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Lend Lease Communities (Yarrabilba) Pty Ltd

Precinct 2, Village 1
Yarrabilba Development

Road Traffic Noise Assessment

Report No. 70Q-13-0312-TRP-515702-6
5 Dec 2014

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Yarrabilba Development - Precinct 2, Village 1
Road Traffic Noise Assessment

REPORT NO:
70Q-13-0312-TRP-515702-6

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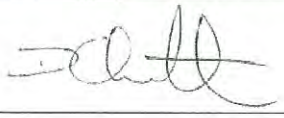
AUTHOR:		
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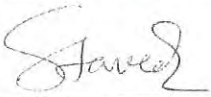
REVIEWED BY:		
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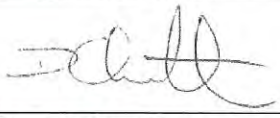
ISSUED BY:		
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REVISION HISTORY:		
Revision No.	**Date Issued:**	**Reason/Comments:**
0	28 Nov 2013	Initial issue
1	18 Dec 2013	Noise barrier revision
2	6 Aug 2014	Expanded layout
3	19 Nov 2014	Lots renumbered
4	19 Nov 2014	Minor Lot changes
5	4 Dec 2014	Revisions to noise levels
6	5 Dec 2014	Additional Lot exceedances

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EXECUTIVE SUMMARY

Vipac Engineers & Scientists Ltd (Vipac) has completed a road traffic noise assessment for the proposed residential Lots in Precinct 2, Village 1, of the Yarrabilba development, on the Waterford-Tamborine Road. Noise impacts on the development have been assessed according to the Department of Transport and Main Roads noise policy and AS 3671:1989 and AS/NZS 2107:2000 standards.

With no noise mitigation, 59 Lots were predicted to exceed the noise limits at the ground floor and 107 at the first floor. A noise barrier 3 m in height is recommended adjacent to the Waterford-Tamborine Road to reduce noise levels at Lots in the development. With the recommended noise barrier, 43 Lots are predicted to exceed the TMR traffic noise criteria at the ground floor level and 72 Lots at the first floor level. For floors of Lots where the noise criteria are exceeded, further acoustic treatment will be required.

For floors of Lots where the noise criteria is exceeded, acceptable indoor noise levels can be achieved by following the glazing, walls and roof recommendations specified in this report, however external doors and windows of the noise affected rooms must remain closed. Under these conditions, alternative ventilation may be required. Alternative ventilation may include air-conditioning, borrowed ventilation, mechanically assisted ventilation or other suitable methods.

The recommended glazing, walls and roof requirements in this report are conservative ratings based on preliminary data and assumptions about room sizes and component construction. Building construction acoustic requirements may be recalculated when final details of room dimensions and building component construction are available to reduce the required ratings.

In conclusion, noise impacts associated with the proposed development can be controlled to an acceptable level by implementing the recommendations in this report.

TABLE OF CONTENTS

1. INTRODUCTION

Vipac Engineers & Scientists Ltd (Vipac) was commissioned by Lend Lease to provide a traffic noise assessment for the proposed residential Lots in Precinct 2, Village 1, in the Yarrabilba development, located on the Waterford-Tamborine Road. The purpose of this assessment is to determine the traffic noise impacts at the Lots.

Noise impacts have been assessed in accordance with the Department of Transport and Main Roads (TMR) noise policy and AS 3671:1989 (AS3671) and AS/NZS 2107:2000 (AS2107) standards.

2. PROPOSED DEVELOPMENT AND SURROUNDING AREA

The following information about the surrounding area was observed on site and is presented in Figure 2-1:

- North: Dowe Haven Equestrian Park and residential dwellings;
- East: Further development Stages;
- South: Further development Stages; and
- West: The Waterford Tamborine Road, and further west residential dwellings.

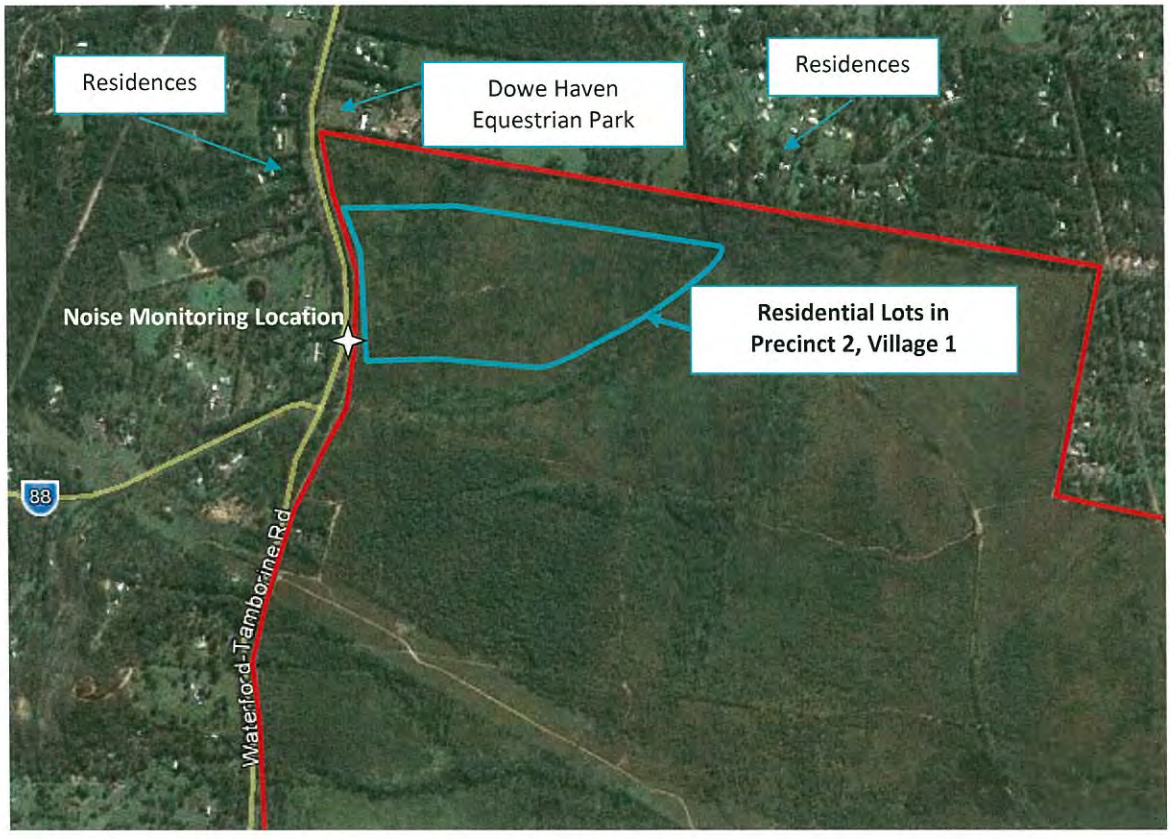

Figure 2-1: Aerial Photograph of the Site and Noise Monitoring Location

The significant noise sources that may potentially impact on Lots in Precinct 2, Village 1 are road traffic noise from the Waterford-Tamborine Road and Yarrabilba Drive.

3. EXISTING NOISE LEVELS

Unattended noise monitoring was conducted for the following purposes:

- To calibrate the noise model; and
- To allow for the calculation of noise descriptors other than the $L_{A10(18hr)}$, which is the output of the noise model.

An environmental noise logger was used to measure the existing noise levels on site. The location of the noise logger is shown in Figure 2-1. Noise monitoring was conducted between the 18th July 2011 and 22nd July 2011 at approximately 1573 Waterford-Tamborine Road. The instrumentation, measurement details and measurement results are presented in Appendix A.

Measured road traffic noise levels used to calibrate the noise model are presented in Table 3-1.

Table 3-1: Measured Noise Levels for Traffic Noise Modelling Calibration

Noise Descriptor	Measured Noise Level
$L_{A10(18hr)}$	74.0 dB(A)

4. NOISE POLICY

The applicable noise criteria are summarised in Table 4-1.

Table 4-1: Applicable Noise Policies

Noise Source	Applicable Noise Criteria
Road traffic noise	The Department of Transport and Main Roads' (TMR) Road Traffic Noise Management: Code of Practice (COP) AS/NZS 2107:2000 Acoustics—Recommended design sound levels and reverberation times for building interiors (AS2107) AS 3671:1989 Acoustics-Road traffic noise intrusion - Building Siting and Construction (AS3671)

The development stages are near the Waterford-Tamborine Road, which will be a major road in the future. Therefore, the Department of Transport and Main Roads' (TMR) 'Road Traffic Noise Management: Code of Practice' (COP) noise criteria have been adopted. The applicable traffic noise limits are:

External noise limit at future residences:

- 57 dB(A) $L_{A10\,(18hr)}$ where the background noise level $L_{A90(8hr)}$ is less than 40 dB(A);
- 60 dB(A) $L_{A10\,(18hr)}$ where the background noise level $L_{A90(8hr)}$ is greater than 40 dB(A);

Private open space:

- 57 dB(A) $L_{A10\,(18hr)}$ where the background noise level $L_{A90(8hr)}$ is less than 45 dB(A);
- 60 dB(A) $L_{A10\,(18hr)}$ where the background noise level $L_{A90(8hr)}$ is greater than 45 dB(A);

Where external façade noise limits cannot be met, the TMR COP refers to AS/NZS 2107:2000 'Acoustics-Recommended design sound levels and reverberation times for building interiors' which has the following maximum indoor noise limits for residences near major roads:

- 40 dB(A) for bedrooms
- 45 dB(A) for living rooms

Since Lots in Precinct 2 Village 1 will be near the Waterford-Tamborine Road, which will be a major road in the future, the external noise limit of 60 dB(A) $L_{A10\,(18hr)}$ free field and the private open space noise limit of 60 $L_{A10\,(18hr)}$ have been adopted for this assessment.

5. TRAFFIC NOISE MODELLING METHODOLOGY

Traffic noise calculations were carried out using SoundPLAN noise modelling software. A 3D computational model was created based on the drawings provided.

The data and assumptions used in traffic noise modelling are presented in Table 5-1. The traffic flow data obtained from Cardno is presented in Table 5-2.

Table 5-1: Data and Assumptions Used in Traffic Noise Modelling

Parameter	Data
Future Residence Receiver Heights	Ground Floor: 1.8m above building pad level First Floor: 4.6m above building pad level (assuming height of storeys as 2.8m) Assumed pad levels are included in Appendix C.
Terrain Data	x13-106prelim cont.dwg, received from KN Group, 16/7/2014
Development Lot Layout	7952-BDY-Current-20140926.dwg received from Lend Lease 30/10/2014
Road Alignment	x13-106prelim cont.dwg, received from RPS, 16/7/2014
Calculation Method	UK's Calculation of Road Traffic Noise (CoRTN)
Traffic Volume Conversions - AADT to 18hr Traffic Flows	94%
Road Surface	Dense Graded Asphalt was modelled as the road surface for all roads. No road surface correction is applied to the base noise level calculated by SoundPLAN because the base noise level prediction assumes dense graded asphalt road surface.
Buildings on Lots	Buildings on Lots have been considered in noise predictions when calculating noise at Lots not immediately adjacent to Yarrabilba Drive or the Waterford Tamborine Road. Buildings with dimensions 10 x 15m, 4m high, have been included in the noise model at worst case locations on Lots, i.e. where buildings will give the least shielding to the Lots behind them.

Table 5-2: Traffic Data Used for Noise Modelling

Road	Scenario	AADT	18hr Traffic Volumes	%CV	Speed (km/h)
Waterford Tamborine Road	Existing	8,700	8,178	8%	90
	Ultimate	42,350	39,809	8%*	90
Yarrabilba Drive	Ultimate	12,410	11,665	5%*	60

** Future %CV is assumed to be the same as current %CV*

5.1 NOISE MODEL CALIBRATION

Noise monitoring was conducted on the Waterford-Tamborine Road, between 18th July 2011 and 27th July 2011. The noise measurements exceeded the traffic noise modelling results by 1.7 dB(A). A difference between predicted and measured result of less than 2 dB(A) is considered acceptable. A calibration factor of +1.7 dB(A) has been added to the Waterford-Tamborine Road noise source.

5.2 NOISE DESCRIPTOR CONVERSIONS

Noise descriptors other than the $L_{A10(18hr)}$ were calculated from noise predictions and noise measurements using the conversion factors presented in Table 5-3.

Table 5-3: Noise Descriptor Conversions

Noise Descriptor	Measured Noise Level	Factor to Convert from $L_{A10(18hr)}$ (dB(A))
$L_{A10(18hr)}$	74.0	0
$L_{Aeq, Max\ 1hr\ Day\ (7am\ to\ 10pm)}$	73.3	-0.8
$L_{Aeq,Max\ 1hr\ Night(10pm\ to\ 7am)}$	72.3	-1.7

6. TRAFFIC NOISE MODELLING RESULTS

Predicted ultimate road traffic noise levels are up to 76 dB(A) $L_{A10\,(18hr)}$. This exceeds the applicable noise limits of 60 dB(A). Predicted noise levels exceed the applicable noise limits by up to 14 dB(A) at the ground floor and 16 dB(A) at the first floor. 59 Lots exceed the noise limits at the ground floor and 107 at the first floor.

A noise barrier 3m in height is recommended to reduce traffic noise levels on Lots. The noise barrier is detailed in Figure B-1 in Appendix B.

With this noise barrier, 43 Lots exceed the noise limits at the ground floor of Lots and 72 at the first floor level of Lots, as shown in Table 6-1 and Table 6-2 respectively.

Table 6-1: Lots Exceeding the Applicable 60 dB(A) External Noise Limits at the Ground Floor with the Recommended Noise Barriers

Lot	$L_{A10(18hr)}$ (dB(A))	Lot	$L_{A10(18hr)}$ (dB(A))	Lot	$L_{A10(18hr)}$ (dB(A))
562	61	587	62	616	63
563	61	588	63	617	64
568	63	589	63	618	63
569	63	590	64	619	64
570	62	591	64	620	63
571	62	592	63	621	63
572	62	593	62	622	63
573	62	594	61	623	63
574	62	596	64	624	63
575	62	610	64	625	63
576	62	611	64	626	62
577	61	612	64	627	62
578	61	613	63	628	62
585	61	614	63		
586	62	615	64		

Table 6-2: Lots Exceeding the Applicable 60 dB(A) External Noise Limits at the First Floor with the Recommended Noise Barriers

Lot	$L_{A10(18hr)}$ (dB(A))	Lot	$L_{A10(18hr)}$ (dB(A))	Lot	$L_{A10(18hr)}$ (dB(A))
523	60	577	63	613	74
531	60	578	62	614	74
532	60	580	61	615	74
533	61	581	63	616	74
534	61	582	63	617	74
558	61	583	64	618	74
559	61	584	64	619	75
560	62	585	65	620	67
561	63	586	66	621	67
562	64	587	68	622	67
563	63	588	72	623	67
564	62	589	73	624	67
565	62	590	75	625	67
566	61	591	74	626	67
567	61	592	68	627	66
568	73	593	66	628	66
569	69	594	65	629	62
570	66	595	63	630	62
571	66	596	74	631	61
572	65	597	61	632	61
573	65	598	61	633	61
574	65	610	76	634	61
575	64	611	76	635	61
576	63	612	74	636	61

Floors of future residences where the noise limits are exceeded will need to be designed and constructed according to the methods outlined in AS 3671:1989, "Acoustics-Road traffic noise intrusion - Building Siting and Construction" and the noise limits in AS2107 (see Section 3). Construction requirements are detailed in Section 6.2.

Noise contour maps are presented in Appendix B. Predicted noise levels at all Lots affected by significant levels of traffic noise are presented in Appendix C.

6.1 OUTDOOR RECREATIONAL SPACE

Traffic noise contour maps of the predicted free field $L_{A10\,(18hr)}$ noise at the ground floor level with the recommended noise barriers are presented in Figure B-6 and Figure B-7 in Appendix B. It can be seen that most Lots have areas that are below the TMR 60 dB(A) $L_{A10\,(18hr)}$ noise limit.

All Lots have some areas where predicted traffic noise levels are less than or equal to 64 dB(A). It is expected that when the buildings are constructed traffic noise levels will be at least 8 dB(A) lower in the space shielded by the buildings. Therefore, all Lots will have areas that would comply with the TMR 60 dB(A) $L_{A10\,(18hr)}$ private open space noise limit.

6.2 ARCHITECTURAL TREATMENTS

The TMR 60 dB(A) noise limit will be exceeded at some Lots in Precinct 2, Village 1. Consequently, the buildings should be designed to achieve the recommended noise limits specified in AS 2107 (See Section 3), as follows:

- Bedrooms: L_{Aeq} 40 dB(A)
- Other habitable Rooms: L_{Aeq} 45 dB(A)

The recommended acoustic ratings for all walls, windows and roofing were calculated using the procedures in Australian Standard AS3671 *"Acoustics – Road Traffic Noise Intrusion Building Siting and Construction"* using worst case assumptions about room dimensions and building orientations.

The assumed construction specifications for future residences are given in Table 6-3.

Table 6-3: The Assumed Construction Specifications for Future Residences

Item	Construction	Expected R_w
External Wall	Brick Veneer	52
	10mm plasterboard	
Ceiling and Roof	Sheet metal / Cement tiles	38
	10mm Plasterboard	
	R2.5 Batts Insulation	
Glazing and Frames	4mm Float	24

6.2.1 Glazing Requirements

Glazing requirements are specified in Table 6-4. Where glazing acoustic requirements are not specified in Table 6-4, glazing ratings from Table 6-3 can be used (i.e. standard glazing systems).

Table 6-4: Required Glazing Construction for Residences on Lots exceeding External Noise Limits to Comply with Indoor Noise Limits

Floor	Room	Orientation of Façade	Required Rw Acoustic Rating of Glazing and Frames
Ground	Bedrooms	N	35
		S	35
		W	36
	Living Rooms	N	31
		S	31
		W	32
First	Bedrooms	N	39
		S	39
		W	41
	Living Rooms	N	36
		S	36
		W	37

Table 6-4 lists the required R_w ratings (Weighted Sound Reduction Index) for glazing and frames. It is required that the R_w performance ratings of the glazing systems (windows and frames) be certified by the supplier prior to installation. Glazing certificates will be required for building certification.

The recommended glazing, walls and roof requirements are conservative ratings based on preliminary data and assumptions about room sizes and component construction. Building construction acoustic requirements may be recalculated when final details of room dimensions and building component construction are available to reduce the required ratings. In addition, window size can be reduced or bedrooms relocated to minimise the acoustic rating required.

6.2.2 Wall Requirements

Wall construction requirements are specified in Table 6-5. Where wall construction requirements are not specified in Table 6-5, construction from Table 6-3 can be used.

Table 6-5: Wall Requirements for Future Residences to Comply with Indoor Noise Limits

Floor	Room	Façade	Requirements	Expected Rw
First	Bedrooms	W,N,S	• Brick Veneer • R2.5 Batts • 1 x 10mm Plasterboard	59

Alternative wall systems achieving the required rating in Table 6-5 may be adopted.

6.2.3 Ceiling and Roof Requirements

Ceiling and roof requirements are specified in Table 6-6. Where ceiling and roof requirements are not specified in Table 6-6, construction from Table 6-3 can be used.

Table 6-6: Ceiling and Roof Requirements for Future Residences to Comply with Indoor Noise Limits

Floor	Room	Requirements	Expected Rw
First	Living Rooms	• Concrete Tile / Sheet metal roof • 1 x 10mm Sound Rated Plasterboard • R2.5 Batts Insulation	41
	Bedrooms	• Concrete Tile / Sheet metal roof • 1 x 13mm Sound Rated Plasterboard • R4.0 Batts Insulation	43

Alternative ceiling / roof systems achieving the required rating in Table 6-6 may be adopted.

6.2.4 Ventilation

For floors of Lots where the noise criteria is exceeded, acceptable indoor noise levels can be achieved with the glazing recommendations specified, however external doors and windows must remain closed. Under these conditions, alternative ventilation will be required. Alternative ventilation may include air-conditioning, borrowed ventilation, mechanically assisted ventilation or other suitable methods.

7. NOISE BARRIER CONSTRUCTION

Traffic noise barriers may consist of an earth mound, an acoustic fence, or a combination thereof. Noise barriers should be constructed in accordance with Main Roads Standard Specification MRS 11.15, "Noise Barriers". Of most importance, noise barriers should have no gaps between palings, or between palings and posts and the ground. A minimum surface density of 12.5kg/m2 should be used.

8. CONCLUSIONS

Vipac Engineers & Scientists Ltd (Vipac) has completed a traffic noise assessment for the proposed residential Lots in Precinct 2, Village 1, in the Yarrabilba development on the Waterford Tamborine Road. Noise impacts on the development have been assessed according to TMR, AS3671 and AS2107 noise policies.

Recommendations are given in this report for noise impacts to comply with the applicable noise criteria.

In conclusion, noise impacts associated with the proposed development can be controlled to an acceptable level by implementing the recommendations in this report.

APPENDIX A: NOISE LOGGING DETAILS

Table A-1: Instrumentation

Instrument	Serial Number	Lab Calibration Due (at Time of Measurement)	Field Calibration
Larson Davis LD-831 Noise logger	831-6	14-Apr-2012	94.0dB(A) before 94.0 dB(A) after
Bruel & Kjaer 4230 Acoustic Calibrator	725011	22-Apr-2012	N/A

Table A-2: Measurement Details for Noise Monitoring

Microphone Height	1.5m
Microphone Orientation	Pointing vertically upwards
SLM Time Weighting	Fast
SLM Frequency Weighting	A
Measurement Interval Period	1 hour intervals
Logger location	Approximately 1573 Waterford-Tamborine Road
Measurement weather	Fine and sunny, light to moderate winds
Date of measurement	Between 18th July 2011 and 22nd July 2011

Table A-3: Noise Monitoring Results (Free Field)

Noise Descriptor	Noise Level (dB(A))
Average LA10, 18hr (6am to 12am)	74
Average LA90, 8hr (10pm to 6am)	28
LAmax (24hr)	99
LAmax,Night (10pm to 7am)	80
Average LAeq,Day(7am to 6pm)	71
Average LAeq,Evening(6pm to 10pm)	69
Average LAeq, Night (10pm to 7am)	66
LAeq,Max 1hr Day (7am to 6pm)	73
LAeq,Max 1hr Evening(6pm to 10pm)	71
LAeq,Max 1hr Night(10pm to 7am)	72
Average LAeq, 15hr (7am to 10pm)	71
Average LAeq, 9hr (10pm to 7am)	66
Average LA90(7am to 6pm)	52
Average LA90(6pm to 10pm)	43
Average LA90(10pm to 7am)	31
Average LAmax (24hr)	86
Average LAmax,Night (10pm to 7am)	85

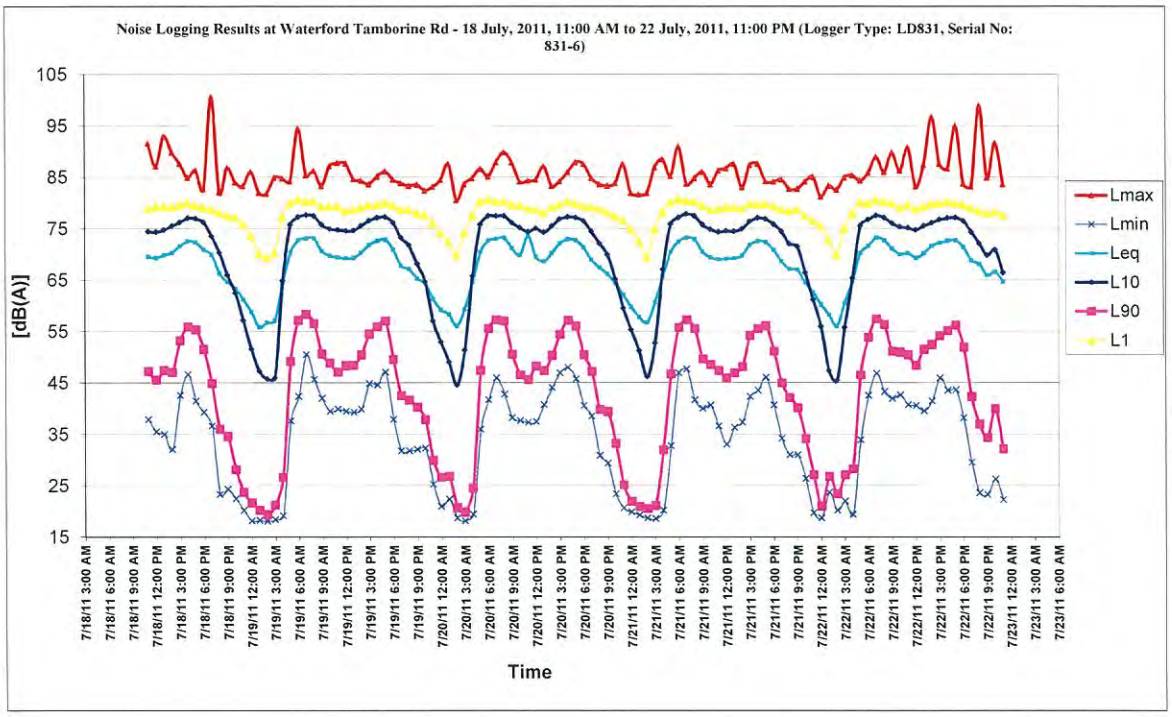

Figure A-1: Noise Monitoring Results (Free Field)

APPENDIX B: NOISE CONTOUR MAPS AND NOISE BARRIER DIAGRAMS

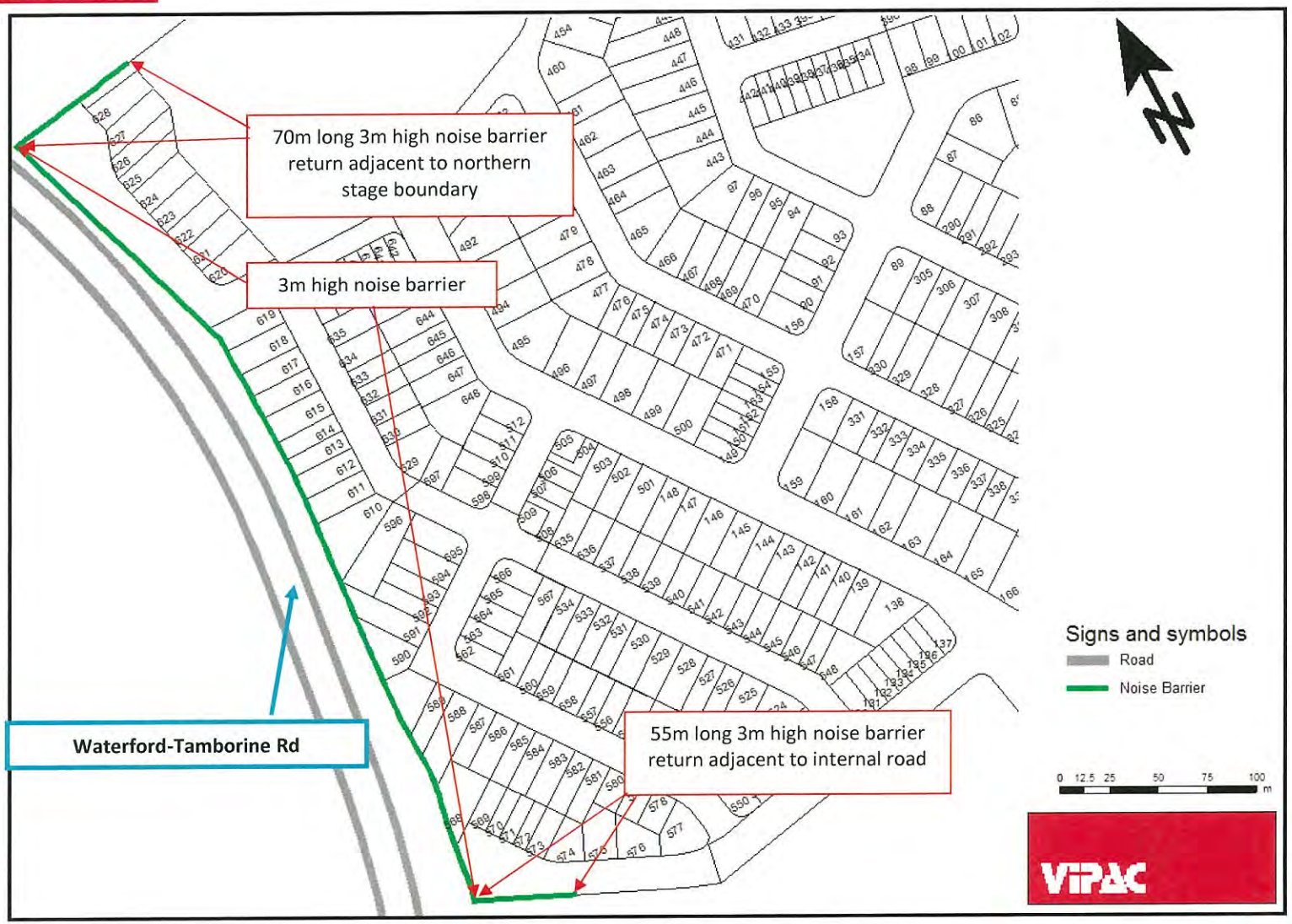

Figure B-1: Noise Barrier Location and Heights

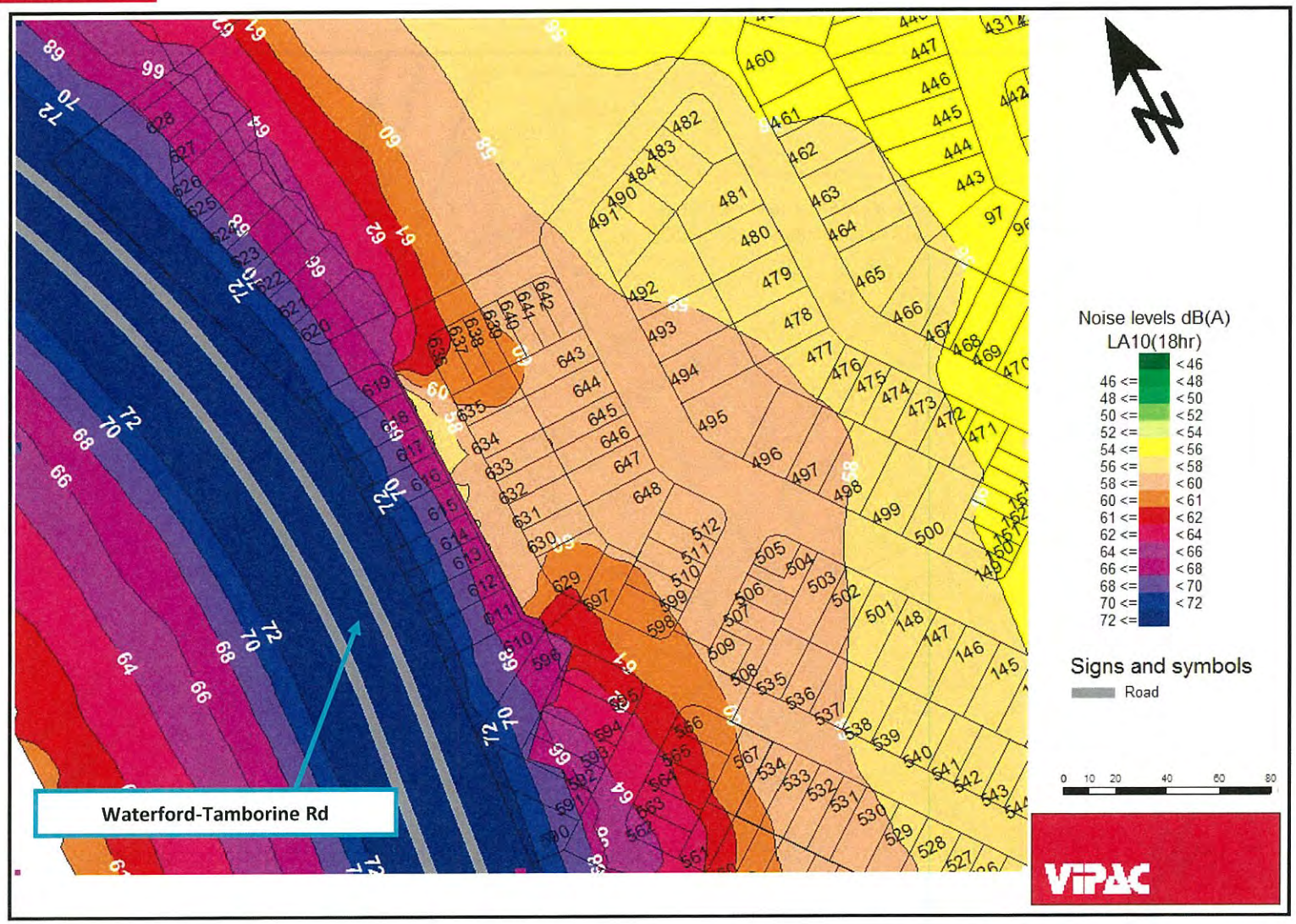

Figure B-2: Predicted Free Field $L_{A10\,(18hr)}$ Traffic Noise Levels at the Ground Floor, No Noise Barriers, North

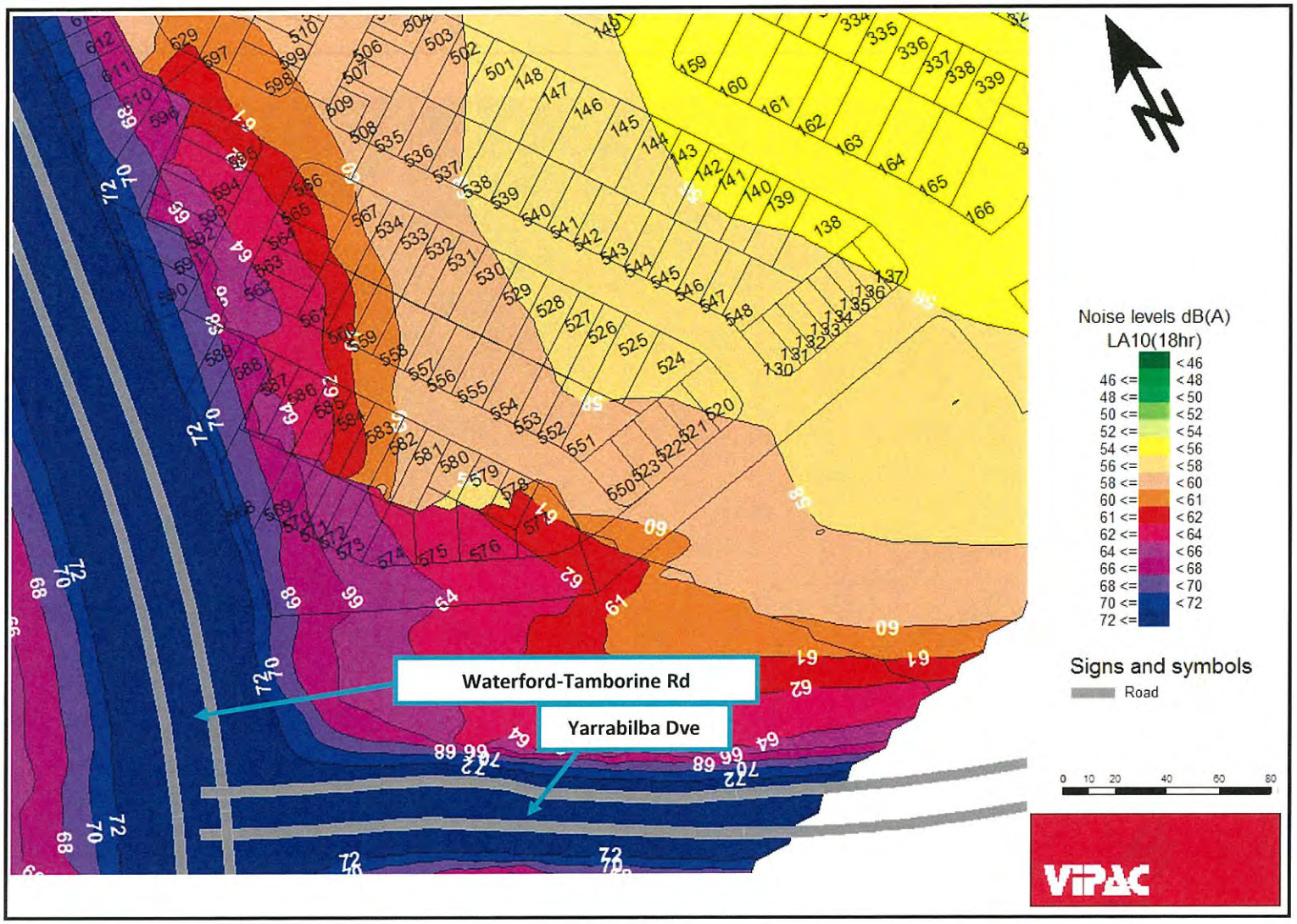

Figure B-3: Predicted Free Field $L_{A10\,(18hr)}$ Traffic Noise Levels at the Ground Floor, No Noise Barriers, South

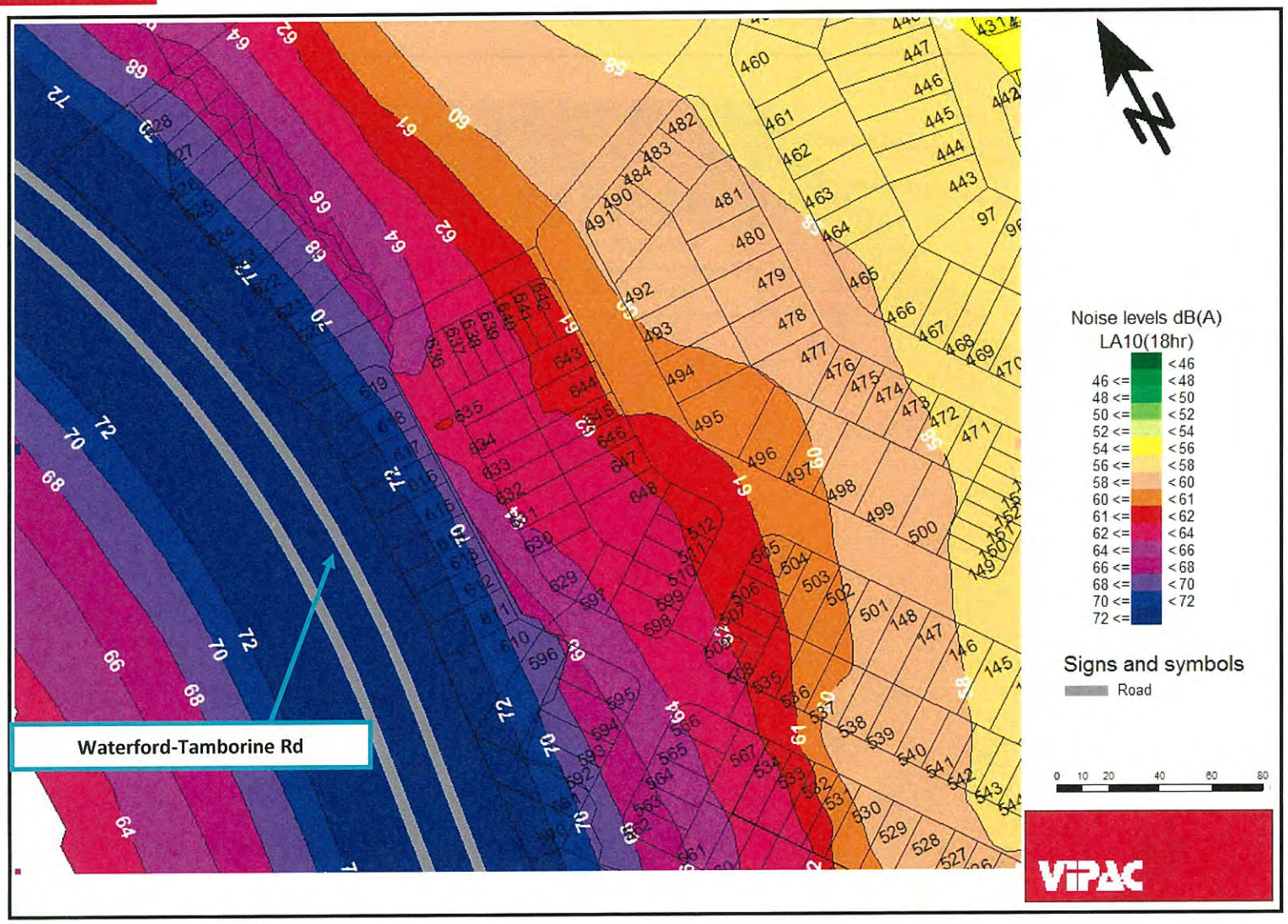

Figure B-4: Predicted Free Field $L_{A10\,(18hr)}$ Traffic Noise Levels at the First Floor, No Noise Barriers, North

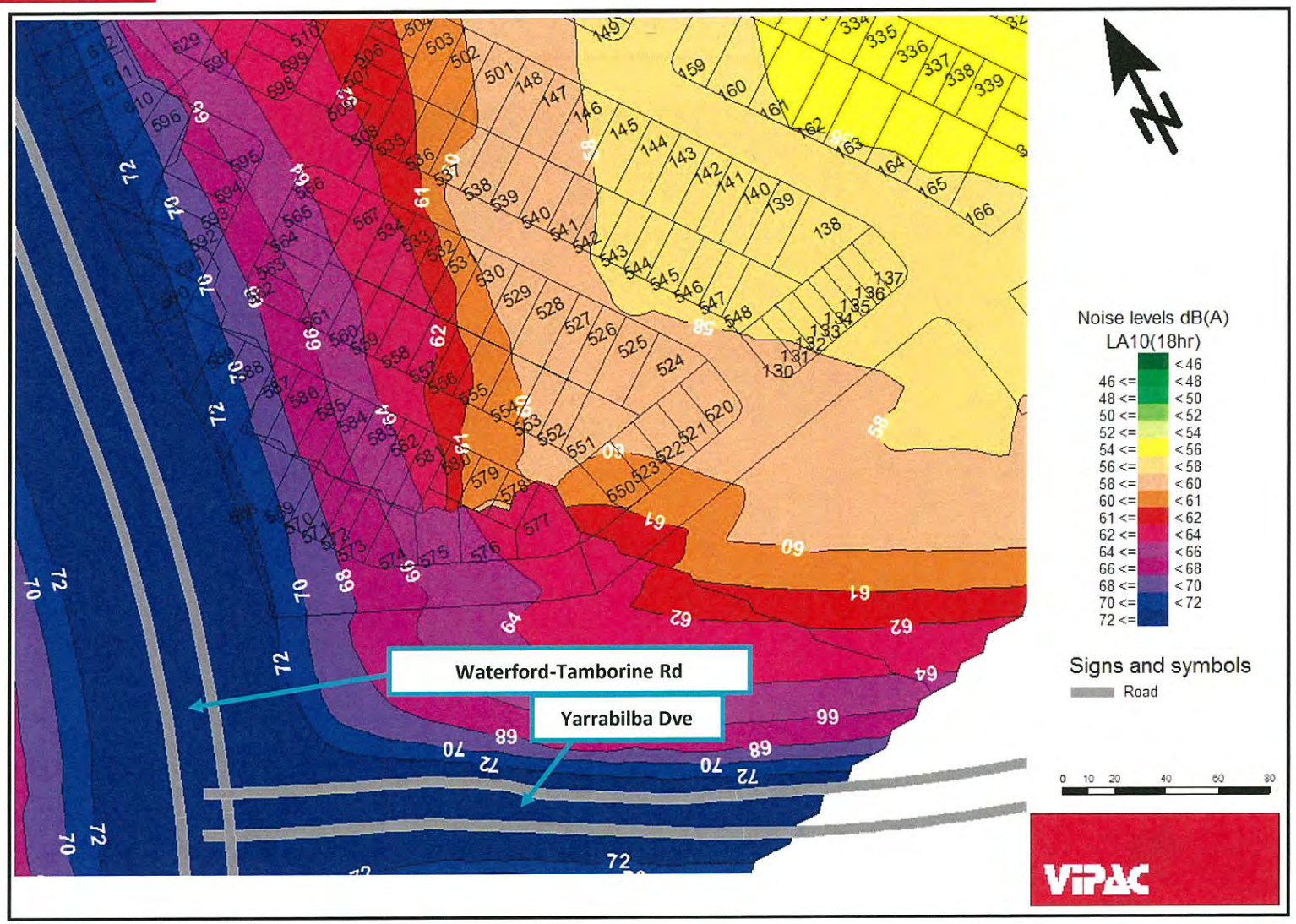

Figure B-5: Predicted Free Field $L_{A10\,(18hr)}$ Traffic Noise Levels at the First Floor, No Noise Barriers, South

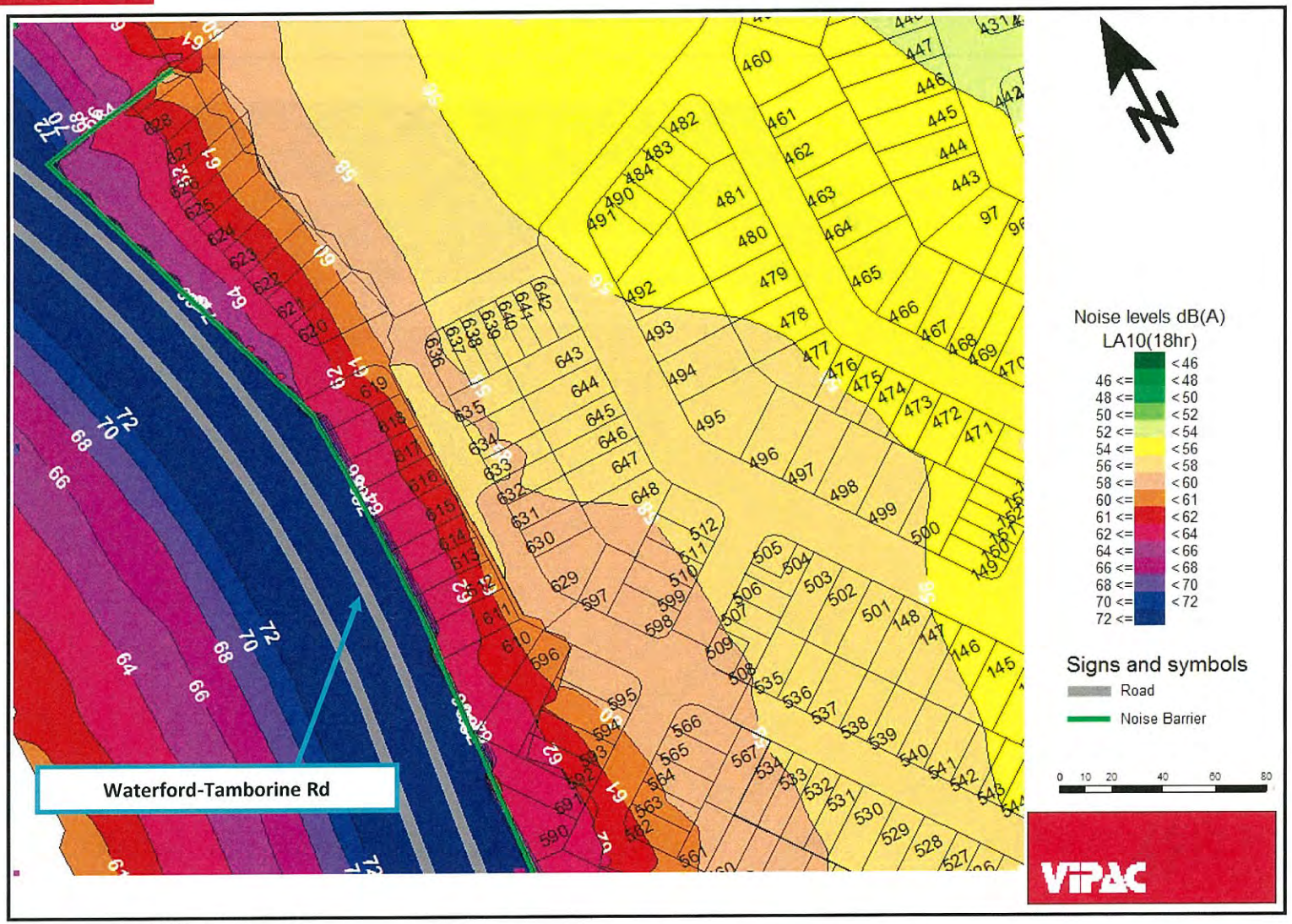

Figure B-6: Predicted Free Field $L_{A10\,(18hr)}$ Traffic Noise Levels at the Ground Floor, with the Recommended Noise Barrier, North

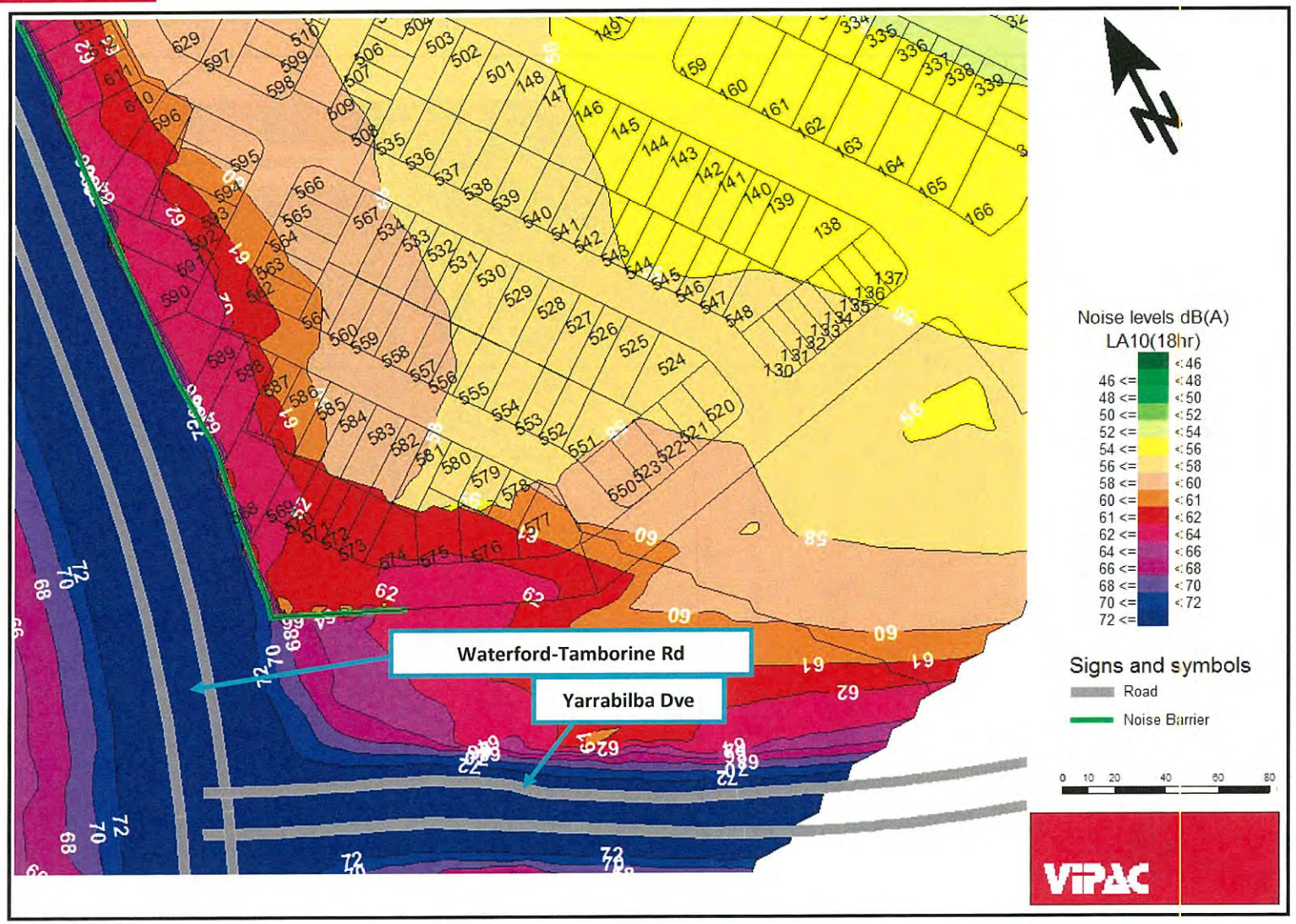

Figure B-7: Predicted Free Field $L_{A10\,(18hr)}$ Traffic Noise Levels at the Ground Floor, with the Recommended Noise Barrier, South

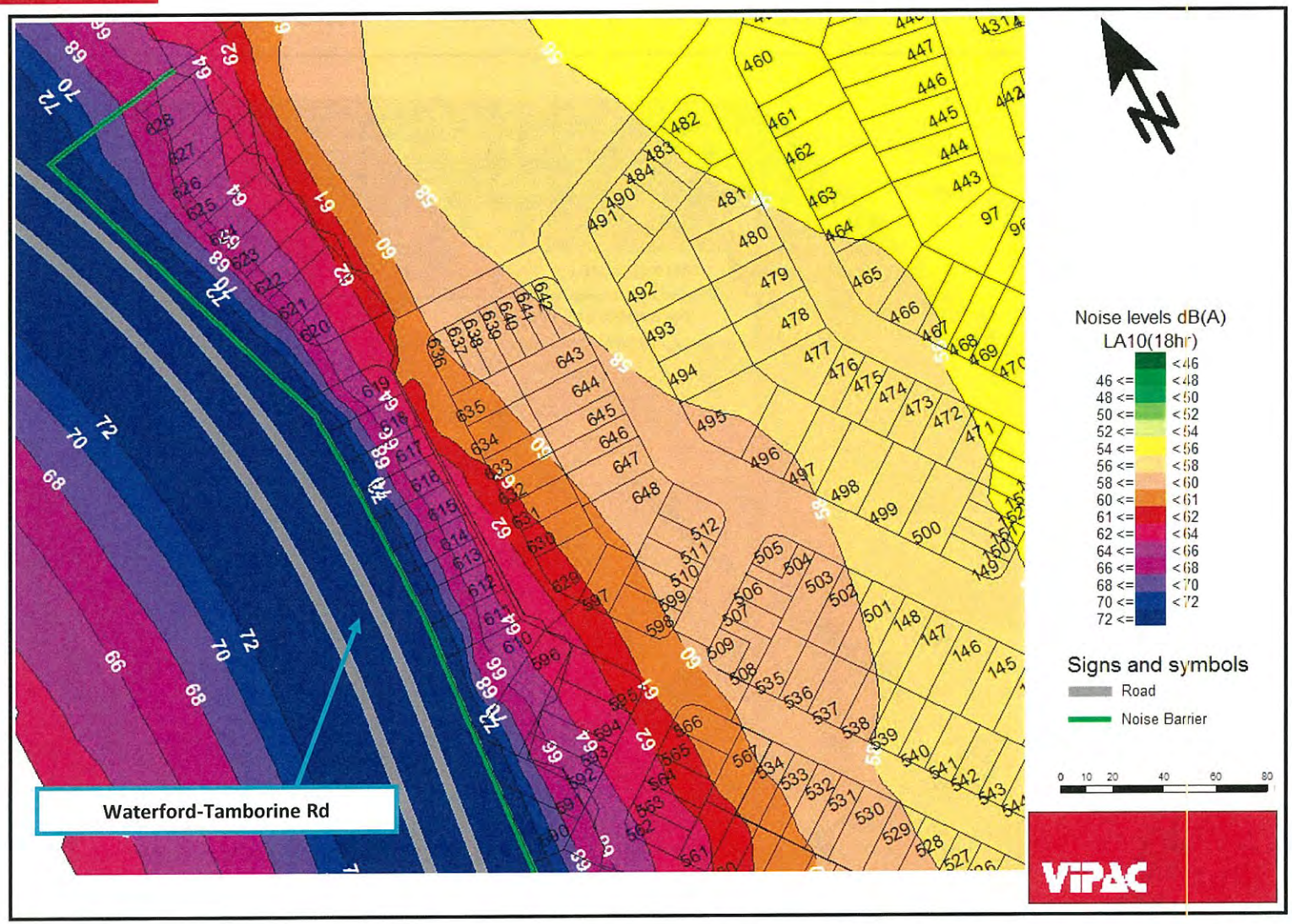

Figure B-8: Predicted Free Field $L_{A10\,(18hr)}$ Traffic Noise Levels at the First Floor, with the Recommended Noise Barrier, North

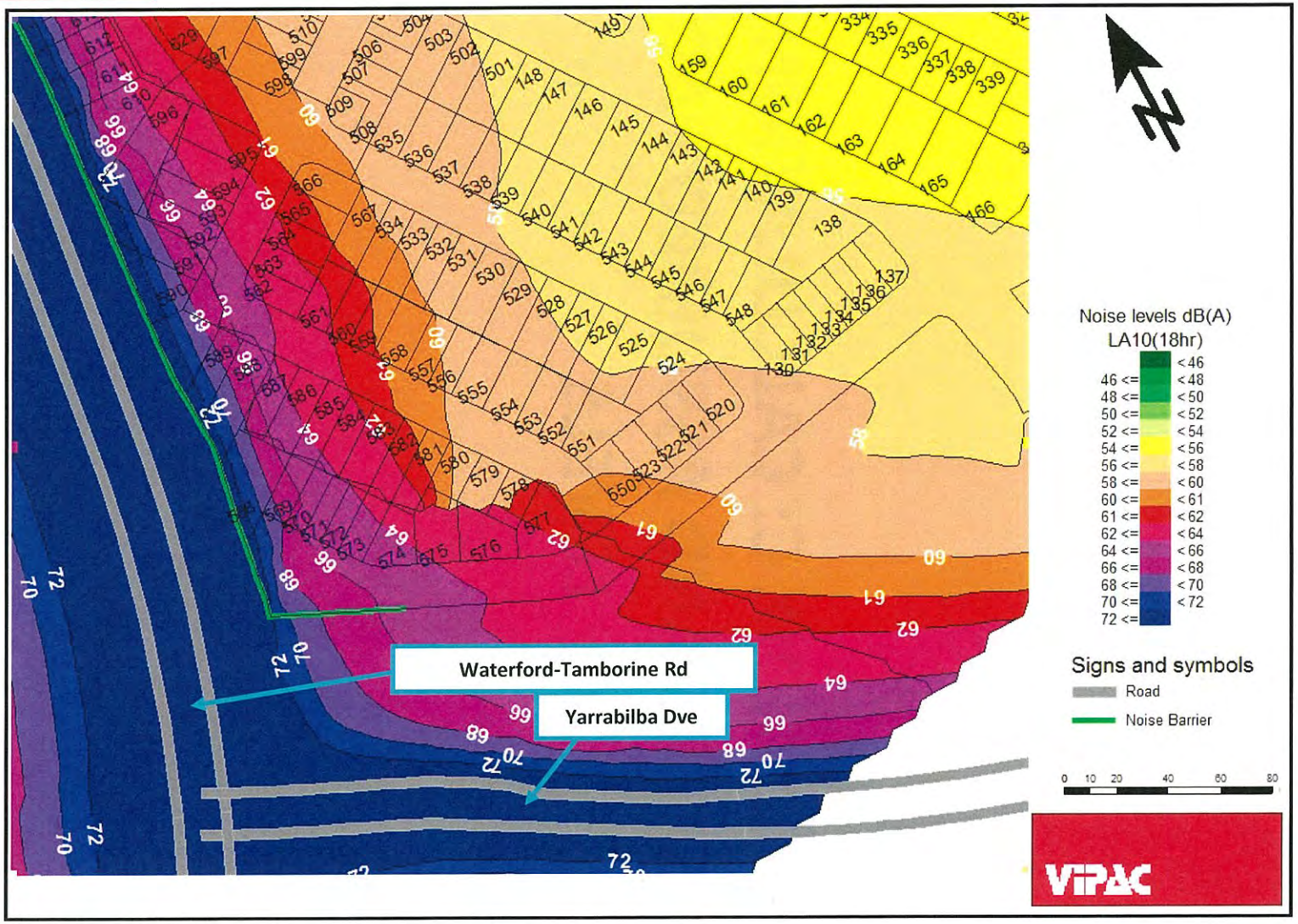

Figure B-9: Predicted Free Field $L_{A10\,(18hr)}$ Traffic Noise Levels at the First Floor, with the Recommended Noise Barrier, South

APPENDIX C: CALCULATION RESULTS AND ASSUMED PAD LEVELS

Table C-1: Noise Modelling Results and Assumed Pad Heights

Lot	Assumed Building Pad AHD	Floor	Predicted Free Field $L_{A10(18hr)}$ (dB(A))	
			With no noise barriers	With the recommended noise barriers
130	47.78	Ground	57	57
		First	58	58
131	47.82	Ground	57	57
		First	58	58
132	47.67	Ground	57	57
		First	58	58
133	47.59	Ground	57	56
		First	58	57
134	47.13	Ground	56	56
		First	57	57
135	46.81	Ground	56	56
		First	57	57
136	46.7	Ground	56	56
		First	57	57
137	46.46	Ground	56	56
		First	57	57
138	47.51	Ground	56	56
		First	57	57
149	52.72	Ground	57	56
		First	58	57
150	52.98	Ground	56	55
		First	58	57
151	52.98	Ground	56	56
		First	58	57
152	52.9	Ground	56	56
		First	58	57
153	52.65	Ground	56	55
		First	57	56
154	51.98	Ground	56	55
		First	57	56
155	51.84	Ground	55	55
		First	57	56
158	50.62	Ground	55	54
		First	56	55
159	50.7	Ground	56	55
		First	57	56
160	49.7	Ground	55	55
		First	56	56
161	48.91	Ground	55	55
		First	56	55
162	48.13	Ground	55	55
		First	56	55
163	47.52	Ground	55	55
		First	56	56
164	46.84	Ground	55	55
		First	56	56
165	46.07	Ground	55	55
		First	56	56
166	45.28	Ground	55	55

Lot	Assumed Building Pad AHD	Floor	Predicted Free Field $L_{A10(18hr)}$ (dB(A))	
			With no noise barriers	With the recommended noise barriers
		First	56	56
331	49.68	Ground	55	54
		First	56	55
332	49.28	Ground	55	54
		First	56	55
333	48.59	Ground	55	54
		First	56	55
334	48.18	Ground	55	54
		First	56	55
335	47.74	Ground	55	54
		First	56	55
336	47.15	Ground	55	54
		First	56	55
337	46.57	Ground	55	54
		First	56	55
338	46.27	Ground	55	54
		First	56	55
339	45.64	Ground	55	54
		First	56	55
340	44.97	Ground	55	54
		First	56	55
341	45.48	Ground	55	55
		First	56	55
471	53.47	Ground	56	56
		First	58	57
472	54.36	Ground	57	56
		First	59	57
473	54.66	Ground	57	56
		First	59	57
474	54.97	Ground	57	56
		First	59	57
475	55.31	Ground	58	56
		First	59	57
476	55.41	Ground	58	56
		First	60	57
477	55.26	Ground	58	57
		First	60	57
478	54.36	Ground	58	56
		First	60	57
479	53.61	Ground	58	56
		First	59	57
480	52.67	Ground	58	56
		First	59	57
481	51.5	Ground	57	55
		First	59	57
482	50.44	Ground	57	55
		First	58	56
483	50.84	Ground	57	55
		First	59	56
484	51.12	Ground	57	55
		First	59	56

Lot	Assumed Building Pad AHD	Floor	Predicted Free Field $L_{A10(18hr)}$ (dB(A))	
			With no noise barriers	With the recommended noise barriers
490	51.55	Ground	57	55
		First	59	57
491	51.58	Ground	58	56
		First	60	57
492	52.41	Ground	58	56
		First	60	57
493	53.5	Ground	58	56
		First	60	58
494	54.42	Ground	59	57
		First	61	58
495	55.39	Ground	59	57
		First	61	58
496	55.97	Ground	59	57
		First	61	58
497	55.89	Ground	59	57
		First	60	58
498	55.54	Ground	58	57
		First	60	58
499	54.98	Ground	58	57
		First	60	58
500	54.07	Ground	57	56
		First	59	57
501	54.59	Ground	58	57
		First	60	58
502	55.17	Ground	58	57
		First	61	59
503	55.81	Ground	59	58
		First	61	59
504	55.98	Ground	59	58
		First	61	59
505	56	Ground	59	58
		First	61	59
506	56	Ground	59	58
		First	61	59
507	56	Ground	59	58
		First	62	59
508	55.94	Ground	60	58
		First	62	60
509	56	Ground	60	58
		First	63	60
510	55.97	Ground	60	58
		First	63	60
511	55.98	Ground	60	58
		First	62	60
512	55.98	Ground	60	58
		First	62	59
520	48.61	Ground	58	58
		First	59	59
521	49.04	Ground	58	58
		First	60	59
522	49.81	Ground	59	59

Lot	Assumed Building Pad AHD	Floor	Predicted Free Field $L_{A10(18hr)}$ (dB(A))	
			With no noise barriers	With the recommended noise barriers
		First	60	60
523	50.02	Ground	59	59
		First	60	60
524	49.82	Ground	58	58
		First	59	59
525	50.7	Ground	58	57
		First	59	58
526	51.32	Ground	58	57
		First	59	58
527	51.98	Ground	58	57
		First	59	58
528	52.44	Ground	58	57
		First	60	59
529	52.96	Ground	59	58
		First	60	59
530	53.75	Ground	59	58
		First	61	60
531	54.38	Ground	59	58
		First	62	60
532	54.76	Ground	60	58
		First	62	60
533	55.23	Ground	60	59
		First	63	61
534	55.53	Ground	60	59
		First	63	61
535	55.73	Ground	59	58
		First	62	60
536	55.22	Ground	59	58
		First	61	59
537	54.63	Ground	58	57
		First	61	59
538	53.95	Ground	58	57
		First	60	58
539	53.35	Ground	58	57
		First	59	58
540	52.73	Ground	57	57
		First	59	58
541	52.15	Ground	57	56
		First	58	57
542	51.57	Ground	57	56
		First	58	57
543	51.04	Ground	57	56
		First	58	57
544	50.56	Ground	57	56
		First	58	57
545	50.12	Ground	57	56
		First	58	57
546	49.59	Ground	57	56
		First	58	57
547	49.08	Ground	57	56
		First	58	57

Lot	Assumed Building Pad AHD	Floor	Predicted Free Field $L_{A10(18hr)}$ (dB(A))	
			With no noise barriers	With the recommended noise barriers
548	48.49	Ground	57	56
		First	58	57
550	50.32	Ground	60	59
		First	61	60
551	51.19	Ground	59	58
		First	60	59
552	51.78	Ground	58	58
		First	60	59
553	52.28	Ground	58	57
		First	60	59
554	52.89	Ground	59	58
		First	60	59
555	53.52	Ground	59	58
		First	61	60
556	54.02	Ground	59	58
		First	62	60
557	54.4	Ground	60	58
		First	63	60
558	54.88	Ground	60	59
		First	64	61
559	55.35	Ground	61	59
		First	64	61
560	55.81	Ground	62	60
		First	65	62
561	56.48	Ground	63	60
		First	66	63
562	56.93	Ground	64	61
		First	68	64
563	56.78	Ground	64	61
		First	67	63
564	56.38	Ground	63	60
		First	66	62
565	56.17	Ground	62	60
		First	65	62
566	56.11	Ground	61	59
		First	64	61
567	55.85	Ground	61	59
		First	64	61
568	56.95	Ground	71	63
		First	73	73
569	56.7	Ground	68	63
		First	70	69
570	56.38	Ground	67	62
		First	69	66
571	55.92	Ground	66	62
		First	69	66
572	55.64	Ground	66	62
		First	68	65
573	55.3	Ground	65	62
		First	67	65
574	54.84	Ground	65	62

Lot	Assumed Building Pad AHD	Floor	Predicted Free Field $L_{A10(18hr)}$ (dB(A))	
			With no noise barriers	With the recommended noise barriers
		First	67	65
575	54.1	Ground	64	62
		First	65	64
576	53.01	Ground	63	62
		First	64	63
577	51.64	Ground	62	61
		First	64	63
578	52.68	Ground	62	61
		First	64	62
579	53.18	Ground	58	57
		First	61	59
580	53.93	Ground	59	58
		First	63	61
581	54.53	Ground	60	58
		First	65	63
582	54.81	Ground	60	59
		First	65	63
583	55.34	Ground	61	59
		First	66	64
584	55.53	Ground	62	60
		First	67	64
585	55.98	Ground	63	61
		First	67	65
586	56.2	Ground	66	62
		First	69	66
587	56.54	Ground	66	62
		First	70	67
588	56.96	Ground	71	63
		First	73	72
589	57.09	Ground	71	63
		First	73	73
590	57.26	Ground	73	64
		First	75	75
591	57.06	Ground	72	64
		First	74	74
592	56.92	Ground	67	63
		First	71	67
593	56.66	Ground	67	62
		First	70	66
594	56.38	Ground	64	61
		First	69	64
595	56.1	Ground	63	60
		First	67	63
596	56.49	Ground	72	64
		First	75	74
597	55.87	Ground	61	59
		First	65	61
598	55.98	Ground	61	59
		First	64	61
599	55.98	Ground	60	58
		First	63	60

Lot	Assumed Building Pad AHD	Floor	Predicted Free Field $L_{A10(18hr)}$ (dB(A))	
			With no noise barriers	With the recommended noise barriers
610	56.2	Ground	74	64
		First	76	76
611	56.02	Ground	74	64
		First	76	76
612	55.8	Ground	73	64
		First	75	74
613	55.84	Ground	73	63
		First	75	74
614	55.61	Ground	73	63
		First	75	74
615	55.38	Ground	73	64
		First	75	74
616	55.04	Ground	73	63
		First	75	74
617	54.84	Ground	73	64
		First	75	74
618	54.54	Ground	73	63
		First	75	74
619	53.94	Ground	73	64
		First	75	75
620	53.56	Ground	70	63
		First	72	67
621	53.58	Ground	70	63
		First	72	67
622	53.35	Ground	70	63
		First	72	67
623	53.38	Ground	70	63
		First	72	67
624	53.3	Ground	70	63
		First	72	67
625	53.42	Ground	70	63
		First	72	67
626	53.39	Ground	69	62
		First	72	67
627	53.44	Ground	68	62
		First	70	66
628	53.76	Ground	68	62
		First	70	66
629	55.52	Ground	61	59
		First	65	62
630	55.27	Ground	60	58
		First	65	62
631	55.11	Ground	60	58
		First	64	61
632	54.88	Ground	60	58
		First	64	61
633	54.66	Ground	60	58
		First	63	61
634	54.34	Ground	60	58
		First	63	61
635	54	Ground	60	58

Lot	Assumed Building Pad AHD	Floor	Predicted Free Field $L_{A10(18hr)}$ (dB(A))	
			With no noise barriers	With the recommended noise barriers
		First	63	61
636	53.33	Ground	61	58
		First	64	61
637	53.52	Ground	61	58
		First	63	60
638	53.48	Ground	61	58
		First	63	60
639	53.13	Ground	60	58
		First	63	59
640	53.2	Ground	60	57
		First	62	59
641	53.06	Ground	60	57
		First	62	59
642	52.62	Ground	59	57
		First	61	58
643	53.68	Ground	60	58
		First	62	60
644	54.05	Ground	60	58
		First	62	60
645	54.44	Ground	60	58
		First	63	60
646	54.81	Ground	60	58
		First	63	60
647	55.14	Ground	60	58
		First	63	60
648	55.69	Ground	60	58
		First	63	60