

Appendix Q

Acoustic



Fraser Drive, South Tweed

Acoustic Assessment

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FRASER DRIVE, SOUTH TWEED ROAD TRAFFIC NOISE ASSESSMENT

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Figure 6	Coolangatta Airport ANEF 2020 Contour Plan

1. INTRODUCTION

Villa World Ltd proposes to develop land described as Lot 2 on DP1000385 and Lot 9 on DP1039569, Fraser Drive, South Tweed Heads. Detached and medium density residential properties with parkland are proposed for the 32.9 ha site. The site locality is illustrated in Figure 1 and proposed site layout in Figure 2.

The site is bound:

- to the east by Fraser Drive and partially cleared land forming part of Sullivans Pioneer Park;
- to the south by an established residential area;
- to the west by an established residential area and Terranora Broadwater; and
- to the north by a coastal wetland, cleared land, residential dwellings and Acacia Street.

The majority of the site has been previously cleared for agricultural purposes. The site is currently not being used for any specific purpose with the exception of occasional livestock grazing. Previous land uses include banana farming and other agricultural uses.

In response to an Information Request from the New South Wales Government Department of Planning on 6 November 2006, an Acoustic Assessment report ('Version 1') was prepared for the site. The information request from NSW Planning for the proposed development states the following.

The Environmental Assessment (EA) for the Project Application must include:

Amenity

11.1 demonstrate that the proposal will be designed, constructed, operated and maintained so that there are no adverse impacts on acoustic (including traffic noise) amenity in the locality.

11.2 Address noise issues associated with the proximity of the development to the Coolangatta Airport.

Subsequent changes were made to the site layout, and further detail made available in regards to Fraser Drive alignment and elevation, Fraser Drive being the dominant noise source adjacent to the site. As such, the acoustic assessment was amended with acoustic modelling incorporating these changed parameters to:

- confirm the requirement for acoustic mitigation; and
- verify the suitability of existing recommendations which included a 2.2m acoustic barrier and covenants for building construction.

This report details the findings of the revised acoustic modelling, and provides recommendations based on these findings.

2. METHODOLOGY

To determine potential acoustic issues for the proposed development, the methodology of this revised acoustic assessment comprised the following elements.

1. The plans of the proposed development and Fraser Drive were reviewed to determine proposed design changes.
2. Predicated future traffic noise levels at the site were re-modelled using the Propagation of Environmental Noise Model Version 1.9.8 (PEN3d2000), developed by ASK Software Engineers Pty Ltd which is based on 'the Calculation of Road Traffic Noise (CORTN)' equation (HMSO, London 1988).

PEN3d2000 is capable of calculating SPL for receivers at a variety of heights from multiple noise sources while accounting for site specific environmental characteristics such as ground level contours and weather conditions.

This model was calibrated before use by running the model with current traffic data and the measured SPL at the site. Traffic count data was obtained from a traffic logger located along Fraser Drive.

Using the traffic data (annual average daily traffic, 'AADT') and growth predictions, the ultimate traffic volumes over a 10- year planning horizon were calculated for 2019. The model was run using this data to predict future road traffic noise impacts on the proposed residential development. Traffic parameters for Fraser Drive, as utilised in acoustic modelling, are presented in Table 1.

Table 1 Traffic Data Parameters – Fraser Drive

Parameter	Value
AADT (24 hours) (2006) (vpd)	7,345
AADT (18 hours) (assumed as 93% of 24 hr AADT) (2006) (vpd)	6,830
% Heavy vehicles (2006)	5
AADT (24 hours) (2019) (vpd)	11,487
AADT (15 hours) (assumed as 93% of 24 hr AADT) (2019) (vpd)	10,682
% Heavy vehicles (2019)	5
% Growth Rate used to predict AADT for 2019	3.5
Pavement surface type	Dense Graded Asphalt
Vehicle speed	60 km/hr

Modelling incorporated design contours for Fraser Drive and the development site.

The results of the modelling were assessed against the following guidelines:

- Environmental Authority of NSW - *Environmental Criteria for Road Traffic Noise* (1999) ('ECRTN');
- Australian Standard AS/NZS 2107-2000: *Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* ('AS 2107');

- Australian Standard AS/NZS 3671-1989: *Acoustics – Road traffic noise intrusion – Building siting and construction* ('AS 3671'); and
 - Australian Standard AS 2021-1985: *Acoustics – Aircraft Noise Intrusion – Building Siting and Construction* ('AS 2021').
3. A discussion of the noise modelling was offered, and appropriate noise mitigation measures were recommended to limit impacts from road traffic if required.

3. ACOUSTIC QUALITY OBJECTIVES

3.1 External Acoustic Quality Objectives

The acoustic quality objectives for the proposed residential development adjacent to a Fraser Drive, a Collector Road, will be 60 dB(A) $L_{Aeq(15hr)}$ as in accordance with the ECRTN. This objective also applies to Parks and Formal Outdoor Areas.

3.2 Internal Acoustic Quality Objectives

Where the external acoustic quality objective for residential developments cannot be achieved, internal maximum design criterion levels as specified in Table 1 of AS 2107 apply.

For the purposes of the proposed development, the internal acoustic quality objective will be 40 dB(A) $L_{Aeq,T}$ for houses near a major road. AS 2107 defines the internal acoustic quality objective as L_{Arec} (the recommended indoor sound level); therefore the indoor acoustic quality objective will hereafter be referred to as L_{Arec} .

4. RESULTS AND DISCUSSION

4.1 Background Noise Levels

To determine the background noise environment, two noise loggers were placed on the site over a three day period from Monday 4 December to Wednesday 6 December 2006. Measurement Location 1 (ML1) was located 5 metres from the edge of Fraser Drive with measurement location 2 (ML2) being located at the rear of the development. The location of the noise loggers are indicated on Figure 2.

Over the three day monitoring period, Tuesday 5 December 2006 was determined to have the highest measured $L_{A10,18hr}$. Based on these measurements Tuesday 5 December was used to calibrate the noise model PEN3d2000.

The measured SPLs for Tuesday 5 December 2006 for ML1 and ML2 are detailed below in Tables 2 and 3 below.

Table 2 Results of Noise Monitoring, 5 December 2006 (ML1)

Road Traffic Noise Descriptor	Time Period	Sound Pressure Level dB(A)
$L_{A10,18hour}$	6am to 12am	70.1
$L_{A90,8hour}$	10pm to 6am	43.5
$L_{Aeq,15hour}$	7am to 10pm	67.2
$L_{Aeq,1hour}$	6am to 7am	68.2
$L_{Aeq,1hour}$	7am to 8am	70.8

Table 3 Results of Noise Monitoring, 5 December 2006 (ML2)

Road Traffic Noise Descriptor	Time Period	Sound Pressure Level dB(A)
$L_{A10,18hour}$	6am to 12am	55.4
$L_{A90,8hour}$	10pm to 6am	47.1
$L_{Aeq,15hour}$	7am to 10pm	54.6
$L_{Aeq,1hour}$	5am to 6am	53.6
$L_{Aeq,1hour}$	7am to 8am	56.7

4.2 Results of Validation Modelling

The model was validated using the predicted 2006 AADT data.

The results of the model validation exercise are presented below.

Measured $L_{A10,18hour}$ SPL (ML1)	70.1 dB(A)
Predicted $L_{A10,18hour}$ SPL (ML1)	70.3 dB(A)

The model was determined to accurately predict the actual SPL at the monitoring location, over-predicting the actual SPL by 0.2dB(A). The agreement between the modelled and the actual SPL is within therefore within the allowable 2 dB(A) deviation specified in the ECRTN.

Modelling was then carried out with the traffic count data adopted for a 10 year traffic planning horizon from the date of commencement of use (2019) to determine the SPLs over the site for the ground floor and first floor of future units.

The finished building pad levels of the future units have not been determined at this stage so to account for an assumed slab depth of 0.3 metres, receiver heights were assumed to be 1.8 metres above the existing ground contour levels for the ground floor, and 4.6 metres above the existing ground contour levels for the first floor of future units.

4.3 Predicted Road Traffic Noise Levels

Noise modelling was carried out to determine SPLs over the site for ground floor and first floor receivers for 2019 to determine compliance with the external acoustic objective of 60 dB(A) ($L_{Aeq(15hr)}$). Modelled output SPL values ($L_{A10(18hr)}$) were converted to $L_{Aeq(15hr)}$ by the standard relationship defined in AS 3671: $L_{Aeq(T)} = L_{A10(T)} - 3dB(A)$. Table 4 presents results of adjusted SPL values calculated for the following modelling scenarios.

- Ground and first floor without acoustic amelioration.
- Ground and first floor with a 10 metre ('m') offset from the site boundary adjacent to Fraser Drive.
- Ground and first floor with a 10m offset and an acoustic barrier located along the site boundary adjacent to Fraser Drive of 2.2m in height.

It is relevant to note that point receivers were placed intermittently throughout the site to gain a representative perspective of expected noise levels at certain lots (and labelled according to that lot's number). Although not all lots were represented in point receiver modelling, non-compliance for non-represented lots could be determined through use of sound contour lines.

Table 4 Predicted 2019 SPLs ($L_{Aeq(15hr)}$) for Ground and First Floors

Point Receiver No.	$L_{Aeq(15hr)}$, dB(A)					
	Ground Floor	First Floor	Ground Floor - 10m offset	First Floor - 10m offset	Ground Floor - 10m offset, 2.2m barrier	First Floor - 10m offset, 2.2m barrier
IH1	55.5	57.3	54.2	57.3	55.3	57.3
IH2	55.1	56.9	54.2	56.9	55.0	56.9
IH3	54.9	56.8	54.1	56.7	54.8	56.7
IH4	55.9	57.9	54.0	56.7	55.7	57.8
IH5	55.0	56.9	53.6	56.6	54.5	56.4
IH6	51.4	53.2	51.5	53.1	51.3	53.1
IH7	51.6	53.5	51.7	53.4	51.5	53.4
IH8	51.8	53.6	51.8	53.4	51.6	53.3
IH9	52.1	53.8	52.1	53.6	52.0	53.6
IH10	52.3	53.9	52.3	53.6	52.1	53.5
IH11	48.3	50.0	48.7	49.9	48.3	49.9
IH12	48.1	49.5	48.5	49.5	48.1	49.4
IH13	48.6	49.8	48.8	49.6	48.5	49.6

Point Receiver No.	L _{Aeq(15hr)} , dB(A)					
	Ground Floor	First Floor	Ground Floor - 10m offset	First Floor - 10m offset	Ground Floor - 10m offset, 2.2m barrier	First Floor - 10m offset, 2.2m barrier
IH14	49.1	50.5	49.4	50.3	49.1	50.3
PRK1	60.2	-	55.8	-	55.7	-
PRK2	60.8	-	59.1	-	59.1	-
1	58.7	61.3	56.8	62.3	55.6	61.6
4	56.8	59.1	53.6	55.1	53.6	55.0
9	60.1	61.8	51.0	52.0	50.8	51.9
18	54.0	55.5	60.0	62.2	59.6	62.3
23	55.8	56.9	58.7	61.3	58.7	61.3
31	56.4	57.5	52.8	53.5	52.8	53.5
35	55.3	56.1	50.2	51.0	50.2	51.0
48	56.0	56.6	55.3	56.1	55.3	56.1
51	50.9	52.2	56.5	59.1	56.5	59.1
52	51.2	52.0	56.4	57.5	56.4	57.5
72	50.2	51.0	51.2	52.0	51.1	52.0
84	52.8	53.5	49.2	49.8	49.2	49.8
88	52.8	53.3	52.8	53.3	52.8	53.3
95	49.2	49.8	59.4	61.1	59.2	61.1
102	62.2	62.9	56.0	56.5	55.9	56.5
104	54.8	56.1	60.4	62.2	59.9	62.2
107	50.1	50.7	54.0	54.6	54.0	54.6
109	61.1	62.8	53.4	53.9	53.4	53.8
111	54.1	54.8	53.0	53.4	53.0	53.4
112	51.3	52.4	60.3	61.9	60.2	62.0
114	56.9	57.8	56.8	57.7	56.7	57.7
116	55.5	56.5	55.4	56.5	55.4	56.5
119	53.5	53.9	55.8	57.0	55.8	57.0
121	53.0	53.5	57.4	57.9	57.4	57.9
123	50.7	51.3	56.5	57.1	56.5	57.1
125	50.5	51.0	60.2	62.4	59.0	62.4
127	61.9	63.2	60.8	62.0	60.7	62.0
130	59.1	61.7	60.1	61.4	60.0	61.4
133	55.9	57.0	60.5	61.7	60.4	61.7
135	61.3	62.8	58.7	60.8	57.9	60.8
136	60.2	62.0	46.7	48.8	46.7	48.8
138	57.4	57.9	44.4	46.0	44.4	46.0
141	56.5	57.1	52.3	52.9	52.3	52.9
143	52.7	53.3	52.5	53.1	52.5	53.1
144	52.4	53.0	43.4	44.3	43.4	44.3
147	61.4	62.3	50.5	51.0	50.5	50.9
150	60.0	61.3	50.7	51.2	50.6	51.2
152	47.0	49.1	51.2	52.3	51.2	52.3
155	44.5	46.1	54.8	56.1	54.8	56.0
157	43.4	44.3	50.1	50.7	50.1	50.7

Note - **Bold** values denote non-compliance with external acoustic quality objective.

(IH) denotes lots within the Integrated Housing area.

(PRK) denotes Park areas.

4.4 Compliance with External Objective

Modelling results for the ground and first floor without acoustic amelioration showed that the external objective could not be complied with at some lots, particularly for those lots sharing a common boundary to Fraser Drive. Table 4 shows that the predicted SPLs for the ground floor of point receivers 9, 102, 109, 127, 135, 136, 147 are non-compliant with the external objective, with a maximum exceedance of 2.2 dB(A). For the first floor, point receivers 1, 9, 102, 109, 127, 130, 135, 136, 147, 150 were found to be non-compliant with the external objective, with a maximum exceedance of 3.2 dB(A). Further, non-compliance at both Park 1 and Park 2 was experienced, with a maximum exceedance of 0.8 dB(A). Figure 3 graphically illustrates these results.

As a number of predicted SPLs were non-compliant with the external objective where no acoustic amelioration was present, a 10m offset from the site boundary adjacent to Fraser Drive was introduced to determine its influence on non-compliant lots. Table 4 shows for the ground floor, point receivers 18, 104, 112, 125, 125, 127, 130 and 133 were non-compliant with the external objective, with a maximum exceedance of 0.8 dB(A). For the first floor, point receivers 1, 18, 23, 95, 104, 112, 125, 125, 127, 130, 133 and 135 were found non-compliant with the external objective, experiencing a maximum exceedance of 2.4 dB(A). Point receivers at both Park 1 and Park 2 measured SPL values that were compliant with the external objective at 10m from the site boundary. Figure 4 graphically illustrates these results.

It is noted that the maximum exceedance predicted for both the ground and first floors with use of an offset were reduced compared to those where no acoustic amelioration was involved. It is also noted that some increase in SPL was experienced with a 10m offset, attributed to different ground contours at specific point receivers; however, an overall decrease in SPL was experienced in this scenario.

As a number of SPL exceedance with a 10m offset from the site boundary were predicted, a 2.2m high acoustic barrier was located along the site boundary adjacent to Fraser Drive, in addition to the offset, to determine its influence on predicted SPL values and compliance with the external objective. Table 4 shows that for the ground floor, SPL values in non-compliance with the external objective were experienced at point receivers 112, 127 and 133, with a maximum exceedance of 0.7 dB(A). For the first floor, exceedance was predicted at point receivers 1, 18, 23, 95, 104, 112, 125, 127, 130, 133 and 135, with a maximum exceedance of 2.4 dB(A). Figure 5 graphically illustrates these results.

4.5 Compliance with Internal Objective

As number of predicted SPL values were found to exceed the external objective for the three modelled scenarios, compliance with L_{rec} was determined for each. AS 3671 specifies Total Noise Reduction ('TNR') as the noise reduction required to achieve L_{rec} (for those point receivers not in compliance with the external objective), where:

$$TNR = L_{Aeq(T)} - L_{Arec} \text{ dB(A)}.$$

Table 5 shows the TNR required for the three modelling scenarios, including: no acoustic amelioration, 10m offset, and 10m offset with 2.2m barrier.

Table 5 TNR Required for Ground and First Floors of Modelling Scenarios

Point Receiver No.	L _{Aeq(15hr)} , dB(A)					
	Ground Floor	First Floor	Ground Floor - 10m offset	First Floor - 10m offset	Ground Floor - 10m offset, 2.2m barrier	First Floor - 10m offset, 2.2m barrier
1	20.2	22.4	16.8	22.3	15.6	21.6
18	20.8	22.8	20.0	22.2	19.6	22.3
23	-	21.3	-	21.3	-	21.3
95	20.1	21.8	19.4	21.1	19.2	21.1
104	22.2	22.9	20.4	22.2	19.9	22.2
112	21.1	22.8	20.3	21.9	20.2	22.0
125	21.9	23.2	20.2	22.4	19.0	22.4
127	21.3	22.8	20.8	22.0	20.7	22.0
130	20.2	22.0	20.1	21.4	20.0	21.4
133	21.4	22.3	20.5	21.7	20.4	21.7
135	-	21.3	-	20.8	-	20.8

Although the offset and offset/acoustic barrier combination scenarios both allowed for a greater reduction of predicted SPL values compared to those experienced with no acoustic amelioration, the reduction was considerably minor. As shown in Table 5, the maximum TNR for the scenario with no acoustic amelioration was calculated as 23.2 dB(A), in comparison with a maximum TNR of 22.4 dB(A) calculated for both the offset and offset/acoustic barrier scenarios. The TNR for those point receivers with predicted SPL not in compliance with the external objective does not exceed 25 dB(A) for all three scenarios.

With a 0.8 dB(A) difference between the maximum TNRs, the offset and offset/acoustic barrier scenarios were not found to significantly reduce the predicted external SPL at nominated lots, and therefore, are not considered effective nor economic options for noise mitigation at this site.

As such, specialised construction will be required for the scenario with no other acoustic amelioration to ensure compliance with L_{rec}.

4.6 Construction Category Requirements

Noise contours shown in Figure 3, in combination with Table 5 demonstrate that all lots directly adjacent to Fraser Drive (Lots 1, 14 – 25, 51, 95, 103 -106, 112 - 113, and 125 – 135) will require specialised construction to achieve compliance with L_{rec}.

AS 3671 designates that Construction Category 2 will be required where the TNR >10 dB(A) and ≤ 25 dB(A), and describes Construction Category 2 as:

“Standard construction, except for lightweight elements such as fibrous cement or metal cladding or all-glass facades. Windows, doors and other openings must be closed.”

Resultantly, to ensure the L_{rec} is achieved for those lots found not to comply with the external objective, Lots 1, 14 – 25, 51, 95, 103 -106, 112 - 113, and 125 – 135 will require the application of Construction Category 2. Implementation of a building covenant is recommended to ensure Construction Category 2 is implemented for all relevant lots. Furthermore, because the reduction in noise achieved by Construction Category 2 relies on all windows and doors being kept closed, air conditioning will also need to be specified in covenants applying to these lots.

5. AIR CRAFT NOISE

Aircraft noise is a factor which has attracted a great deal of community attention in the vicinity of airports. Noise can be generated in a community from a number of different sources, however, in the proximity of air fields, aircraft noise is often the loudest and most readily identifiable single source of noise.

The Australian Noise Exposure Forecast (ANEF) system has been endorsed by the Australian Government to be used as the basis for land use planning for the areas in the vicinity of Australian airfields and is documented in the Australian Standard AS2021 – 2000 Acoustics – Aircraft Noise Intrusion – Building Siting and Construction. ANEF contours represent increased exposure to aircraft noise with increasing value of the contour. The standard identifies suitable land uses within the various ANEF zones.

Figure 6 represents the ANEF contours for the area surrounding the Coolangatta Airport in the year 2020. This figure also illustrates the location of the site and shows that the site lies outside of the 20 ANEF contour.

As stated in AS 2021, if the site is outside the 20 ANEF contour, noise from sources other than aircraft may dominate. The construction of proposed buildings, therefore, does not require specific design to provide protection against aircraft noise intrusion. The main source of noise at the site is road traffic noise from Fraser Road and this has been assessed in this report.

6. RECOMMENDATIONS AND CONCLUSIONS

Villa World Ltd proposes to develop a noise-sensitive land-use described as Lot 2 on DP1000385 and Lot 9 on DP1039569, Fraser Drive, South Tweed Heads. The site is located adjacent to Fraser Drive, a major road in South Tweed Heads.

In response to an Information Request from the New South Wales Government Department of Planning, an Acoustic Assessment report (Version 1) was prepared for the site. Subsequent changes were made to the site layout, and further detail made available in regards to ground contours for Fraser Drive. Resultantly, the acoustic assessment was amended with revised acoustic modelling incorporating these changed parameters. Version 1 of this report recommended the use of a 2.2m acoustic barrier along the site boundary, and specified building construction requirements for future dwellings on the site. This revised acoustic amendment has determined the suitability of such recommendations as described below.

This results of the revised modelling showed reduced SPL values to those predicted in Version 1. A number of modelling scenarios were run, the results of which showed that the external acoustic quality objective would be exceeded with no noise amelioration, with the use of a 10m offset from the site boundary, and with use of the 10m offset and a 2.2m acoustic barrier. It was found that the 10m offset and offset combined with acoustic barrier did not provide significant noise reduction, and were not recommended for noise mitigation purposes at the site.

As a number of predicted SPL values did not comply with the external objective, predicted noise levels were considered against the internal acoustic quality objective. Traffic Noise Reduction values to achieve the internal objective were determined in accordance with AS 3167. Lots 1, 14 – 25, 51, 95, 103 -106, 112 - 113, and 125 – 135 were found to require architectural treatment equivalent to Construction Category 2 to limit intrusiveness of traffic noise.

The site lies outside of the 20 ANEF contour surrounding the Coolangatta Airport in the year 2020. As stated in AS 2021, if the building site is outside the 20 ANEF contour, noise from sources other than aircraft may dominate. Resultantly, mitigation against aircraft noise intrusion will not be required.

Based on the findings of this acoustic assessment, the following recommendations are offered.

- Preparation of a building covenant requiring the Lots 1, 14 – 25, 51, 95, 103 -106, 112 - 113, and 125 – 135 to be constructed using Construction Category 2, as defined by AS 3167, and air conditioning to be installed at dwellings on these lots.

FIGURES

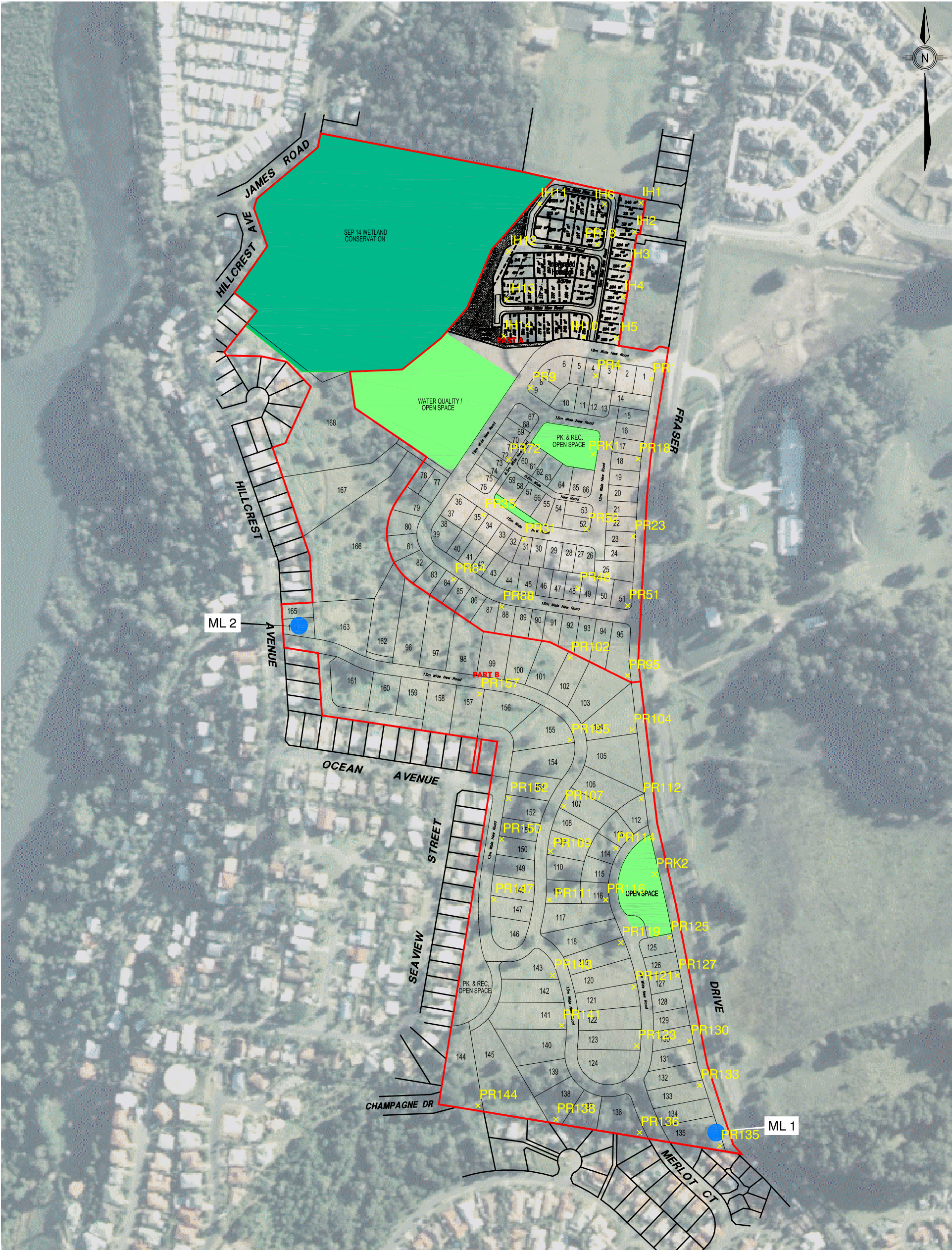
- Figure 1** **Locality Plan**
- Figure 2** **Proposed Site Layout**
- Figure 3** **Predicted SPL Contours ($L_{Aeq(15hour)}$) for Ground and First Floor**
- Figure 4** **Predicted SPL Contours ($L_{Aeq(15hour)}$) for Ground and First Floor with 10m Offset**
- Figure 5** **Predicted SPL Contours ($L_{Aeq(15hour)}$) for Ground and First Floor with 10m Offset and 2.2m Acoustic Barrier**
- Figure 6** **Coolangatta Airport ANEF 2020 Contour Plan**



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Scale 1:20,000 (A4)
FIGURE 1
LOCALITY PLAN



Proposed development as per "Proposed Layout Fraser Drive Tweed Heads",
Plan Ref. 20934-5, Drg.No. 20934,
PMM BRISBANE PTY LTD, 22 November 2006

LEGEND

-  Site Boundary
-  Measurement Location (ML)
-  PR138 Point Receiver (PR)
-  IH2 Integrated Housing Point Receiver

40 0 40 80 120 160 200m 1:4000

Scale 1:4000 (A3)

**FIGURE 2
PROPOSED SITE LAYOUT**

Project No.: 7214/29

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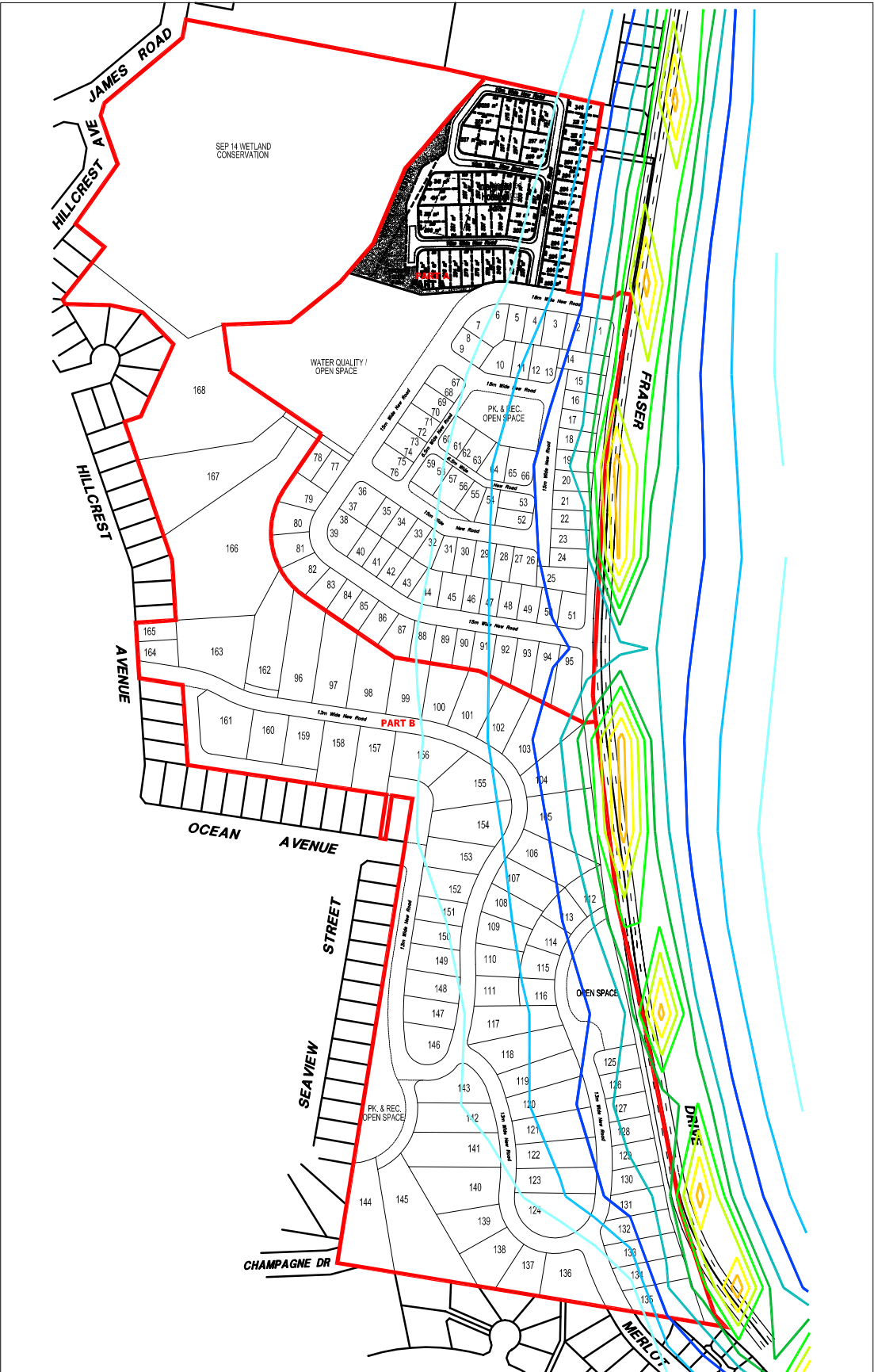
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XREFs:

PRINT DATE: 05 June, 2008 - 4:50pm

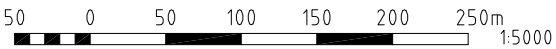
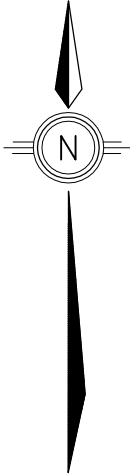
GROUND FLOOR

- LEGEND
- Stage Boundary
 - 57.5 dB(A)
 - 60.0 dB(A)
 - 62.5 dB(A)
 - 65.0 dB(A)
 - 67.5 dB(A)
 - 70.0 dB(A)
 - 72.5 dB(A)
 - 75.0 dB(A)
 - 77.5 dB(A)



FIRST FLOOR

- LEGEND
- Stage Boundary
 - 57.5 dB(A)
 - 60.0 dB(A)
 - 62.5 dB(A)
 - 65.0 dB(A)
 - 67.5 dB(A)
 - 70.0 dB(A)
 - 72.5 dB(A)
 - 75.0 dB(A)
 - 77.5 dB(A)



Scale 1:5,000 (A3)

FIGURE 3

PREDICTED SPL CONTOURS(L_{Aeq}(15hours)) FOR GROUND AND FIRST FLOOR

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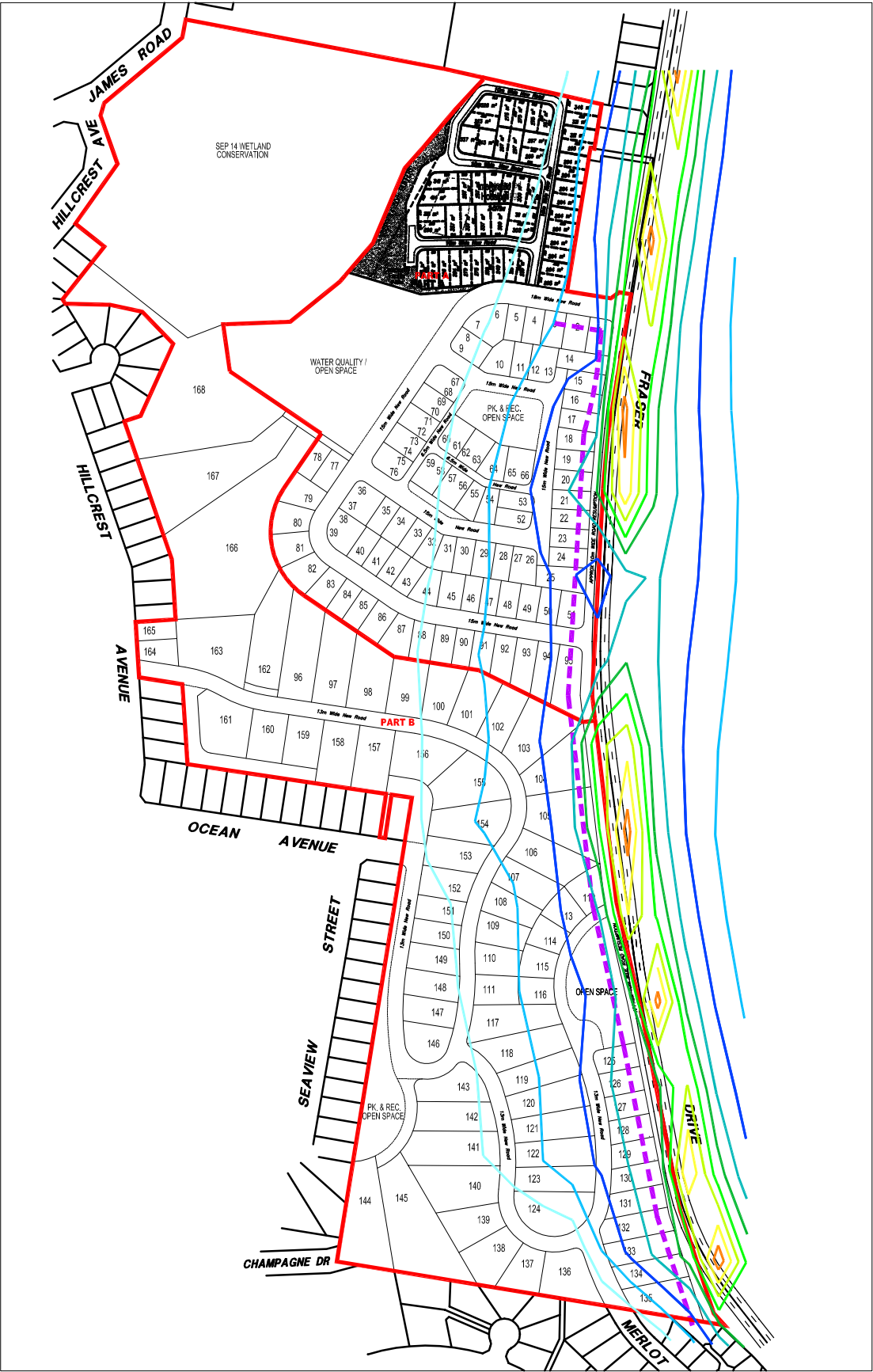
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CAD FILE: I:\7214-29\Acoustic Assessment\Figure 3 - Predicted SPL contours(L_{Aeq}(15hours)) for ground and first floor.dwg
XREF's:

Project No.: 7214/29

PRINT DATE: 10 June, 2008 - 10:20am

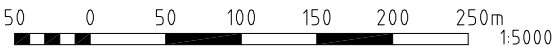
GROUND FLOOR

- LEGEND
- Stage Boundary
 - 10m Offset Line
 - 57.5 dB(A)
 - 60.0 dB(A)
 - 62.5 dB(A)
 - 65.0 dB(A)
 - 67.5 dB(A)
 - 70.0 dB(A)
 - 72.5 dB(A)
 - 75.0 dB(A)
 - 77.5 dB(A)



FIRST FLOOR

- LEGEND
- Stage Boundary
 - 10m Offset Line
 - 57.5 dB(A)
 - 60.0 dB(A)
 - 62.5 dB(A)
 - 65.0 dB(A)
 - 67.5 dB(A)
 - 70.0 dB(A)
 - 72.5 dB(A)
 - 75.0 dB(A)
 - 77.5 dB(A)



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CAD FILE: I:\7214-29\Acad\Acoustic Assessment\Figure 4 - Predicted SPL contours(LAeq(15hours)) for ground and first floor with 10m offset.dwg
XREF's:

PREDICTED SPL CONTOURS(L_{Aeq}(15hours)) FOR GROUND AND FIRST FLOOR WITH 10m OFFSET

Scale 1:5,000 (A3)

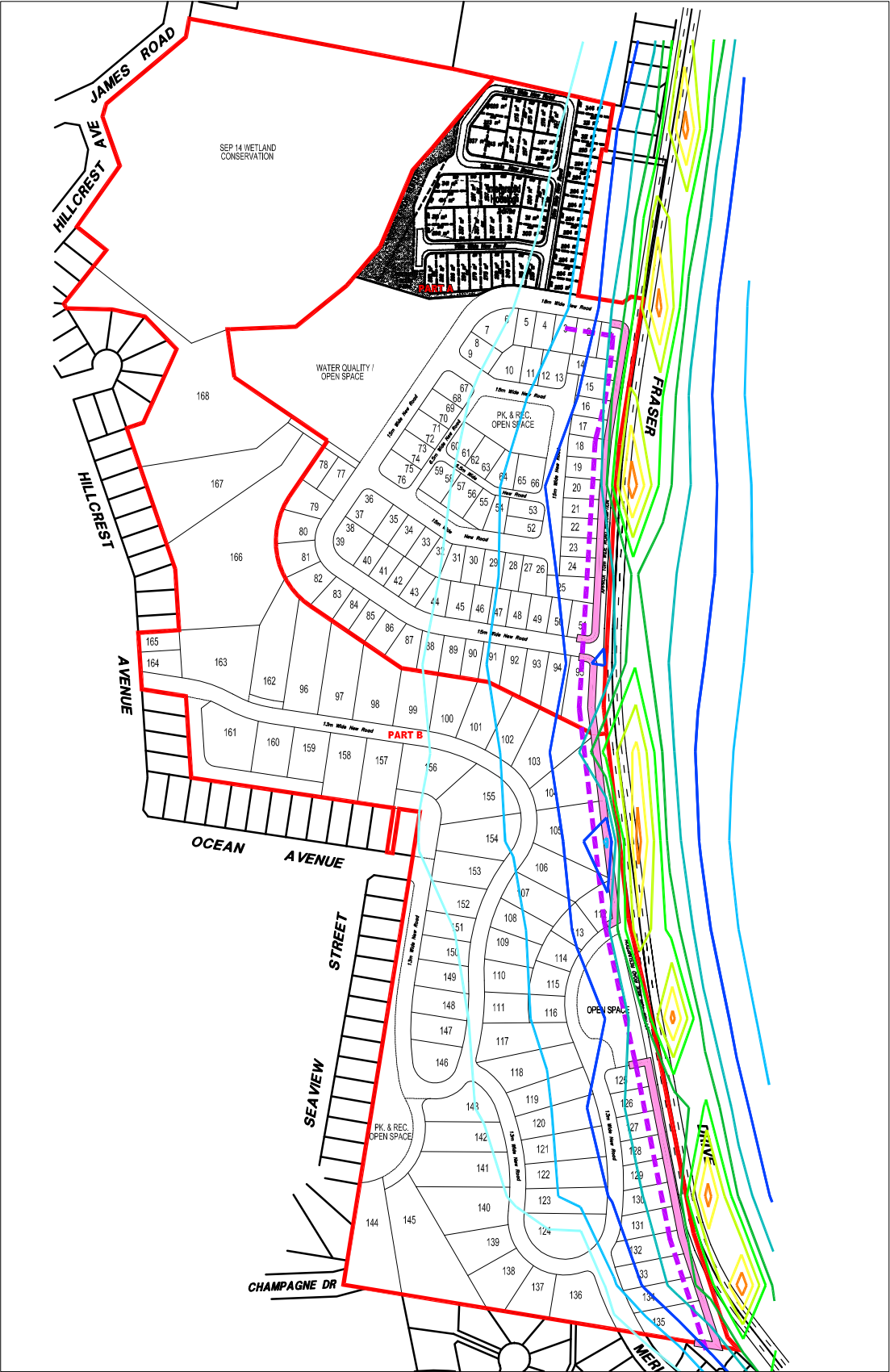
FIGURE 4

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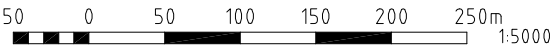
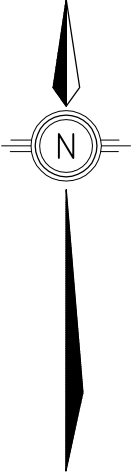
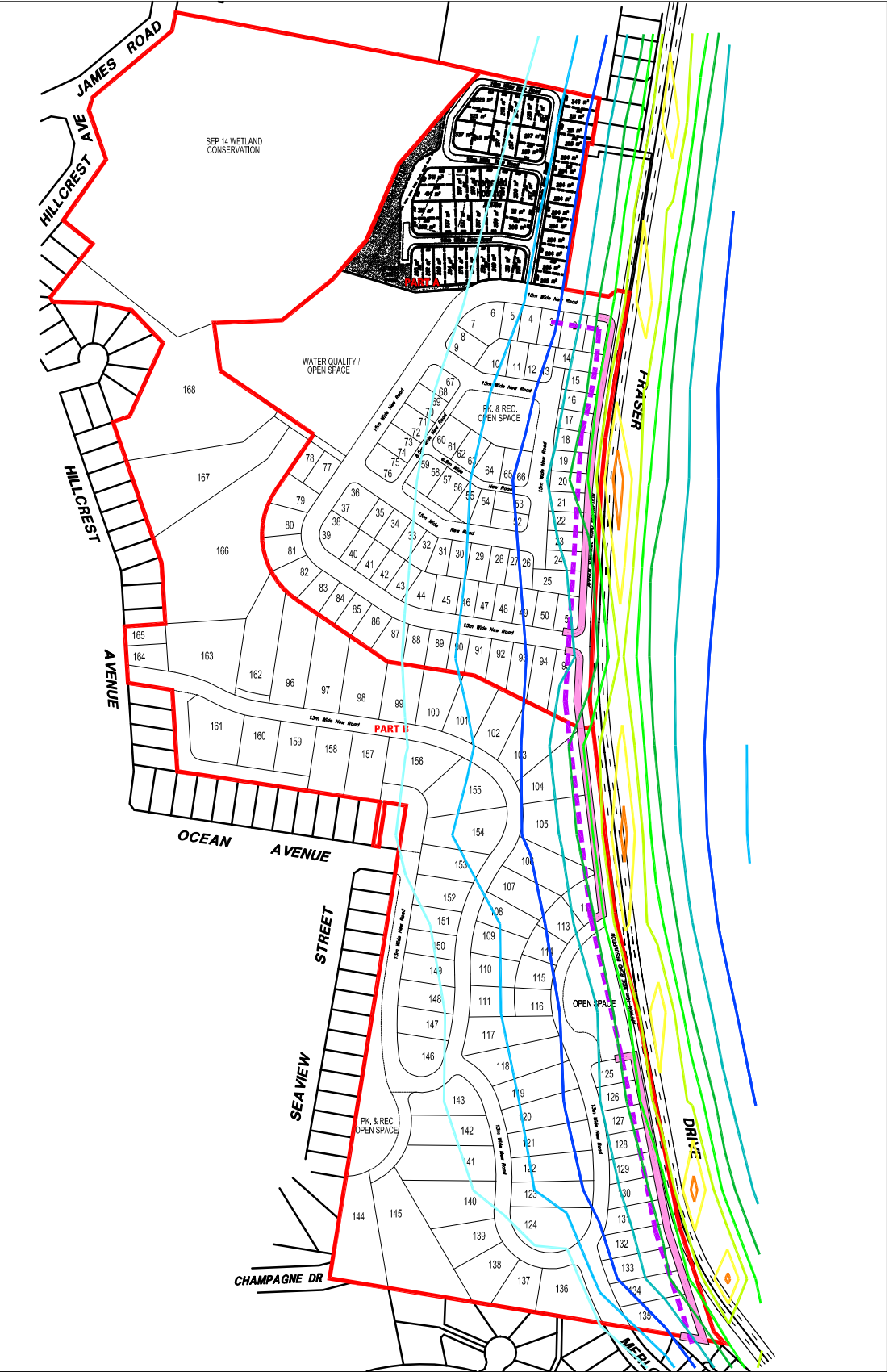
GROUND FLOOR

- LEGEND
- Stage Boundary
 - 10m Offset Line
 - 2.2m Acoustic Barrier
 - 57.5 dB(A)
 - 60.0 dB(A)
 - 62.5 dB(A)
 - 65.0 dB(A)
 - 67.5 dB(A)
 - 70.0 dB(A)
 - 72.5 dB(A)
 - 75.0 dB(A)
 - 77.5 dB(A)



FIRST FLOOR

- LEGEND
- Stage Boundary
 - 10m Offset Line
 - 2.2m Acoustic Barrier
 - 57.5 dB(A)
 - 60.0 dB(A)
 - 62.5 dB(A)
 - 65.0 dB(A)
 - 67.5 dB(A)
 - 70.0 dB(A)
 - 72.5 dB(A)
 - 75.0 dB(A)
 - 77.5 dB(A)



Scale 1:5,000 (A3)

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CAD FILE: I:\7214-29\Acad\Acoustic Assessment\Figure 5 - Predicted SPL contours(L_Aeq(15hours)) for ground and first floor with 10m offset and 2.2m acoustic barrier.dwg
XREF's:

FIGURE 5
PREDICTED SPL CONTOURS(L_{Aeq}(15hours)) FOR GROUND AND FIRST FLOOR
WITH 10m OFFSET AND 2.2m ACOUSTIC BARRIER

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