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Report No. 04-4349B

**Residential Subdivision
Coach Road West, Morayfield**

Revised Traffic Assessment

COPY #3

September 2004

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Association of Australian Acoustical Consultants

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**Residential Subdivision
Coach Road West, Morayfield
Revised Traffic Assessment**

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SUMMARY

Kalbita Pty Ltd proposes to develop a residential subdivision between Old Coach Road and the Bruce Highway, Morayfield. The property is described as Lot 900 on RP886172, Lot 1 on RP902077 and Lot 103 on RP 886171, Parish of Caboolture.

The local authority is the Caboolture Shire Council (CSC). The Bruce Highway directly adjoins the eastern boundary of the site; rendering the Department of Main Roads (DMR) as a Concurrence Agency.

In April 2003, our office conducted a traffic noise study which addressed the noise impacts on the site in accordance with DMR requirements, and determined appropriate noise controls (Ref. PI/03/4349Rpt – Rev 0). In May 2004, the developer added an additional lot to the development, and we reassessed traffic noise levels across the site to ensure that the requirements of DMR were met for the new layout (Ref. MT/04/4349BRpt – Rev 0).

Recently, the developer has again modified the lot layout of the development, and the design has progressed to including finished lot levels. The purpose of this study is to assess the revised layout and finished lot levels.

The following conclusions and recommendations are given:

- (i) For the anticipated traffic volumes in the year 2014 with no noise barriers in place, the predicted traffic noise levels exceed the DMR criterion of 63dBA (L_{A10} (18 hour)) for a number of lowset dwellings within the development. Upper storeys of highset dwellings on a number of lots would also exceed this criterion.
- (ii) It is recommended that a noise barrier 3m high should be constructed along the eastern lot boundaries with a return along the southern boundary of Lot 448, with the remaining barriers to be 2.4m high, as shown in Figure 4. The detailed description of the proposed barrier locations is presented in Section 8.0. The barriers may be a combination of mound and barrier. DMR will require that this barrier conforms to the requirements and minimum standards of Main Roads' Standard Specification MRS 11.15 *Noise Barriers*.
- (iii) With the proposed barriers in place the DMR criterion would still be exceeded for dwellings constructed on Lots 391, 408 to 412, 417, 422, 424 to 449 and the upper floor of any highset dwellings constructed on Lots 144, 163, 164, 392 to 395, 400 to 407, 413 to 416, 418 to 421 and 423. It is anticipated that DMR will impose their "No House" Covenant to Lots 391, 408 to 412, 417, 422, 424 to 449 and their "Single Storey" covenant to Lots 144, 163, 164, 392 to 395, 400 to 407, 413 to 416, 418 to 421 and 423. The wording of their "No House" and "Single Storey" covenants is presented in Section 8.0.
- (iv) The DMR criterion for outdoor recreational spaces will be achieved throughout the proposed development by the use of the combination of the proposed barriers at the boundary and 2m high courtyard barriers. The criterion for park areas will be achieved in a large portion of parkland area.

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1.0 Introduction

Kalbita Pty Ltd proposes to develop a residential subdivision between Old Coach Road and the Bruce Highway, Morayfield. The location of the site is shown on Figure 1. The subdivision layout is shown in Figure 2.

The property is described as Lot 900 on RP886172, Lot 1 on RP902077 and Lot 103 on RP 886171, Parish of Caboolture.

The local authority is the Caboolture Shire Council (CSC). The Bruce Highway directly adjoins the eastern boundary of the site; rendering the Department of Main Roads (DMR) as a Concurrence Agency.

In April 2003, our office conducted a traffic noise study which addressed the noise impacts on the site in accordance with DMR requirements, and determined appropriate noise controls (Ref. PI/03/4349Rpt – Rev 0). In May 2004, the developer added an additional lot to the development, and we reassessed traffic noise levels across the site to ensure that the requirements of DMR were met for the new layout (Ref. MT/04/4349BRpt – Rev 0).

Recently, the developer has again modified the lot layout of the development, and the design has progressed to including finished lot levels.

The purpose of this report is to present an analysis of the noise impacts associated with the new lot layout and finished pad levels, and to establish the attenuation required to mitigate noise to meet DMR requirements. This assessment has been carried out in accordance with the requirements of the Department of Main Roads - Road Traffic Noise Management: Code of Practice.

2.0 Proposed Development

The site is located on the eastern side of Coach Road West and adjoins the western boundary of the Bruce Highway, as shown in Figure 1.

Figure 2 shows the proposed site layout. The total site area is 12.783ha. It is proposed to develop 80 residential allotments, with some parkland on the northern side of the site, with a nature reserve on the southern end of the site. Access to the site will be via Coach Road West.

3.0 Traffic Noise Criteria

The assessment has been carried out in accordance with Queensland Department of Main Roads (DMR) Code of Practice¹. DMR requires that future traffic noise levels be predicted at a 10 year planning horizon. A summary of the DMR criteria is contained in Table 1.

Table 1: Summary of DMR Traffic Noise Criteria

External Traffic Noise Criteria	
•	63dBA $L_{A10(18\text{hour})}$ ² at any façade where the $L_{A90(8\text{hour})}$ ³ is greater than 40dBA, or
•	60dBA $L_{A10(18\text{hour})}$ at any façade where the $L_{A90(8\text{hour})}$ is less than or equal to 40dBA.
Outdoor Recreational Space	
•	60dBA $L_{A10(18\text{hour})}$ (free-field) where the $L_{A90(18\text{hour})}$ ⁴ is greater than 45dBA, or
•	57dBA $L_{A10(18\text{hour})}$ (free-field) where the $L_{A90(18\text{hour})}$ is less than or equal to 45dBA.
Open Spaces such as Parks	
•	63dBA $L_{A10(12\text{hour})}$ ⁵ (free-field)
Internal Traffic Noise Criteria	
•	Design limit in bedrooms (from AS2107 ⁶) = 35 dBA ($L_{Aeq\text{ night}}$ ⁷)
•	Design limit in living rooms (from AS2107) = 40 dBA ($L_{Aeq\text{ day}}$ ⁸)

¹ Road Traffic Noise Management – Code of Practice, Jan 2000

² $L_{A10(18\text{hour})}$ is the arithmetic average of the 18 hourly measurements of the L_{A10} noise level which corresponds to the A-weighted level which is exceeded for 10 percent of the time between 6am and midnight on a typical weekday.

³ $L_{A90(8\text{hour})}$ is the arithmetic average of the 8 hourly measurements of the L_{A90} measurements exceeded 90% of the time between 10pm and 6am.

⁴ $L_{A90(18\text{hour})}$ is the arithmetic average of the 18 hourly measurements of the L_{A90} measurements exceeded 90% of the time between 6am and midnight.

⁵ $L_{A10(12\text{hour})}$ is the arithmetic average of the 12 hourly measurements of the noise level exceeded for 10 percent of the time between 6am and 6pm on a typical weekday.

⁶ AS2107-2000 *Acoustics - Recommended Design Sound Levels and Reverberation Times in Building Interiors*

⁷ $L_{Aeq\text{ night}}$ refers to the equivalent or energy-averaged noise level at night, over the loudest hour between 10pm and 6am.

⁸ $L_{Aeq\text{ day}}$ refers to the equivalent or energy-averaged noise level during the day and evening, over the loudest hour between 6am and 10pm.

4.0 Methodology

The future traffic noise levels at the site have been predicted using the SoundPLAN computer program. This program uses the CoRTN⁹ algorithms endorsed by DMR.

Traffic volumes have been obtained from DMR. These are presented in Table 2.

Table 2: Traffic Volumes - Bruce Highway

Scenario	AADT	Commercial vehicles	Speed Zone
Existing	66,800vpd	8.4 %	100kph
2014	88,100vpd	8.4 %	100kph

Physical data has been obtained from drawings provided by Perry & Morphett Pty Ltd and aerial photos provided by the Department of Natural Resources. Current and future alignments for the Bruce Highway were obtained from DMR.

In the model, the road surface treatments were assumed to be newly laid 50mm stone mastic asphalt (SMA) for northbound lanes and relatively new dense graded asphalt for southbound lanes. This is in accordance with advice received in 2001 from DMR.

In accordance with good scientific practice, the computer model has been tested and adjusted for this site, by running the model for present day traffic conditions and comparing the model predictions with measured traffic noise levels at the site.

Site noise measurements have also been used to establish a relationship between the L_{A10} (18hour), L_{Aeq} night and L_{Aeq} day parameters.

⁹ CoRTN - 1988 – “Calculation of Road Traffic Noise” Department of Transport, Welsh Office, HMSO 1988

5.0 Traffic Noise Measurements

Existing traffic noise levels have been measured on the site in accordance with AS2702¹⁰. This was conducted by unattended noise logging over a continuous 24-hour period beginning on the afternoon of Thursday 20th March 2003. The test location is shown as Location 1 on Figure 2, approximately 200m from the Bruce Highway.

Test instrumentation consisted of:

- Noise logger, ARL Type EL215 S/N 194411
- Acoustical calibrator, Rion Type NC73 S/N 10813189

The test results are summarised in Table 3. The results are presented graphically in Figure 7.

Table 3: Summary of Traffic Noise Measurements (Free-field)

Parameter	Measured Level dBA*	Difference between $L_{A10,(18\text{Hour})}$ and $L_{Aeq}(\text{Parameter})$
L_{A10} (18 hour)	58.9	-
$L_{Aeq, \text{day}}$	60.3	$L_{A10} (18\text{hour}) + 1.4$
$L_{Aeq, \text{night}}$	58.4	$L_{A10} (18\text{hour}) - 0.5$
$L_{A90(8\text{hour})}$	45.7	N/A
$L_{A90(18\text{hour})}$	54.0	N/A
L_{A10} (12 hour)	58.8	$L_{A10} (18\text{hour}) - 0.2$
$L_{Aeq, 24\text{hr}}$ ¹¹	55.7	$L_{A10} (18\text{hour}) - 3.3$

* It is normal practice to quote decibels to the nearest whole number. Fractions are retained here to minimise any cumulative rounding error.

From the measured $L_{A90(8\text{hour})}$ and $L_{A90(18\text{hour})}$ noise levels in Table 3 and criteria in Table 1, the façade traffic noise criterion is 63dBA $L_{A10(18\text{hour})}$ (façade corrected) and the formal outdoor recreational space criterion is 60dBA $L_{A10(18\text{hour})}$ (free-field).

¹⁰ AS2702 – 1984 *Acoustics - Methods for the Measurement of Road Traffic Noise*

¹¹ $L_{Aeq, 24\text{hr}}$ is the equivalent continuous A-weighted sound pressure level over the 24 hour period

6.0 Model Verification

The existing traffic parameters shown in Table 4 have been used to prepare the SoundPLAN model for current conditions.

Table 4: Existing Traffic Parameters

Parameter	Bruce Highway
Traffic volume (AADT)	66,800 vpd
Derived 18 hour count (94%)	62,752 vpd
Traffic composition	8.4 % commercial vehicles
Speed	100 kph (zoned)
Absorbing ground	100 %

The model prediction for this data is 58.3 dBA $L_{A10(18\text{hour})}$. The measured noise level is 58.9 dBA $L_{A10(18\text{hour})}$. This is within the acceptable tolerance of +/- 2 dBA.

7.0 Prediction of Future Traffic Noise Levels

The computer model for the site has been modified for 2014 traffic conditions as defined in Table 2. The following assumptions have been made:

- 18 hour traffic volume will be 94% of AADT figures;
- road surface treatments will be ten year-old 40mm-50mm Stone Mastic Asphalt (SMA) for northbound and southbound lanes. (Ref: DMR);
- the Bruce Highway will have been widened to six lanes, with the new lanes constructed on the outside of the existing lanes;
- noise predictions include an allowance of 2.5dBA for façade reflection; and
- receivers heights representative of lowset dwellings have been taken to be 1.6m above natural ground contours, while receivers for highset dwellings have been taken to be 4.2m above natural ground contours.
- building envelopes are assumed to be 6 metres from the property frontage, and 15 metres deep;
- earthworks will generally be minimal, and finished level contours have been supplied by the civil engineers;

- building pads will be formed by balanced cut and fill. The pad levels used in the noise model for the building envelopes are shown in Table 5.

Table 5: Pad Levels for Buildings on Lots

Lot Number	Pad Level (m)	Lot Number	Pad Level (m)	Lot Number	Pad Level (m)
143	7.88	396	9.14	423	14.92
144	7.85	397	9.67	424	15.76
145	8.54	398	10.44	425	16.69
146	9.06	399	11.43	426	17.58
147	9.58	400	11.41	427	18.12
148	10.06	401	10.89	428	18.46
149	10.61	402	10.41	429	18.68
150	11.27	403	9.88	430	18
151	11.89	404	9.31	431	17.88
152	12.68	405	8.77	432	17.77
153	13.36	406	8.21	433	17.64
154	14.02	407	7.68	434	17.31
155	12.55	408	7.45	435	16.79
156	11.8	409	7.8	436	16.03
157	10.96	410	8.65	437	15.3
158	10.25	411	9.42	438	14.55
159	9.58	412	10.21	439	13.86
160	9.02	413	9.93	440	13.21
161	8.54	414	10.36	441	12.63
162	8.12	415	11.03	442	12.08
163	7.75	416	11.71	443	11.55
164	7.51	417	11.74	444	10.92
391	7.16	418	12.41	445	10.34
392	7.37	419	12.43	446	9.67
393	7.78	420	12.31	447	8.94
394	8.25	421	13.75	448	8.2
395	8.66	422	13.91	449	7.8

The model has been used to generate noise contour plots over the subdivision with no noise control measures in place. The plot for lowset receptors is shown in Figure 3. These contours include a correction of 0.6 dBA upwards to account for the discrepancy between the measurement result and the model prediction in Section 6.0.

It is evident from Figure 3 that the 63dBA noise contour intrudes onto a majority of the site. A total of 36 lots would exceed the 63 dBA L_{A10} (18 hour) external noise criterion at 1.6m agl. Noise control measures are therefore required.

8.0 Required Attenuation

To achieve the DMR criteria for lowset dwellings would require a barrier 5.8m high above the current natural ground level. The height of this barrier is greater than the maximum specified height prescribed in the Code of Practice. This height is also considered to be impractical in terms of construction and aesthetics, and is unlikely to be accepted by Council.

The barrier height of 5.8m is considered to be impractical. To avoid construction of such a large barrier it is proposed to protect this site by using a combination of a smaller barrier and covenants on lots that exceed the DMR criterion. It is proposed to control noise intrusion onto the site through the construction of a 3m high noise barrier and building controls to design to AS3671-1989¹² on affected lots.

The following barrier design is proposed (shown in Figure 4):

- Barriers 3m high will be constructed along the eastern property boundary adjacent to the Bruce Highway, from the northeast corner of Lot 430 to the southeast corner of Lot 449 and returning to the southwest corner of Lot 449.
- Barriers 2.4m high will be constructed along the southern road boundary (Acemia Drive) from the southwest corner of Lot 449 to the west for a distance of approximately 65m;
- Barriers 2.4m high will be constructed on the northern return, from the northeast corner of Lot 430 to the road boundary and around to the western side of the site.
- Entries to the environmental reserves and park area have been modelled on the northern and southern barrier returns. These openings allow for an access width of approximately 5m.
- Because the barrier is to be constructed near to a State-controlled road, DMR will require the design of this fence to conform to the requirements and minimum standards of Main Roads' Standard Specification MRS 11.15 *Noise Barriers*.

The noise prediction model has been run with the proposed barriers in place. Figures 5 & 6 show the predicted noise levels at lowset and highset dwellings across the development. Figure 7 shows the predicted $L_{A10(12\text{hour})}$ noise levels at 1.5m agl for the undeveloped land on the northern and southern boundaries to be used for environmental reserves and park area.

It can be seen from Figure 5 that with the inclusion of the acoustic barriers described above, compliance with the criterion of 63dBA $L_{A10(18\text{hour})}$ for lowset dwellings is achieved for a significant number of lots, with the exception of Lots 391, 408-412, 417, 422, 424-449.

¹² AS3671-1989 "Acoustics - Road Traffic Noise Intrusion - Building Siting and Construction"

Figure 6 shows the noise contour plot for highset residences with the noise barriers in place. In order to be conservative, all intervening residences have been assumed to be lowset. It is evident from this figure that the 63 dBA L_{A10} (18-hour) covers Lots 144, 163, 164, 391-395, 400-449.

It is expected that DMR will require that any dwellings constructed on Lots 391, 408 to 412, 417, 422, 424 to 449 and the upper floor of any highset dwellings constructed on Lots 144, 163, 164, 392 to 395, 400 to 407, 413 to 416, 418 to 421 and 423 are to be designed and constructed in accordance with AS3671-1989 "Acoustics - Road Traffic Noise Intrusion - Building Siting and Construction".

To meet the requirements of DMR, it is anticipated that DMR will impose their "No House" Covenant to Lots 391, 408 to 412, 417, 422, 424 to 449 and their "Single Storey" covenant to Lots 144, 163, 164, 392 to 395, 400 to 407, 413 to 416, 418 to 421 and 423. The wording of their "No House" and "Single Storey" covenants are presented below.

"No House" Covenant

The landowner shall use a building or buildings to be built on the Lot as a house. The landowner shall not use any part of a building (including a house) on the Lot as a habitable room without the consent of the Covenantee.

The Covenantee must not unreasonably withhold its consent. The only situation in which it will be unreasonable for the Covenantee to withhold its consent is if the landowner at no cost to either the State or local government can mitigate road traffic noise impact so that any building containing a habitable room has:-

- a) indoor noise levels which do not exceed levels recommended in AS/NZS 2107:2000 Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors; and*
- b) has been designed in accordance with AS3671 - 1989 Acoustics - Road Traffic Noise Intrusion - Building Siting and Construction (to achieve compliance with the maximum indoor noise levels recommended by AS/NZS 2107:2000). (The landowner should note that this may require the installation of mechanical ventilation or air conditioning and use of special building materials.)*

"Single Storey" Covenant

The landowner shall use a building or buildings constructed or proposed to be built on the Lot as a house. The landowner shall not use any part of a storey or the whole storey of a building above the ground storey of any building on the Lot as a habitable room without the consent of the Covenantee.

The Covenantee must not unreasonably withhold its consent. The only situation in which it will be unreasonable for the Covenantee to withhold its consent is if the

landowner at no cost to either the State or local government can mitigate road traffic noise impact so that:-

- a) indoor noise levels do not exceed levels recommended in AS/NZS 2107:2000 Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors; and
- b) a storey or storeys above the ground storey are designed in accordance with AS3671 - 1989 Acoustics - Road Traffic Noise Intrusion - Building Siting and Construction (to achieve compliance with the maximum indoor noise levels recommended by AS/NZS 2107:2000). (The landowner should note that this may require the installation of mechanical ventilation or air conditioning and use of special building materials.)

It is understood that DMR will require a "covenant plan" showing the survey plan, noise amelioration conditions, the (finished) pad levels in AHD and the type of covenant (ie "single storey") be developed prior to plan sealing.

To this end, it is expected that, should the finished levels vary substantially (ie by >200mm) than the current design adopted for this assessment, an additional review of the degree of traffic noise intrusion onto the site may need to be conducted using the finished site levels. This subsequent review would normally be conducted after DA but before plan sealing. Note that the ground levels at the building pads for all lots as adopted in the noise model are presented in Table 5 above.

9.0 Outdoor Recreational Areas and Park Areas

The DMR criterion for outdoor recreational spaces is 60 dBA $L_{A10(18\text{ hour})}$ (free-field). This corresponds to a façade-corrected noise level of 63 dBA $L_{A10(18\text{ hour})}$. As can be seen in Figure 5, the predicted external traffic noise criterion of 63dBA $L_{A10(18\text{hour})}$ is achieved on the ground floor at all lots with the exception of Lots 391, 408 to 412, 417, 422, 424 to 449.

By the use of approximately 2m high courtyard barriers in addition to the barriers proposed, the outdoor recreational spaces will be sufficiently protected to achieve the DMR outdoor recreational space noise level criterion of 60 dBA $L_{A10(18\text{hour})}$. Courtyard barriers should be constructed of materials which provide a superficial mass not lower than 10kg/m^2 and have aggregated leakage penetrations not greater than 1% of area.

An example arrangement of courtyard barriers is shown in Figure 8.

The DMR criterion for open spaces such as parks is 63 dBA $L_{A10(12\text{ hour})}$ (free-field). As can be seen in Figure 7, the predicted external traffic noise criterion of 63 dBA $L_{A10(12\text{ hour})}$ is achieved in more than half of the area designated as parkland on the southern end of the site and a small portion of the northern area of the site.

It can be concluded that the DMR criterion for outdoor recreational spaces will be achieved throughout the proposed development by the use of the combination of the proposed barriers at the boundary and 2m high courtyard barriers. The criterion for park areas will be achieved in a large portion of parkland area.

10.0 Conclusions and Recommendations

- (v) For the anticipated traffic volumes in the year 2014 with no noise barriers in place, the predicted traffic noise levels exceed the DMR criterion of 63dBA ($L_{A10(18 \text{ hour})}$) for a number of lowset dwellings within the development. Upper storeys of highset dwellings on a number of lots would also exceed this criterion.
- (vi) It is recommended that a noise barrier 3m high should be constructed along the eastern lot boundaries with a return along the southern boundary of Lot 448, with the remaining barriers to be 2.4m high, as shown in Figure 4. The detailed description of the proposed barrier locations is presented in Section 8.0. The barriers may be a combination of mound and barrier. DMR will require that this barrier conforms to the requirements and minimum standards of Main Roads' Standard Specification MRS 11.15 *Noise Barriers*.
- (vii) With the proposed barriers in place the DMR criterion would still be exceeded for dwellings constructed on Lots 391, 408 to 412, 417, 422, 424 to 449 and the upper floor of any highset dwellings constructed on Lots 144, 163, 164, 392 to 395, 400 to 407, 413 to 416, 418 to 421 and 423. It is anticipated that DMR will impose their "No House" Covenant to Lots 391, 408 to 412, 417, 422, 424 to 449 and their "Single Storey" covenant to Lots 144, 163, 164, 392 to 395, 400 to 407, 413 to 416, 418 to 421 and 423. The wording of their "No House" and "Single Storey" covenants is presented in Section 8.0.
- (viii) The DMR criterion for outdoor recreational spaces will be achieved throughout the proposed development by the use of the combination of the proposed barriers at the boundary and 2m high courtyard barriers. The criterion for park areas will be achieved in a large portion of parkland area.

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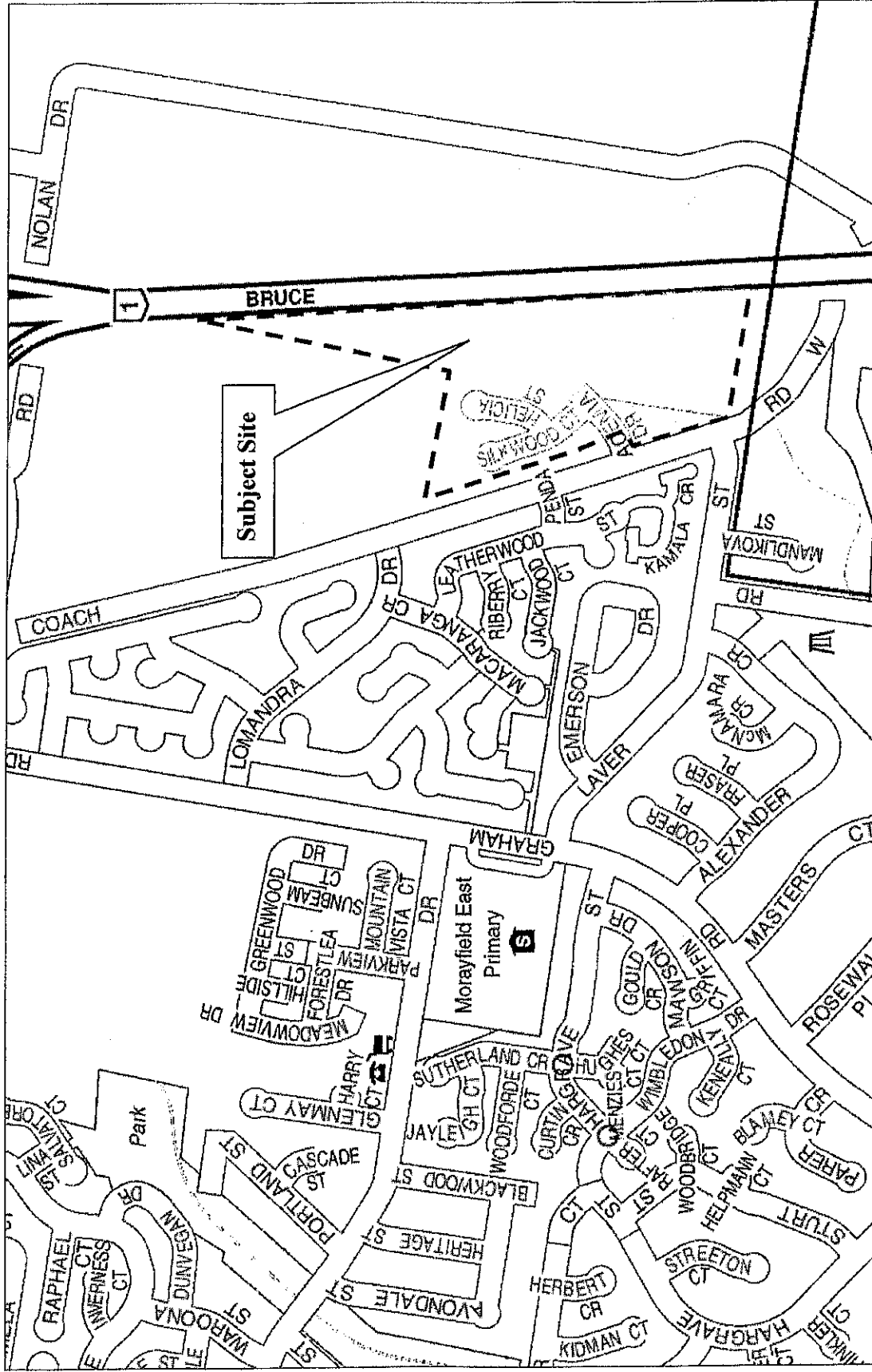


Figure 1: Site Location

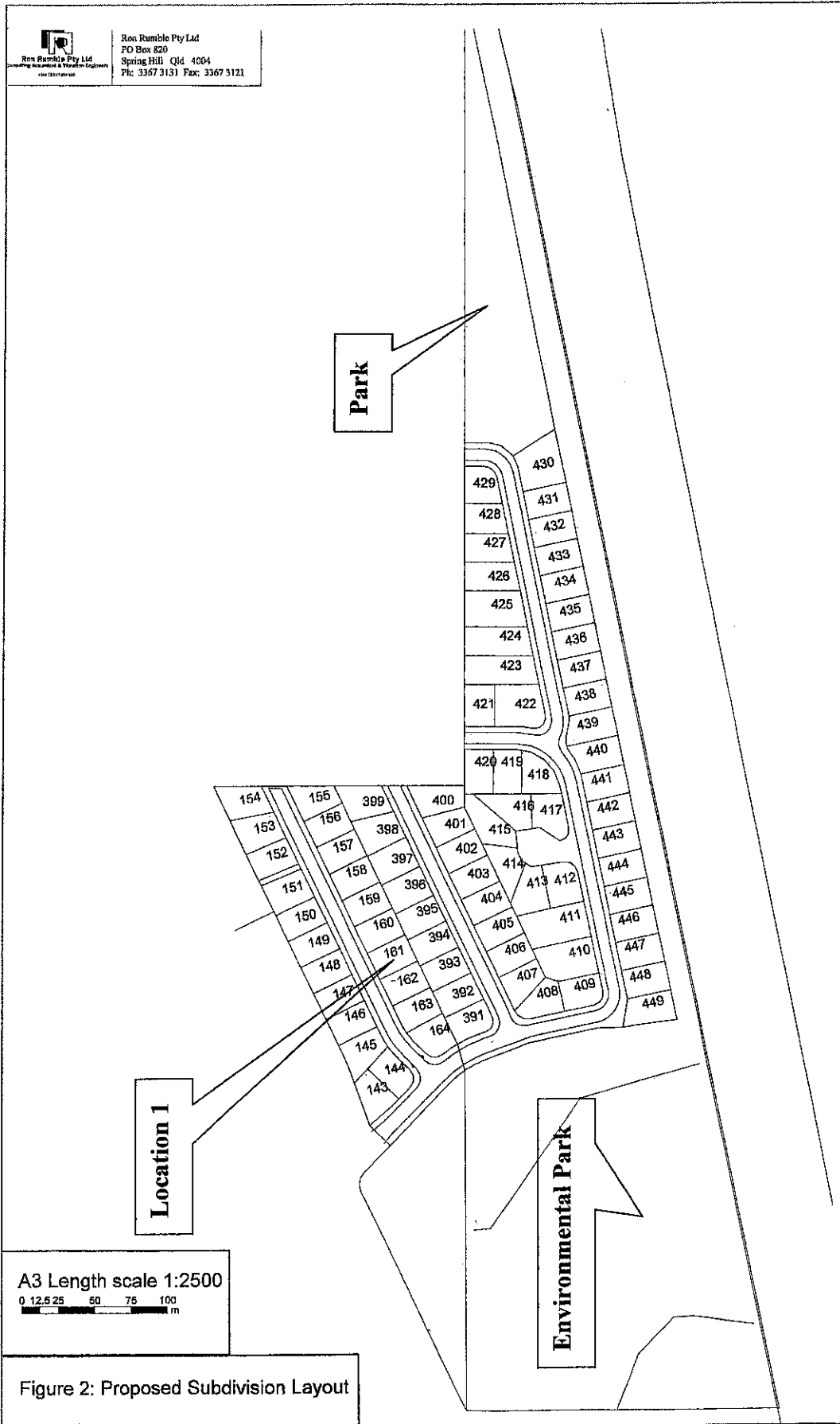
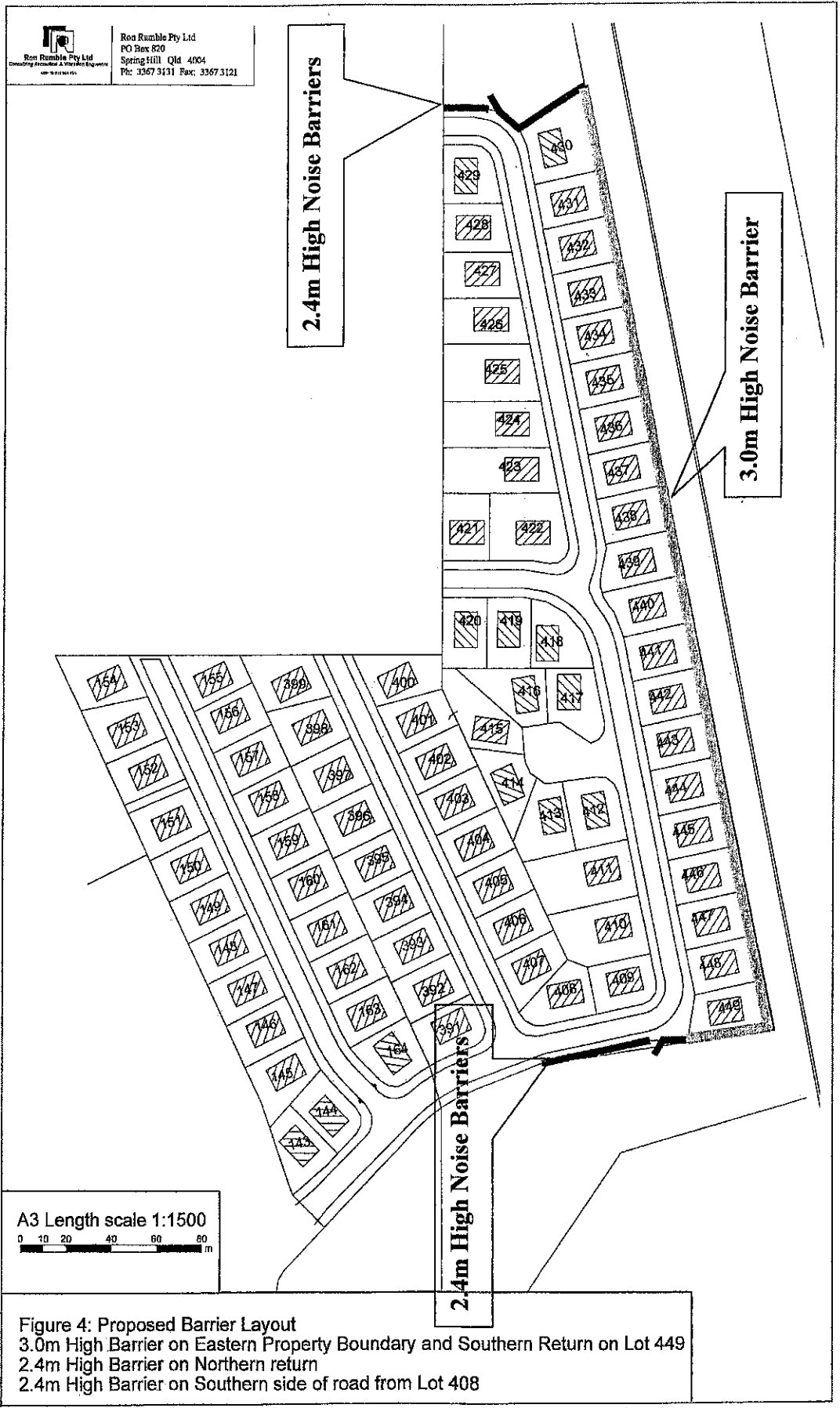


Figure 2: Site Plan

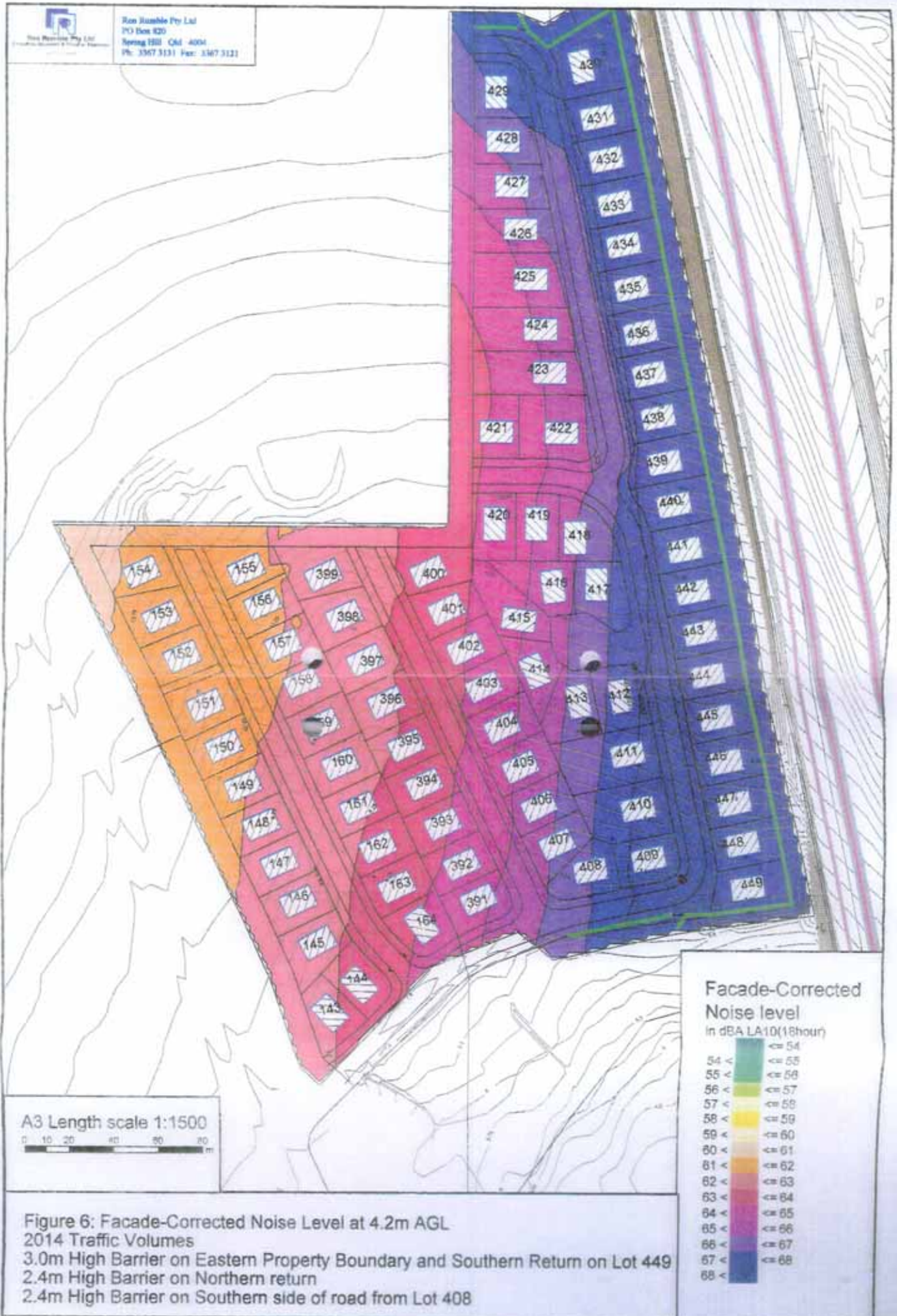


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Figure 4: Proposed Barrier Location



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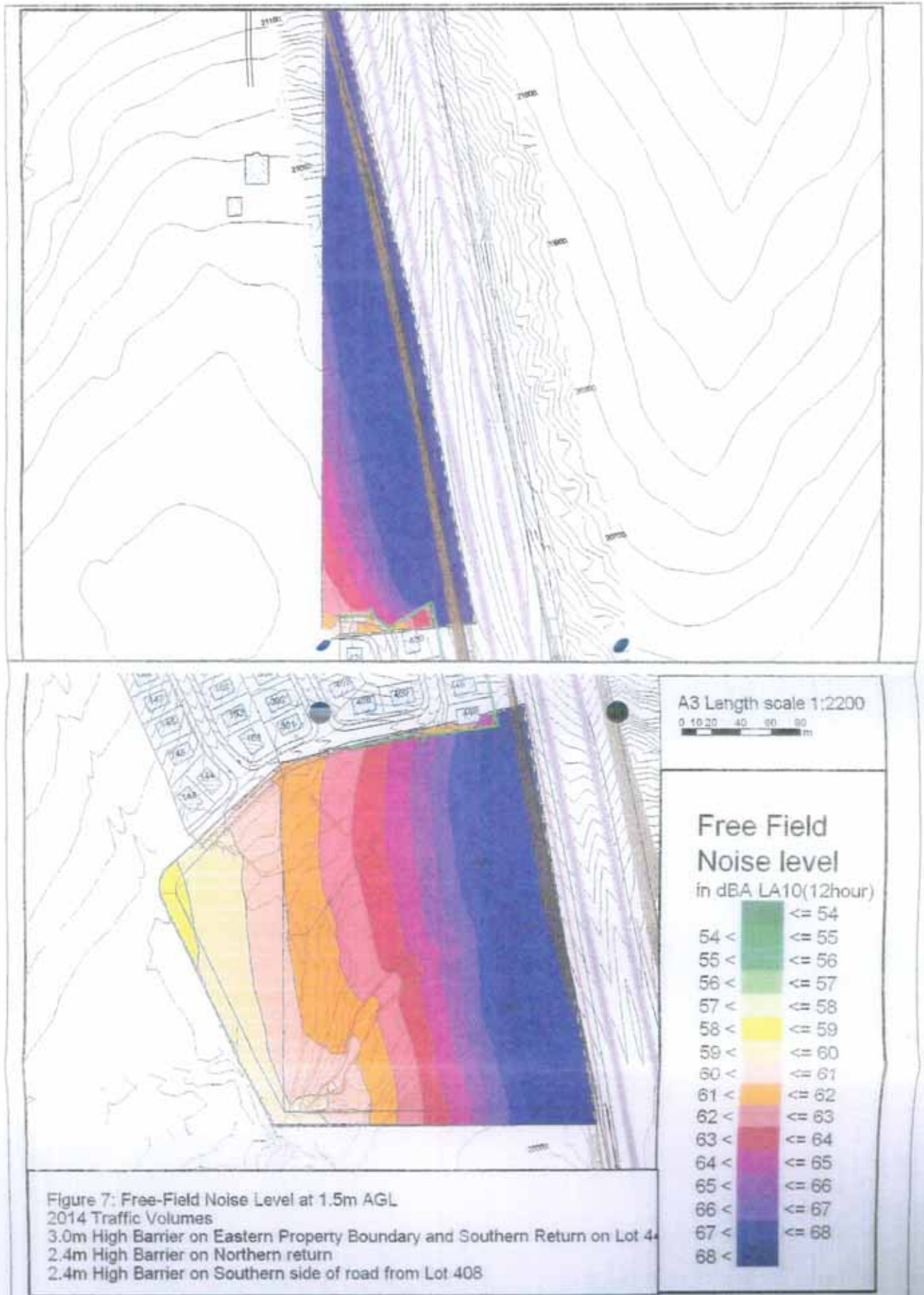
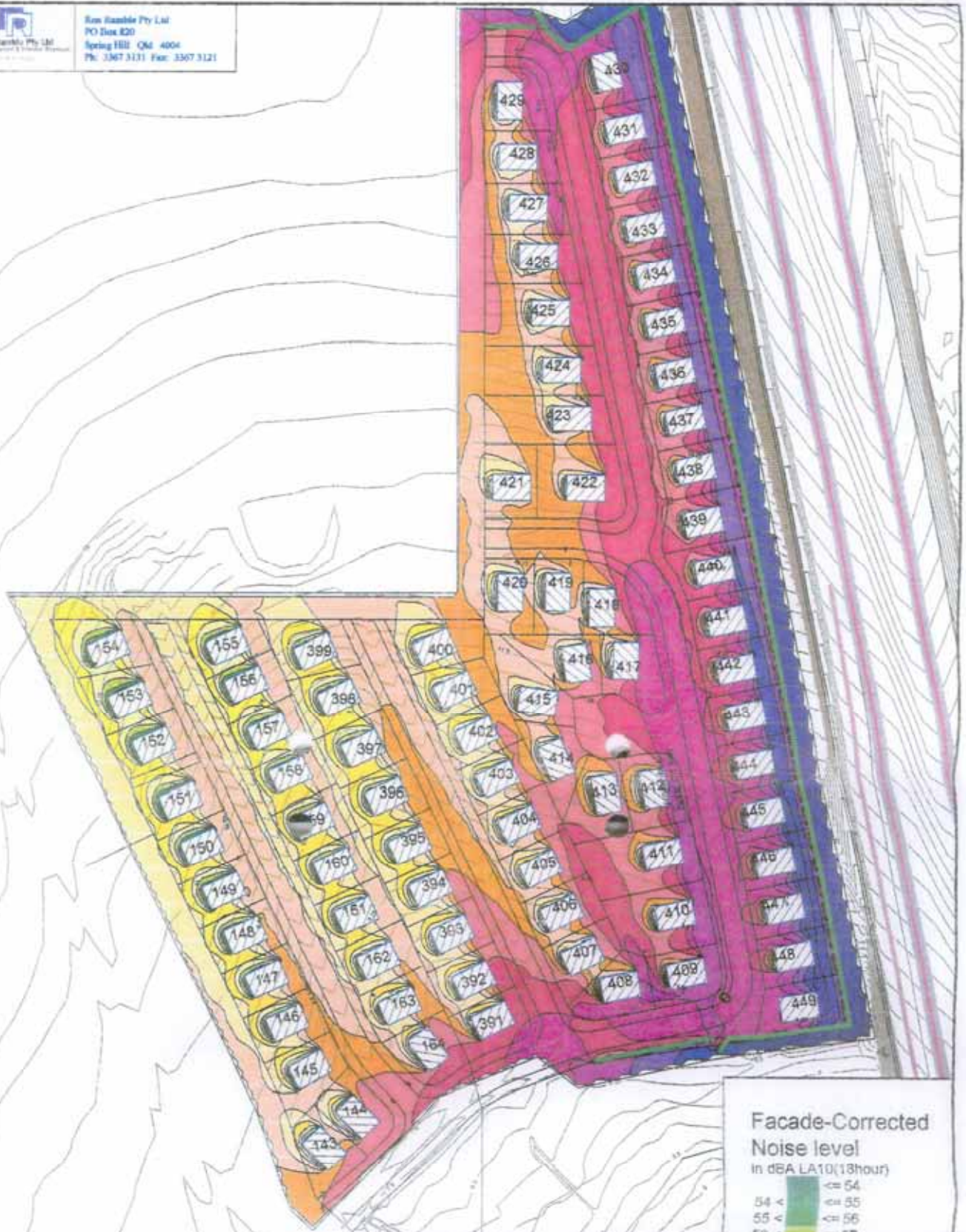


Figure 7: Proposed Barriers - Noise Level Contours @1.5m AGL



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A3 Length scale 1:1500



Facade-Corrected Noise level

in dBA LA10(18hour)

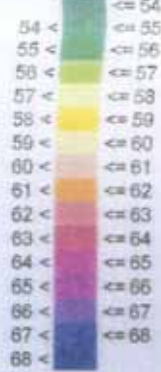


Figure 5: Facade-Corrected Noise Level at 1.6m AGL
 2014 Traffic Volumes
 3.0m High Barrier on Eastern Property Boundary and Southern Return on Lot 449
 2.4m High Barrier on Northern return
 2.4m High Barrier on Southern side of road from Lot 408

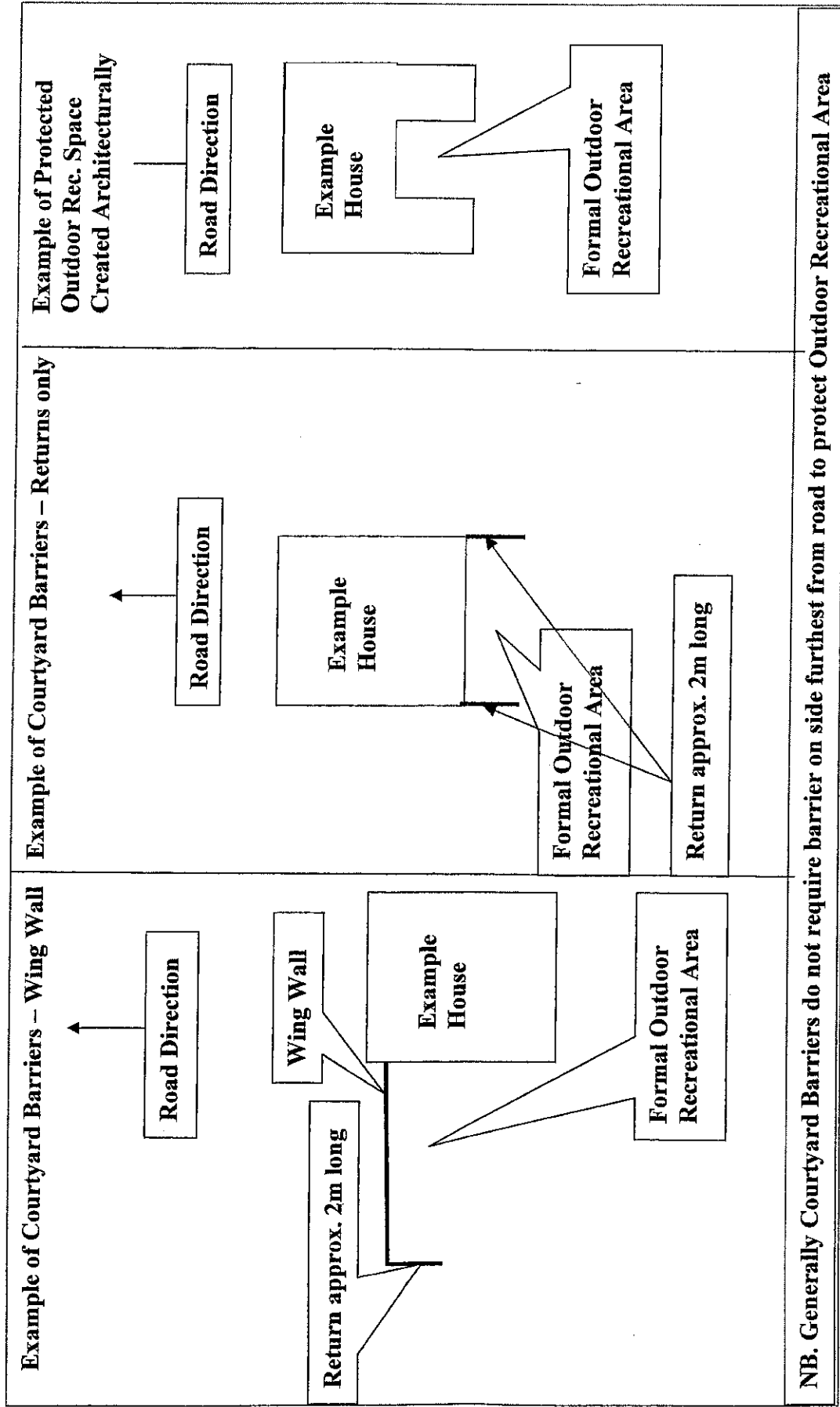


Figure 8: Examples of Courtyard Barriers

Figure 9: Logger Data

