceptable solutions for acoustic treatment requirements

In order to provide the maximum noise category assessed, considering both rail and road noise impact on both towers, **Table 9 and Table 10** below summarises the prevailing noise impact and its associated noise categories on all façades

Table 9: Minimum QDC MP4.4 Transport Noise Categories - Tower A

FLOOR LEVEL	MINIMUM QDC MP4.4 NOISE CATEGORY- TOWER A			
	NORTH	SOUTH	EAST	WEST
1	Category 3	Category 3	Category 4	-
2	Category 3	Category 3	Category 4	-
3	Category 3	Category 3	Category 4	Category 2
4	Category 2	Category 3	Category 3	Category 2
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22	Category 3	Category 2	Category 3	Category 2
23	Category 3	Category 2	Category 3	Category 2
24	Category 3	Category 2	Category 2	Category 2
25	Category 3	Category 2	Category 2	Category 2

Table 10: Minimum QDC MP4.4 Transport Noise Categories - Tower B

FLOOR LEVEL	MINIMUM QDC MP4.4 NOISE CATEGORY- TOWER B			
	NORTH	SOUTH	EAST	WEST
3	Category 3	Category 3	Category 1	Category 3
4	Category 3	Category 3	Category 1	Category 3
5	Category 3	Category 3	Category 2	Category 3
6	Category 3	Category 3	Category 2	Category 3
7	Category 3	Category 3	Category 2	Category 3
8	Category 3	Category 3	Category 2	Category 3
9	Category 3	Category 3	Category 2	Category 3
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20	Category 3	Category 2	Category 2	Category 3
21	Category 3	Category 2	Category 2	Category 3
22	Category 3	Category 2	Category 2	Category 3
23	Category 3	Category 2	Category 2	Category 3
24	Category 3	Category 2	Category 2	Category 3
25	Category 3	Category 2	Category 2	Category 3

The provision of external facade elements achieving the above minimum noise categories will ensure that the development meets the noise amenity requirements of the following Codes:

- Transport Noise Corridor Overlay
- Railway Transport Noise Code;

At the detailed design phase of the project, façade element acoustic design requirements will be further assessed.

6.0 NOISE IMPACT OF PROPOSED DEVELOPMENT

6.1 Plant and Equipment Noise

External plant and equipment associated with the proposed development is likely to include centrally located or balcony mounted air-conditioning plant for the residential units and lift plant.

For plant and equipment noise, an appropriate assessment is using Australian Standard **AS2107**, *AS2107:2000 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* as a basis for determining the potential for noise intrusion into adjacent habitable dwellings from steady-state noise sources that operate during all hours of the day.

The noise limits are:

The maximum recommended design sound levels stated in Table 1 of AS2107.

Table 1 of AS2107:2000 is as follows:

Type of occupancy/activity	Recommended design sound level, L_{Aeq}, dB(A)	
	Satisfactory	Maximum
7 RESIDENTIAL BUILDINGS		
<i>Houses and apartments near major roads-</i>		
<i>Living areas</i>	35	45
<i>Sleeping areas</i>	30	40
<i>Work areas</i>	35	40
<i>Apartment common areas (e.g. foyer, lift lobby)</i>	45	55

Due to the urban nature of the site and the proximity to major transport routes, 'Houses and apartments near major roads' would typically be considered to be an appropriate description of the proposed development at the subject site.

The adopted noise criteria for the assessment of plant noise impacts from the proposed development is an internal noise level of 35 dB(A) to bedrooms and 40 dB(A) to living areas. Considering a minimum noise attenuation of 5 dB(A) through an open window, the strictest plant and equipment noise criterion is **40 dB(A)** external to surrounding residential façades.

As such, any mechanical plant and equipment associated with the development should be located and acoustically treated and/or shielded to achieve the 40 dB(A) limit external to surrounding residential facades.

The 40 dB(A) noise limit does not necessarily apply to a single item of plant, but rather should constitute the additive noise component levels of all plant and equipment proposed and in operation during the assessed period, measured at the nearest residential receptor(s).

Experience dictates that appropriate noise controls are feasible to achieve the 40 dB(A) noise limit using modern plant, ensuring that residential amenity is not adversely impacted by the required air-conditioning plant and equipment.

Any lift motors should be selected and acoustically enclosed if required in order to achieve the 40 dB(A) limit external to surrounding residential facades. This design standard will ensure

that the noise of the lift motors does not adversely impact on amenity at surrounding residential premises.

More detailed assessment of acoustic treatments required for the major plant and equipment installations should be undertaken at the detailed design stage of the development. Experience with many other similar developments in proximity to existing residential areas dictates that appropriate noise controls are feasible to ensure that plant and equipment can achieve the noise limits required. Plant selection and acoustic design will form an integral part of the detailed design process for future development on the site.

6.2 Car Parking Noise Impacts

Car parking for the development will be in 4 basement levels, and 3 enclosed podium levels. The proposed car parking levels are enclosed and hence are suitably screened to on-site and surrounding residential uses. Access to the car parking areas is via a driveway from Abbotsford Road.

In summary the noise of proposed car parking shall be within the ambient noise levels and contained by the enclosed basement car park structure. Thus, site car parking will not adversely impact on amenity at the proposed on-site residences and existing surrounding land uses.

6.3 Service Vehicle Activities and Loading Noise

Considering the nature of the development it is likely that servicing would occur during the daytime and evening periods only (7am to 10pm) when ambient traffic noise peaks are highest. Thus, given the minor nature of the servicing requirements for the development, it is considered that there is no potential to adversely impact on amenity at on-site or surrounding residences. Furthermore, service vehicles will enter the site from Abbotsford Road and conduct operations within an enclosed area, shielded from sensitive residential receptors.

7.0 CONCLUSIONS

MWA Environmental has been engaged by Seymour Group to prepare a Noise Impact Assessment for proposed mixed use development at Bowen Hills. This report considers the requirement for the proposed residential development to achieve an appropriate acoustic environment that complies with the relevant planning noise levels.

The report has been prepared in accordance with requirements as specified in the Brisbane City Council *Noise Impact Assessment Planning Scheme Policy* and the Department of Transport and Main Roads *Policy Position Statement: Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure* (Version 2, 10 May 2013).

The railway noise assessment has demonstrated the indicative QDC MP4.4 Noise Categories which apply to each façade and level of the two residential towers to achieve the design internal noise levels under this policy.

The road noise assessment has demonstrated the indicative QDC MP4.4 Noise Categories which apply to each façade and level of the two residential towers to achieve the design internal noise levels under this policy.

The noise monitoring conducted has identified that noise from surrounding commercial and industrial uses falls within the road and rail transport noise levels. On this basis, the acoustic treatments required for the transportation noise sources, in conjunction with air conditioning/mechanical ventilation of units will ensure appropriate amenity is maintained for future residents from commercial/industrial noise.

The assessment of noise emissions from the proposed development has demonstrated that:

1. The required fixed plant and equipment at the development may be suitably selected, located and/or acoustically treated to achieve the appropriate limits at on-site and surrounding residences.
2. Carparking noise associated with the proposed development will be well within the existing road traffic noise levels experienced at surrounding residential dwellings and thus will not adversely impact upon acoustic amenity at surrounding residential land uses.
3. The provision of construction materials to achieve minimum noise reduction as per the noise categories identified in **Table 9** and **Table 10** will ensure that the development meets the noise amenity requirements.

Thus, the assessment conducted has demonstrated that the proposed development can be designed and constructed in accordance with the relevant noise amenity standards.

It is recommended that the development be approved with reasonable and relevant conditions.

MWA Environmental
24 July 2015

FIGURES

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CLIENT
SEYMOUR GROUP

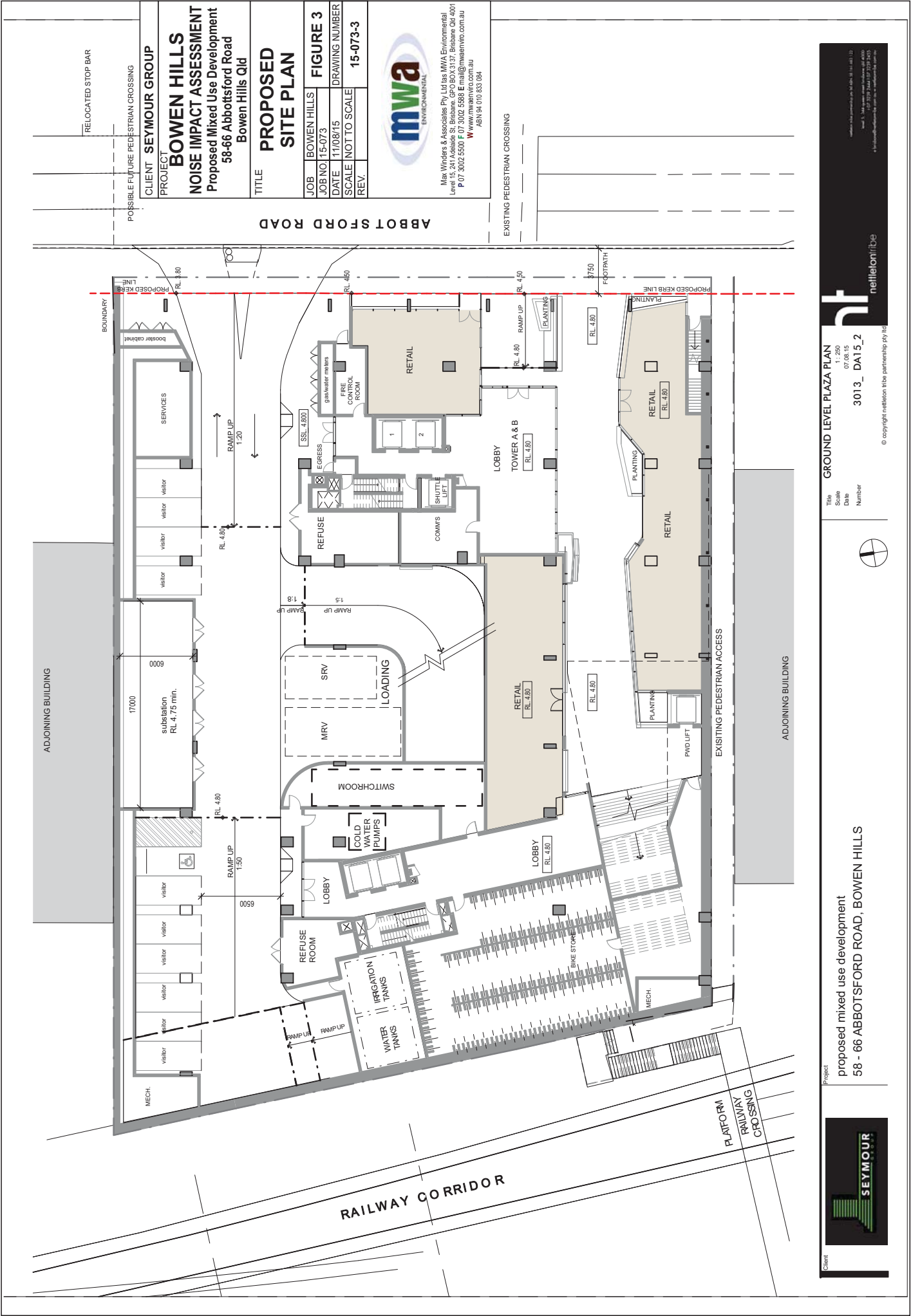
PROJECT
BOWEN HILLS
NOISE IMPACT ASSESSMENT
Proposed Mixed Use Development
58-66 Abbotsford Road
Bowen Hills Qld

TITLE

**SURROUNDING
LAND USES**

JOB	BOWEN HILLS	FIGURE 2
JOB NO	15-073	
DATE	11/08/15	DRAWING NUMBER
SCALE	1:3000 (A4)	
REV.		15-073-2

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Level 15 241 Adelaide St, Brisbane, GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 064



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Title
Scale
Date
Number

3013_ DAI 5_2

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CLIENT: SEYMOUR GROUP	
PROJECT: BOWEN HILLS	
NOISE IMPACT ASSESSMENT	
Proposed Mixed Use Development	
58-66 Abbottsford Road	
Bowen Hills Qld	
TITLE: PROPOSED SITE PLAN	
JOB: BOWEN HILLS	FIGURE 3
JOB NO: 15-073	DRAWING NUMBER
DATE: 11/08/15	SCALE: NOT TO SCALE
REV:	15-073-3



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Level 15, 241 Adelaide St, Brisbane, QLD 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 033 084

GROUND LEVEL PLAZA PLAN
1: 250
07.08.15
3013_ DAI 5_2

LEGEND

SITE BOUNDARY

D

NOISE DATALOGGER LOCATION
(UNATTENDED)

2

SHORT TERM NOISE MONITORING
LOCATIONS 1-2 (ATTENDED)

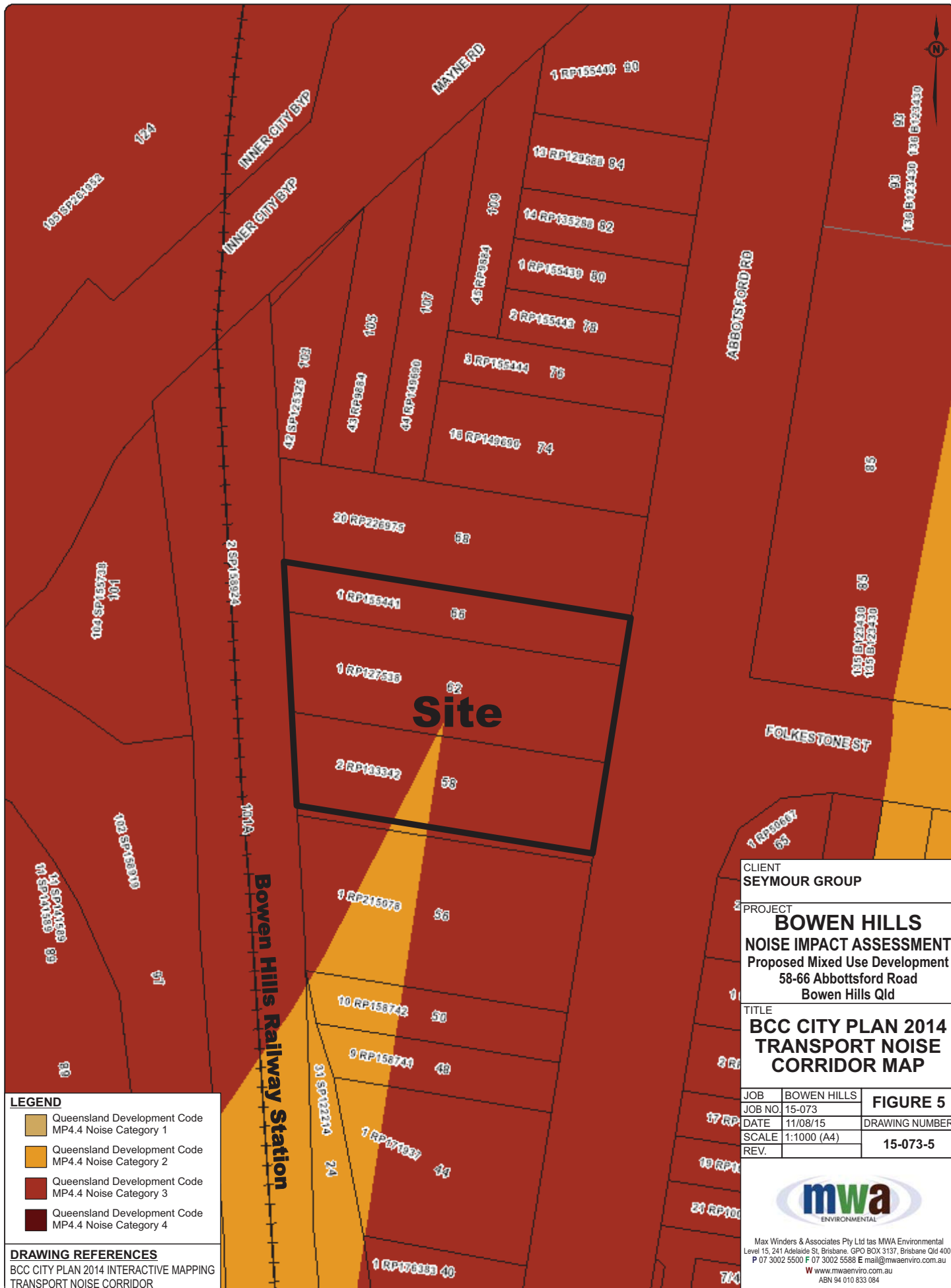
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CLIENT	SEYMOUR GROUP
PROJECT	BOWEN HILLS NOISE IMPACT ASSESSMENT Proposed Mixed Use Development 58-66 Abbottsford Road Bowen Hills Qld
TITLE	NOISE MONITORING LOCATIONS
JOB	BOWEN HILLS
JOB NO	15-073
DATE	11/08/15
SCALE	1:1000 (A4)
REV.	
FIGURE 4	
DRAWING NUMBER	
15-073-4	

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Level 15 241 Adelaide St, Brisbane, GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 064



Brisbane City Plan 2014



BRISBANE CITY Planning Scheme

NOTES

This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 12 September 2014.

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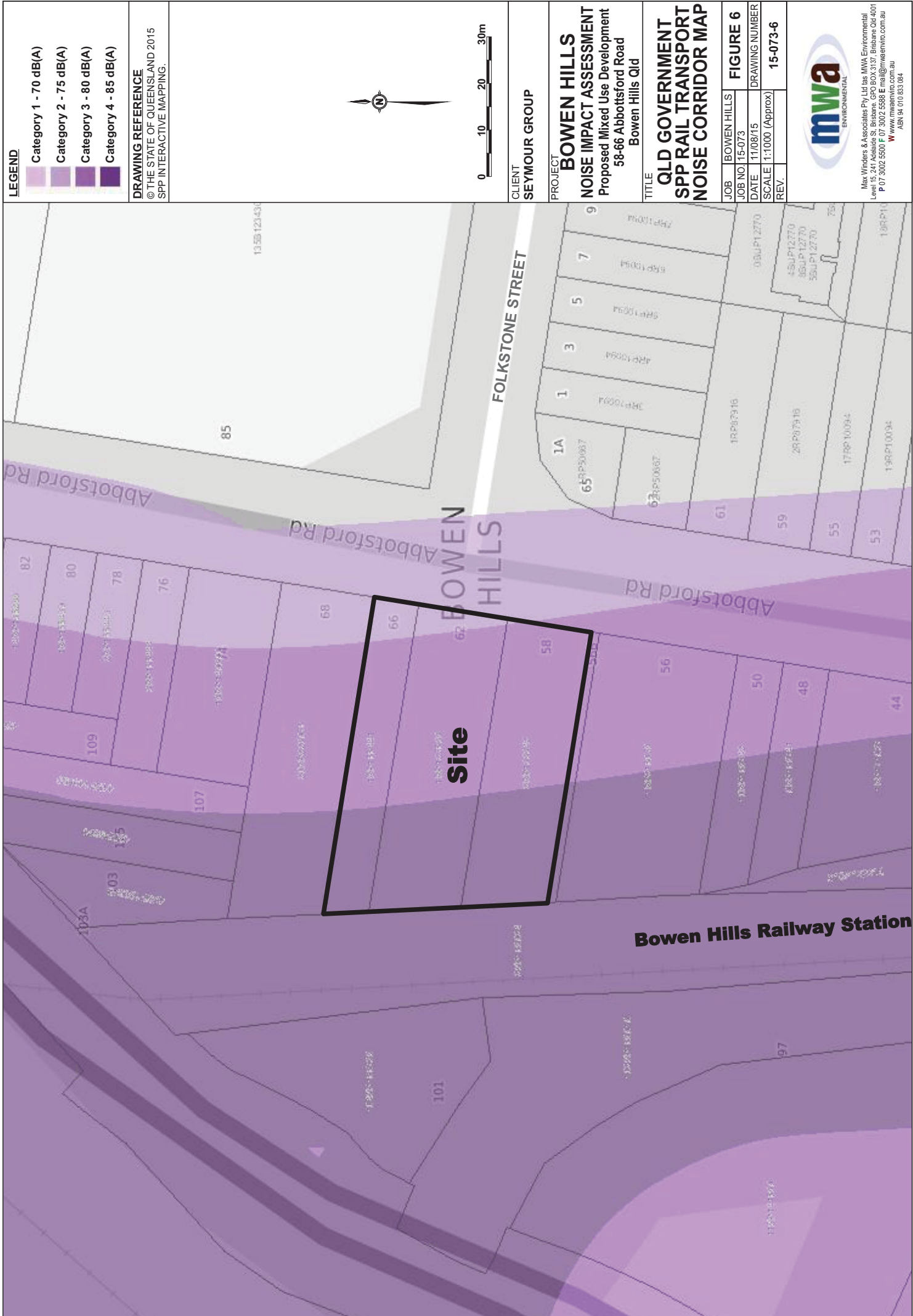
Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Approximate Scale @ A4 1:1,000



Metres

Date: 30/06/2015



LEGEND	
	Category 1 - 70 dB(A)
	Category 2 - 75 dB(A)
	Category 3 - 80 dB(A)
	Category 4 - 85 dB(A)

DRAWING REFERENCE
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SPP INTERACTIVE MAPPING.



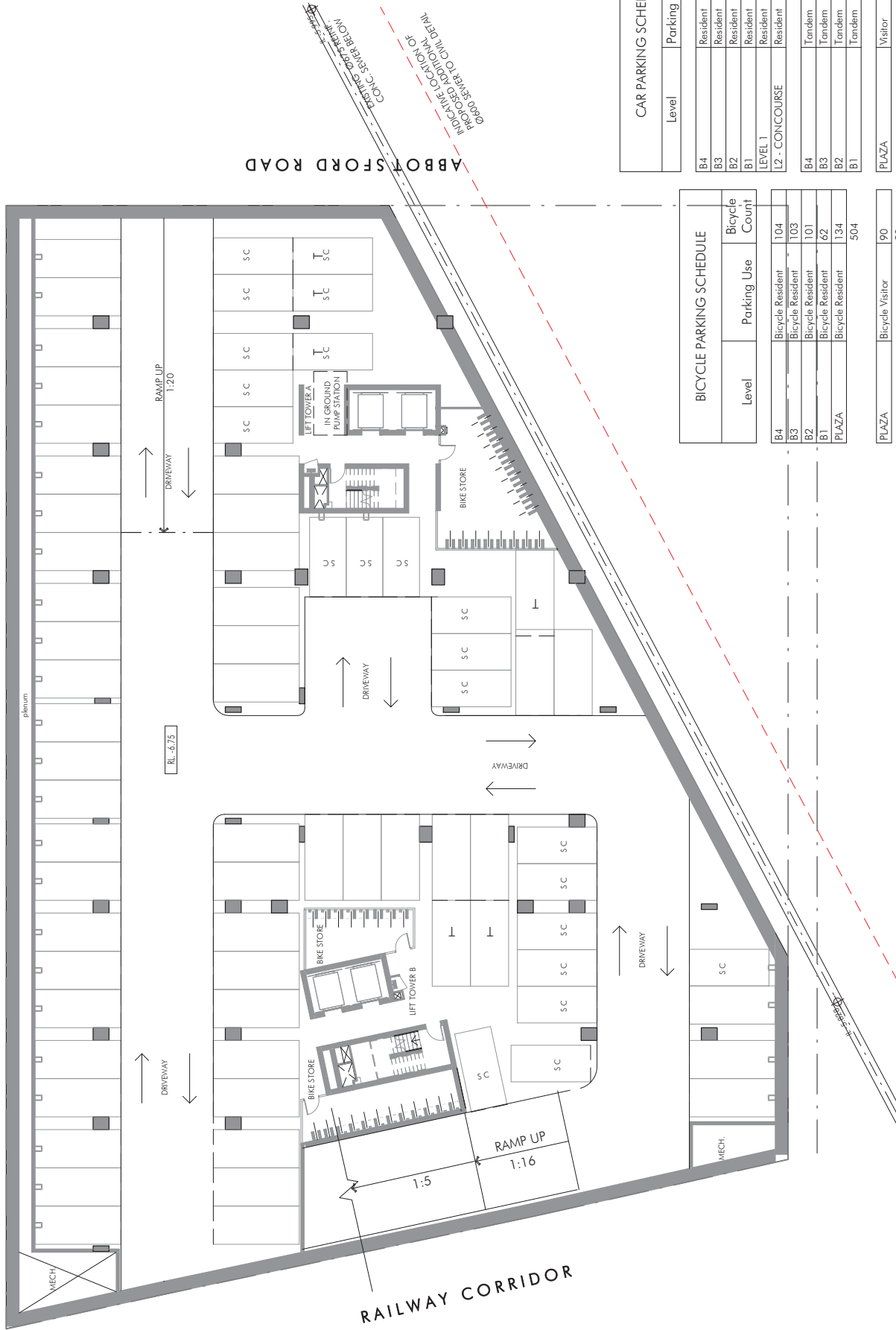
CLIENT SEYMOUR GROUP	
PROJECT BOWEN HILLS NOISE IMPACT ASSESSMENT Proposed Mixed Use Development 58-66 Abbotsford Road Bowen Hills Qld	
TITLE QLD GOVERNMENT SPP RAIL TRANSPORT NOISE CORRIDOR MAP	
JOB NO. 15-073	FIGURE 6
DATE 11/08/15	DRAWING NUMBER
SCALE 1:1000 (Approx)	REV.
15-073-6	



Max Widders & Associates Pty Ltd as MWA Environmental
Level 15 241 Adelaide St, Brisbane, GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
www.mwaenviro.com.au
ABN 94 010 833 084

ATTACHMENT 1

Architectural Drawings



CAR PARKING SCHEDULE		
Level	Parking Use	Count

B4	Resident	69
B3	Resident	93
B2	Resident	93
B1	Resident	84
LEVEL 1	Resident	58
L2 - CONCOURSE	Resident	76
		473

B4	Tandem	6
B3	Tandem	2
B2	Tandem	2
B1	Tandem	2
		12

PLAZA	Visitor	11
		11
		496

BICYCLE PARKING SCHEDULE		
Level	Parking Use	Bicycle Count

B4	Bicycle Resident	104
B3	Bicycle Resident	103
B2	Bicycle Resident	101
B1	Bicycle Resident	62
PLAZA	Bicycle Resident	134
		504

PLAZA	Bicycle Visitor	90
		90
		594

Grand total: 496

BASEMENT LEVEL 4 PLAN

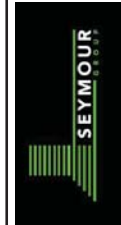
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07/08/15

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Title
Scale
Date
Number



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Project
proposed mixed use development
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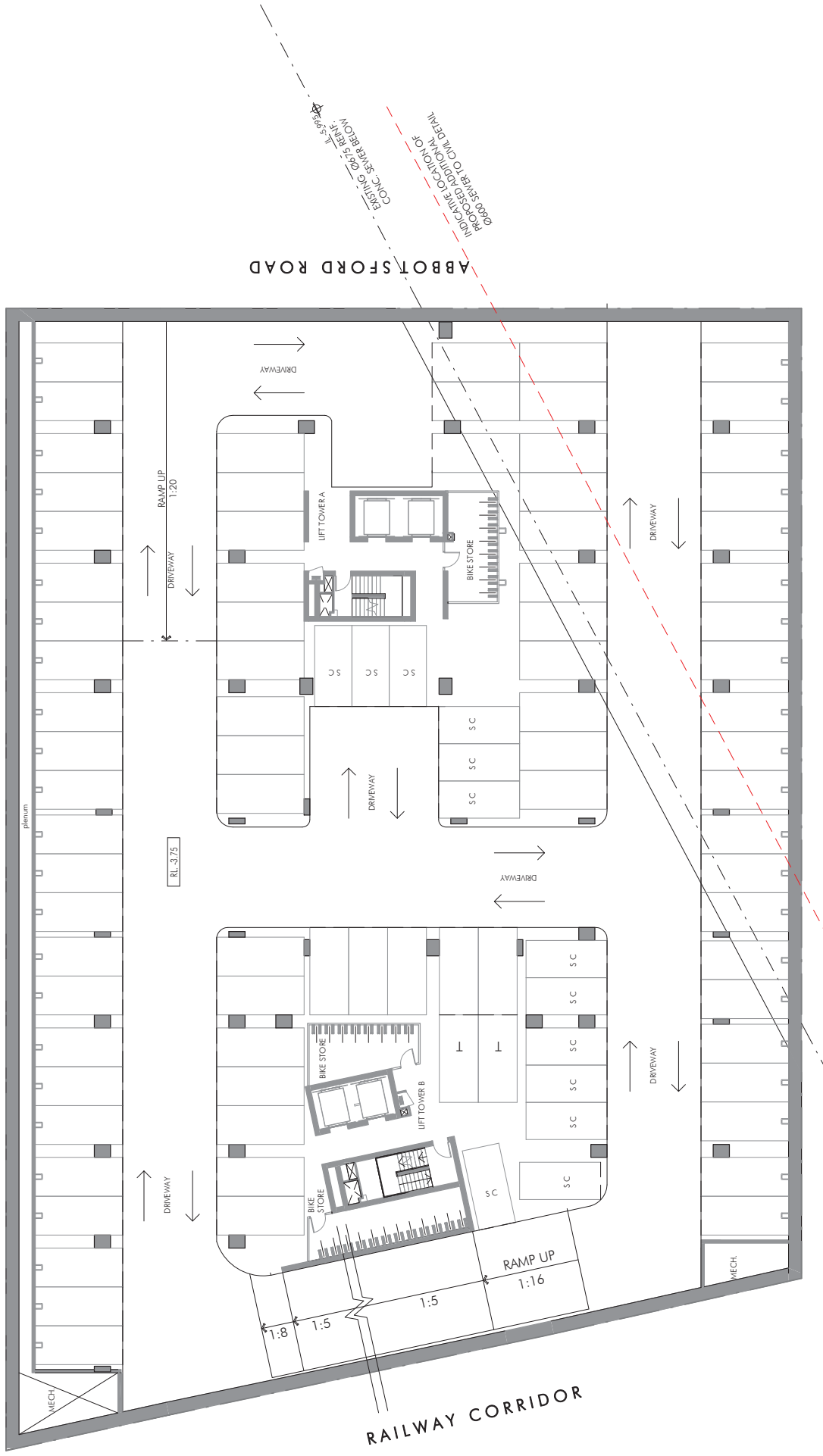


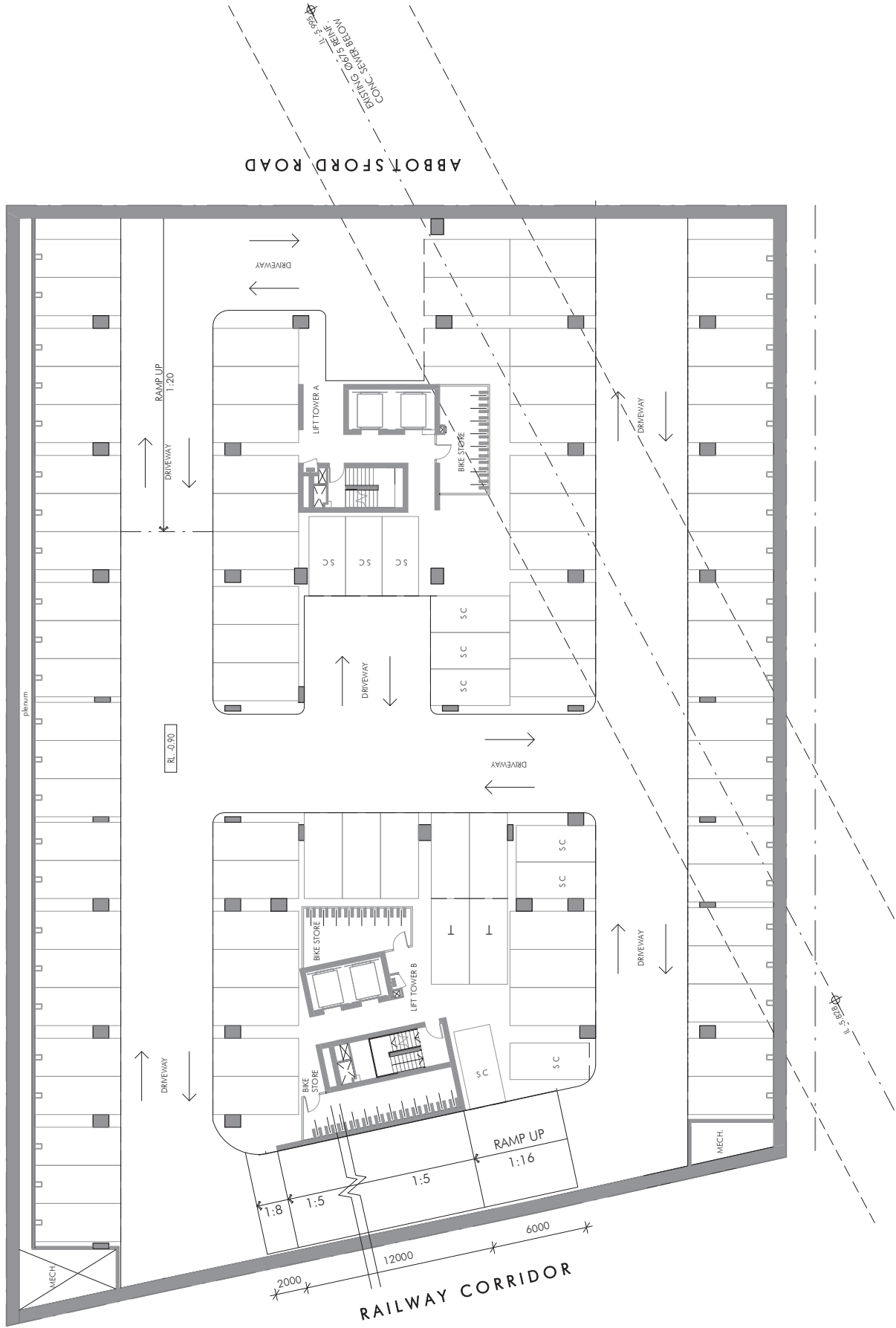
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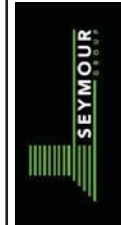
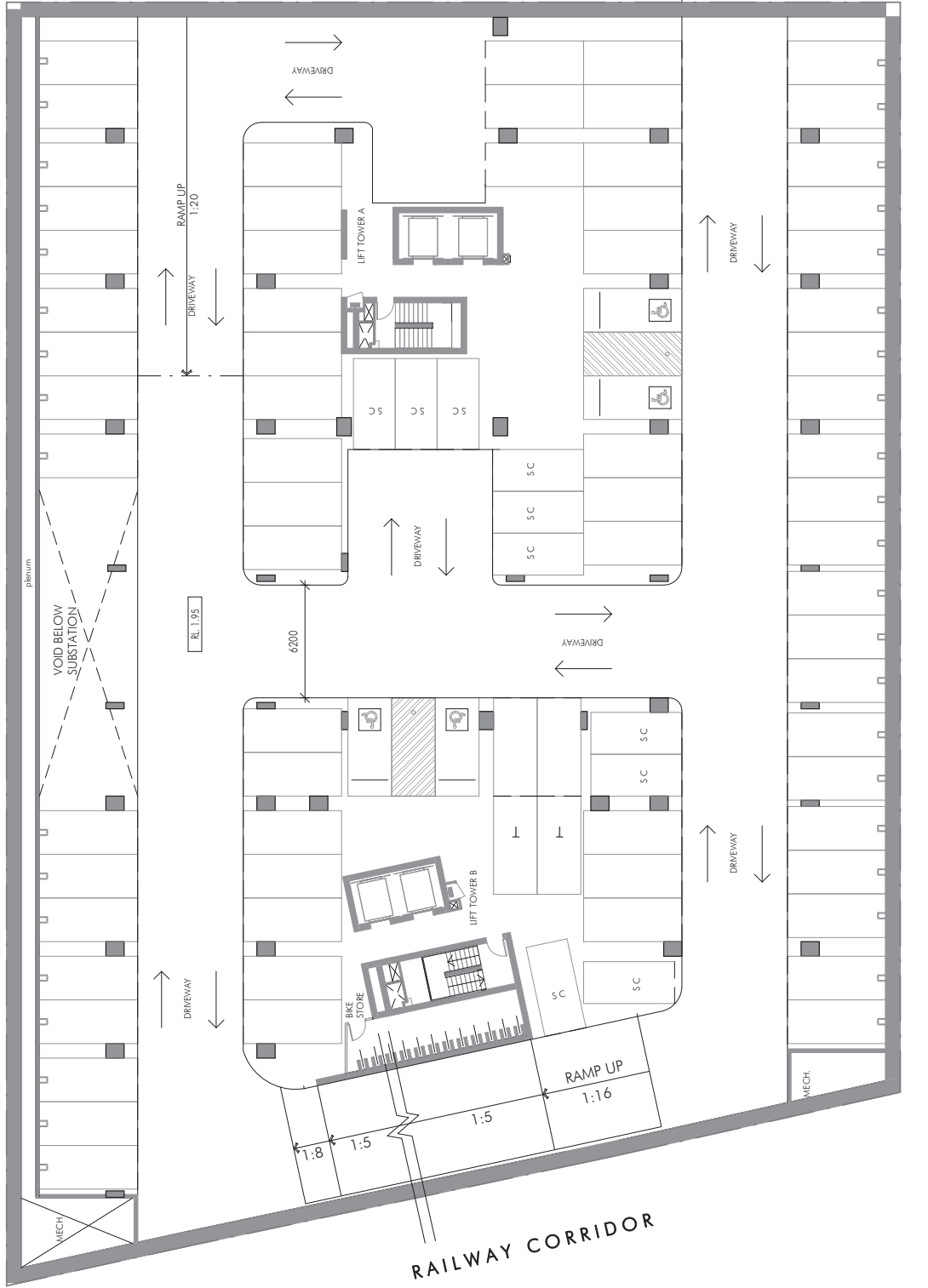
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nettleon tribe partnership pty ltd ABN 91 161 483 722
Level 3, 301 Seymour Street Brisbane QLD 4000
t 07 2259 2444 f 07 2259 2455
e info@nettleontribe.com.au w nettleontribe.com.au







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Scale
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Number

BASEMENT LEVEL 1 PLAN

1:250

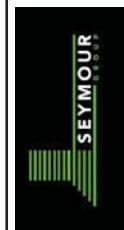
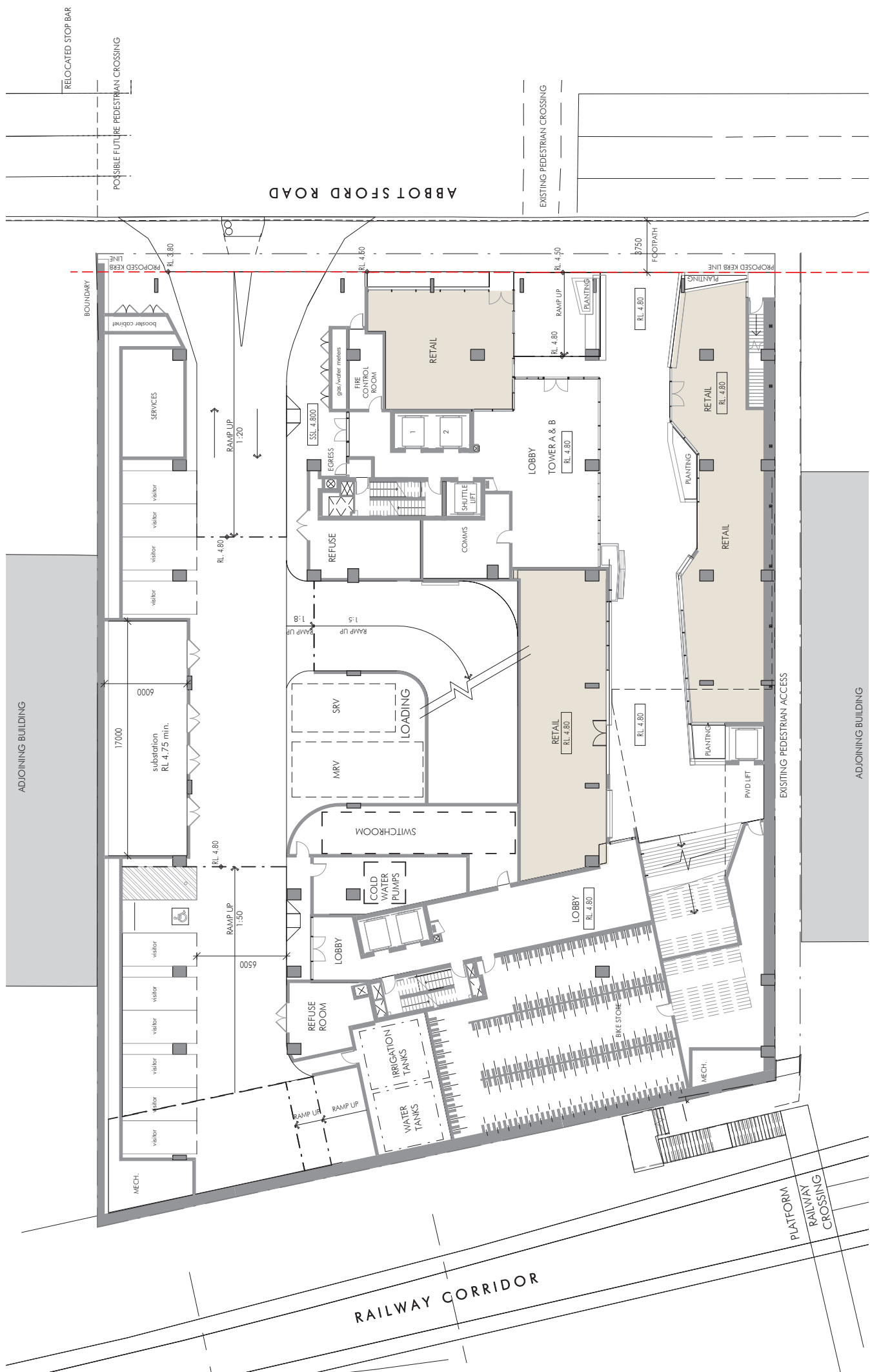
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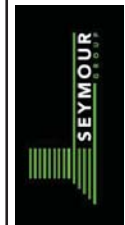
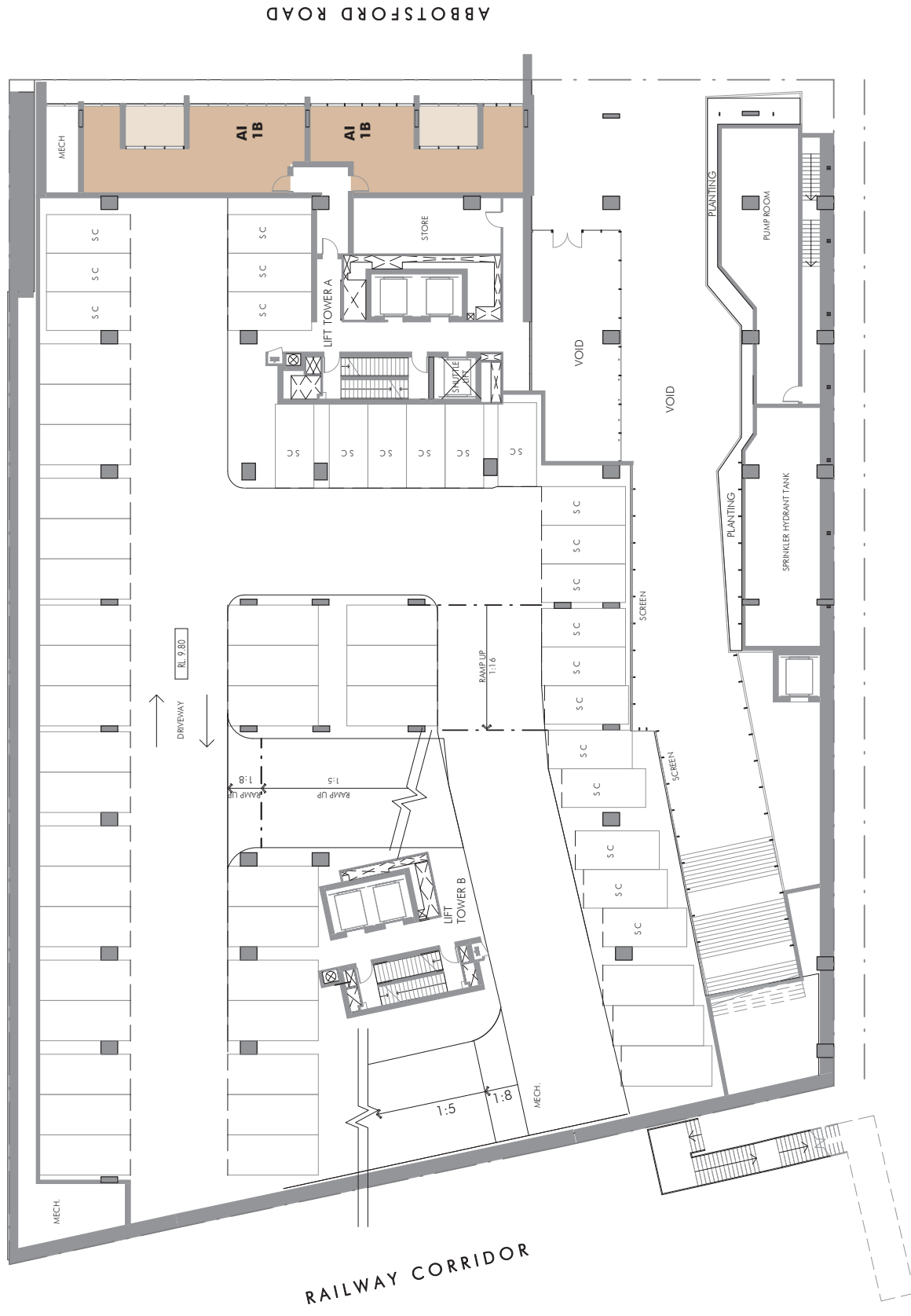
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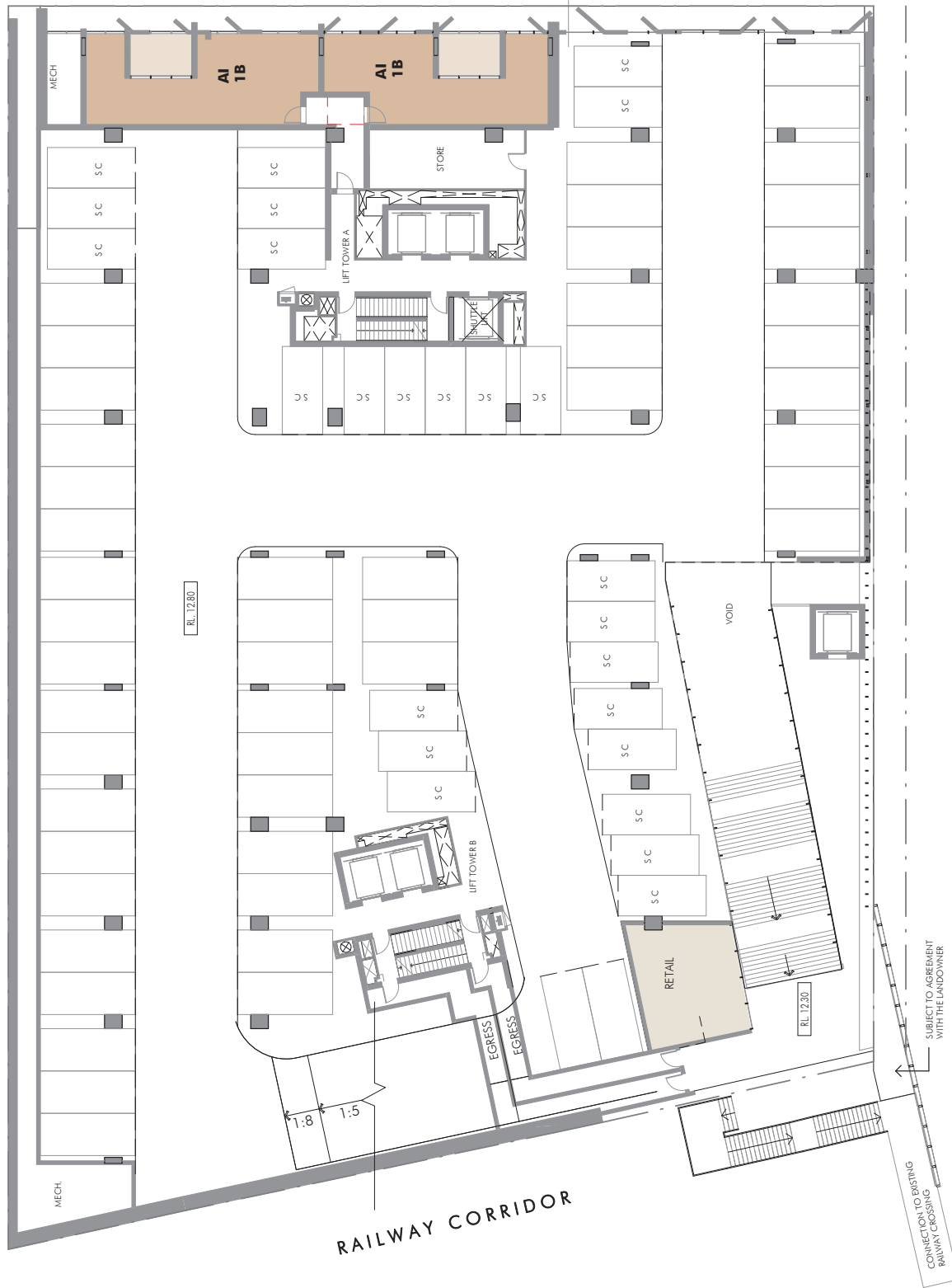
Title
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 Date
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LEVEL 1 PLAN
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 t 02 9259 2444 f 02 9259 2455
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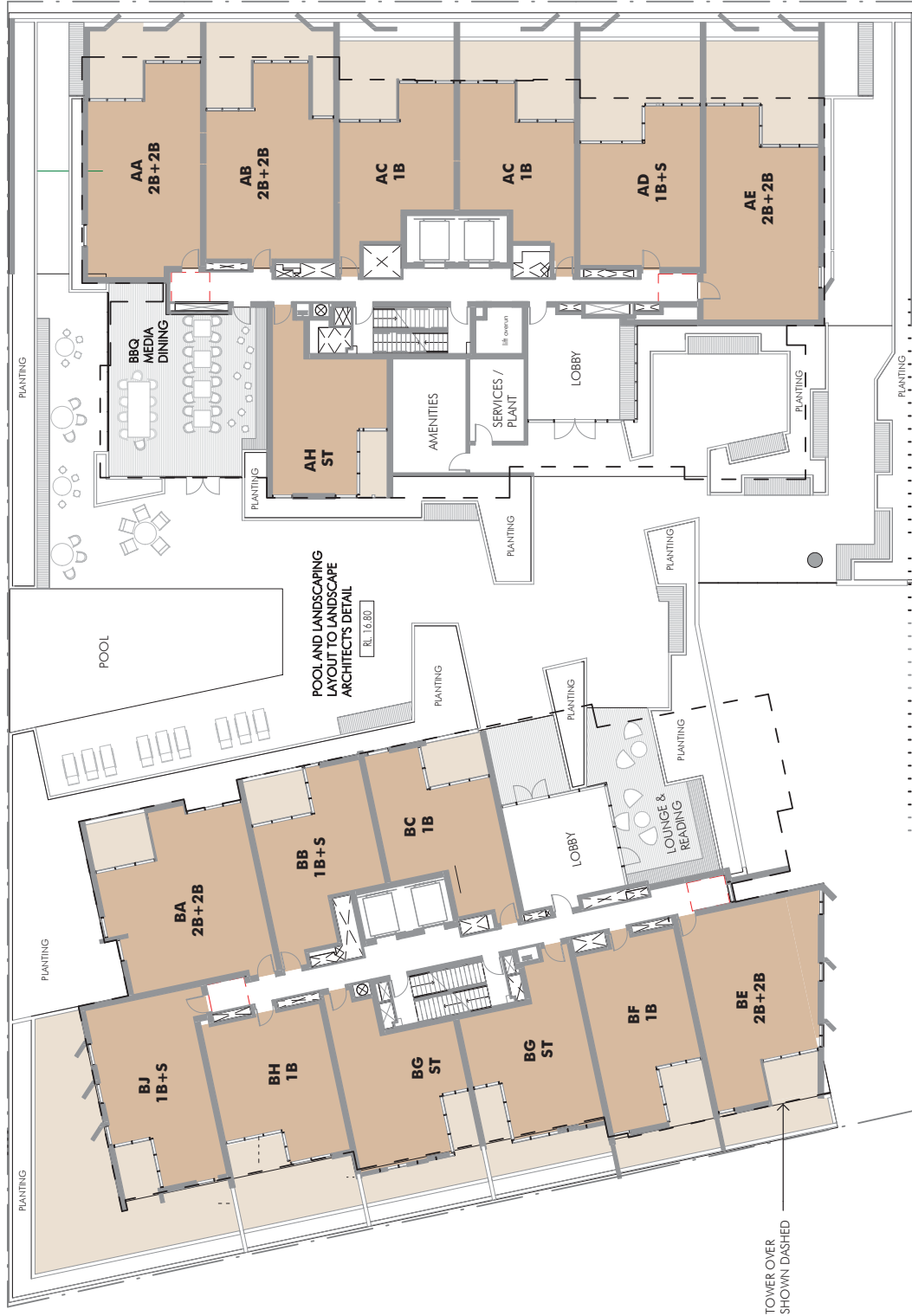
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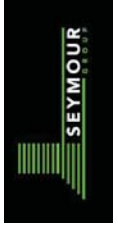
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Level 3, 304 George Street Sydney NSW 2000
t 61 2 9252 2444 f 61 2 9252 2455
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ABBOTSFORD ROAD



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Title
Scale
Date
Number

LEVEL 3 PLAN
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07.08.15
3013_ DA18_2

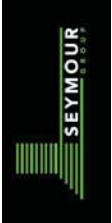
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Level 3, 3/41 Mount Street Brisbane QLD 4000
t 07 2259 2444 f 07 2259 2455
e brian@nettleontribe.com.au w nettleontribe.com.au



ABBOTSFORD ROAD



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Title
Scale
Date
Number

LEVEL 4 - 25 TYPICAL PLAN
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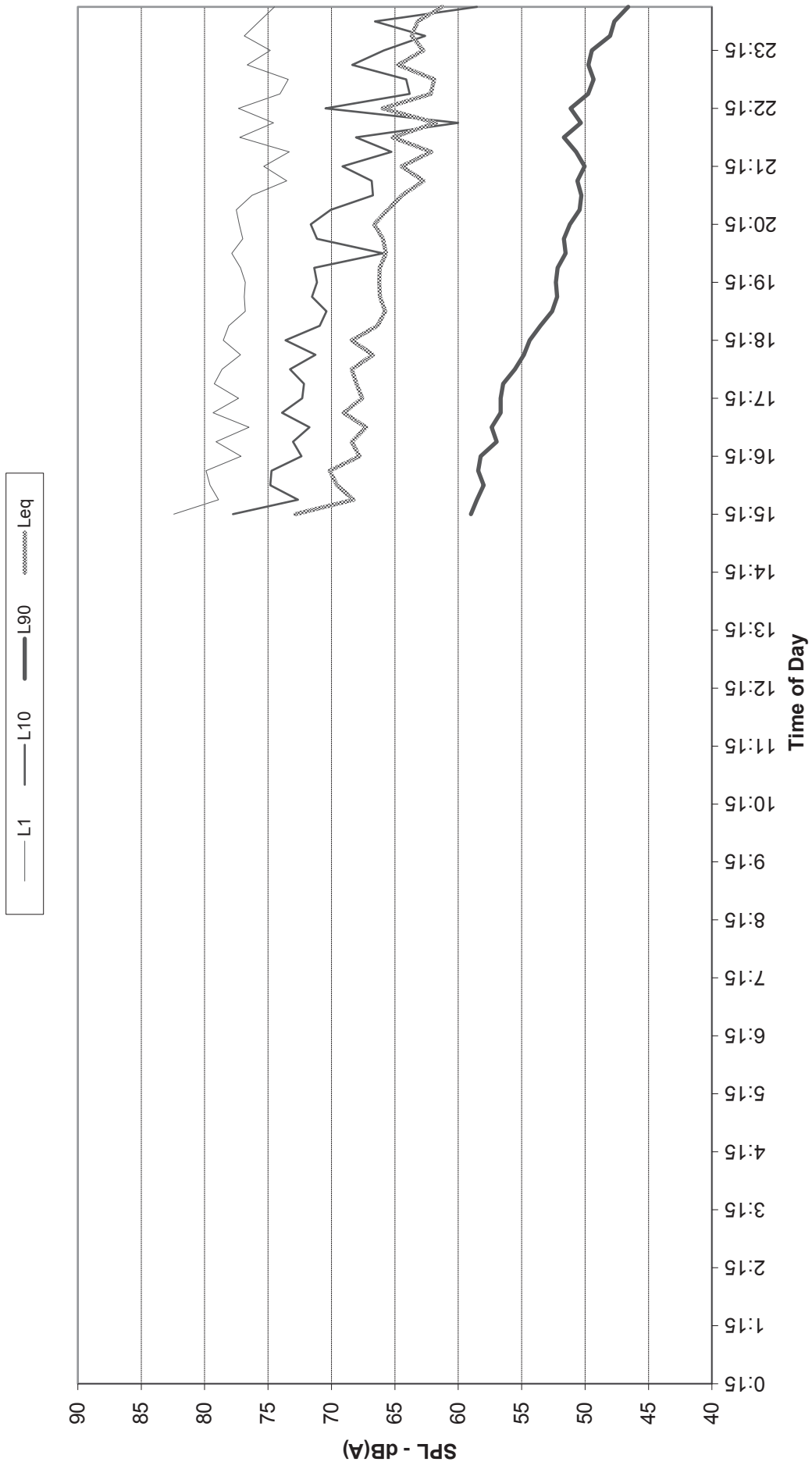


nettleonrbe partnership pty ltd ABN 48 161 483 722
Level 3, 3/4 Market Street Brisbane QLD 4000
t 07 2259 2444 f 07 2259 2455
e info@nettleonrbe.com.au w nettleonrbe.com.au

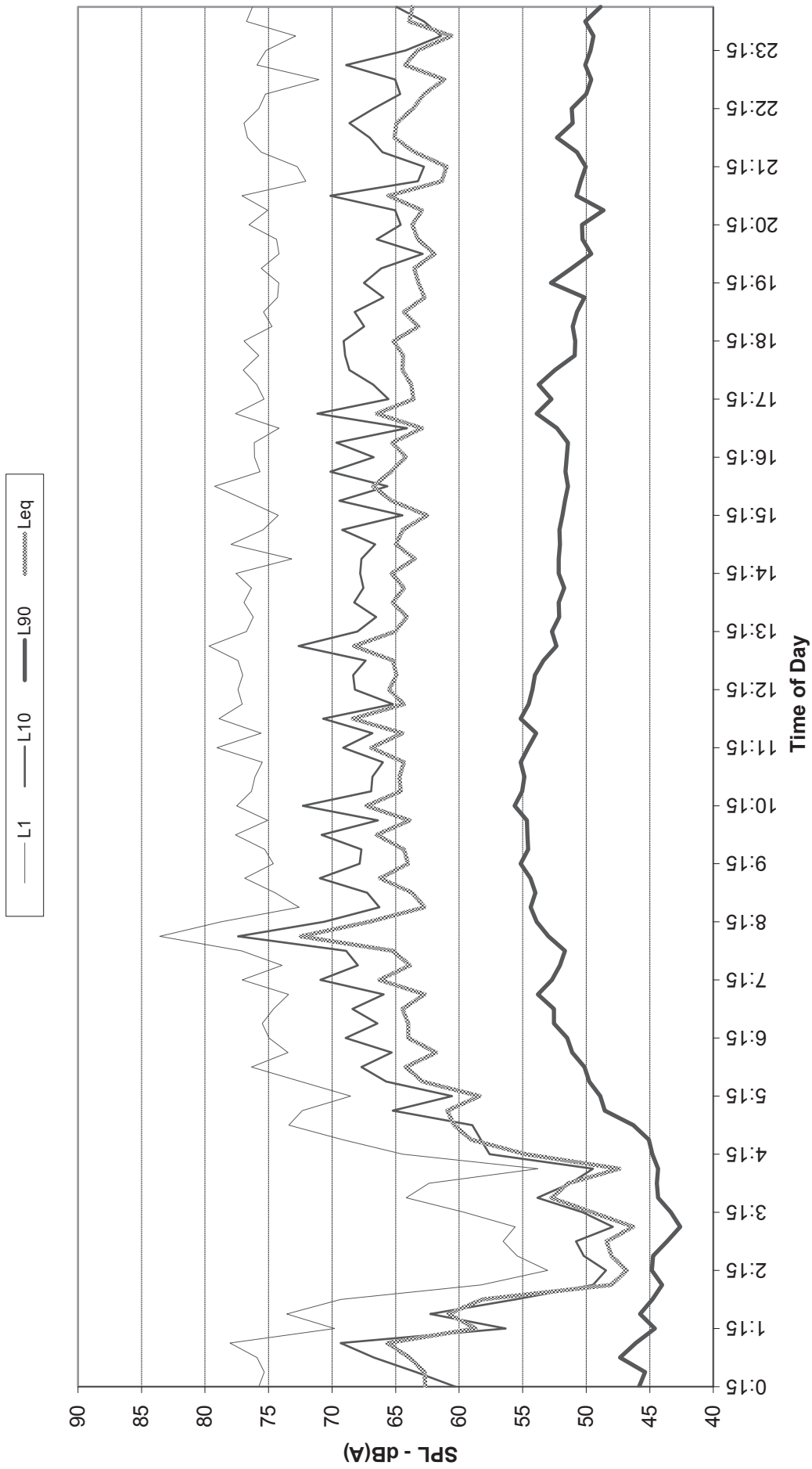
ATTACHMENT 2

Noise Datalogger Traces

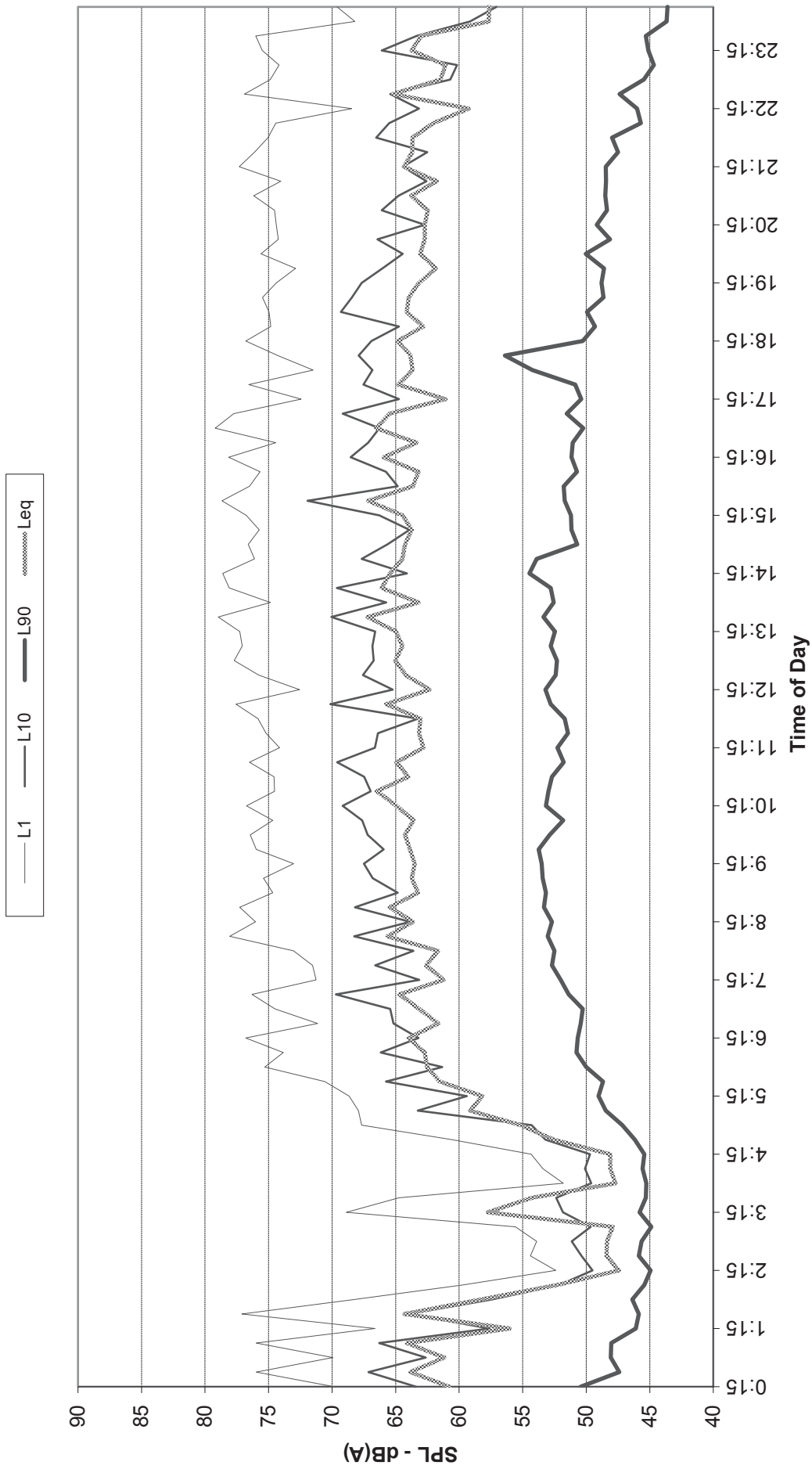
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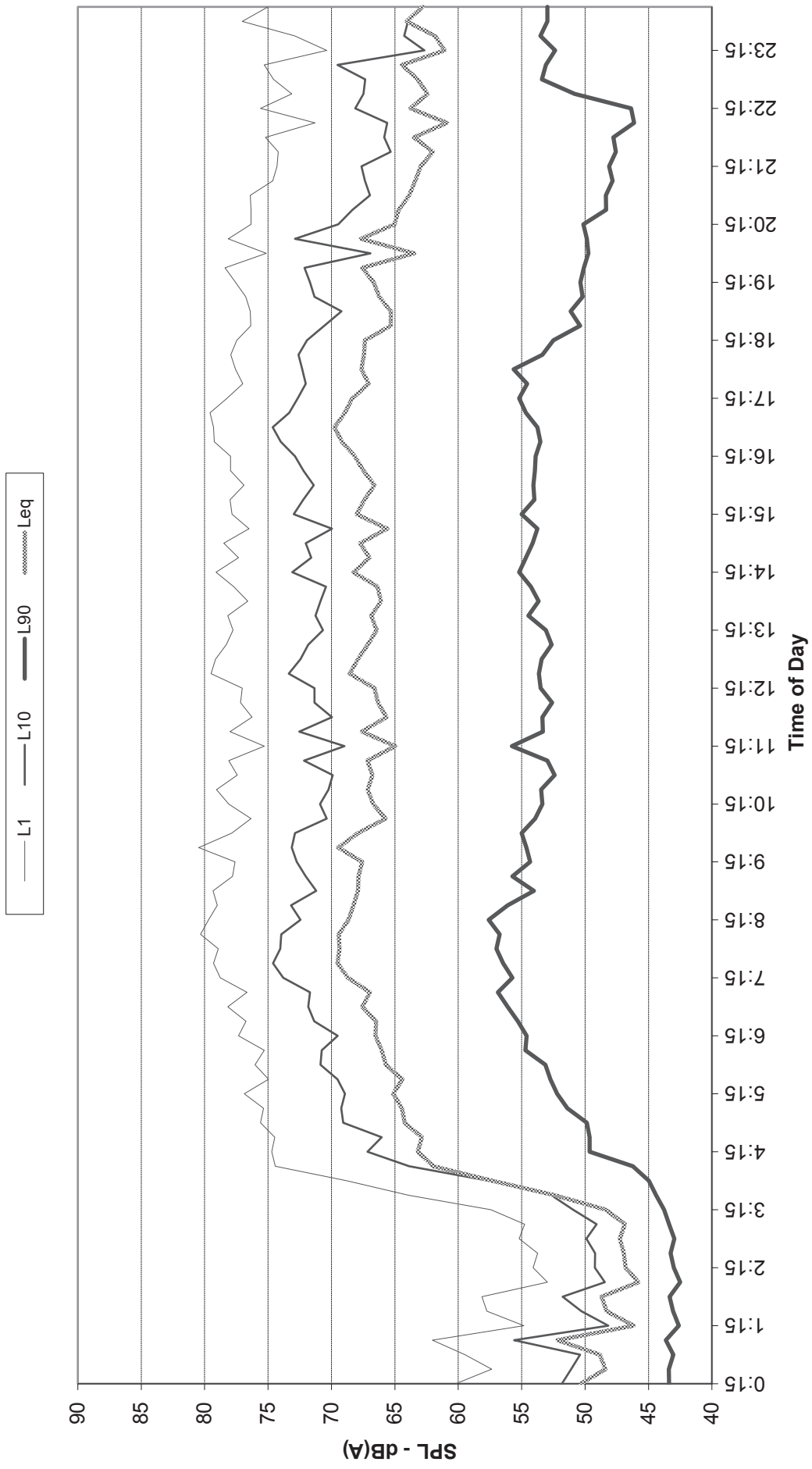
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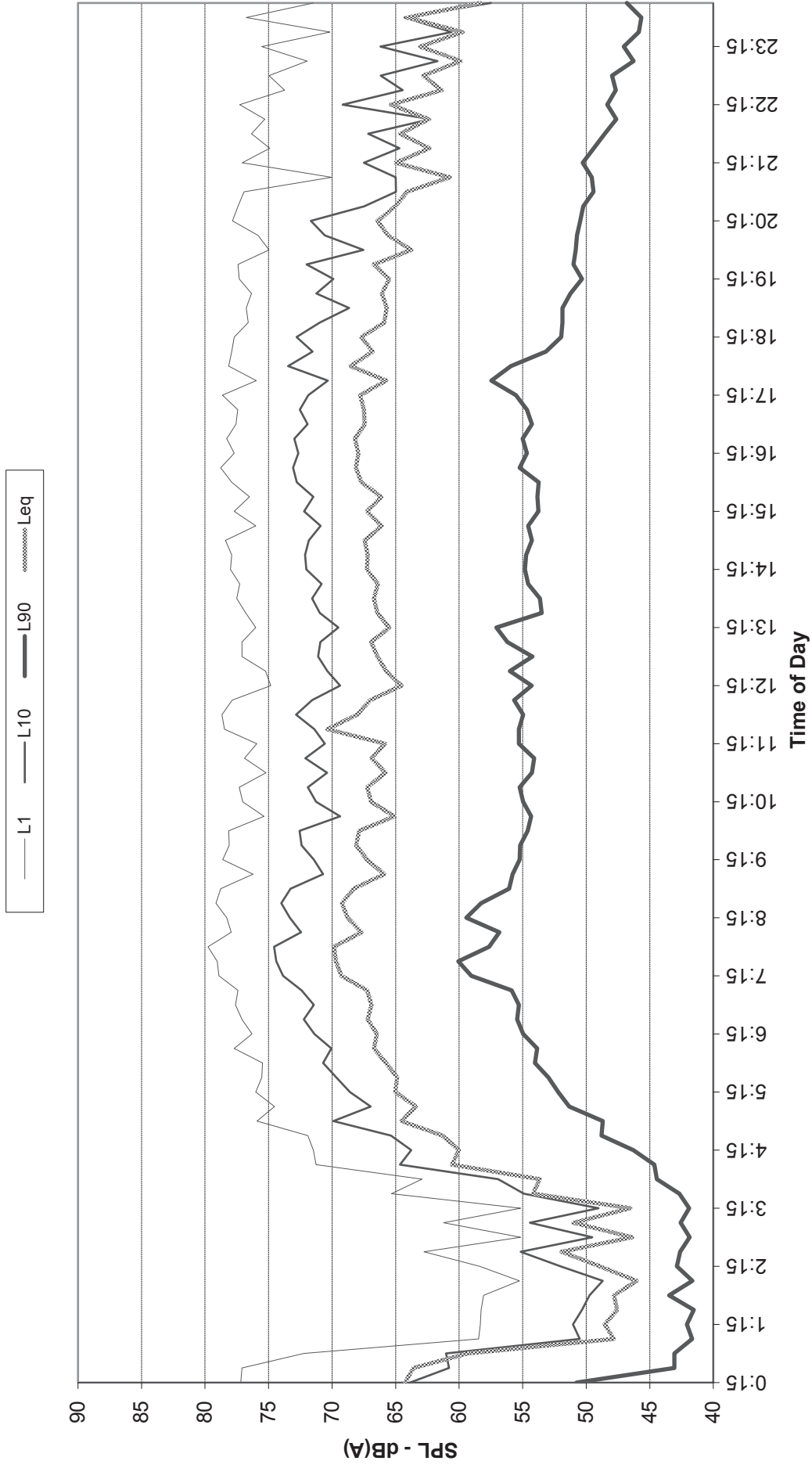
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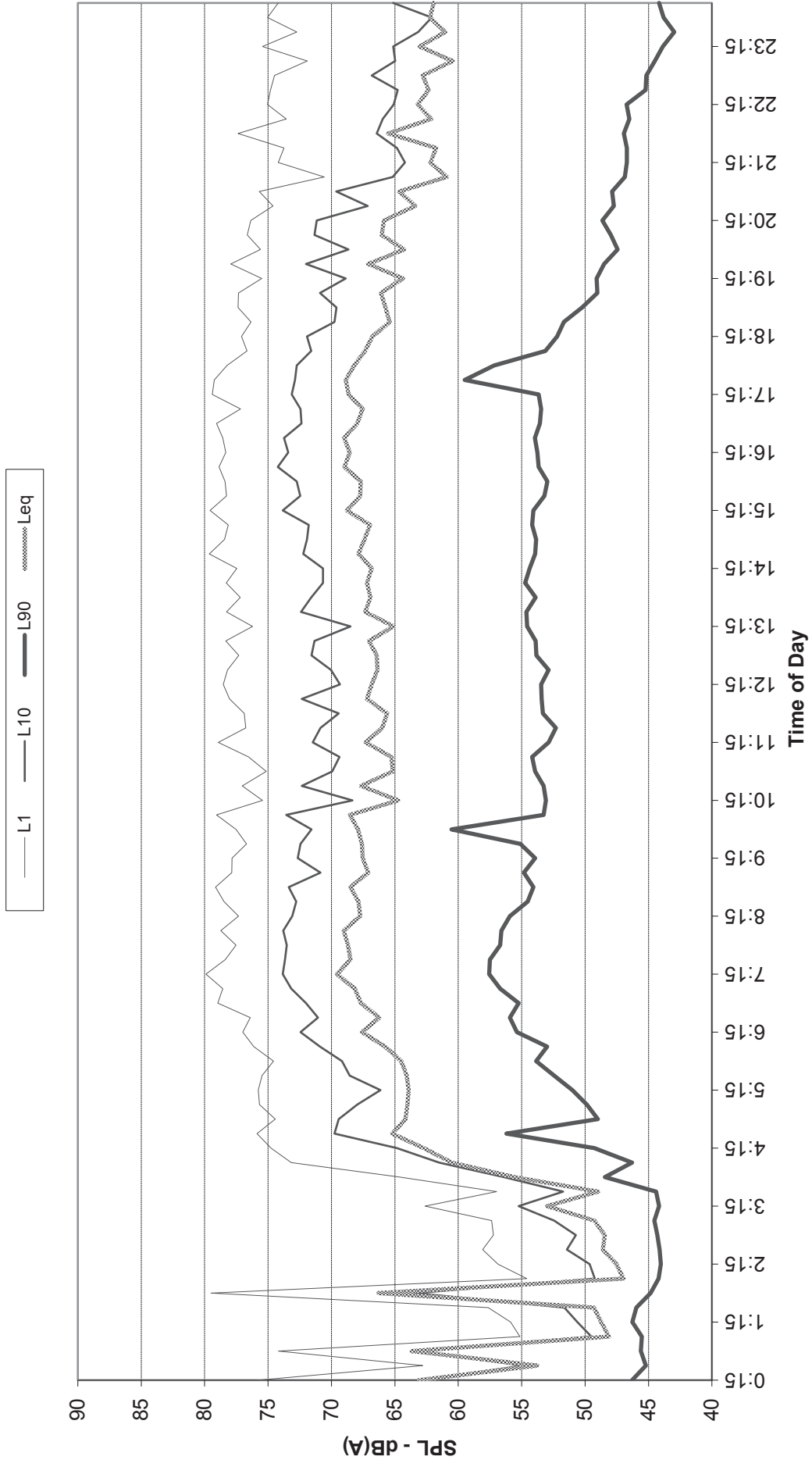
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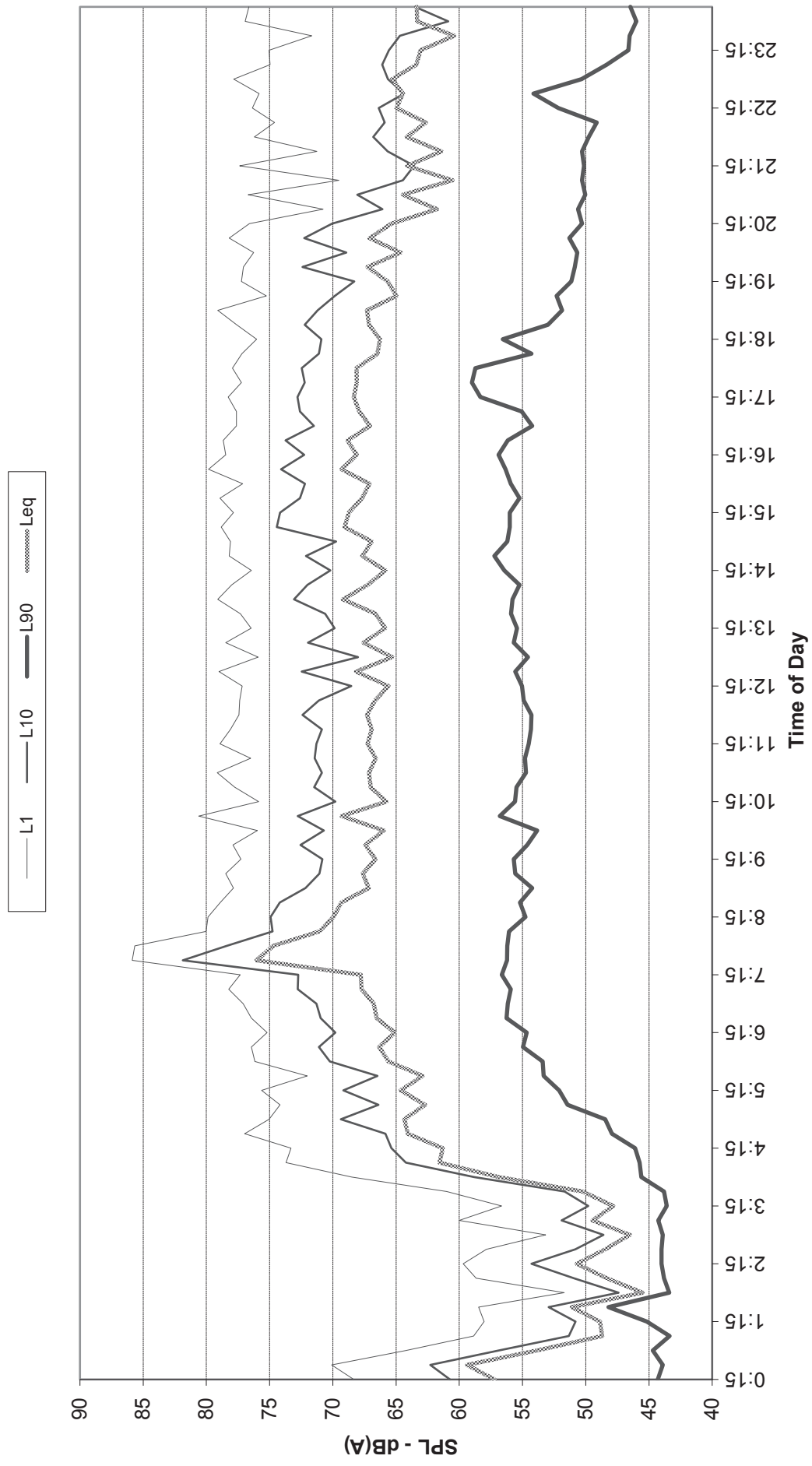
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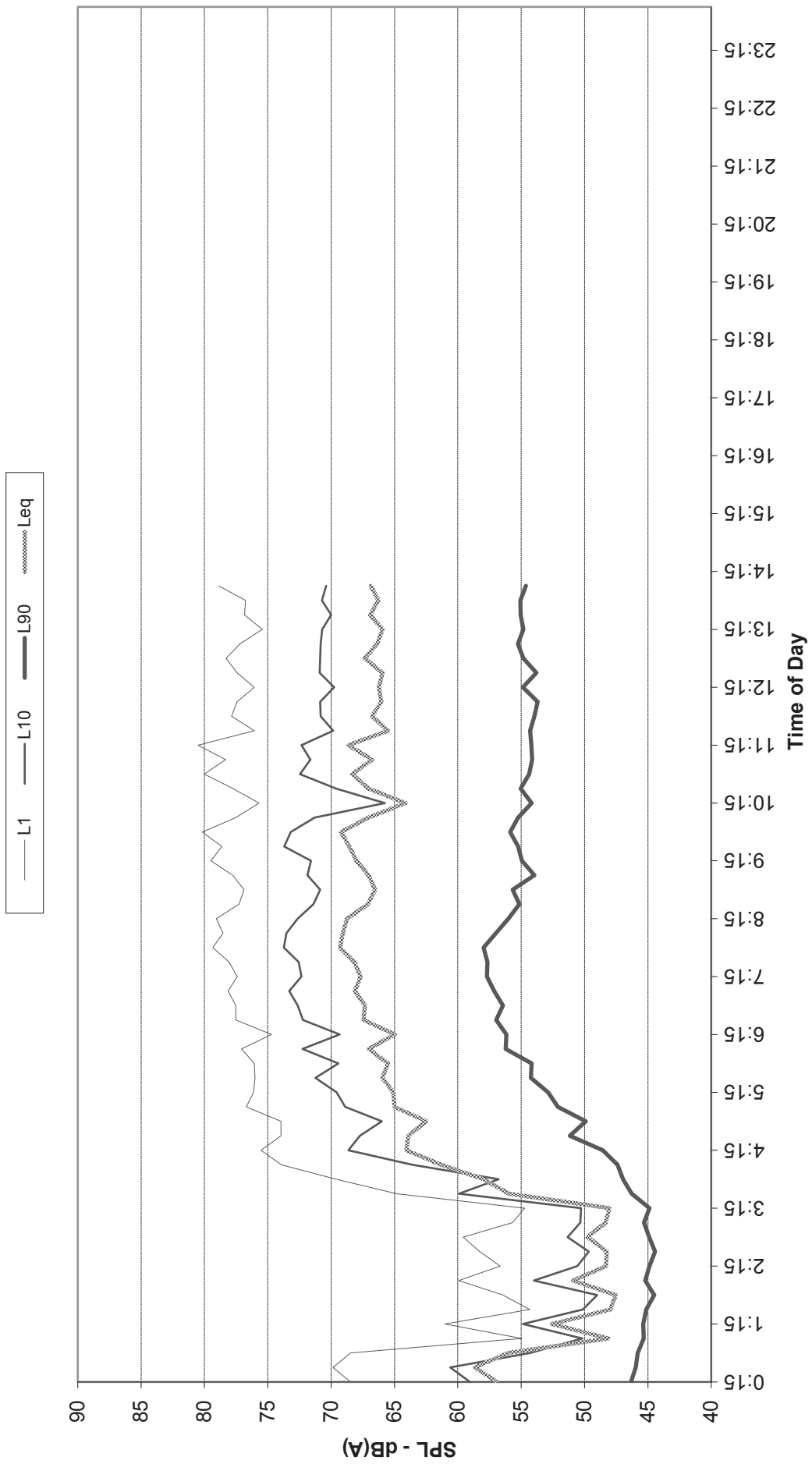
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Recorded Statistical Noise Levels for Bowen Hills 15-073 - 58-66 Abbotsford Road - 25-Jun-2015



Recorded Statistical Noise Levels for Bowen Hills 15-073 - 58-66 Abbotsford Road - 26-Jun-2015



ATTACHMENT 3

SoundPLAN 7.3 Modelling – Traffic Noise Impact Results



Bowen Hills
Assessed receiver levels
Validation

2

Receiver	L10(18h) dB(A)
Validation Logger	66.1

Max Winders & Associates Pty Ltd GPO Box 3137 Brisbane QLD 4000
AUSTRALIA

1

Bowen Hills

Assessed receiver levels

Ultimate Traffic Noise Impact

2

Receiver	FI	Dir	L10(18h) dB(A)
Tower A - Level 1	GF	N	69.9
Tower A - Level 1	GF	E	75.4
Tower A - Level 2	GF	S	71.3
Tower A - Level 2	GF	N	70.6
Tower A - Level 2	GF	E	75.2
Tower A - Level 3	GF	E	74.5
Tower A - Level 3	GF	N	70.0
Tower A - Level 3	GF	S	71.1
Tower A - Level 3	GF	W	55.2
Tower A - Level 4-25	GF	S	67.5
	F 1		69.2
	F 2		69.5
	F 3		69.5
	F 4		69.5
	F 5		69.3
	F 6		69.2
	F 7		69.0
	F 8		68.9
	F 9		68.7
	F 10		68.6
	F 11		68.4
	F 12		68.2
	F 13		68.1
	F 14		68.0
	F 15		67.8
	F 16		67.7
	F 17		67.6
	F 18		67.4
	F 19		67.3
	F 20		67.2
	F 21		67.1
Tower A - Level 4-25	GF	W	56.6
	F 1		58.1
	F 2		59.7
	F 3		61.3
	F 4		62.2
	F 5		62.8
	F 6		63.3
	F 7		63.7
	F 8		64.1
	F 9		64.4
	F 10		64.6

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AUSTRALIA

1

Bowen Hills

Assessed receiver levels

Ultimate Traffic Noise Impact

2

Receiver	Fl	Dir	L10(18h) dB(A)
Tower A - Level 4-25	F 11	E	64.8
	F 12		64.9
	F 13		65.1
	F 14		65.2
	F 15		65.3
	F 16		65.3
	F 17		65.3
	F 18		65.4
	F 19		65.4
	F 20		65.3
	F 21		65.3
	GF		67.5
	F 1		72.5
	F 2		72.6
	F 3		72.2
	F 4		71.8
	F 5		71.5
	F 6		71.1
	F 7		70.7
	F 8		70.4
	F 9		70.1
Tower A - Level 4-25	F 10	N	69.8
	F 11		69.5
	F 12		69.2
	F 13		68.9
	F 14		68.7
	F 15		68.4
	F 16		68.2
	F 17		67.9
	F 18		67.7
	F 19		67.5
	F 20		67.2
	F 21		67.0
	GF		65.0
	F 1		68.0
	F 2		69.0
	F 3		69.4
	F 4		69.5
	F 5		69.5
	F 6		69.5
	F 7		69.5
	F 8		69.5
	F 9		69.5

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2

Bowen Hills

Assessed receiver levels

Ultimate Traffic Noise Impact

2

Receiver	Fl	Dir	L10(18h) dB(A)
	F 10		69.5
	F 11		69.5
	F 12		69.5
	F 13		69.4
	F 14		69.4
	F 15		69.4
	F 16		69.3
	F 17		69.3
	F 18		69.2
	F 19		69.1
	F 20		69.1
	F 21		69.0
Tower B - Level 3	GF	W	65.5
Tower B - Level 3	GF	E	60.8
Tower B - Level 3	GF	N	64.9
Tower B - Level 4-25	GF	N	66.2
	F 1		67.3
	F 2		68.3
	F 3		69.2
	F 4		69.9
	F 5		70.4
	F 6		70.8
	F 7		71.1
	F 8		71.3
	F 9		71.5
	F 10		71.5
	F 11		71.6
	F 12		71.6
	F 13		71.6
	F 14		71.5
	F 15		71.4
	F 16		71.3
	F 17		71.2
	F 18		71.1
	F 19		71.0
	F 20		70.8
	F 21		70.7
Tower B - Level 4-25	GF	E	62.0
	F 1		63.5
	F 2		64.1
	F 3		64.7
	F 4		65.0
	F 5		65.2

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3

Bowen Hills

Assessed receiver levels

Ultimate Traffic Noise Impact

2

Receiver	Fl	Dir	L10(18h) dB(A)
Tower B - Level 4-25	F 6	S	65.5
	F 7		65.7
	F 8		66.0
	F 9		66.1
	F 10		66.3
	F 11		66.3
	F 12		66.4
	F 13		66.3
	F 14		66.3
	F 15		66.2
	F 16		66.2
	F 17		66.1
	F 18		66.0
	F 19		65.9
	F 20		65.8
	F 21		65.8
	GF		65.1
	F 1		66.0
	F 2		66.8
	F 3		67.2
	F 4		67.4
	F 5		67.5
	F 6		67.6
Tower B - Level 4-25	F 7	W	67.6
	F 8		67.7
	F 9		67.6
	F 10		67.6
	F 11		67.6
	F 12		67.5
	F 13		67.5
	F 14		67.4
	F 15		67.3
	F 16		67.3
	F 17		67.2
	F 18		67.1
	F 19		67.0
	F 20		66.9
	F 21		66.8
	GF		66.7
	F 1		67.7
	F 2		68.5
	F 3		69.3
	F 4		70.0

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4

Bowen Hills

Assessed receiver levels

Ultimate Traffic Noise Impact

2

Receiver	FI	Dir	L10(18h) dB(A)
	F 5		70.5
	F 6		70.8
	F 7		71.1
	F 8		71.3
	F 9		71.4
	F 10		71.5
	F 11		71.5
	F 12		71.5
	F 13		71.4
	F 14		71.4
	F 15		71.3
	F 16		71.2
	F 17		71.0
	F 18		70.9
	F 19		70.8
	F 20		70.6
	F 21		70.5

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Bowen Hills Assessed receiver levels Railway Noise Impact

2

Receiver	FI	Dir	Lmax dB(A)
Tower A - Level 1	GF	N	73.1
Tower A - Level 1	GF	E	52.6
Tower A - Level 2	GF	N	74.3
Tower A - Level 2	GF	S	77.5
Tower A - Level 2	GF	E	53.9
Tower A - Level 3-25	GF	S	81.5
	F 1		78.9
	F 2		78.8
	F 3		78.7
	F 4		78.6
	F 5		78.4
	F 6		78.2
	F 7		78.1
	F 8		77.9
	F 9		77.7
	F 10		77.5
	F 11		77.3
	F 12		77.1
	F 13		76.9
	F 14		76.7
	F 15		76.5
	F 16		76.3
	F 17		76.0
	F 18		75.8
	F 19		75.6
	F 20		75.4
	F 21		75.2
	F 22		75.0
Tower A - Level 3-25	GF	W	79.6
	F 1		79.5
	F 2		79.4
	F 3		79.2
	F 4		79.1
	F 5		78.9
	F 6		78.7
	F 7		78.5
	F 8		78.3
	F 9		78.1
	F 10		77.9
	F 11		77.7
	F 12		77.5
	F 13		77.2
	F 14		77.0

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Bowen Hills Assessed receiver levels Railway Noise Impact

2

Receiver	Fl	Dir	Lmax dB(A)
Tower A - Level 3-25	F 15	E	76.8
	F 16		76.5
	F 17		76.3
	F 18		76.1
	F 19		75.8
	F 20		75.6
	F 21		75.4
	F 22		75.2
	GF		55.5
	F 1		55.9
	F 2		56.4
	F 3		56.6
	F 4		56.6
	F 5		56.5
	F 6		56.5
	F 7		56.5
	F 8		56.5
	F 9		56.6
	F 10		56.8
	F 11		57.0
	F 12		57.2
Tower A - Level 3-25	F 13	N	57.4
	F 14		57.6
	F 15		57.8
	F 16		58.0
	F 17		58.2
	F 18		58.1
	F 19		58.1
	F 20		58.1
	F 21		58.1
	F 22		58.0
	GF		76.9
	F 1		78.3
	F 2		78.9
	F 3		79.0
	F 4		76.9
	F 5		76.8
	F 6		76.7
	F 7		76.6
	F 8		76.4
	F 9		76.3
	F 10		76.1
	F 11		76.0

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2

Bowen Hills Assessed receiver levels Railway Noise Impact

2

Receiver	Fl	Dir	Lmax dB(A)
	F 12		75.8
	F 13		75.7
	F 14		75.5
	F 15		75.3
	F 16		75.2
	F 17		75.0
	F 18		74.8
	F 19		74.6
	F 20		74.5
	F 21		74.3
	F 22		74.1
Tower B - Level 3-25	GF	W	88.3
	F 1		87.6
	F 2		86.9
	F 3		86.2
	F 4		85.5
	F 5		84.8
	F 6		84.1
	F 7		83.5
	F 8		82.9
	F 9		82.3
	F 10		81.8
	F 11		81.2
	F 12		80.7
	F 13		80.3
	F 14		79.8
	F 15		79.4
	F 16		79.0
	F 17		78.6
	F 18		78.2
	F 19		77.8
	F 20		77.5
	F 21		77.1
	F 22		76.8
Tower B - Level 3-25	GF	S	87.8
	F 1		87.2
	F 2		86.5
	F 3		85.9
	F 4		85.2
	F 5		84.6
	F 6		83.9
	F 7		83.3
	F 8		82.7

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3

Bowen Hills Assessed receiver levels Railway Noise Impact

2

Receiver	FI	Dir	Lmax dB(A)
Tower B - Level 3-25	F 9	E	82.2
	F 10		81.7
	F 11		81.2
	F 12		80.7
	F 13		80.2
	F 14		79.8
	F 15		79.4
	F 16		78.9
	F 17		78.6
	F 18		78.2
	F 19		77.8
	F 20		77.5
	F 21		77.1
	F 22		76.8
	GF		75.9
	F 1		76.4
	F 2		76.3
	F 3		76.2
	F 4		76.2
	F 5		76.3
	F 6		76.2
	F 7		76.1
	F 8		76.0
Tower B - Level 3-25	F 9	N	75.9
	F 10		75.8
	F 11		75.7
	F 12		75.6
	F 13		75.4
	F 14		75.3
	F 15		75.2
	F 16		75.1
	F 17		74.9
	F 18		74.8
	F 19		74.6
	F 20		74.5
	F 21		74.4
	F 22		74.2
	GF		86.6
	F 1		86.1
	F 2		85.6
	F 3		85.0
	F 4		84.5
	F 5		83.9

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4

Bowen Hills Assessed receiver levels Railway Noise Impact

2

Receiver	FI	Dir	Lmax dB(A)
	F 6		83.4
	F 7		82.8
	F 8		82.3
	F 9		81.8
	F 10		81.3
	F 11		80.8
	F 12		80.4
	F 13		79.9
	F 14		79.5
	F 15		79.1
	F 16		78.7
	F 17		78.3
	F 18		78.0
	F 19		77.6
	F 20		77.3
	F 21		77.0
	F 22		76.7

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ATTACHMENT 4

Queensland Development Code MP4.4

MP 4.4 – BUILDINGS IN A TRANSPORT NOISE CORRIDOR

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Purpose

To ensure *habitable rooms* of Class 1, 2, 3 and 4 buildings located in a *transport noise corridor* are designed and constructed to reduce *transport noise*.

Commencement

This version of Mandatory Part (MP) 4.4 of the Queensland Development Code (QDC) commences on 1 September 2010.

Application

The part applies to building work for the construction or renovation of a *residential building* in a designated *transport noise corridor*.

Referral Agency

There is no referral agency for this part.

Associated Requirements

- (a) *Building Act 1975*
- (b) *Building Regulation 2006*
- (c) Building Code of Australia

Referenced Documents

Number	Date	Title
AS/NZS 2107	2000	Acoustics – Recommended design sound levels and reverberation times for building interiors.
AS 3671	1989	Acoustics – Road traffic noise intrusion – Building siting and construction.
AS/NZS ISO 717.1	2004	Acoustics – Rating of sound insulation in buildings and building elements – Airborne sound insulation.
ISO 140.3 (incorporating Amendment No. 1)	1995	Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Laboratory measurements of airborne sound insulation of building elements.
	2008	Road Traffic Noise Management: Code of Practice (Department of Transport and Main Roads).
Version 2	2007	Code of Practice: Railway Noise Management (Queensland Rail).

Definitions

Note: *Italicised* words within the body of the text, other than legislation titles, are defined below.

Acceptable solution means a relevant building solution which is deemed to satisfy the relevant performance requirement for the purposes of section 14 (4) (a) (ii) of the *Building Act 1975*.

Acoustically rated plasterboard means plasterboard that has been measured to achieve an R_w in accordance with AS/NZS ISO 717.1

Acoustically rated seals means seals that have been measured with a door to achieve an R_w in accordance with AS/NZS ISO 717.1

Annual Average Daily Traffic (AADT) has the meaning given in section 246X(7) of the *Building Act 1975*.

A-weighted sound pressure level is the level of the frequency weighted sound pressure determined in accordance with AS/NSZ 2107:2000.

BCA means the Building Code of Australia.

dB(A) means decibels measured on the 'A' weighting frequency.

External envelope means the structural elements and components of a building, including the roof, ceiling, walls and *floors*, which separate a *habitable room* from the exterior of the building.

Floor means a slab on ground or part of the *external envelope* which is elevated and exposed to the source of the *transport noise*, but does not include internal floors providing separation between individual sole-occupancy units or storeys.

Habitable Room has the meaning given in the BCA.

L_A is the shortened form of *A weighted sound pressure level* as defined in AS/NZS 2107:2000.

$L_{A10, 18hr}$ means the arithmetic average of the *A-weighted sound pressure level* that is exceeded for 10% of every hour over 18 consecutive hours between 6 am and 12 midnight.

$L_{A90,T}$ means the *A-weighted sound pressure level* that is exceeded for 90 per cent of the measuring period (T).

L_{Aeq} means an *A-weighted sound pressure level* of a continuous steady sound that within a measuring period has the same mean square sound pressure as a sound level that varies with time as defined in AS/NZS 2107:2000.

L_{Amax} means the maximum *A-weighted sound pressure level* during the nominated assessment period.

Manufacturers' specifications means specifications that that have been measured in accordance with AS/NZS ISO 717.1 for a material or system and have been approved by a *registered testing authority*.

Noise assessment means an acoustic report, prepared in accordance with Schedule 3, which identifies the *noise category* applicable to a building or site based on site testing of acoustic properties.

Noise category means the category of *transport noise* that is applicable to a building or site within a designated *transport noise corridor*, based on the amount of noise monitored or modeled for the location as indicated in:

- (a) State or Local Government records, as identified in a gazettal notice following designation of a *transport noise corridor*; or

Note: In cases where there is any inconsistency between current designations of transport noise corridors by different State and Local Government authorities, the higher of the noise categories applies.

Note: As soon as practicable after designating land as a transport noise corridor, a Local Government must include a record of the transport noise corridor in its planning scheme. Information is also held and is available for public enquiry in a State Government website.

- (b) a *noise assessment* prepared by a *suitably qualified person*.

Planning scheme has the meaning given in the *Sustainable Planning Act 2009*.

Railway land has the meaning given in the *Building Act 1975*.

Registered testing authority has the meaning given in the BCA.

Residential building means a class 1, class 2, class 3 or class 4 building as defined in the BCA.

R_w means the “weighted sound reduction index” as specified in ISO 140-3.

Single Event Maximum Level has the meaning given in Queensland Rail Limited’s *Code of Practice: Railway Noise Management* (2007) Version 2.

State-controlled road has the meaning given in the *Transport Infrastructure Act 1994*.

Suitably qualified person means a person who is assessed by a building assessment manager to be a competent person in accordance with Part 5 of the *Building Regulation 2006*.

Transport noise means airborne noise originating from a *transport noise corridor*.

Transport noise reduction means the level of reduction of *transport noise* required from the façade of the building to the internal environment, as identified in Schedule 1.

Note: The predicted levels of transport noise reduction will be achieved only when doors, windows and other openings in the relevant parts of the building’s external envelope are closed.

Transport noise corridor means land designated under Chapter 8B of the *Building Act 1975* as a *transport noise corridor*.

MP 4.4 – BUILDINGS IN A TRANSPORT NOISE CORRIDOR

Note: This is identified in State and Local Government records as described in a gazettal notice following designation of the transport noise corridor.

**PERFORMANCE
REQUIREMENTS****ACCEPTABLE SOLUTIONS*****Residential buildings***

P1	<i>Habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupants' health and amenity.</i>	A1	The external envelope of <i>habitable rooms</i> in a <i>residential building</i> located in a <i>transport noise corridor</i> complies with the minimum R_w for each building component specified in Schedule 1 to achieve a minimum <i>transport noise reduction</i> level for the relevant <i>noise category</i> by: (a) using materials specified in Schedule 2; OR (b) using materials with <i>manufacturer's specifications</i> that, in combination, achieve the minimum R_w value for the relevant building component and applicable <i>noise category</i>.
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Schedule 1

Noise category	Minimum transport noise reduction (dB (A)) required for habitable rooms	Component of building's external envelope	Minimum R_w required for each component
Category 4	40	Glazing	43
		External walls	52
		Roof	45
		Floors	51
		Entry doors	35
Category 3	35	Glazing	38 (where total area of glazing for a habitable room is greater than 1.8m ²)
			35 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)
		External walls	47
		Roof	41
		Floors	45
		Entry doors	33

Noise category	Minimum transport noise reduction (dB (A)) required for <i>habitable rooms</i>	Component of building's <i>external envelope</i>	Minimum R_w required for each component
Category 2	30	Glazing	35 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
		External walls	32 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		Roof	41
		Floors	38
		Entry doors	45
Category 1	25	Glazing	33
		External walls	27 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
		Roof	24 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		Entry Doors	35
			35
Category 0	No additional acoustic treatment required – standard building assessment provisions apply.		28

Schedule 2

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
Glazing	43	Double glazing consisting of two panes of minimum 5mm thick glass with at least 100mm air gap and full perimeter <i>acoustically rated seals</i> .
	38	Minimum 14.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> ;
		OR
		Double glazing consisting of one pane of minimum 5mm thick glass and one pane of minimum 6mm thick glass with at least 44mm air gap, and full perimeter <i>acoustically rated seals</i>
	35	Minimum 10.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> .
	32	Minimum 6.38mm thick laminated glass with full perimeter <i>acoustically rated seals</i> .
	27	Minimum 4mm thick glass with full perimeter <i>acoustically rated seals</i>
	24	Minimum 4mm thick glass with standard weather seals

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
External walls	52	Two leaves of clay brick masonry, at least 270mm in total, with subfloor vents fitted with noise attenuators.
		Two leaves of clay brick masonry at least 110mm thick with: (i) cavity not less than 50mm between leaves; and (ii) 50mm thick mineral insulation or 50mm thick glass wool insulation with a density of 11kg/m ³ or 50mm thick polyester insulation with a density of 20kg/m ³ in the cavity. OR Two leaves of clay brick masonry at least 110mm thick with: (i) cavity not less than 50mm between leaves; and (ii) at least 13mm thick cement render on each face OR Single leaf of clay brick masonry at least 110mm thick with: (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) Mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m ³ positioned between studs; and (iii) One layer of plasterboard at least 13mm thick fixed to outside face of studs. OR Single leaf of minimum 150mm thick masonry of hollow, dense concrete blocks, with mortar joints laid to prevent moisture bridging.

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	41	Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves
		OR
		Single leaf of clay brick masonry at least 110mm thick with:
		(i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and
		(ii) mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m ³ positioned between studs; and
		(iii) One layer of plasterboard at least 10mm thick fixed to outside face of studs
		OR
		Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face
		OR
		Concrete brickwork at least 110mm thick
		OR
		In-situ concrete at least 100mm thick
		OR
		Precast concrete at least 100mm thick and without joints.

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	35	Single leaf of clay brick masonry at least 110mm thick with: (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs OR Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally.
Roof	45	Concrete or terracotta tile or sheet metal roof with sarking, <i>acoustically rated plasterboard</i> ceiling at least 13mm thick fixed to ceiling joists, cellulose fibre insulation at least 100mm thick with a density of at least 45kg/m³ in the cavity. OR Concrete or terracotta tile or sheet metal roof with sarking, 2 layers of <i>acoustically rated plasterboard</i> at least 16mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m³ or polyester insulation at least 50mm thick with a density of at least 20kg/m³ in the cavity.
	41	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m³ or polyester insulation at least 50mm thick with a density of at least 20kg/m³ in the cavity. OR Concrete suspended slab at least 100mm thick.
	38	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m ³ .

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	35	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity.
Floors	51	Concrete slab at least 150mm thick.
		Concrete slab at least 100mm thick
	45	OR Tongued and grooved boards at least 19mm thick with: (i) timber joists not less than 175mm x 50mm; and (ii) mineral insulation or glass wool insulation at least 75mm thick with a density of at least 11kg/m ³ positioned between joists and laid on plasterboard at least 10mm thick fixed to underside of joists; and (iii) mineral insulation or glass wool insulation at least 25mm thick with a density of at least 11kg/m ³ laid over entire floor, including tops of joists before flooring is laid; and (iv) secured to battens at least 75mm x 50mm; and (v) the assembled flooring laid over the joists, but not fixed to them, with battens lying between the joists.
Entry Doors	35	Solid core timber not less than 45mm thick, fixed so as to overlap the frame or rebate of the frame by not less than 10mm, with full perimeter <i>acoustically rated seals</i> .
	33	Fixed so as to overlap the frame or rebate of the frame by not less than 10mm, fitted with full perimeter <i>acoustically rated seals</i> and constructed of - (i) solid core, wood, particleboard or blockboard not less than 45mm thick; and/or (ii) acoustically laminated glass not less than 10.38mm thick.

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	28	Fixed so as to overlap the frame or rebate of the frame, constructed of - (i) Wood, particleboard or blockboard not less than 33mm thick; or (ii) Compressed fibre reinforced sheeting not less than 9mm thick; or (iii) Other suitable material with a mass per unit area not less than 24.4kg/m ² ; or (iv) Solid core timber door not less than 35mm thick fitted with full perimeter <i>acoustically rated seals</i> .

Schedule 3

The objective of the *noise assessment* is to clearly demonstrate that the *noise category* that is applicable to a particular part of or entire building, or site. The criteria for determining the relevant *noise category* are given below in Table 1:

Table 1 – *Noise category levels*

Noise Category	Level of <i>transport noise</i> * ($L_{A10, 18hr}$) for <i>State-controlled roads</i> and designated local government roads	Single event maximum noise* (L_{Amax}) for <i>railway land</i>
Category 4	≥ 73 dB(A)	≥ 85 dB(A)
Category 3	68 - 72 dB(A)	80 – 84 dB(A)
Category 2	63 – 67 dB(A)	75 – 79 dB(A)
Category 1	58 - 62 dB(A)	70 - 74 dB(A)
Category 0	≤ 57 dB(A)	≤ 69 dB(A)

* measured at 1 m from the façade of the proposed or existing building.

Noise assessment requirements – State-controlled Roads and Local Government roads:

A *noise assessment* for *State-controlled roads* and *Local Government roads* must be undertaken in accordance with the *Road Traffic Noise Management: Code of Practice* (Department of Transport and Main Roads, 2008).

In addition, the *noise assessment* must contain the following information as a minimum:

1) Background Information and Existing Acoustic Environment

- A brief description of the project.
- A brief description of the current noise environment.
- Documentation of noise monitoring equipment and procedures.
- A site plan showing:
 - o Location of *transport noise corridor*;
 - o Location of proposed *residential buildings*;
 - o Location of noise monitoring equipment including distance to *transport noise corridor*;
 - o Any other existing or proposed structures, including but not limited to buildings, barriers, walls and fences;
 - o Any earth mounding, cuttings or other significant topographical features.
- Site photograph indicating the position of the noise monitor.
- Type of instrument used and field calibration checks.
- Noise monitoring results including:
 - o Sample times and measurement intervals (both attended and unattended);
 - o Weather conditions during measurement including wind speed, wind direction and rainfall;
 - o Adjustments for reflecting surfaces;
 - o Description of sources other than from the *transport noise corridor* (e.g. aircraft, industry, mechanical plant, dog barking) and discussion of any affect on the results;
 - o Table summarising measured noise levels;
 - o Graphical presentation of monitored noise levels using 15 minute intervals and including the $L_{Aeq, adj, 15min}$ and $L_{A90, 15min}$ parameters for a minimum continuous duration of 48 hours.
- Methodology for determining noise levels at locations other than those monitored.

2) Transport Noise Corridor Noise Predictions

- Description of the noise model used and algorithms used in prediction modelling.
- All parameters used in the model including:
 - o Traffic volumes, existing and future (future volumes a minimum of 10 years from the date of the assessment must be used for design purposes);
 - o Road gradient;
 - o Percentage component of heavy vehicles;
 - o Vehicle speed;
 - o Pavement surface and any surface correction;
 - o Ground cover;
 - o Reflections from buildings and barriers.
- Statement of the source, accuracy and resolution of data used for:
 - o Topography;
 - o Road gradient;
 - o Receiver heights;
 - o Any noise barriers, walls or earth mounds.
- Verification of the noise model using the measured levels to demonstrate that the model is capable of generating accurate outputs.
- Noise prediction results including:
 - o A table summarising existing noise levels and predicted future levels;
 - o Statements quantifying any adjustments made to the predicted noise levels for the purpose of assessment;
 - o A table presenting the calculated *noise category* for all *habitable rooms**.

*Note: For multiple storey buildings each building storey must be considered individually. The calculated *noise category* may vary from level to level, particularly where barrier effects are present due to factors such as walls, fences, buildings, and topography.

Noise assessment requirements – *Railway land*:

A *noise assessment* for *railway land* shall be undertaken in accordance with the Code of Practice: Railway Noise Management (2007) Version 2.

In addition, the *noise assessment* must contain the following information as a minimum:

1) Background Information and Existing Acoustic Environment

- A brief description of the project.
- A brief description of the current noise environment.
- Documentation of noise monitoring equipment and procedures.
- A site plan showing:
 - Location of *transport noise corridor*;
 - Location of proposed *residential buildings*;
 - Location of noise monitoring equipment including distance to *transport noise corridor*;
 - Any other existing or proposed structures, including but not limited to buildings, barriers, walls and fences;
 - Any earth mounding, cuttings or other significant topographical features.
- Site photograph indicating the position of the noise monitoring equipment.
- Type of instrument used and field calibration checks.
- Noise monitoring results including:
 - Sample times and measurement intervals (both attended and unattended);
 - Weather conditions during measurement including wind speed, wind direction and rainfall;
 - Adjustments for reflecting surfaces;
 - Description of sources other than from the *transport noise corridor* (e.g. aircraft, industry, mechanical plant, dog barking) and discussion of any affect on the results;
 - Table summarising measured noise levels;
 - Graphical presentation of monitored noise levels (L_{Amax} , *Single Event Maximum Level(s)*) determined over a minimum continuous duration of 48 hours within 100m of a *railway land*.
- Methodology for determining noise levels at locations other than those monitored.

2) Transport Noise Corridor Noise Predictions

- Description of the noise model used and algorithms used in prediction modelling.
- All parameters used in the model including:
 - Percentage component of freight trains;
 - Total number of train services;
 - Vehicle speed;
 - Ground cover;
 - Reflections from buildings and barriers.

- Statement of the source, accuracy and resolution of data used for:
 - o Topography;
 - o Gradient;
 - o Receiver heights;
 - o Any noise barriers, walls or mound bases.
- Verification of the noise model using the measured levels to demonstrate that the model is capable of generating accurate outputs.
- Noise prediction results including:
 - o A table summarising existing noise levels and predicted future levels;
 - o Statements quantifying any adjustments made to the predicted noise levels for the purpose of assessment;
 - o A table presenting the calculated *noise category* for all *habitable rooms**.

*NB: For multiple storey buildings each building storey must be considered individually. The calculated *noise category* may vary from level to level, particularly where barrier effects are present due to factors such as walls/fences, buildings and topography.