16 December 2016

Ref: 8413/6885

Metromix Pty Ltd
150 Rhondda Road
Teralba NSW 2284

NOVEMBER 2016 NOISE MONITORING RESULTS – TERALBA QUARRY

This letter report presents the results of attended noise monitoring conducted for the Metromix operated Teralba Quarry (TQ) commencing on Wednesday 16th through to Friday 18th of November, 2016. Noise monitoring was carried out in accordance with the conditions of the TQ Noise Management Plan (NMP) as shown in extract on page 2 (referenced from EPL 0536).

Although the project approval nominates noise criteria at nine locations, Metromix recognises that meaningful monitoring data will continue to be collected from the closest locations to the active operational areas. As a result of this, and as outlined within the approved NMP, for periods when operations are confined to areas south of Rhondda Road, noise monitoring will be undertaken at Locations EPL-A, B, D, E and H.

Further to this, location EPL-C and EPL-F have been omitted from the noise monitoring programme given they are not required as other monitoring locations are nearby. **Table 1** lists the address and coordinates of each noise monitoring location, with the relevant monitoring locations that were monitored during the August 2016 period highlighted in **bold**. The locations are shown on the figure in **Appendix I**.

Table 1
Noise Monitoring Locations (from PA 10-0183)

Location in EPL	Address	Easting	Northing
EPL-A	**Awaba Street, Teralba**	**369080**	**3651470**
EPL-B	**Rhondda Road, Teralba**	**369250**	**6351915**
EPL-C	Rhondda Road, Teralba [1]	369205	6352015
EPL-D	**Rhondda Road, Teralba**	**369150**	**6352135**
EPL-E	**Victoria Avenue, Teralba**	**369060**	**6352620**
EPL-F	Victoria Avenue, Teralba [1]	369130	6352945
EPL-H	**School Road, Wakefield**	**366210**	**6352520**

1. Metromix has obtained permission for this monitoring location to be omitted.

It is noted that during the period when monitoring is undertaken at Location B, Metromix is required to provide a spotter to record the number of trucks departing from the Quarry and not the Teralba Business Park. Spectrum Acoustics personnel undertook identification of quarry trucks as part of the noise monitoring procedure.

Condition	Requirement
L4.1	The licensee must ensure that noise generated by the activities within the premises do not exceed the following criteria measured by dB(A) at any residence or privately owned land.

Location	Day Shoulder 6:00am - 7:00am	Day 7:00am - 6:00pm	Evening 6:00pm – 10:00pm	Night 10:00pm – 6:00am
	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$ $L_{A1(1min)}$
A-	38	38	37	35 45
B-	42	46	36	35 45
C-	42	42	35	35 45
D,E,G,H,I	35	35	35	35 45
F	37	38	38	35 45

Note: The licensee may provide to the EPA written evidence of any agreement with a landholder which is subject to the above noise limits. The written evidence may be submitted with a licence variation to remove the landholder from the above table.

Condition	Requirement
L4.2	The licensee must comply with the operating hours set out in the following table:

Day	Receipt of Concrete or VENM* or ENM**	Loading and Dispatch of Quarry Trucks	Extraction and Processing
Monday - Friday	7:00am to 5:00pm	4:00am Monday to midnight Friday	7:00am to 7:00pm
Saturday	7:00am to 2:00pm	Midnight Friday to 6:00pm Saturday	7:00am to 2:00pm
Sundays and Public Holidays	None	None	none

Note: Maintenance activities may occur at any time provided they are inaudible at privately-owned residence.
*VENM = Virgin Excavated Natural Material
**ENM = Excavated Natural Material

L4.3	The noise limits set out in conditions L4.1 apply under all meteorological conditions except for anyone of the following: a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or b) Stability category F temperature inversion conditions and wind speeds greater the 2 metres/second at 10 metres above ground level; or c) Stability category G temperature inversion conditions.
L4.4	For the purpose of condition L4.3: a) the meteorological data to be used for determining meteorological conditions is the data recorded at the meteorological station identified in this licence as EPA Identification Point W1. b) Stability category temperature inversion conditions are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the *NSW industrial Noise Policy (EPA 2000)* Note: The weather station must be designed, commissioned and operated in a manner to obtain the necessary parameters required under the above condition.
L4.5	For the purpose of determining the noise generated at the premises the licensee must use a Class 1 or Class 2 noise monitoring device as defined by AS IEC61672.1 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing.
L4.6	To determine compliance: 1. With the $L_{Aeq(15\ min)}$ noise limits in condition L4.1, the licensee must locate noise monitoring equipment; a) within 30 metres of a dwelling facade (but not closer than 3 metres) where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises; b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises, or, where applicable, c) within approximately 50 metres if the boundary of a national park or nature reserve. 2. With the LA1(1 minute) noise limits in condition L4.1, the noise monitoring equipment must be located within 1 metre of a dwelling facade. 3. With the noise limits in condition L4.1, the noise monitoring equipment must be located; a) at the most affected point at a location where there is no dwelling at the location, or b) at the most affected point within an area at a location prescribed by conditions L4.6 1(a) or L4.6 1(b).

NOISE MEASUREMENTS

Attended noise monitoring was conducted with Brüel & Kjær Type 2250 Precision Sound Analysers. This instrument has Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters” and has current NATA calibration. Field calibration was carried out at the start and end of each monitoring period.

The noise monitoring was conducted in general accordance with the requirements of Section 9 of the NMP (Noise Monitoring Protocol and Evaluation of Compliance) as follows;

“*Metromix proposes to adopt a noise monitoring protocol that provides feedback on the effectiveness of the noise control measures and demonstrate compliance with the conditions within the Project Approval 10_0183 and Environment Protection Licence 0536.*

The approach to monitoring compliance is based substantially upon Metromix’s experience to date which has identified the on-site activities have not been the source of noise complaints or any recorded non-compliance. Hence, it is considered the monitoring program needs to reflect this fact.”

A-weighted noise levels were measured over 15 minute monitoring periods with data acquired at 1 second statistical intervals and the meter set to “fast” response. Each 1 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing INP ‘modifying factors’. Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

The worst case 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from TQ was audible, Bruel & Kjaer “*Evaluator*” analysis software was used to quantify the contributions of the quarry and other significant noise sources to the overall level. Quarry noise from TQ is shown in the tables in bold type. Where noise from TQ is listed as faintly audible, this means the noise levels from the quarry were at least 10 dB below the ambient level during the measurement and not measurable.

Noise levels were recorded for each of the L10, Leq, Lmax, L1, L90 and Lmin percentiles. All noise levels shown in the tables of results are in dB(A) Leq (15 min). Levels for the other percentiles are not shown as they have no compliance criteria for comparison but are available on request.

Meteorological data used in this report was obtained from the quarry-operated weather station at the site.

Noise Compliance Assessment

The results of the noise measurements undertaken throughout the various time periods are provided in **Tables 2** to **13**. EPL 536 refers to the various time periods as follows:

a) Day-Shoulder is defined as the period between 6am to 7am Monday to Saturday.

b) Day is defined as:
   (i) the period from 7am to 6pm Monday to Saturday; and
   (ii) the period from 8am to 6pm Sundays and Public Holidays.

c) Evening is defined as the period from 6pm to 10pm.

d) Night is defined as:
   (i) the period from 10pm to 7am Monday to Saturday; and
   (ii) the period from 10pm to 8am Sundays and Public Holidays.

Table 2
Teralba Quarry Noise Monitoring Results – 16 November 2016
Night

Location	Start Time	Total noise dB(A) Leq	Criterion dB(A) Leq	Wind speed/ direction	Identified Noise Sources (Leq (15 min)
A	5:40 am	50	35	1.0 m/s 343°	Birds (47), traffic (46), industrial noise (40), power lines (31), **TQ (24)**
B	4:30 am	49	35	1.2 m/s 341°	Traffic (49), birds & insects (33), **TQ inaudible**[1]
D	4:30 am	43	35	1.2 m/s 341°	Traffic (41), birds (38), **TQ (26)**
E	5:37 am	50	35	1.0 m/s 343°	Birds (50), traffic (32), **TQ inaudible**
H	4:55 am	42	35	1.4 m/s 347°	Traffic (40), birds (38), **TQ inaudible**
Note: [1] See text description and analysis					

Table 3
Teralba Quarry Noise Monitoring Results – 16 November 2016
Day Shoulder

Location	Start Time	Total noise dB(A) Leq	Criterion dB(A) Leq	Wind speed/ direction	Identified Noise Sources (Leq (15 min)
A	6:41 am	52	38	0.9 m/s 318°	Trains (48), traffic (46), birds (46), industrial noise (42), power lines (31), **TQ (25)**
B	6:05 am	48	42	0.9 m/s 345°	Traffic (44), birds (43), industrial noise (41), trains (32), **TQ inaudible**[1]
D	6:23 am	52	35	0.9 m/s 328°	Traffic (50), birds (45), industrial noise (45), **TQ (35)**
E	6:40 am	50	35	0.9 m/s 318°	Birds (49), traffic (42), industrial noise (26), **TQ inaudible**
H	6:44 am	46	35	0.8 m/s 316°	Birds (45), traffic (41), **TQ inaudible**
Note: [1] See text description and analysis					

Table 4 Teralba Quarry Noise Monitoring Results – 16 November 2016 Day					
Location	**Start Time**	**Total noise dB(A) Leq**	**Criterion dB(A) Leq**	**Wind speed/ direction**	**Identified Noise Sources (Leq (15 min)**
A	7:34 am	47	38	1.1 m/s 291°	Industrial noise (44), birds (43), traffic (39), train (30), **TQ (24)**
B	9:52 am	60	46	1.8 m/s 155°	Traffic (60), industrial noise (41), birds (32), **TQ inaudible**'
D	9:21 am	52	35	1.6 m/s 168°	Traffic (51), birds (45), **QT (30)**, industrial noise (27)
E	4:17 pm	47	35	2.3 m/s 149°	Birds (47), wind (31), traffic (27), **TQ inaudible**
H	7:39 am	48	35	1.0 m/s 289°	Birds (48), traffic (27), **TQ (23)**
Note: ' See text description and analysis					

Table 5 Teralba Quarry Noise Monitoring Results – 16 November 2016 Evening					
Location	**Start Time**	**Total noise dB(A) Leq**	**Criterion dB(A) Leq**	**Wind speed/ direction**	**Identified Noise Sources (Leq (15 min)**
A	6:38 pm	50	37	1.7 m/s 146°	Traffic (49), birds & insects (43), **TQ inaudible**
B	6:00 pm	58	36	1.8 m/s 140°	Traffic (58), birds (28), **TQ inaudible**'
D	6:35 pm	57	35	1.6 m/s 140°	Traffic (57), birds (34), wind (31), **TQ (24)**
E	6:00 pm	45	35	1.8 m/s 140°	Birds (44), wind (34), traffic (29), domestic (29), **TQ inaudible**
H	6:20 pm	47	35	1.4 m/s 134°	Birds & insects (47), domestic (33), traffic (28), **TQ inaudible**
Note: ' See text description and analysis					

Table 6 Teralba Quarry Noise Monitoring Results – 17 November 2016 Night					
Location	**Start Time**	**Total noise dB(A) Leq**	**Criterion dB(A) Leq**	**Wind speed/ direction**	**Identified Noise Sources (Leq (15 min)**
A	5:39 am	41	35	0.6 m/s 293°	Birds (41), **TQ (30)**, industrial noise (27), traffic (27)
B	4:30 am	52	35	0.5 m/s 269°	Train (49), traffic (47), birds (41), industrial (30), **TQ inaudible**'
D	4:30 am	38	35	0.5 m/s 269°	Birds (37), traffic (30), industrial noise (26), **TQ inaudible**
E	5:36 am	44	35	0.6 m/s 293°	Birds (44), traffic (29), **TQ inaudible**
H	4:50 am	42	35	0.5 m/s 280°	Birds (40), traffic (38), **TQ inaudible**
Note: ' See text description and analysis					

Table 7 Teralba Quarry Noise Monitoring Results – 17 November 2016 Day Shoulder					
Location	**Start Time**	**Total noise dB(A) Leq**	**Criterion dB(A) Leq**	**Wind speed/ direction**	**Identified Noise Sources (Leq (15 min)**
A	6:40 am	44	38	0.7 m/s 295°	Birds & insects (43), industrial noise (35), **TQ (30)**, traffic (25), train (26)
B	6:00 am	68	42	0.6 m/s 291°	Traffic (68), birds (41), industrial (39), **TQ (28)**[1]
D	6:20 am	44	35	0.8 m/s 254°	Traffic (42), industrial noise (38), birds (35), **TQ (30)**
E	6:37 am	44	35	0.9 m/s 295°	Birds (44), traffic (29), industrial (25), **TQ inaudible**
H	6:43 am	44	35	0.7 m/s 295°	Birds (43), traffic (36), **TQ (30)**
Note: [1] See text description and analysis					

Table 8 Teralba Quarry Noise Monitoring Results – 17 November 2016 Day					
Location	**Start Time**	**Total noise dB(A) Leq**	**Criterion dB(A) Leq**	**Wind speed/ direction**	**Identified Noise Sources (Leq (15 min)**
A	7:03 am	48	38	0.9 m/s 211°	Industrial noise (46), birds (41), traffic (37), power lines (30), **TQ inaudible**
B	8:40 am	60	46	0.8 m/s 195°	Traffic (59), industrial noise (52), birds (36), **TQ inaudible**[1]
D	7:14 am	48	35	0.8 m/s 207°	Traffic (46), birds (43), batch plant (33), industrial noise (31), **TQ (29)**
E	8:58 am	50	35	0.9 m/s 291°	Birds (50), traffic (31), industrial noise (25), **TQ inaudible**
H	11:28 am	44	35	1.5 m/s 109°	Birds (44), domestic (31), traffic (24), **TQ (23)**
Note: [1] See text description and analysis					

Table 9 Teralba Quarry Noise Monitoring Results – 17 November 2016 Evening					
Location	**Start Time**	**Total noise dB(A) Leq**	**Criterion dB(A) Leq**	**Wind speed/ direction**	**Identified Noise Sources (Leq (15 min)**
A	6:00 pm	49	37	1.7 m/s 59°	Traffic (48), birds (38), trains (36), **TQ inaudible**
B	6:34 pm	52	36	1.5 m/s 52°	Traffic (49), train (48), domestic (37), birds (34), **TQ inaudible**[1]
D	6:00 pm	48	35	1.7 m/s 59°	Traffic (46), birds (41), train (39), **TQ inaudible**
E	6:36 pm	41	35	1.5 m/s 52°	Birds (40), traffic (34), **TQ inaudible**
H	6:00 pm	46	35	1.7 m/s 59°	Birds (46), domestic (31), traffic (28), **TQ inaudible**
Note: [1] See text description and analysis					

Table 10
Teralba Quarry Noise Monitoring Results – 18 November 2016
Night

Location	Start Time	Total noise dB(A) Leq	Criterion dB(A) Leq	Wind speed/ direction	Identified Noise Sources (Leq (15 min)
A	5:38 am	52	35	1.7 m/s 34°	Train (50), industrial noise (47), birds (40), power lines (32), traffic (29), **TQ inaudible**
B	4:30 am	59	35	2.6 m/s 22°	Train (57), traffic (55), industrial noise (36), insects (34), **TQ inaudible**[1]
D	4:30 am	39	35	2.6 m/s 22°	Traffic (38), birds (30), train (26), **TQ inaudible**
E	5:36 am	44	35	1.7 m/s 32°	Birds (44), traffic (31), **TQ inaudible**
H	4:52 am	47	35	2.5 m/s 30°	Birds (46), traffic (40), **TQ inaudible**
Note: [1] See text description and analysis					

Table 11
Teralba Quarry Noise Monitoring Results – 18 November 2016
Day Shoulder

Location	Start Time	Total noise dB(A) Leq	Criterion dB(A) Leq	Wind speed/ direction	Identified Noise Sources (Leq (15 min)
A	6:39 am	48	38	1.8 m/s 343°	Industrial noise (45), birds (43), train (36), power lines (32), traffic (31), **TQ inaudible**
B	6:21 am	49	42	1.6 m/s 17°	Industrial noise (46), traffic (42), train (41), **TQ (37)**
D	6:03 am	45	35	1.7 m/s 26°	Traffic (43), birds (38), trains (30), **TQ (28)**, industrial noise (25)
E	6:38 am	45	35	1.8 m/s 343°	Birds (44), traffic (36), industrial (26), **TQ inaudible**
H	6:41 am	48	35	1.8 m/s 343°	Birds (46), traffic (42), **TQ inaudible**
Note: [1] See text description and analysis					

Table 12
Teralba Quarry Noise Monitoring Results – 18 November 2016
Day

Location	Start Time	Total noise dB(A) Leq	Criterion dB(A) Leq	Wind speed/ direction	Identified Noise Sources (Leq (15 min)
A	7:31 am	50	38	1.9 m/s 349°	Birds (48), industrial noise (44), traffic (36), train (33), power lines (32), **TQ inaudible**
B	9:08 am	64	46	2.2 m/s 265°	Traffic (64), birds (41), industrial noise (39), **TQ inaudible**[1]
D	7:27 am	52	35	1.9 m/s 346°	Traffic (51), birds (46), **TQ (29)**, industrial noise (28)
E	9:12 am	43	35	2.2 m/s 266°	Birds (43), traffic (30), industrial noise (25), **TQ inaudible**
H	10:57 am	51	35	2.3 m/s 331°	Birds (51), traffic (25), **TQ inaudible**
Note: [1] See text description and analysis					

Table 13 Teralba Quarry Noise Monitoring Results – 18 November 2016 Evening					
Location	**Start Time**	**Total noise dB(A) Leq**	**Criterion dB(A) Leq**	**Wind speed/ direction**	**Identified Noise Sources (Leq (15 min)**
A	6:00 pm	49	37	1.9 m/s 68°	Birds (47), trains (45), **TQ inaudible**
B	6:35 pm	54	36	2.4 m/s 47°	Traffic (54), birds (39), **TQ inaudible**[1]
D	6:00 pm	47	35	1.9 m/s 68°	Traffic (47), birds (32), wind (30), industrial noise (27), **TQ inaudible**
E	6:34 pm	44	35	2.4 m/s 47°	Birds (42), wind (39), traffic (29), **TQ inaudible**
H	6:02 pm	54	35	1.9 m/s 68°	Birds (54), traffic (26), **TQ inaudible**
Note: [1] See text description and analysis					

Table 14 Teralba Quarry (L1 1min) Noise Monitoring Results – 16 November 2016 (Night)					
Location	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Quarry Sources ($L_{1\ (1\ min)}$)**
A	5:40 am	59	1.0 m/s 343°	Birds	27 (Quarry trucks)
B	4:30 am	61	1.2 m/s 341°	Traffic	n/a
D	4:30 am	56	1.2 m/s 341°	Traffic	28 (General operations)
E	5:37 am	58	1.0 m/s 343°	Birds	n/a
H	4:55 am	46	1.4 m/s 347°	Birds	n/a

Table 15 Teralba Quarry (L1 1min) Noise Monitoring Results – 17 November 2016 (Night)					
Location	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Quarry Sources ($L_{1\ (1\ min)}$)**
A	5:39 am	50	0.6 m/s 293°	Birds	38 (Quarry trucks)
B	4:30 am	63	0.5 m/s 269°	Train	n/a
D	4:30 am	45	0.5 m/s 269°	Birds	n/a
E	5:36 am	52	0.6 m/s 293°	Birds	n/a
H	4:50 am	49	0.5 m/s 280°	Birds	n/a

Table 16 Teralba Quarry (L1 1min) Noise Monitoring Results – 18 November 2016 (Night)					
Location	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Quarry Sources ($L_{1\ (1\ min)}$)**
A	5:38 am	66	1.7 m/s 34°	Train	n/a
B	4:30 am	68	2.6 m/s 22°	Train	42 (Quarry trucks)
D	4:30 am	49	2.6 m/s 22°	Traffic	31 (General operations)
E	5:36 am	55	1.7 m/s 32°	Birds	n/a
H	4:52 am	57	2.5 m/s 30°	Birds	n/a

The results shown in **Tables 2** to **13** show that, under the operational and atmospheric conditions at the time of monitoring, noise emissions from TQ did not exceed the relevant criterion at any monitoring location during any part of the survey.

Monitoring location EPL-B is situated close to the corner of Rhondda Road and Railway Street. This monitoring location is included predominantly to measure quarry noise from emissions from trucks exiting the site along the private section of the access road (through the Teralba Business Park). From the monitoring location it was possible to determine which trucks were associated with the quarry and a dedicated spotter was not required during this monitoring period.

When measuring noise at the EPL-B location, the noise emissions from the exiting quarry trucks (whilst on the private section of the access road) were inaudible due to industrial noise and other traffic within the vicinity overriding this noise source.

At location EPL-D the acoustic environment is significantly influenced by noise from traffic on Rhondda Rd, trains and other industries within the vicinity. Noise emissions from the batching plant which is located adjacent to TQ contributed to the received noise during some monitoring periods.

Data from those times where TQ operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions of "modifying factor corrections" in the NSW Industrial Noise Policy.

In addition to the operational noise, the noise from TQ must not exceed **45 dB(A) L1 (1 min)** within the night-time period i.e. between the hours of 10 pm and 7 am, in accordance with *Condition L4.1* of EPL 536. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the quarry. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the façade of a bedroom window.

To avoid undue disturbance to residents, the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations. It must be noted, however, that the sleep disturbance criterion is to be measured near a bedroom window. As the internal layout of each residence is not known, to consider a worst case, a bedroom window is assumed to be facing the operational noise monitoring location.

As shown in **Tables 14 - 16**, during the night time measurement circuits the L1 (1 min) noise from TQ did not exceed 45 dB(A) at any monitoring location.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

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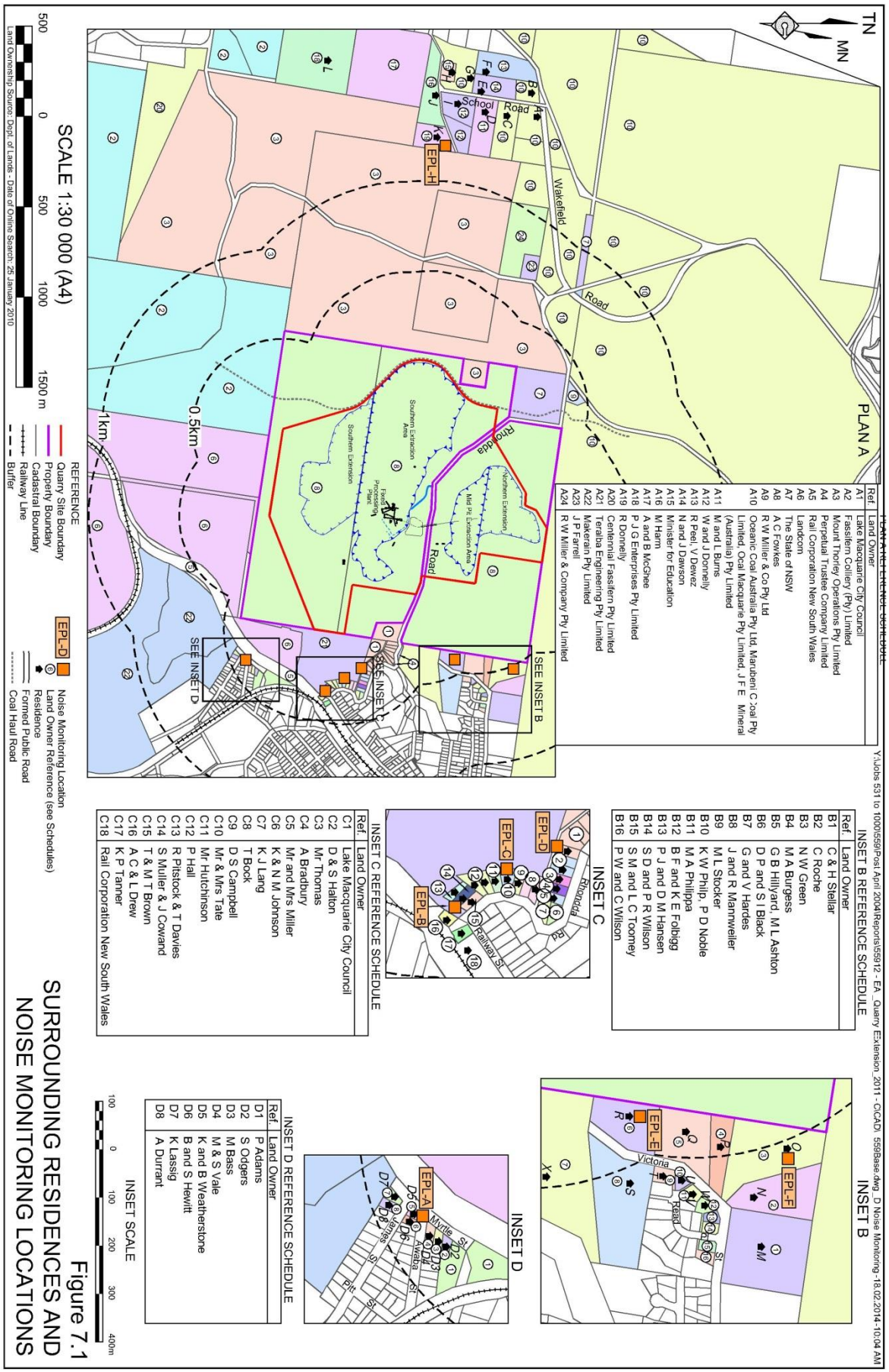

Figure 7.1
SURROUNDING RESIDENCES AND NOISE MONITORING LOCATIONS