Appendix 2

Noise Assessment

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EXECUTIVE SUMMARY

This report assesses noise impacts potentially resulting from the construction and operation of the proposed Orchard Hills Waste and Resource Management Facility as described in the Modified Preferred Project Report and concludes noise emissions will comply with DECCW noise criteria.

The Project Site is located in Orchard Hills, western Sydney within a predominantly rural area of open grazing land and low density housing to its north, east and south-east.

The principal noise-generating sources of the Project would include crushers, screens, shredders and separating equipment at the hub of its waste re-processing facility, and mobile plant such bulldozers, scrapers, compactors and haul trucks relating to the clay/shale extraction and waste emplacement activities planned for the site over its 25 year lifespan.

The Project's potential to generate noise impacts has been assessed in accordance with the noise guidelines of the NSW Department of Environment, Climate Change and Water (DECCW). The assessment considers noise from off-site traffic generated by the Project as well as noise from its on-site operations throughout the various stages of its lifecycle.

The Project's proposed hours of operation would be 7am-6pm Monday to Friday and 8am-2pm on Saturday (the latter adjusted to 8am-1pm Saturday in the case of the Site Establishment phase). All activities associated with the site – including truck arrivals to site – would be restricted to these daytime hours.

The modified Project includes a range of noise mitigation measures additional to those incorporated in the April 2010 Project. The principal noise mitigation measures that would be adopted from the April 2010 Project include:

- the siting of the waste recycling and re-processing facility at the furthest distance on the Project Site from residences;
- housing fixed recycling and re-processing equipment, particularly the crushers and trommel, within acoustic shrouds and enclosures. (Additional enclosures have been added for the modified Project);
- the retention/placement of earth mounding around the entire recycling and re-processing area; and
- deploying 4m-high mobile acoustic barriers on the external faces of perimeter mounding during site establishment works. All works will be undertaken behind the acoustic barriers at all times.

The modified Project involves the following measures to achieve compliance with the DECCW noise guidelines.

- application of acoustic treatment of the mobile earthmoving equipment to be used on site so that the equipment generates lower noise levels;
- using 5m-high interim acoustic earth mounds on the elevated sections of the landform during capping operations. All works will be undertaken behind the acoustic earth mounds at all times;
- internal haul roads being excavated to an elevation of 47m AHD so as to enhance the screening effect of the site's topography and/or erecting 3m-high earth mounds, where necessary, immediately adjacent to internal haul roads; and
- provision of fixed acoustic screening for clay/shale loading operations, specifically in Cell 3, through strategic placement of the 4m-high barriers in an east-west orientation so as to maximise the acoustic screening for earthmoving equipment during loading operations.

The noise impact(s) of the project at the surrounding residences have been determined by comprehensive computer modelling which included consideration of all significant factors (eg, source noise levels, topography, meteorology) affecting noise propagation.

As indicated in the **Table E1**, computer modelling and the assessment concludes that given the proposed mitigation measures, **no exceedances of the relevant noise criteria would occur at neighbouring residences during the construction phase of the Project even under adverse meteorological conditions**. With neutral meteorological conditions, noise generated will be materially less than the criteria.

Table E1
Predicted $L_{Aeq,15min}$ Noise Levels at Residences During Site Establishment

Residence	All Plant Operating ($L_{Aeq,15min}$ dB(A))		Construction Noise Criterion* dB(A)
	Neutral Met Conditions	Adverse Met Conditions	
9 Verdehlo Way	35	39	44
3 Chablis Pl	39	41	44
15 Cabernet Cct	39	43	44
11 Cabernet Cct	39	43	44
Bates Residence	35	39	44
Newham Residence	35	39	44
210 Luddenham Rd	<30	35	47
216 Luddenham Rd	<30	34	47
230 Luddenham Rd	<30	30	47
262 Luddenham Rd	<30	<30	47

* The construction noise criterion is set at 10dB(A) above the background level as nominated in the DECCW's Interim Construction Noise Guideline

During the Project's operational phase, the greatest potential for noise impacts would result from the operation of mobile equipment at or near the final levels of the final landform. During such times, noise will be suitably ameliorated by operating mobile earthmoving equipment behind 5m-high earth mounds which will be positioned as required so that works always occur behind the mounds. As indicated in **Table E2**, these strategies will ensure that **no exceedances of the relevant noise criteria will result from the operational phase of the Project under any of the considered scenarios even under adverse meteorological conditions**. Noise at receivers from these operational scenarios will be even lower than indicated during periods of neutral conditions. .The noise criterion for the 25 year operational phase of the project is set at 5dB(A) above the existing level of background noise.

Table E2
Predicted L_{Aeq} Operational Noise Levels Exceeded for 10% of 15-Minute Periods (daytime periods, 7am to 6pm)

Residence	ID (1)	Operational Noise Level at Residence ($L_{Aeq,15min}$ dB(A))			Daytime Criterion dB(A)
		Scenario 2	*Scenario 3*	*Scenario 4*	
9 Verdehlo Way	-	36	38	37	39
3 Chablis Pl	V	37	38	38	39
15 Cabernet Cct	W	38	39	37	39
11 Cabernet Cct	-	38	39	38	39
Bates Residence	A	37	38	38	39
Newham Residence	B	38	39	39	39
210 Luddenham Rd	T	38	37	37	42
216 Luddenham Rd	R	35	35	35	42
230 Luddenham Rd	O	33	32	33	42
262 Luddenham Rd	I	32	32	33	42

Further, it is predicted that noise levels from trucks travelling to and from the Project Site would comply with relevant traffic noise criteria.

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1. INTRODUCTION

1.1 SCOPE

This report presents the assessment of potential noise impacts of the modified proposed waste and resource management facility and its associated haulage activities in accordance with the following guidelines as required by the NSW Department of Environment, Climate Change and Water (DECCW).

- *Interim Construction Noise Guideline*
- *Industrial Noise Policy (INP)*
- *Environmental Criteria for Road Traffic Noise (ECRTN)*

This report effectively updates the noise assessment undertaken for the facility proposed in the April 2010 Environmental Assessment (Wilkinson Murray, 2010).

1.2 SURROUNDING LAND USES

The Project Site is located within a predominantly rural area comprising open grazing land and low density housing (refer to **Figure 2.1**).

Immediately to the west of the Project Site is land owned by the Commonwealth which is used by the Australian Defence Force. To the south of the Project Site and south of Patons Lane, the land accommodates buildings and other facilities associated with an existing horse stud.

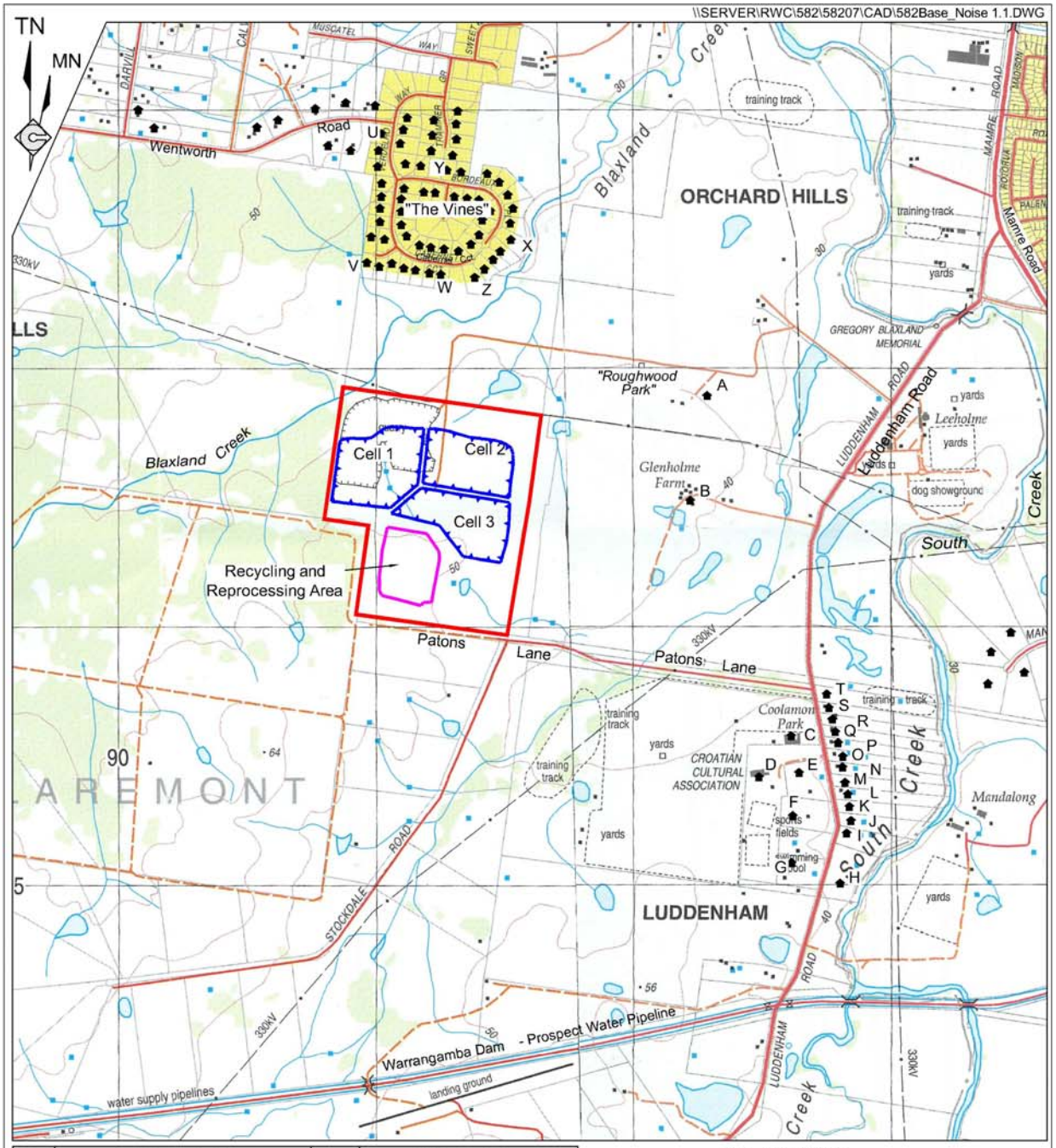
Located approximately 0.5-1.5km to the north of the Project Site and beyond open grazing land is a relatively recent (early 1990's) residential subdivision comprising detached housing referred to as "The Vines". Further to the north (approximately 2-3km), the land also comprises low density residential dwellings on large allotments, with this area extending north to the M4 Motorway.

Land uses immediately east of the Project Site consist of open grazing land and ancillary buildings including rural housing. Further to the east (approximately 3km) are the established residential suburbs of St Clair and Erskine Park.

Figure 2.1 indicates the land ownership and residences closest to the Project Site. The residences potentially most affected by noise from the Project are:

- residences within "The Vines" Estate located approximately 0.5-1.5km north of the Project Site;
- two isolated, rural residences immediately east of the site (the Bates and Newham residences, A and B respectively), and
- residences located south-east of the intersection of Luddenham Road and Patons Lane.

Where the Project's noise is satisfactorily controlled to these three groups of residences, then noise from the Project will comply with the relevant criteria at all other noise-sensitive receivers.



No.	Distance (m) to: Recycling Plant	Distance (m) to: Nearest Waste Cell	No.	Distance (m) to: Recycling Plant	Distance (m) to: Nearest Waste Cell
A	1330	720	N	1840	1500
B	1110	640	O	1820	1470
C	1600	1260	P	1780	1430
D	1570	1250	Q	1760	1400
E	1700	1370	R	1730	1370
F	1760	1450	S	1700	1340
G	1860	1580	T	1680	1310
H	2060	1760	U	1670	1090
I	1970	1660	V	1190	590
J	1960	1640	W	1140	570
K	1930	1600	X	1320	730
L	1900	1570	Y	1530	970
M	1870	1540	Z	1140	570

REFERENCE
Project Site Boundary
Residence
Proposed Limit of Recycling and Re-processing Area
Proposed Limit of Extraction

SCALE 1:25 000

250 0 250 500 750 1000 1250 m

Base Map Source: Prospect (2001) and Penrith (2001) 1:25 000 Topographic Maps

Figure 1.1
SURROUNDING LAND USES

2. DESCRIPTION OF THE MODIFIED PROJECT

2.1 PRINCIPAL COMPONENTS OF THE PROJECT SITE

As indicated in **Figure 2.2**, the principal components on the Project Site would include:

- a waste recycling and re-processing facility within the south-western corner of the site;
- a waste emplacement area divided into three cells;
- an optimum clay/shale extraction area (within Cell 3);
- a network of internal access roads;
- site offices, ablutions, weighbridges and a wheel wash;
- existing bunding around the perimeter of the Project Site (which will be modified during the site establishment phase) and proposed acoustic mounding around the waste recycling and re-processing area; and
- various water management structures.

2.2 PRINCIPAL NOISE SOURCES

Throughout its operational life, the types and locations of the Project's noise sources will change. A detailed account of the specific combination of sources used for predicting noise emissions from the various stages throughout life of the Project is presented in **Section 5.5.** In overview, however, the site's noise emissions will result primarily from the following:

- The operation of various types of size-reduction and sorting equipment, a picking station fitted with a bin vibratory feeder that make up the recycling and re-processing facility located within the south-western corner of the site. Mobile earthmoving equipment would also be operating within the facility managing both raw feed materials and the products produced;
- Clay/shale extraction within the defined cells using for example scrapers, bulldozers and/or haul trucks;
- Waste emplacement within the defined cells involving trucks delivering waste and a compactor; and
- Road-registered trucks and staff passenger vehicle traffic on internal roads and public roads approaching the site.

All activity associated with the Project, including trucks arrivals to the Site, will be contained to daytime hours, 7am-6pm, Monday to Friday and 8am-2pm Saturday (or until 1pm Saturdays in the case of the Site Establishment phase).

Figure 2.1
INDICATIVE PROJECT SITE LAYOUT

2.3 PRINCIPAL NOISE MITIGATION MEASURES TO BE ADOPTED FOR THE MODIFIED PROJECT

The modified Project includes a range of noise mitigation measures designed to ensure that noise levels at surrounding residences comply with the relevant noise criteria. The measures include those proposed in the April 2010 project together with any additional measures found to be required for the modified project to satisfy the relevant noise criteria.

The principal noise mitigation measures that would be adopted include:

- the siting of the waste recycling and re-processing facility on the Project Site at the furthest distance from residences;
- the placement of earth mounding at the northern, eastern and southern boundaries of Site;
- using 5m-high interim acoustic earth mounds on the elevated sections of the landform during capping operations. All works will be undertaken behind the acoustic earth mounds at all times;
- acoustic mounding enclosing the waste recycling and re-processing cell;
- housing the fixed recycling and re-processing equipment - particularly the crushers and the trommel - within acoustic enclosures;
- deploying 4m-high mobile acoustic barriers on the external faces of perimeter mounding during site establishment works on both the northern and eastern faces. All works will be undertaken behind the acoustic barriers at all times;
- applying acoustic treatment to selected mobile earthmoving equipment to be used on site;
- internal haul roads being excavated to an elevation of 47m AHD so as to enhance the screening effect of the site's topography and/or erecting 3m-high earth mounds, where necessary, immediately adjacent to internal haul roads; and
- provision of fixed acoustic screening for clay/shale loading operations, specifically in Cell 3, through strategic placement of 4m-high barriers in an east-west orientation across the active stockpile area so as to always acoustically screen earthmoving equipment during loading operations.

In addition, the Proponent will develop a series of Noise Management Plans throughout the life of the Project which will prescribe specific design and operational procedures and mitigation measures designed to minimise the noise exposure of surrounding residences to works at the site. The initial Noise Management Plan for the site establishment phase will specify in detail, the staging of the vertical development of the northern and eastern faces and final landforms in relation to the positioning of the mobile acoustic barrier so as to screen works sufficiently at all times. Each Plan will also tailor the Project's noise monitoring program to the approved work schedule during the period covered by the plan to maintain the relevance of monitoring results.

3. EXISTING NOISE ENVIRONMENT

Developing noise criteria for the Project's noise emissions first requires knowledge of the level of existing background noise. To this end, long-term, unattended noise monitoring was undertaken adjacent to the following three residences during the monitoring periods indicated:

Site 1: Vacant Lot adjacent to 15 Cabernet Circuit, The Vines, Orchard Hills (28 May – 8 June, 2009);

Site 2: Bates' Residence, on "Roughwood Park" via Luddenham Road, Orchard Hills (18-28 June 2009).

Site 3: 216 Luddenham Road, Luddenham (28 May – 8 June, 2009).

These monitoring locations were chosen on the basis of representing those residences potentially most affected by noise from the Project. The surveyed background noise levels measured in mid-2009 remain applicable for this assessment

The monitoring was undertaken using environmental noise loggers which were set to A-Weighted, Fast response, continuously monitoring over 15-minute sampling periods. The equipment calibration was checked before and after the surveys and no significant instrumentation drift occurred.

The data collected from the noise loggers enabled the calculation of the Assessment Background Level (ABL), which is a single figure measure of the otherwise varying background noise during each day, evening and night periods respectively. The median of these daily values at each monitoring site is the Rating Background Level (RBL), which is taken to be the value which defines the background noise level to be used for assessing the Project. (These terms are defined further in **Attachment 1**.)

Notably, the calculation of the RBL's excludes any noise data collected during periods of rain or high winds (> 5m/s) in accordance with the *Industrial Noise Policy (INP)*. Detailed results of the noise monitoring – including periods of weather-excluded data - are shown graphically in **Attachment 2**. Notably, even notwithstanding the exclusion of this weather-affected data, more than a week's worth of valid monitoring data was obtained at each of the three sites monitored.

Tables 3.1, 3.2 and 3.3 indicate the calculated RBL levels over the daytime time periods (7am-6pm as defined by the DECCW). The Project will not operate during night, evening or shoulder periods.

As is relevant for developing the Project's noise *amenity criteria* (discussed in **Section 4.2.1.2**), on-site surveys indicated that the existing (pre-Project) level of "industrial" noise (refer to **Attachment 1**) is negligible.

Table 3.1
Summary of Background Noise Levels for Residences of The Vines (Site 1)

Date	Assessment Background Level dB(A)
	Daytime[1]
28 May 2009	35.1
29 May 2009	33.8
30 May 2009	37.0
31 May 2009	35.0
01 June 2009	33.0
02 June 2009	29.2
03 June 2009	33.2
04 June 2009	32.5
05 June 2009	30.2
06 June 2009	33.7
07 June 2009	35.7
08 June 2009	35.2
RBL	**34**

Note: (1) Daytime 7.00am-6.00am

Table 3.2
Summary of Background Noise Levels at Site 2 – Bates' Residence

Date	Assessment Background Level dB(A)
	Daytime[1]
18 June 2009	40.5
19 June 2009	38.7
20 June 2009	37.0
21 June 2009	35.3
22 June 2009	33.7
23 June 2009	33.9
24 June 2009	35.9
25 June 2009	33.0
26 June 2009	33.0
27 June 2009	33.1
28 June 2009	32.1
RBL	**34**

Note: (1) Daytime 7.00am-6.00am

Table 3.3
Summary of Background Noise Levels at Site 3 – 216 Luddenham Road, Luddenham

Date	Assessment Background Level dB(A)
	Daytime[1]
28 May 2009	39.0
29 May 2009	37.0
30 May 2009	39.5
31 May 2009	38.2
01 June 2009	37.0
02 June 2009	34.0
03 June 2009	36.5
04 June 2009	37.5
05 June 2009	35.0
06 June 2009	36.0
07 June 2009	38.0
08 June 2009	37.2
RBL	**37**

Note: (1) Daytime 7.00am-6.00am

4. PROJECT NOISE CRITERIA

The Project will comprise two distinct phases: a site establishment or construction phase of approximately 6 months, followed by an operational phase lasting for approximately 25 years. Noise emissions from the site are assessed differently during each of these phases as outlined below.

4.1 CONSTRUCTION NOISE CRITERIA

During its site establishment or construction phase, noise from the site is assessed in relation to the DECCW's *Interim Construction Noise Guideline* which recommends noise level objectives based on the following recommended standard hours of work:

- Monday to Friday 7am to 6pm;
- Saturday 8am to 1pm; and
- No work on Sundays or Public Holidays.

Construction Noise Goals at residences are detailed in **Table 4.1**.

Table 4.1
Construction Noise at Residences Using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,15min}$ dB(A)	How to Apply
Recommended standard hours: *Monday to Friday 7 am to 6 pm* *Saturday 8 am to 1 pm* *No work on Sundays or public holidays*	*Noise affected RBL + 10 dB*	*The noise affected level represents the point above which there may be some community reaction to noise.* *Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise.* *The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.*
	Highly noise affected 75 dB	*The highly noise affected level represents the point above which there may be strong community reaction to noise.* *Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level.* *If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.*
Outside recommended standard hours	*Noise affected RBL + 5 dB*	*A strong justification would typically be required for works outside the recommended standard hours.* *The proponent should apply all feasible and reasonable work practices to meet the noise affected level.* *Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.*

All *construction* work on this Project will occur only during the recommended standard hours of work, ie. between 7am-6pm, Monday to Friday and 8am-1pm on Saturday, public holidays excluded.

Based on the Rating Background Levels (RBL's) determined for the Project (**Tables 3.1 – 3.3**), the specific construction noise criteria for the Project are outlined in **Table 4.2**.

Table 4.2
Criteria for Project Construction Noise at Residences

Time Period	Construction Noise Criteria, $L_{Aeq,15min}$ dB(A)		
	The Vines	Bates Residence	Luddenham Rd
Day	44	44	47

4.2 OPERATIONAL NOISE CRITERIA

Once the Project enters its *operational* phase, the assessment of the site's noise emissions is undertaken in two parts:

- noise from *on-site* operations (including any on-site traffic) is assessed under the *Industrial Noise Policy (INP)*; and
- noise from *off-site* traffic associated with the Project is assessed under the *Environmental Criteria for Road Traffic Noise (ECRTN).* These criteria are presented in **Section 4.3** below.

4.2.1 Criteria for Noise from On-Site Activities

The *NSW Industrial Noise Policy (INP)* sets out a two-part noise criterion for *operational* noise emanating from within the site. The final criteria (see **Section 4.2.3**) are established by adopting whichever is the more stringent of the Intrusiveness or Amenity criteria.

4.2.1.1 Intrusiveness Criterion

The intrusiveness criterion specifies that the L_{Aeq} noise level from the Project's on-site noise sources should not exceed the Rating Background Level (RBL) (**Tables 3.1 – 3.3**) by more than 5dB(A).

4.2.1.2 Amenity Criterion

The second consideration is the amenity criterion, which seeks to ensure that the L_{Aeq} noise contribution from the Project will not combine with existing *industrial* noise sources to exceed levels considered acceptable for the area. For residences in a rural setting, the relevant recommended "acceptable" levels are:

- Daytime (7.00am-6.00pm) 50 dB(A) L_{Aeq}
- Evening (6.00pm-10.00pm) 45 dB(A) L_{Aeq}
- Night (10.00pm-7.00am) 40 dB(A) L_{Aeq}

In this case, there is very little pre-existing "industrial" noise (eg, noise from stationary sources such as factories or plant) in the area surrounding the Project Site. The existing ambient noise of the area is dictated by regional traffic (on the M4 Motorway and Mamre Road in particular) which is NOT an industrial noise source. Thus, due to the absence of other competing industrial sources in the area, the level of "industrial" (which, in this case, is to say operational) noise from the Project Site is permitted up to the acceptable levels presented above.

4.2.1.3 Project Criteria for On-Site Operational Noise

Table 4.3 presents the derivation of the Project's operational noise criteria, which represents whichever is the more stringent of the intrusiveness or amenity criteria.

Table 4.3
Summary of Intrusiveness & Amenity Noise Criteria

Time Period	Intrusiveness Criteria, $L_{Aeq,15min}$ dB(A)			Amenity Criteria, $L_{Aeq,period}$ dB(A)		
	The Vines	Bates Residence	Luddenham Rd Residences	The Vines	Bates Residence	Luddenham Rd Residences
Day	39	39	42	50	50	50

Note: (1) Daytime: 7.00am-6.00pm

Table 4.3 reveals that for day periods, it is the intrusiveness criterion that governs the Project's overall operational noise criteria. **Table 4.4** summarises the overall criteria that control the total noise emissions from the Project Site, in terms of the $L_{Aeq,15min}$ noise level.

Table 4.4
Criteria for Operational Noise at Residences from On-Site Activities

Time Period	Project Noise Criteria, $L_{Aeq,15min}$ dB(A)		
	The Vines	Bates Residence	Luddenham Rd
Day	39	39	42

Note: (1) Daytime 7.00am-6.00pm

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4.2.2 Criteria for Noise from Off-Site Traffic

The *Environmental Criteria for Road Traffic Noise* (*ECRTN*) sets out criteria for assessment of noise from Project vehicles on public roads when travelling to and from the site.

The *ECRTN* sets out noise criteria for "Arterial", "Collector" and "Local" roads. The classification of roads included in the Project's proposed transportation network (refer to **Figure 6.1**) is listed below:

Local Roads: Patons Lane, Luddenham Road
Collector Roads: Mamre Road
Freeway/Arterial Roads: M4 Motorway, Great Western Hwy, Elizabeth Dr, Westlink M7

Based on the criteria specified in the *ECRTN*, it is likely that the potential for traffic noise impacts from the Project would be greatest on the local roads of Patons Lane and, in particular, Luddenham Road, where several residences are located at various distances set back from these roads (refer to **Figure 2.1**).

The *ECRTN* traffic noise criteria for "land use developments with potential to create additional traffic on local roads" are that noise from traffic associated with the Project should not exceed:

For Local Roads

- Daytime (7.00am-10.00pm) $L_{Aeq,1hr}$ = 55dB(A)
- Night Time (10.00pm-7.00am) $L_{Aeq,1hr}$ = 50dB(A)

These criteria relate to the level of noise from Project traffic as measured external to the most affected building façade of the nearest affected residence.

Where existing traffic noise levels already exceed these values, the *ECRTN* indicates that:

> *"Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments.*
>
> *In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dB."*

4.2.3 Criteria for the Prevention of Sleep Disturbance

Although heavy vehicles will be restricted from doing so, a small number of employee vehicles will arrive at the site in the period immediately prior to 7am, ie, within the night time period (10pm-7am as defined by DECCW). Given that the number of vehicles approaching the site during this period will be very low, and in any case, represent a small proportion compared to existing traffic flows, the potential for sleep disturbance within residences due to these vehicles movements is very low and therefore not considered further in this assessment.

5. PREDICTION OF OPERATIONAL NOISE LEVELS

5.1 INTRODUCTION

Operational noise levels throughout the life of the Project have been determined through computer modelling using the Environmental Noise Model (ENM) software with the principal input variables being topography within and surrounding the Project Site, equipment noise levels and seasonal meteorological conditions. This section reviews each of these variables and how they have been incorporated into the modelling through the nominated noise scenarios.

5.2 TOPOGRAPHIC INFORMATION USED IN NOISE MODELLING

The topographical information for the Project Site and the surrounding land used in the noise modelling was provided by R.W. Corkery & Co Pty Ltd. The topographical data was resolved to 1m height intervals in the case of ground information within the Project Site, and to 0.5m height intervals for the topography surrounding the Project Site. The site topography, acoustic barriers and berms would change throughout the life of the Project, and therefore have varying influence on the propagation of noise from site activities. Hence, for each scenario, careful consideration was given to the topography at which equipment was to operate and to the intervening topography between site and receivers.

5.3 EQUIPMENT NOISE LEVELS USED IN NOISE MODELLING

Table 5.1 lists all equipment included in noise modelling and the assumed sound power levels. As part of the noise mitigation strategy for the Project, several items of plant will have noise mitigation treatment applied to them. As indicated in **Table 5.1,** the sound power level for each item of acoustically-treated mobile plant to be used on the Project Site was determined by Hushpak Engineering Pty Limited based on plant inspections and noise measurements undertaken in January 2011, and reductions nominated by them to be achievable. All plant operated at the site would be audited before arriving onto site to ensure that its operational noise emission complies with the sound power levels detailed in **Table 5.1**.

Table 5.1
Modelled Equipment & Sound Power Levels

Page 1 of 2

Equipment	Source Description	$L_{Aeq,15min}$ SWL dB(A)
Truck (1)	Truck (no mitigation) in motion	107
	Water Truck with noise mitigation	104
Compactor (1)	Compacting earth on final landform Fitted with noise mitigation	106
FEL (1)	Earthworks & loading trucks Fitted with noise mitigation	108
Scraper (1)	Earthworks Fitted with noise mitigation	104

Table 5.1 (Cont'd)
Modelled Equipment & Sound Power Levels

Equipment	Source Description	$L_{Aeq,15min}$ SWL dB(A)
Excavator(1)	Earthworks	102
Bulldozer (1)	Earthworks Fitted with noise mitigation	112
Jaw Crusher(2)	Processing recyclable materials Crusher housed in acoustic enclosure	111
Impact Crusher (2)	Processing recyclable materials	117
Trommel(2)	Processing recyclable materials Trommel housed within enclosure	100
Shredder(2)	Processing recyclable materials	112
Picking Stn(2)	Small conveyor used for sifting/sorting	100

Notes:
(1) Sound power levels for acoustically-treated mobile plant were determined by Hushpak Engineering Pty Limited based on plant inspections and noise measurements undertaken in January 2011, and reductions nominated by them to be achievable.
(2) Sound power level based on realistically-achievable values, as advised by the Proponent. Where the equipment is in a full enclosure, a 10dB reduction is assumed.
(3) Sound power level based on previous measurements of standard plant by Wilkinson Murray

5.4 SEASONAL METEOROLOGICAL CONDITIONS

The *INP* requires that in predicting operational noise levels, wind speed and direction should be taken into account if wind speeds of up to 3m/s in the source to receiver direction occur more than 30% of the time in any season. The INP also requires that predictions account for the effect of temperature inversions where operations occur during night periods, as is relevant for the Project's proposed early morning works (detailed in **Section 5.3.5**).

Records of wind speed and direction and atmospheric stability class were obtained from DECCW's meteorological station at St Marys, approximately 3km north-east of the Project Site, for the year January 2007 to December 2007. **Table 5.2** indicates that during the daytime periods over the entire year, winds of between 0.5m/s and 3m/s occur for over 30% of the time only from the North and North-West during Autumn and from the north-east during summer.

Table 5.2
Daytime Percentage Occurrence of Wind Speeds Between 0.5 and 3m/s

Period	Season	N	NE	E	SE	S	SW	W	NW
Day	Autumn	32.1	22.4	10.4	22.3	27.5	24.2	22.0	33.2
	Spring	26.7	26.8	16.8	24.0	21.5	16.4	11.3	24.0
	Summer	29.9	33.2	21.8	22.7	17.0	12.6	9.3	23.4
	Winter	21.2	15.6	10.4	18.4	25.6	24.5	20.1	19.3

In cases where consideration of meteorological conditions is required, Wilkinson Murray has developed a procedure for addressing meteorological conditions which is considered to be consistent with the intent of the INP, and is more realistic than the procedure of adopting a single condition for assessment (although more difficult to implement). This involves calculating the noise level exceeded for 10% of all day, evening or night periods in each season, using the range of meteorological conditions present at the site. The highest of these 10% exceedance values for any season is taken as the value to be compared with the intrusiveness criterion.

This procedure has been accepted by DECCW in previous assessments, and is used in this report to calculate noise levels from the Project Site.

5.5 OPERATIONAL SCENARIOS USED IN NOISE MODELLING

5.5.1 Introduction

The following four operational scenarios were considered for this noise assessment. These represent the typical *worst case* operating conditions during each stage of the Project and therefore apply to operations during any of the proposed combinations of waste receipt and re-processing and clay/shale extraction and product despatch.

	Waste Received	Clay/shale Despatched	Recycled/Re-processed Products Despatched
1	-	Limited[1]	nil
2	300 000tpa	160 000tpa	190 000tpa
3	450 000tpa	160 000tpa	245 000tpa
4	450 000tpa	160 000tpa	245 000tpa

Notes: 1. Limited clay/shale will be transported from site following the sealing of Patons Lane

It is important to note that this assessment is made on a worst case busy day scenario. In reality during these operating scenarios, the most likely situation will be that not all plant will be operating concurrently or at their most exposed locations, and noise emissions from the site will therefore most often will be lower than is represented in this assessment.

5.5.2 Scenario 1 – Site Establishment Stage

It is noted that **Figure 5.1** presents a "snapshot" of activities throughout the site establishment phase with interim ground levels used to reflect operational areas. These works are largely designed to provide long-term noise controls for the site, and are expected to last for approximately six months.

Noise Mitigation in Place for this Scenario

- 4m high mobile barriers along the northern side of the northern face positioned adjacent to working areas.
- The elevation of the northern face is 52m AHD for the considered scenario (progressing to the final height of 55m AHD).
- The internal acoustic earth mound on the northern and eastern side of the recycling/re-processing area is constructed to 55m AHD for the considered scenario (progressing to final height of 57m AHD).

Activities in Progress

A. Excavation within the recycling and re-processing area to create the required floor topography [1 x Excavator (30t) @ 51m AHD; 1 x Compactor (Cat 825H) @ 48m AHD; 1 x 40t articulated truck @ 51m AHD].

B. Excavation of material from Cell 1A to create the required topography and delivery to the northern face [1 x Excavator (30t) @ 30m AHD; 2 x 40t articulated truck (Cat 740) @ 39m AHD (AT1); and 48m AHD (AT2)] [Note: The on-site bulldozer used periodically for ripping shale has been included in Activity G].

C. Shaping of excavated material from Cell 1A on the northern face [1 x Compactor (Cat 825H) @ 48m AHD; 1 x Water Truck @ 52m AHD].

D. Excavation and shaping of material near Dam 2 to complete landscaping works on the northwestern side of the Project Site [1 x Excavator (30t) @ 45m AHD and 1 x 40t articulated truck @ 39m AHD (AT1)].

E. Loading clay / shale from stockpiles at ground level above Cell 2 into trucks for despatch off site [1 road truck @ 45m AHD (Tr1) / 1 road truck @ 47m AHD (Tr2) (60 truck movements per day) and front-end loader @ 45m AHD].

F. Dust suppression and road maintenance [1 x 30 000L truck @ 48m AHD.

G. Excavation of material from the existing southwestern bund wall to create the nominated profiles to provide materials for the construction of the acoustic noise mound surrounding the recycling and re-processing area ((1 x Excavator (30t) @ 62m AHD (Ex)).

Note: Where haul trucks are indicated, these are assumed to be moving.

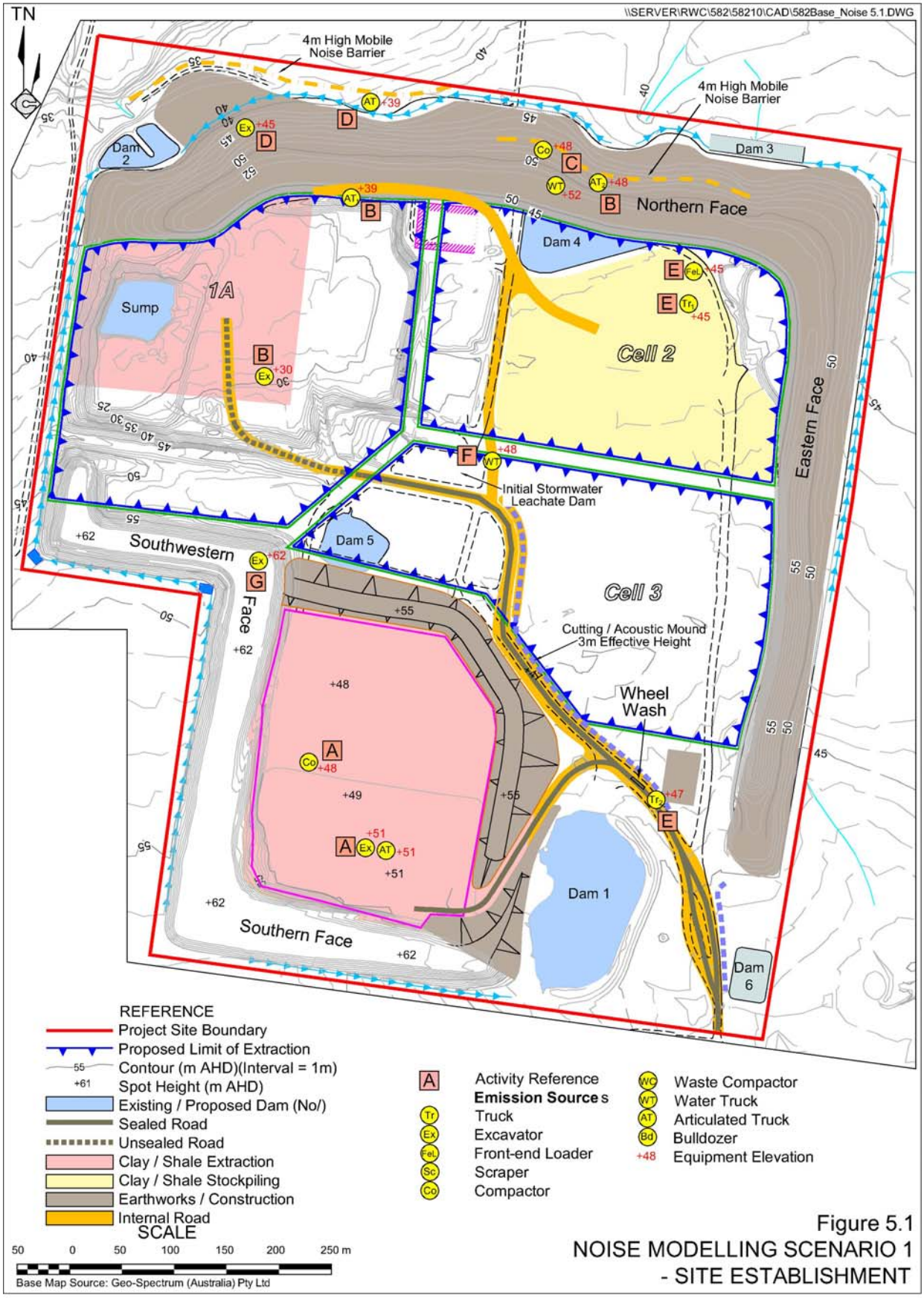

Figure 5.1
NOISE MODELLING SCENARIO 1 - SITE ESTABLISHMENT

5.5.3 Scenario 2 – Initial Waste Emplacement and Recycling

This scenario is representative of activities proposed during the early stages of operation. Noise modelling of this scenario was based on the typical worst case plant configuration and noise mitigation elements listed below, which are illustrated in **Figure 5.2**. Where an item of equipment is to be used in multiple areas (eg. front-end loader), it has been modelled in the area likely to create the highest noise level off site. As for Scenario 1, noise levels generated from this phase of works will typically be less than those presented in this assessment which is based on peak site operating conditions.

Activities Completed and Noise Mitigation Installed

- Audio-visual mound around the recycling and re-processing area to a height of 57m AHD.
- Northern face (continuous) to a height 55m AHD.
- Installation of all recycling and re-processing equipment and buildings.

Activities in Progress

A. Delivery of wastes by truck to recycling and re-processing area (@ 49m AHD (Tr1) and 48m AHD (Tr4) and Cell 1A and @ 45m AHD (Tr2) and 47m AHD (Tr3)). [16 truck movements per hour].

B. Compaction of wastes in Cell 1A [Waste Compactor (Cat 825H @ 45m AHD) (WC)].

C. Ripping and excavation of material from Cell 1B and delivery to stockpile area [1 x D11 Bulldozer @ 30m AHD (Bd) and 1 x Scraper (Cat 637) @ 45m AHD (Sc)].

D. Loading clay / shale from stockpiles at ground level above Cell 2 into trucks for despatch off site [1 truck @ 45m AHD (Tr1) / 1 mobile truck @ 47m AHD (Tr2) (8 truck movements per hour) and front-end loader @ 45m AHD (FeL)].

E. Operation of all recycling and re-processing plant within the recycling and re-processing area at various levels 45m/48m AHD and long reach excavator (15t) @ 45m AHD (Ex)].

F. Dust suppression and road maintenance [1 x 30 000L truck @ 45m AHD.

G. Articulated truck back loading from F @ 45m AHD] Note: The on-site front-end loader has been included in Activity D as the loader would operate intermittently in both areas.

H. Loading of recycling products into truck (tr) within the recycling and re-processing area. [Front-end loader (Cat 966) @ 49m AHD and stationary truck at 49m AHD)

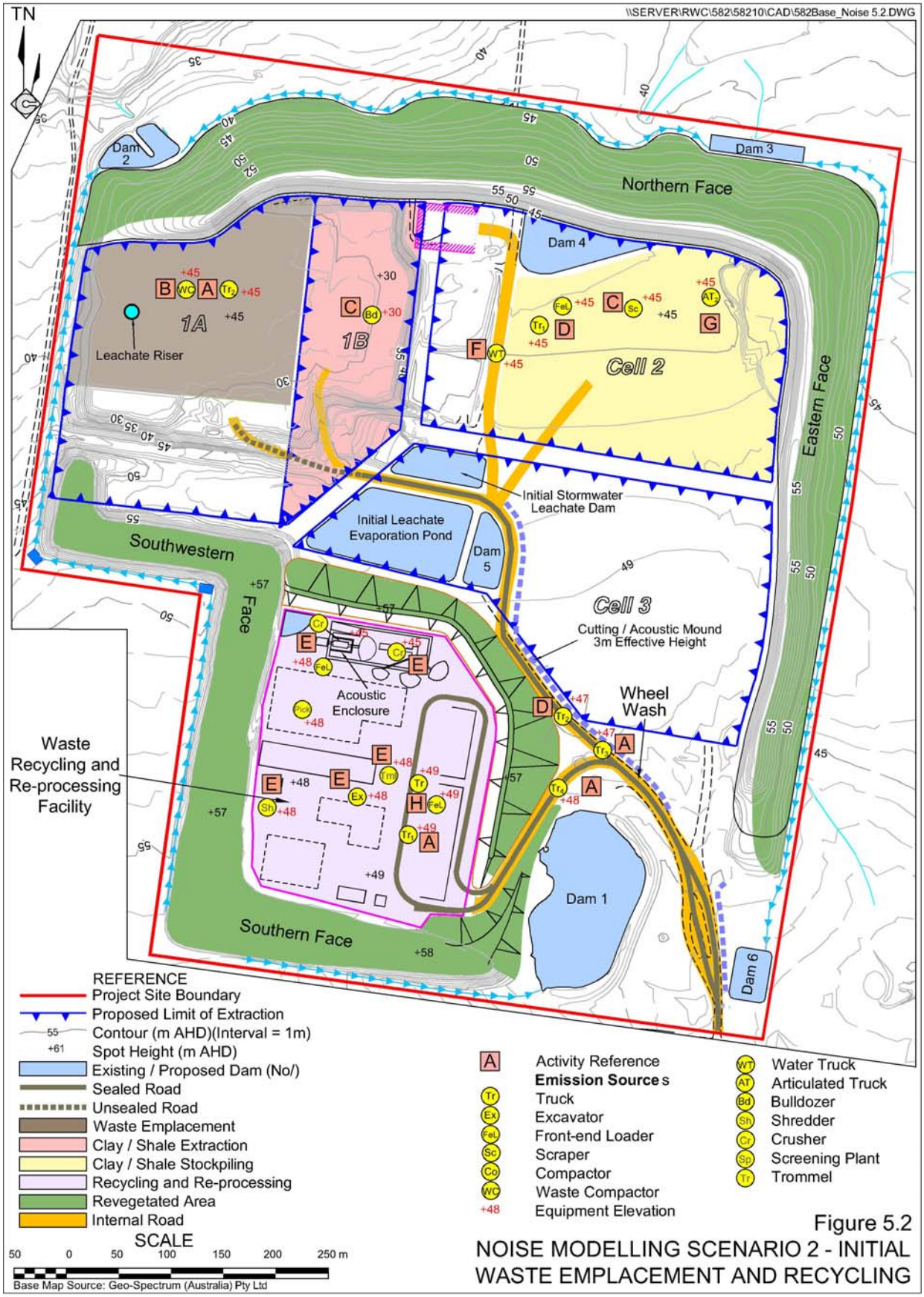

Figure 5.2
NOISE MODELLING SCENARIO 2 - INITIAL WASTE EMPLACEMENT AND RECYCLING

5.5.4 Scenario 3 – Stage 2A Waste Operations

This scenario is representative of activities proposed on site during the middle stages of operation. Noise modelling of this scenario was based on the typical worst case plant configuration and noise mitigation elements listed below, and which are illustrated in **Figure 5.3**. As for other Scenarios, the site's noise emissions from *typical* site activities during this stage will be less than the levels predicted by this assessment which are based on peak operating conditions.

Activities Completed and Noise Mitigation Installed

- Final landform above Cell 1 (capping underway).
- All haul roads to the elevated area within Cell 1 would be positioned as far as possible to maximise the use of naturally-occurring shielding.
- Operation of the recycling and re-processing plant (with all safeguards/controls in place).
- Audio-visual mound around the recycling and re-processing area to height 57m AHD.
- An interim acoustic mound with an elevation of 55m AHD and 5m elevation difference within activity area. All activities will be undertaken behind the acoustic earth mounds at all times.
- Excavation of Cell 2A completed and waste placement and compaction underway.
- Two or more fixed 4m high barriers within the active stockpile area (the locations of the noise barriers would be nominated by a noise consultant).

Activities in Progress

A. Delivery of wastes by truck to recycling and re-processing area (@ 49m AHD (Tr1) and 47m AHD (Tr4) and Cell 2A @ 45m AHD (Tr2) and 47m AHD (Tr3)). [16 truck movements per hour].

B. Unloading and compaction of wastes in Cell 2A [Truck unloading (Tr 1) @ 45m AHD; Waste Compactor (Cat 825H @ 45m AHD) (WC)].

C. Ripping and excavation of material from Cell 2B and delivery to stockpile area [1 x D11 Bulldozer @ 40m AHD (Bd) and 1 x Scraper (Cat 637) @ 45m AHD (Sc2)].

D. Loading clay / shale from stockpiles at ground level above Cell 3 into trucks for despatch off site [1 @ 45m AHD (Tr1) / 1 @ 45m AHD (Tr2) (8 truck movements per hour) and front-end loader @ 45m AHD (FeL)].

E. Operation of all recycling and re-processing plant within the recycling and re-processing area at various levels 45m/48m/49m AHD and long reach excavator (15t) @ 45m AHD (Ex) and front-end loader @ 48m AHD (FeL].

F. Dust suppression and road maintenance [1 x 30 000L truck @ 47m AHD.

G. 1 x 40t articulated trucks @ 47m AHD (AT2).

H. Loading of recycling products into truck within the recycling and re-processing area. [Front-end loader (Cat 966) @ 49m AHD and truck (Tr) at 49m AHD].

J Final shaping and compacting initial layers of capping. Bulldozer pushing/shaping material @ 51m AHD (Bd). Sheeps-foot roller and tractor compacting surface (Co) @ 51m AHD.

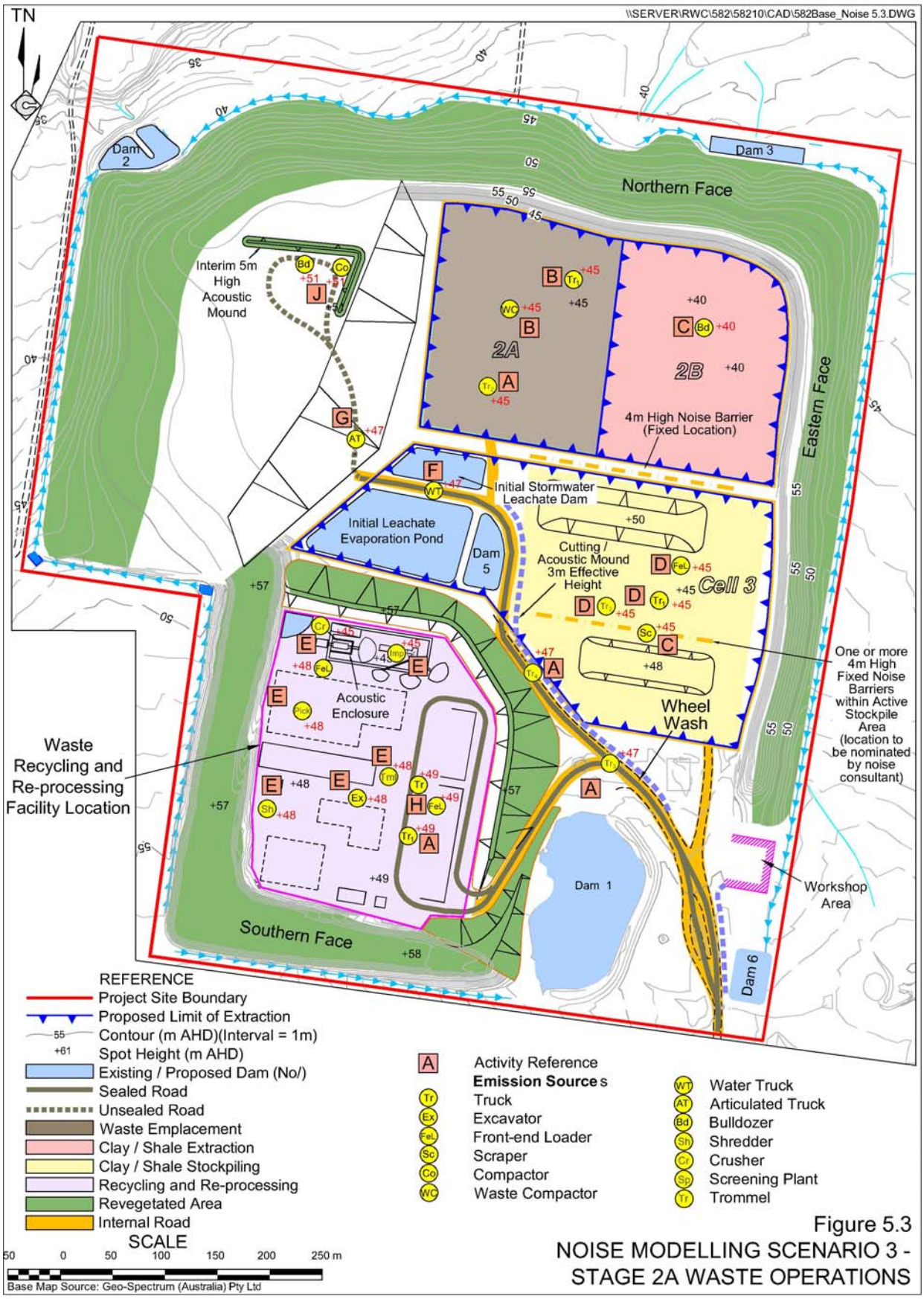

Figure 5.3
NOISE MODELLING SCENARIO 3 - STAGE 2A WASTE OPERATIONS

5.5.5 Scenario 4 – Stage 3B Operations

This scenario is representative of activities proposed during the latter stages of the operation. Noise modelling of this scenario was based on the typical worst case plant configuration and noise mitigation elements listed below, and which are illustrated in **Figure 5.4**. Noise levels generated from this stage of works will typically be less than those presented in this assessment which is based on peak site operating conditions.

Activities Completed and Noise Mitigation Installed

- Final landform (and capping) above Cells 1 and 2.
- Final landform on Cell 3A (capping underway).
- Excavation within Cell 3C.
- All haul roads to the external areas above Cell 3A kept contained behind the eastern face.
- The internal audio-visual mound on the northern and eastern sides of the recycling/re-processing area to a height of 57m AHD.
- An interim acoustic mound with an elevation of 55m AHD.

Activities in Progress

A. Delivery of wastes by truck to recycling and re-processing area (@ 49m AHD (Tr1) and 47m AHD (Tr4) and Cell 3B @ 47m AHD (Tr2) and 44m AHD (Tr3)). [16 truck movements per hour].

B. Compaction of wastes in Cell 3B [Waste Compactor (Cat 825H @ 45m AHD) (WC)].

C. Ripping and excavation of material from Cell 3C and delivery off site [1 x D11 Bulldozer @ 40m AHD (Bd) and 2 x road-registered trucks @ 47m AHD (Tr1) and 47m AHD (Tr2) (8 truck movements per hour) and front-end loader @ 40m AHD (FEL)].

D. Dust suppression and road maintenance [1 x 30 000L truck @ 40m AHD.

E. Operation of all recycling and re-processing plant within the recycling and re-processing area at various levels 45m/48m AHD and long reach excavator (15t) (Ex)] and front-end loader (FEL) @ 48m AHD.

F. Loading of recycling products into stationary truck (idling) within the recycling and re-processing area. [Front-end loader (Cat 966) @ 49m AHD and truck (Tr) at 49m AHD].

G. Final shaping and compacting initial layers of capping. Bulldozer pushing/shaping material @ 51m AHD (Bd) and sheeps-foot roller and tractor compacting surface (Co) @ 51m AHD. Delivery of capping material by articulated trucks [1 x 40t articulated truck @ 48m AHD (AT_1).

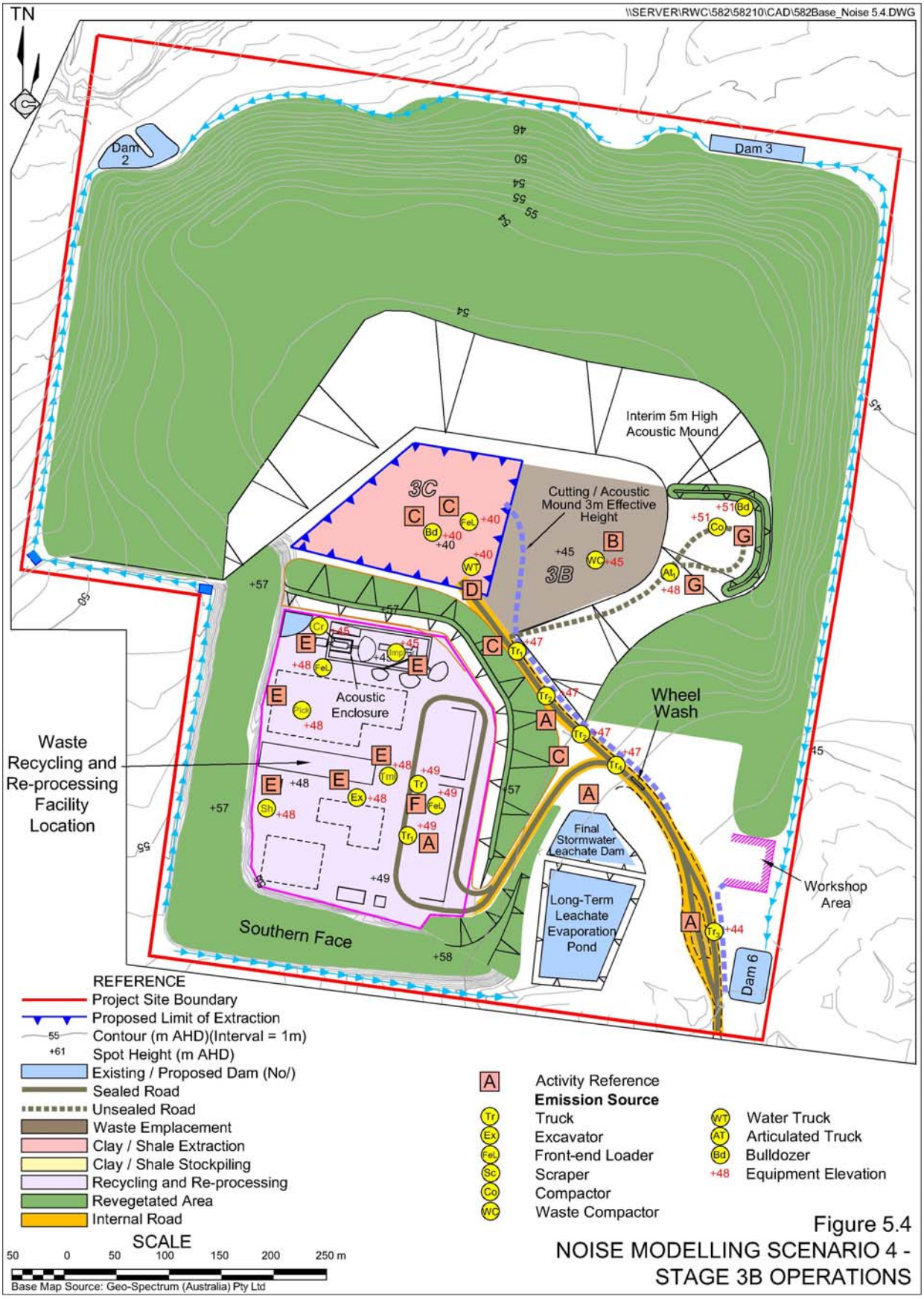

Figure 5.4
NOISE MODELLING SCENARIO 4 - STAGE 3B OPERATIONS

5.6 PREDICTED NOISE LEVELS FROM SITE ESTABLISHMENT WORKS

Table 5.3 indicates the predicted noise levels that will be received at residences during worst case site establishment activities (Scenario 1 as indicated in **Figure 5.1**) for neutral and worst case prevailing meteorological conditions (**Section 5.4**). The results presented include the acoustic benefit of the presence of a 4m-high mobile barrier in the immediate vicinity of earthmoving equipment working on the external (northern) face of the northern face (**Figure 5.1**).

Table 5.3
Predicted $L_{Aeq,15min}$ Noise Levels at Residences During Site Establishment

Residence	ID (1)	All Plant Operating ($L_{Aeq,15min}$ dB(A))		Construction Noise Criterion dB(A)
		Neutral Met Conditions	Adverse Met Conditions	
9 Verdehlo Way	-	35	39	44
3 Chablis Pl	V	39	41	44
15 Cabernet Cct	W	39	43	44
11 Cabernet Cct	-	39	43	44
Bates Residence	A	35	39	44
Newham Residence	B	35	39	44
210 Luddenham Rd	T	<30	35	47
216 Luddenham Rd	R	<30	34	47
230 Luddenham Rd	O	<30	30	47
262 Luddenham Rd	I	<30	<30	47

Note: (1) Residence ID as indicated in Figure 2.1

Table 5.3 indicates that construction noise will comply with the construction noise criteria (**Table 4.2**) at all times for earthmoving equipment operating on external slopes during the construction of the northern and eastern faces. The mobile acoustic barrier will be positioned so as to screen residences in The Vines at all times during works on the external faces. The faces will be developed such that the outermost sections of the slope under construction are established first so as to accommodate the mobile acoustic barrier, with back-filling following. This configuration will be repeated as the elevation of the face is increased.

5.7 PREDICTED OPERATIONAL NOISE LEVELS FROM ON-SITE ACTIVITIES

For the prediction of daytime operational noise levels, 41 separate meteorological conditions were considered with wind speeds of 0.5-3m/s in each of eight directions, and zero wind speed (representing both zero wind and wind speeds above 3m/s). Noise levels were calculated under each of these conditions, and the probability of occurrence of each condition for daytime periods in each season was then used to calculate the L_{Aeq} noise level which would be exceeded for 10% of 15-minute periods. **Table 5.4** indicates the predicted operational noise level exceeded for 10% of 15 minute periods during the worst case season for daytime meteorological conditions (**Section 5.4)**. The predicted operational noise levels are also presented in the form of noise contours in **Figures 5.5** to **5.7**. Predictions of noise levels include the acoustic benefit of all earth mounding and all acoustic housings included in the site layout design as detailed in **Section 5.2**.

Table 5.4
Predicted L_{Aeq} Operational Noise Levels Exceeded for 10% of 15-Minute Periods (daytime periods, 7am to 6pm)

Residence	ID (1)	Operational Noise Level at Residence ($L_{Aeq,15min}$ dB(A))			Daytime Criterion (dB(A)
		Scenario 2	*Scenario 3*	*Scenario 4*	
9 Verdehlo Way	-	36	38	37	39
3 Chablis Pl	V	37	38	38	39
15 Cabernet Cct	W	38	39	37	39
11 Cabernet Cct	-	38	39	38	39
Bates Residence	A	37	38	38	39
Newham Residence	B	38	39	39	39
210 Luddenham Rd	T	38	37	37	42
216 Luddenham Rd	R	35	35	35	42
230 Luddenham Rd	O	33	32	33	42
262 Luddenham Rd	I	32	32	33	42

Notes: (1) Residence ID as indicated in Figure 2.1

As for the construction phase, in order to develop the site's final landform, earthmoving equipment will at times be required to operate above the level of the perimeter acoustic mounding during Scenarios 3 and 4. In order to appropriately control the noise from these activities to residences, an interim 5m-high earth mound will be constructed initially on the outermost reaches of the working area, with all back-filling to be conducted behind (south of) this mound. The mound will then be progressively moved to shield the current back-filling area from surrounding residences. This process will be adopted repeatedly as required until the full design height of the final landform has been achieved. In this manner, mobile plant operating above the height of the perimeter acoustic mounding will always be screened from residences in The Vines. As a result of this mitigation, operational noise from Scenarios 2, 3 and 4 will comply (**Table 5.4**) with all relevant noise criteria under all meteorological conditions.

Notably, the predicted noise levels presented in **Table 5.4** represents emission levels from typical worst case conditions (ie. plant operating at capacity in locations most exposed to residences in worst case wind conditions i.e. gentle winds blowing toward residences.) At many times, noise levels from the site will be less than the presented levels. Further, at times of favourable winds (blowing away from, rather than toward residences), noise will be much reduced from these levels. The Noise Management Plans to be developed for the Project will optimise the operational flexibility of the site in order to take advantage of these opportunities to reduce noise from the site to residences.

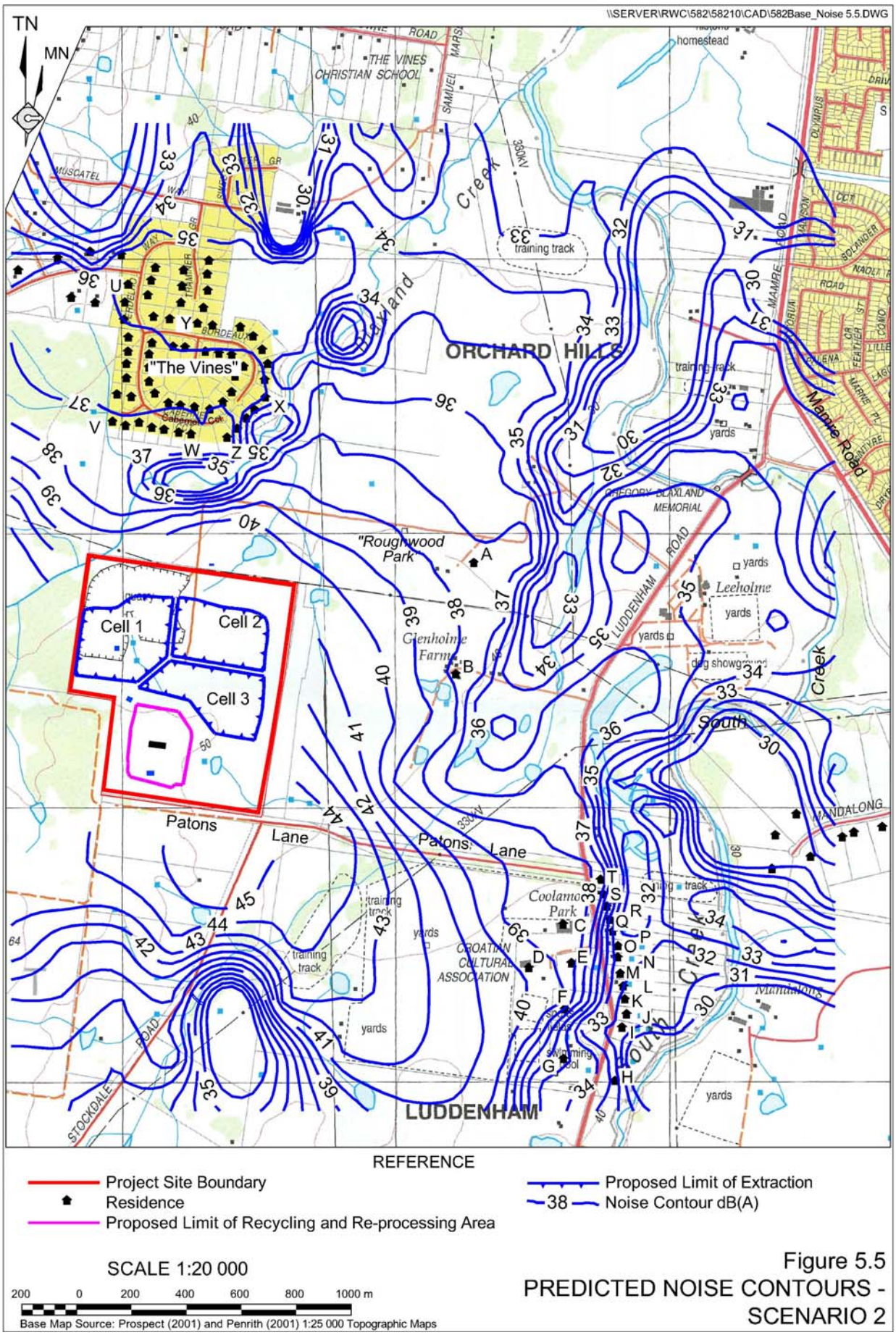

Figure 5.5
PREDICTED NOISE CONTOURS - SCENARIO 2

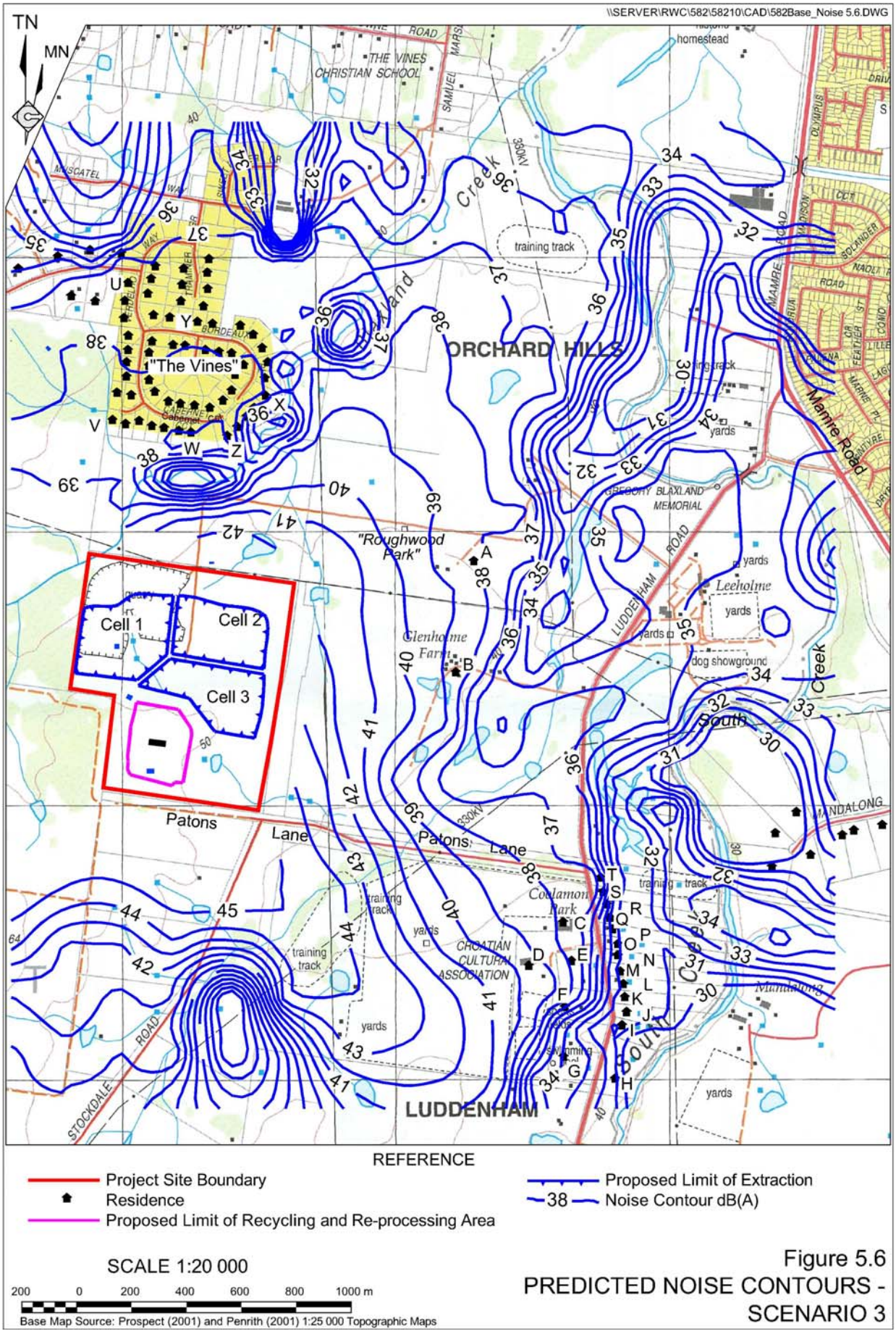

Figure 5.6
PREDICTED NOISE CONTOURS - SCENARIO 3

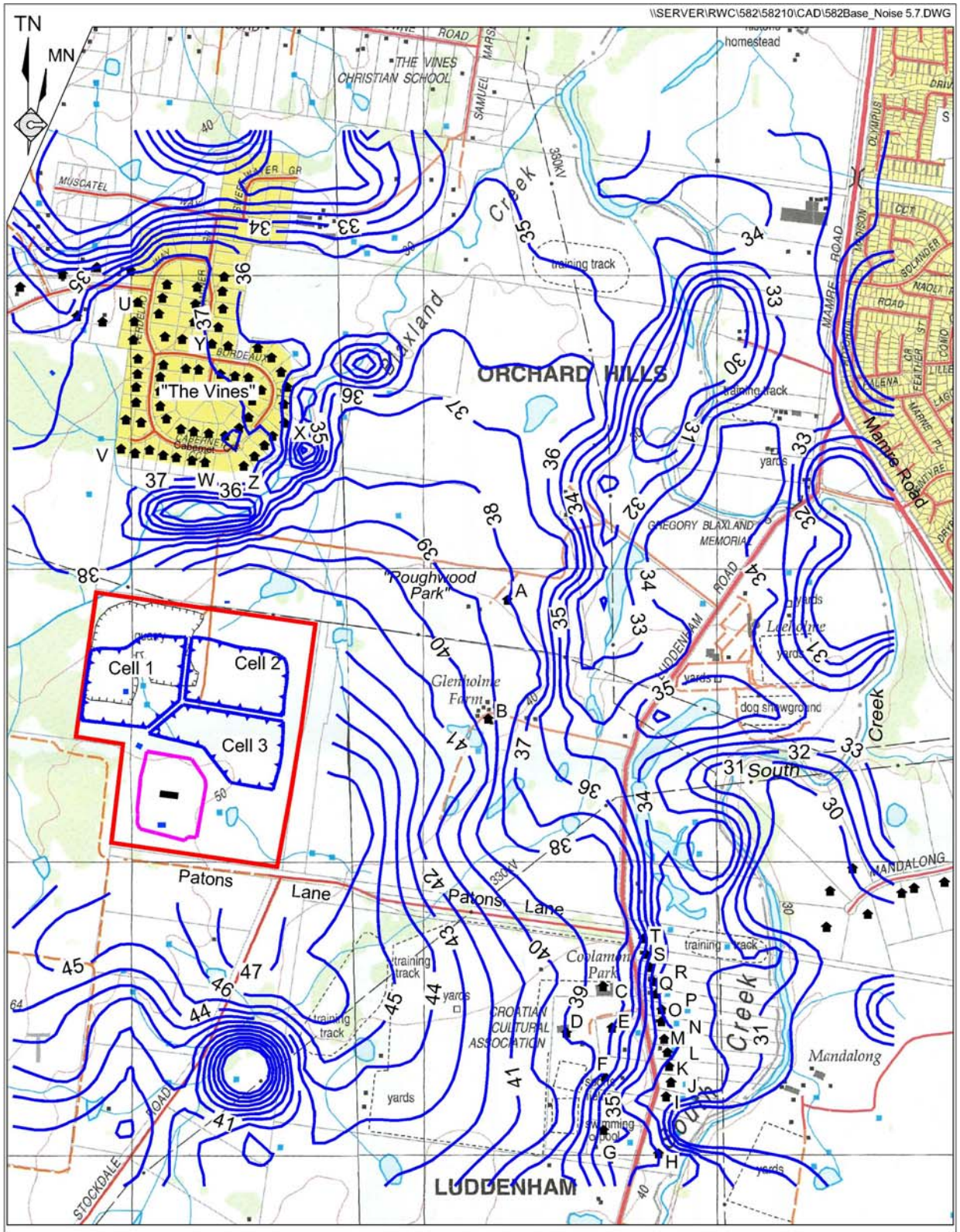

Figure 5.7
PREDICTED NOISE CONTOURS - SCENARIO 4

6. PREDICTION OF NOISE FROM THE PROJECT'S OFF-SITE TRAFFIC

6.1 TRANSPORTATION ROUTES

Figure 6.1 indicates the proposed transportation routes for the delivery of waste, and the despatch of clay/shale and recycled and re-processed products. All vehicles will approach the Project Site via Mamre Road, Luddenham Road and Patons Lane. Vehicles travelling to/from the north would likely exit/enter Mamre Road from either the M4 Western Motorway or Great Western Highway. Vehicles travelling to/from the south would enter/exit Mamre Road from Elizabeth Drive and subsequently the Westlink M7.

Vehicles will not travel on local roads between the Project Site and the M4 Western Motorway or Westlink M7 except when materials are being received from/delivered to those areas.

It is predicted that 80% of the truck movements to and from the Project Site would occur via Mamre Road northwards whilst the remainder of truck movements would occur via Mamre Road southwards.

6.2 EXISTING TRAFFIC

Data relating to existing traffic movements in the vicinity of the Project Site have been collected (in June 2009by surveys at the intersections of:

- Mamre Road and Luddenham Road, Orchard Hills, and
- Luddenham Road and Patons Lane, Orchard Hills.

In summary, the traffic assessment resolved that the highest existing hourly traffic flow on Luddenham Road is approximately 300 vehicles/hour (in the afternoon peak hour). This is inclusive of the total number of vehicles, including trucks, travelling in either direction along Luddenham Road. The percentage of heavy vehicles (>3 tonnes) within this flow was reported to range up to approximately 7%. The traffic assessment also determined the Annual Average Daily Traffic (AADT) count to be approximately 3200 vehicles per day, with 5% heavy vehicles, and an 85-percentile speed of 84km/h.

6.3 TRAFFIC DURING SITE ESTABLISHMENT PHASE

Traffic impacts from the Project, if any, will be dictated by traffic generation during its operational phase, rather during its construction phase, when a significantly lower number of trucks will access the site. Where it can be shown that traffic impacts during the operational phase will be acceptable, then it will follow that noise to residences from construction traffic will also comply with the relevant criteria.

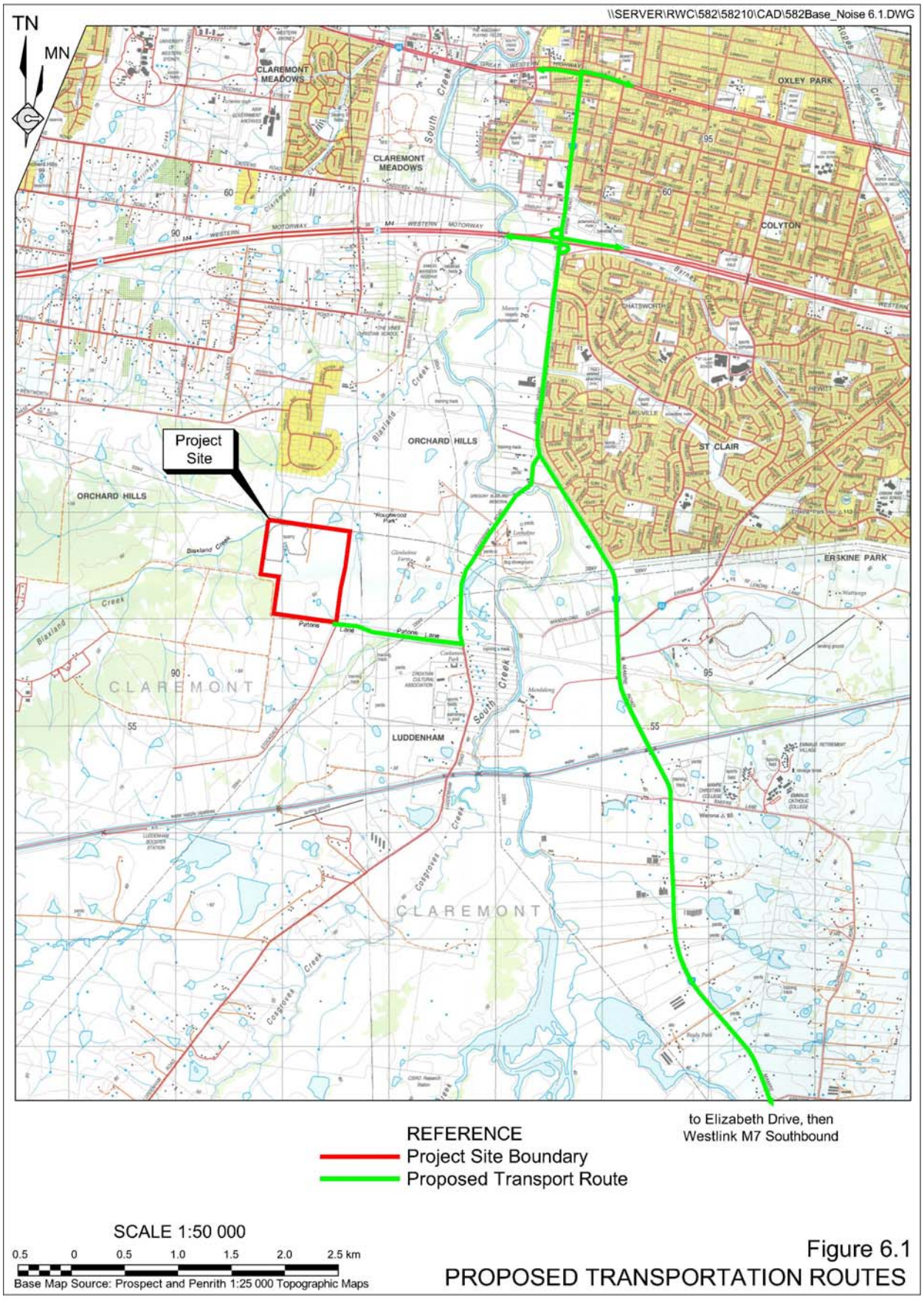

Figure 6.1
PROPOSED TRANSPORTATION ROUTES

6.4 TRAFFIC DURING OPERATIONAL PHASE

For the purposes of the assessments of impacts of heavy vehicles delivering waste to the Project Site, two levels of waste deliveries are proposed which, based on an average load of 30 tonnes, would generate the heavy vehicle movements indicated in **Table 6.1**Table 6.1.

Table 6.1
Projected Waste Heavy Vehicle Movements

Annual Waste Deliveries	Average Daily Movements*
300 000t	72
450 000t	110

* Assumes receipts on Saturday = 50% weekday quantities

Clay/shale Despatch

Most trucks transporting clay/shale from the Project Site will be truck and dog trailers carrying an average 30t load. For the purpose of assessing the impact of heavy vehicles transporting clay/shale from the Project Site, two production levels are proposed which, based on an average load of 30 tonnes, would generate the heavy vehicle movements indicated in **Table 6.2**. It is noted that whilst back loading would be undertaken wherever possible, for assessment purposes it is assumed that no back loading would be undertaken.

Table 6.2
Projected Clay/Shale Heavy Vehicle Movements

Annual Clay/shale Despatched	Average Daily Movements*
120 000t	32
160 000t	44

* Assumes clay/shale despatched Mondays to Fridays only

For the assessment of noise in Scenarios 2, 3 and 4, the maximum level of clay/shale despatched has been assumed.

Recycling / Re-processing Product Despatch

The products produced by the recycling and re-processing plant will be despatched from site, with a small proportion as backloads in heavy vehicles carrying an average 30t load. For assessment purposes, two production levels are considered. The production levels and their corresponding average daily movements are indicated in **Table 6.3**.

Table 6.3
Projected Heavy Vehicle Movements relating to Product Despatch

Recycling/Re-processing Products Despatched	Average Daily Movements[#]
190 000t	46
245 000t	60

[#] Assumes products despatched on Saturday = 50% weekday quantities

In order to determine a realistic cap for overall heavy vehicle traffic levels, the operational scenarios listed in **Table 6.4** and their heavy vehicle movements were considered.

Table 6.4
Cumulative Heavy Vehicle Transport Scenarios

Scenario	Waste Deliveries		Clay/Shale Despatched		Recycled / Re-processed Products Despatched		Total Truck Movements
	Quantity	Av. Daily Movements	Quantity	Av. Daily Movements	Quantity	Av. Daily Movements	
1	450 000	110	160 000	44	245 000	60	214
2	300 000	72	120 000	32	190 000	46	150

Table 6.4 indicates that the maximum *average* number of truck loads on any day (during the Site's maximum operating capacity) for all incoming and outgoing materials would be approximately 107 loads (214 movements). Given there will be daily variations in the various heavy vehicle movements and the deliveries of consumables to site, the Proponent has nominated an upper level of heavy vehicles at 250 per day.

Based on an 11 hour day, this would equate to an average of **approximately 12 heavy vehicle loads (24 movements) per hour**.

The number of *light* vehicles travelling to and from the Project Site daily would vary between 20 and 30 (ie, 40 and 60 light vehicle movements per day). These movements would be concentrated at the beginning and end of each operational day. Between 10 and 15 vehicle movements would occur during each of the first and last operational hours of the day, with the remainder of movements spread throughout the remainder of the day.

6.5 PREDICTION OF TRANSPORTATION NOISE IMPACTS

L_{Aeq} noise levels associated with existing traffic, and the proposed additional traffic, were calculated using the *CoRTN* prediction procedure. Worst-case assumptions, as outlined above, were made with regard to traffic generated by the Project. For existing traffic, although the maximum traffic volume in any hour was recorded as 300 per hour, a lower volume of 250 per hour was assumed for a typical hour during the daytime.

The receivers potentially most affected by traffic noise from the proposal are set back from Luddenham Road, and of these, the most-affected is located approximately 60m from the nearest point of the route (the intersection of Luddenham Road, and Patons Lane) taken by trucks arriving to the site from the north.

Other parameters used in the model are shown in **Table 6.5**.

Table 6.5
Calculation of Noise Levels from Road Traffic

Parameter	Existing Traffic	Additional Project Traffic
Vehicles Per Hour	250	39 (24 heavy + 15 light)
Percentage Heavy Vehicles	7%	62%
Road Surface Correction	+1 dB	+1 dB
Distance to facade	21 m	60 m
Percentage Soft Ground	50%	50%
Calculated $L_{Aeq,1hr}$	60.6 dBA	52.5 dBA

Table 6.5 indicates that a typical existing hourly traffic noise level of 60.6 dBA can be expected at the worst-case receiver, and additional traffic from the project, under worst-case conditions, would create 52.5 dBA. The total traffic noise level is then calculated to be 61.2 dBA, or an increase of 0.6 dB over the existing level, which is within the allowance criterion of +2 dBA. Thus, operational traffic noise levels associated with the Project are predicted to be well within relevant criteria.

6.6 MANAGEMENT OF TRANSPORTATION NOISE

With a view to minimising noise from the Project's heavy vehicle movements on public roads, the Proponent will implement a Driver's Code of Conduct for all drivers travelling to and from the Project Site to ensure all issues related to unacceptable driver behaviour would not be tolerated. Relevant noise-related requirements in the code of conduct will relate to:

- strict adherence to the approved hours of operation;
- avoidance of the use of exhaust brakes on Luddenham Road within 500m of the intersection with Patons Lane and at all times whilst travelling on Patons Lane;
- maintenance of vehicles to maintain compliance with RTA noise criteria, and
- avoidance of speeding on roads approaching the Project Site.

It is proposed that the content of the Code of Conduct would be prepared in consultation with the residents near the intersection of Patons Lane and Luddenham Road to ensure that appropriate limitations/expectations are placed on drivers travelling to and from the Project Site. The Code of Conduct would incorporate a penalty clause for the re-offending drivers, ie. three substantiated offences and they would be banned from travelling to the Project Site.

7. COMPLIANCE NOISE MONITORING

The Project will incorporate an ongoing real-time noise monitoring system and separately, an ongoing attended noise monitoring program, as required, throughout its operational life. The program will include both environmental noise monitoring of the site's total noise emissions and on-site of fixed plant and mobile earthmoving equipment auditing. This monitoring will serve to:

- validate the noise predictions presented in this assessment,
- ensure that fixed plant earthmoving equipment noise levels do not exceed the sound power levels presented in **Table 5.2**;
- ensure the effectiveness of the noise mitigation measures included in the Project's design; and
- through the adoption of a real-time noise monitoring system, ensure the ongoing compliance of the site's total noise emissions.

Real time monitoring is environmental best practice given its ability to identify, monitor and record audio samples of specific noise sources and instantaneously (and wirelessly) transmit these to a central console, such that immediate action can be taken on noise from equipment or processes that are approaching or exceed relevant noise criteria.

Details of the noise monitoring program will be included in a Noise Monitoring Plan to be prepared following the receipt of project approval. The Plan would address on-site auditing of the major items of plant (as identified in **Table 5.2** or otherwise, as new plant is introduced throughout the Project). It is proposed to establish a real-time noise monitoring system at an agreed location within The Vines Estate. Attended monitoring will also be undertaken adjacent to one of each of the following groups of residences:

- One of Residence V, W, or Z (refer to **Figure 2.1**); and
- One of Residences A or B, and
- One of Residences P, Q, R,S or T,

as dictated by the location of site operations and meteorological conditions prevailing on the day of monitoring, and access restrictions to these residences. Monitoring of noise during both the site establishment and operational phases will be based on the measurement of the $L_{Aeq,15min}$ noise level with earthmoving equipment engaged in its normal operating modes.

It is proposed that environmental monitoring of (off-site) Project traffic noise would be undertaken from the most exposed building façade of Residence T (**Figure 2.1**), the closest residence to the intersection of Luddenham Road and Patons Lane. Monitoring of traffic noise will be based on the measurement of the $L_{Aeq,1hour}$ noise levels of vehicle passbys on public roads (rather than private, on-site haul roads).

On-site noise auditing of individual plant emission levels will occur not less frequently than once every two years, and otherwise, when new earthmoving equipment is introduced to the Project Site.

Attended noise monitoring of the site's total noise emissions will be undertaken at least quarterly during the first 2 years, and additionally, within one month of the commencement of a new operational stage of the Project (as indicated in **Sections 5.3.1 – 5.3.5**).

Environmental monitoring will be undertaken during times of peak site operating conditions. The monitoring reporting will include an inventory of all plant operating during the monitoring period and an account of the prevailing winds (if any) during monitoring. The Site Manager will be consulted prior to, during and immediately after the monitoring session to advise on the number of and general location of earthmoving equipment operating during the monitoring period.

The monitoring program would be reviewed annually to ensure only meaningful data is being collected.

All monitoring results would be made available to relevant regulatory bodies and included in each Annual Environmental Management Report.

8. CONCLUSION

This report details how noise emissions from all construction and operational phases of the modified Orchard Hills Waste and Resource Management Facility will comply with DECCW noise criteria.

This assessment also concludes that no exceedance of relevant criteria for off-site traffic noise would occur.

In addition to the ameliorative measures, detailed in the body of this report, the Proponent will develop a series of Noise Management Plans throughout the life of the Project which will serve to further reduce the noise exposure at surrounding residences. The initial Plan would prescribe strategies in detail regarding matters such as the use of real-time noise monitoring, and the staging of the site establishment activities in relation to the re-positioning of the mobile acoustic barrier so as to appropriately screen works at all times. Each Plan would re-assess the Project's noise monitoring program and the relevance of its results to future works processes

ATTACHMENTS

(No. of pages excluding this page = 25)

Attachment 1 Glossary of Acoustic Terms

Attachment 2 Results of Unattended Background Noise Monitoring

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Attachment 1

Glossary of Terms

Number of pages excluding this page (2)

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GLOSSARY

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph overleaf, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

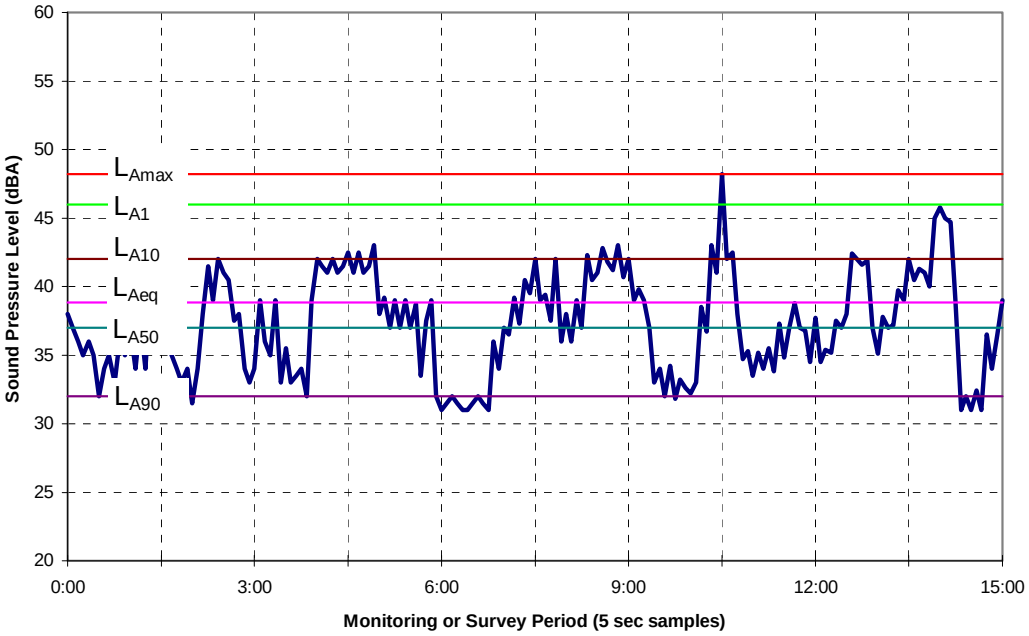
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period **–** daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



Attachment 2

Results of Unattended Background Noise Monitoring

Number of pages excluding this page (21)

(Note: These charts are included in colour on the Project CD)

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Location: Site 1: Vacant Lot, 13 Cabernet Cct, The Vines
Data shaded: Wind; Rain

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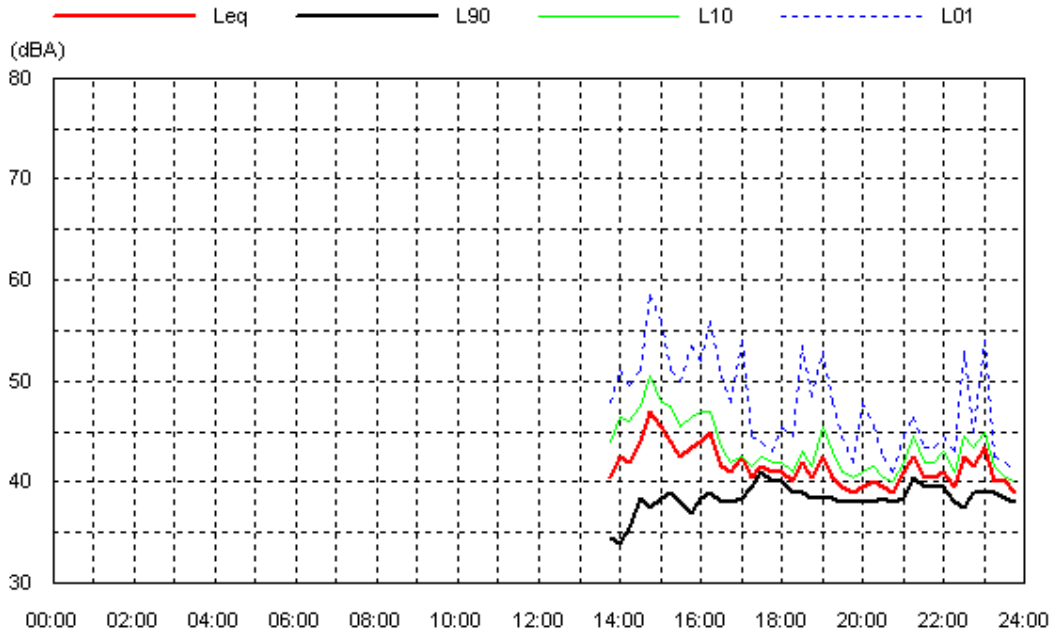

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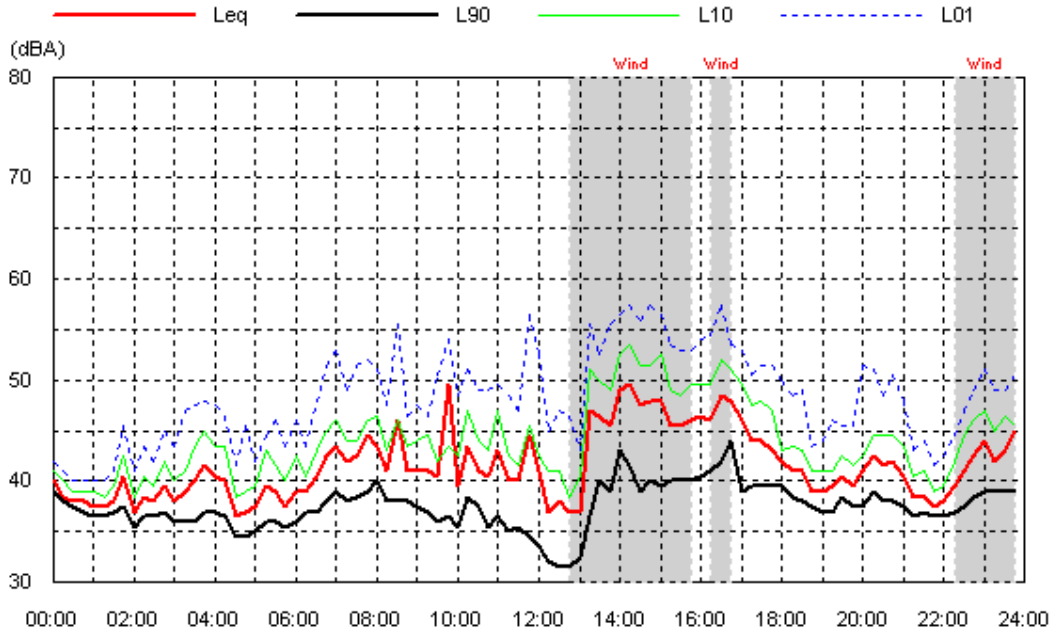

Location: Site 1: Vacant Lot, 13 Cabernet Cct, The Vines
Data shaded: Wind; Rain

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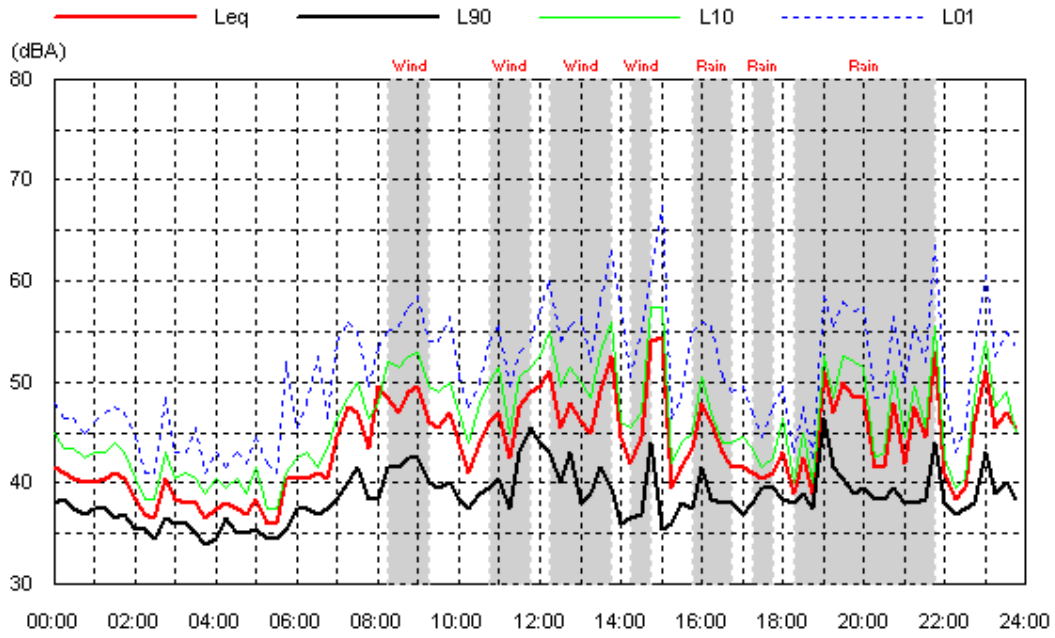

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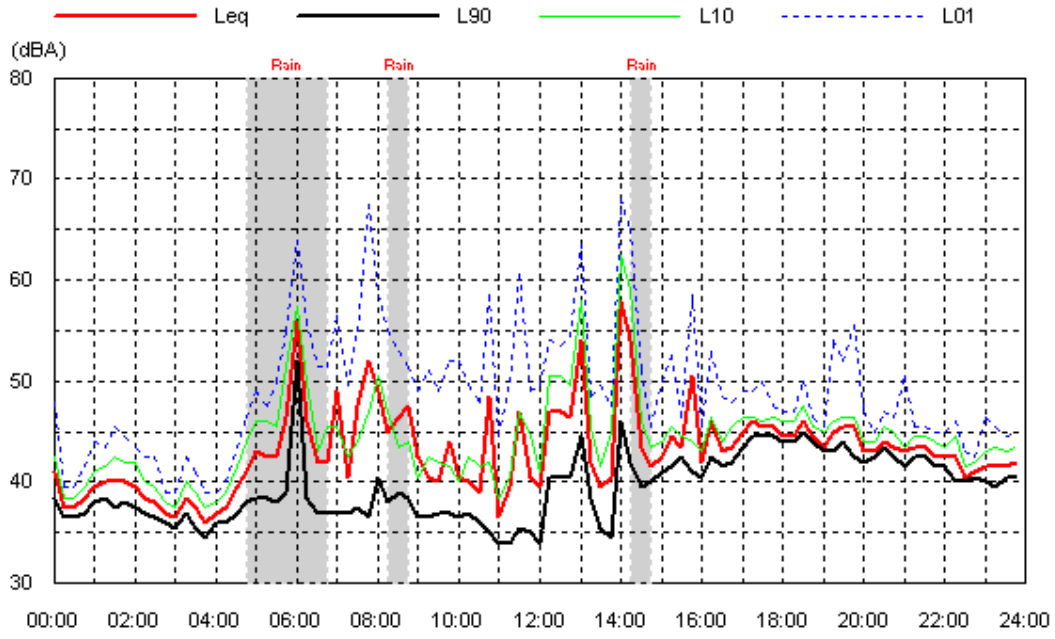

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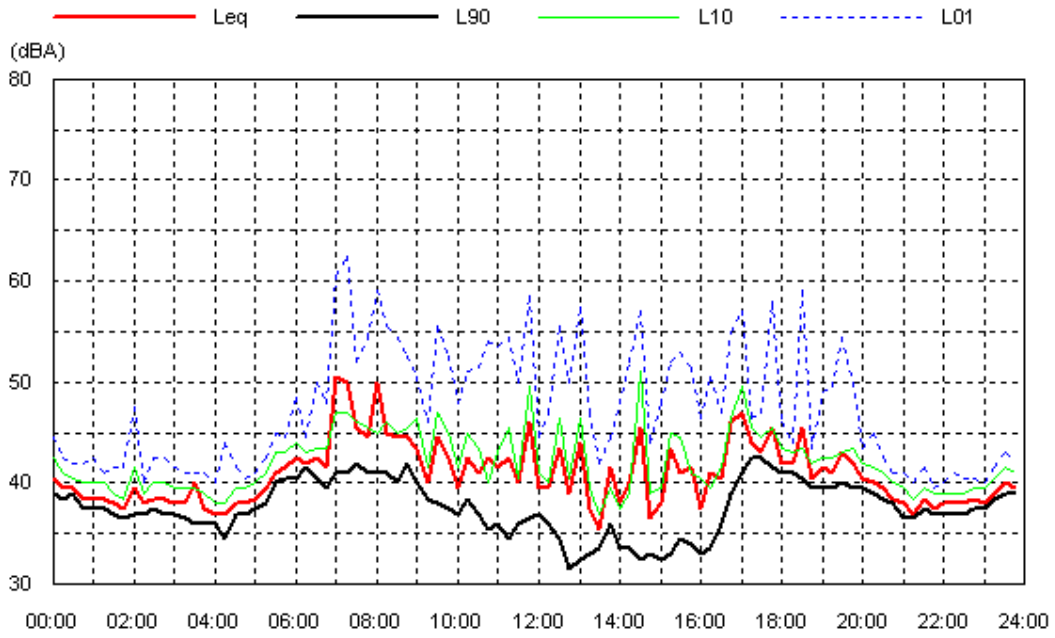

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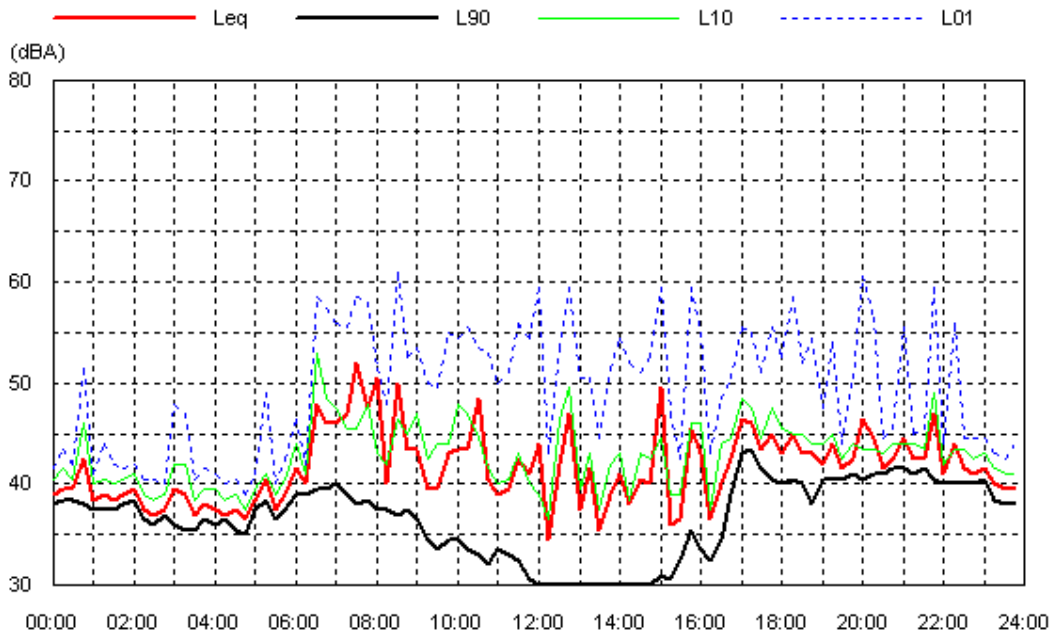

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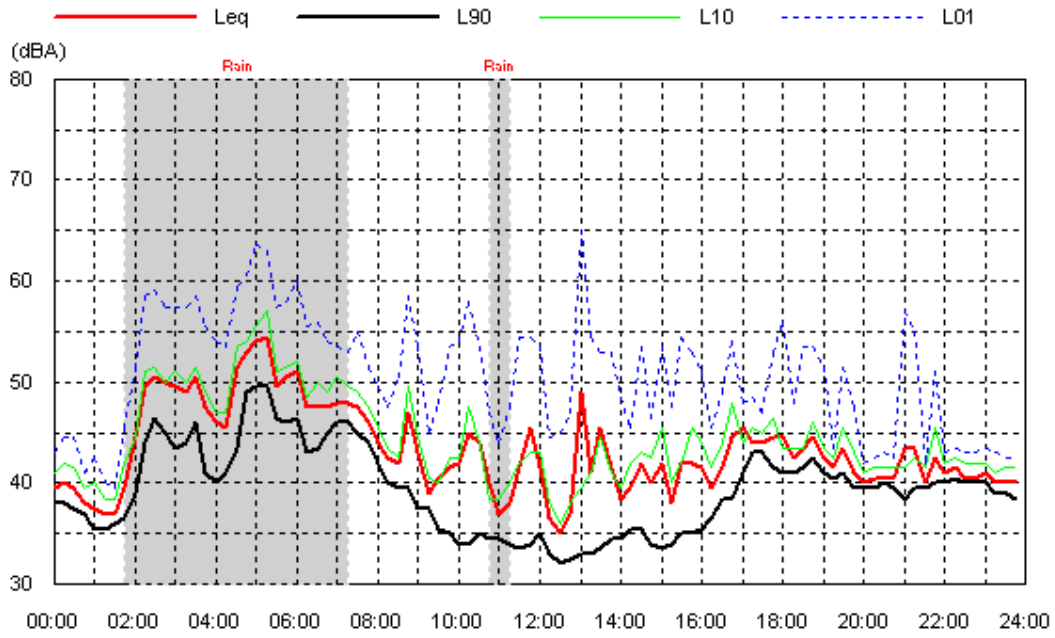

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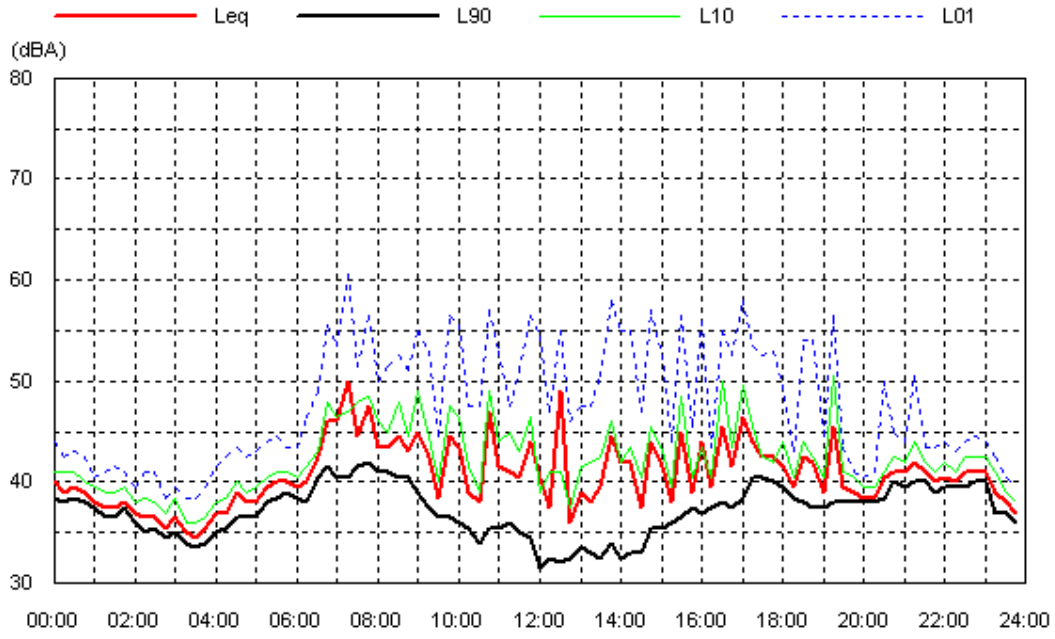

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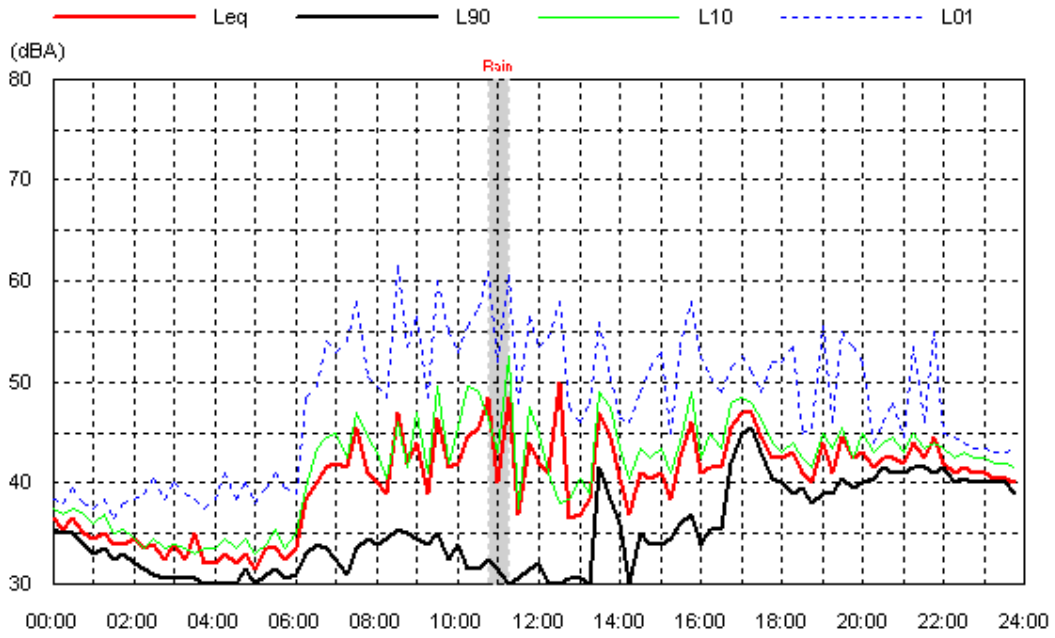

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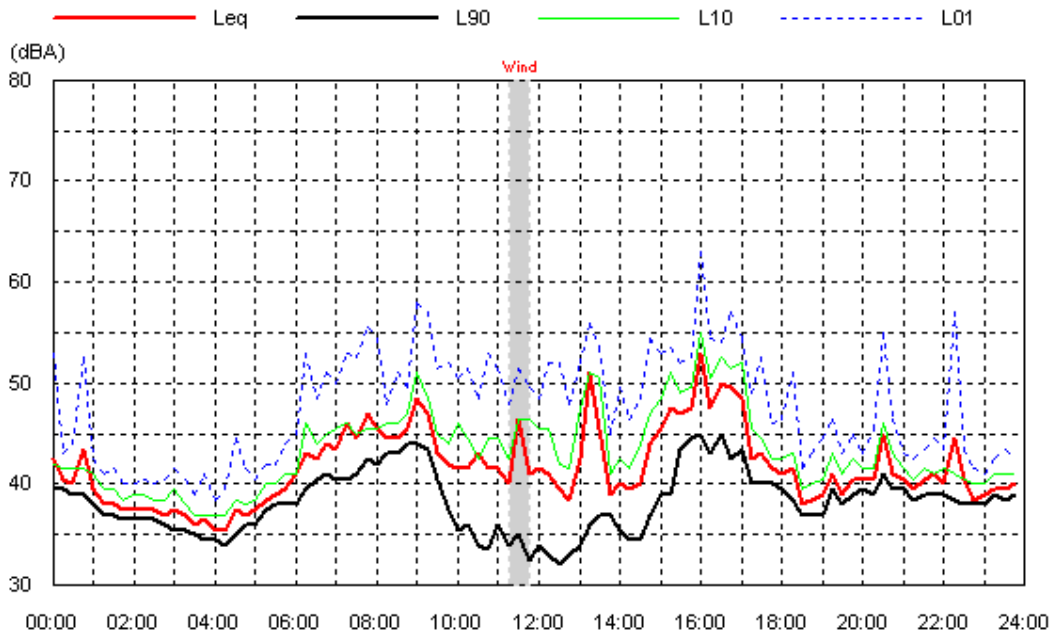

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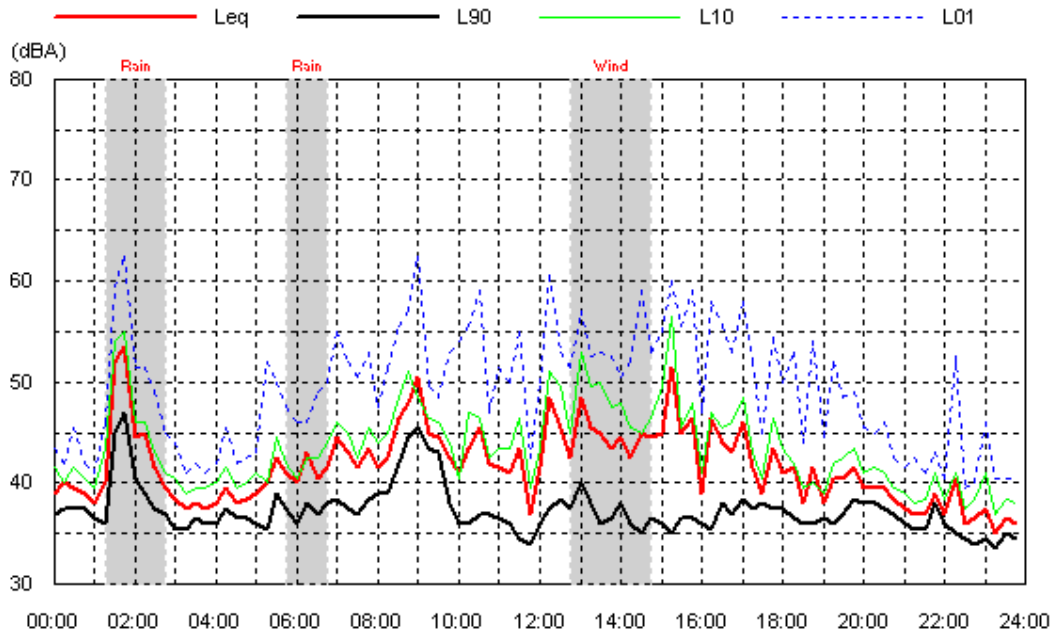

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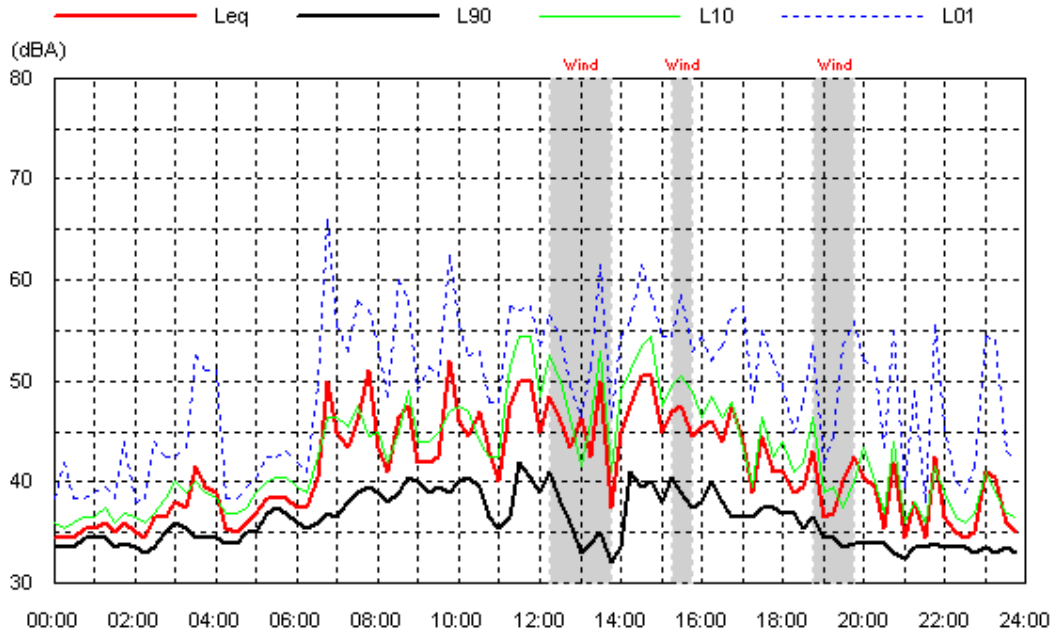

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Data shaded: Wind; Rain

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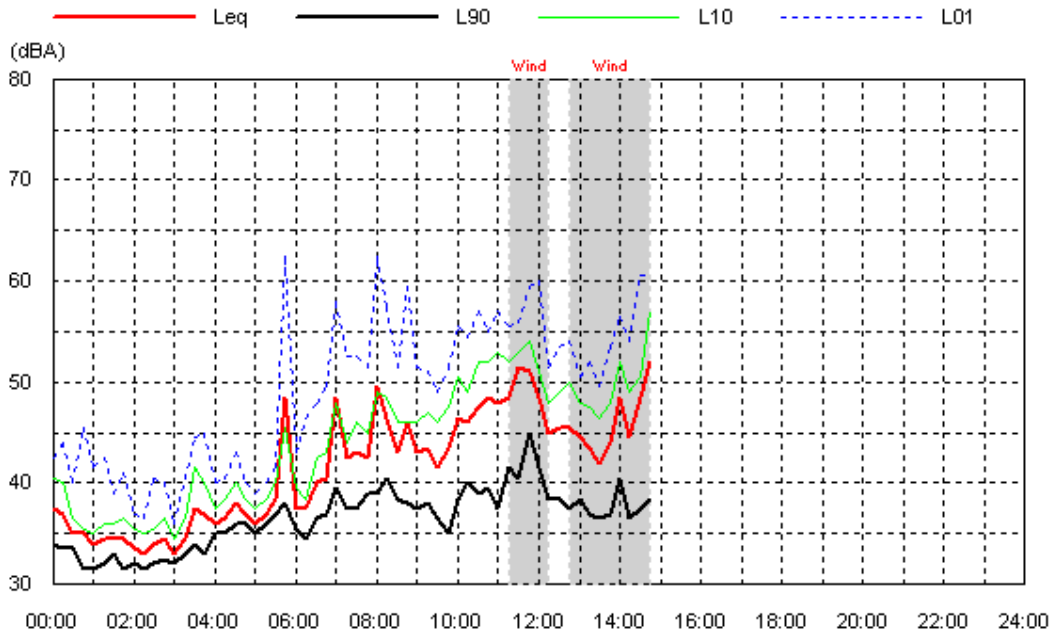

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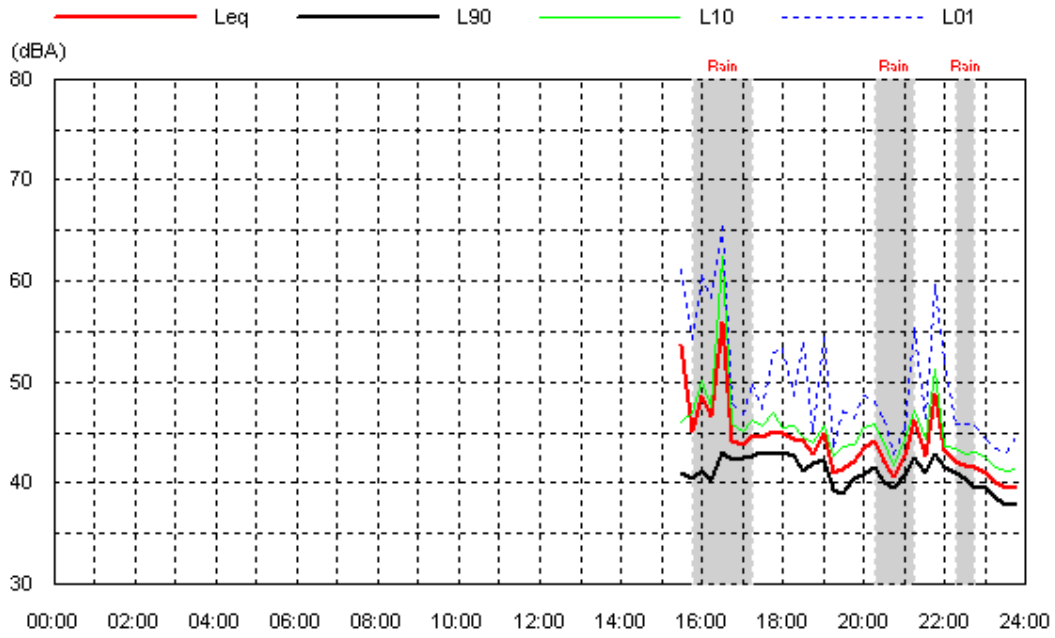

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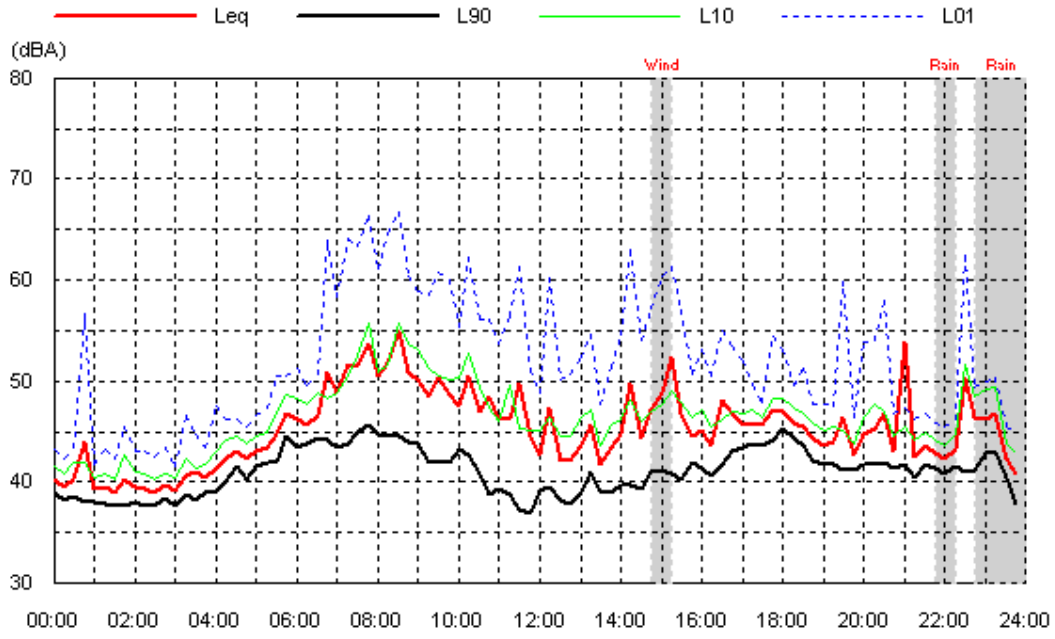

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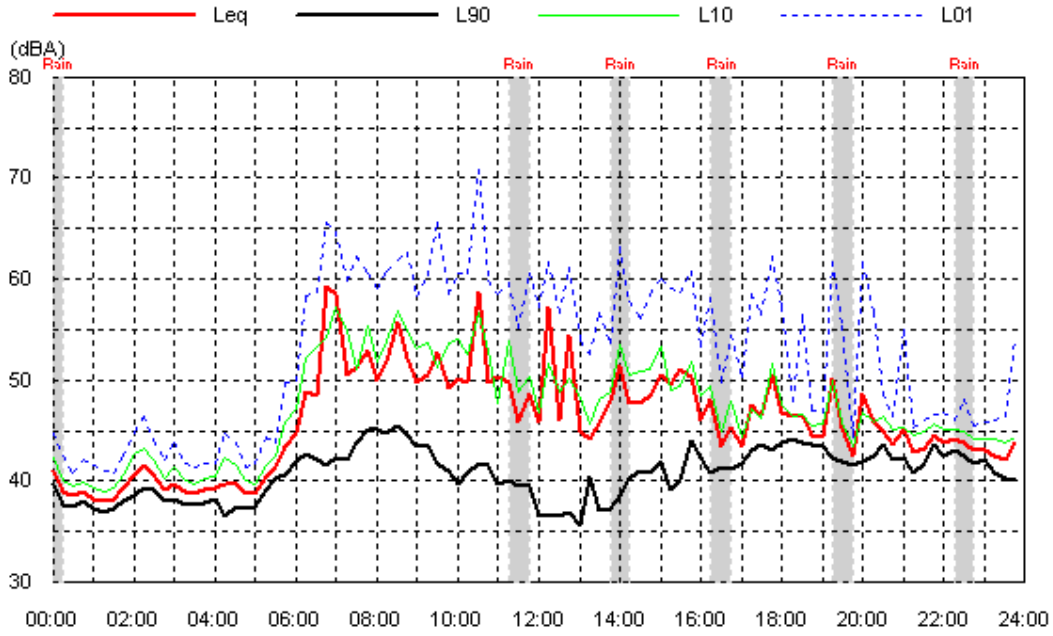

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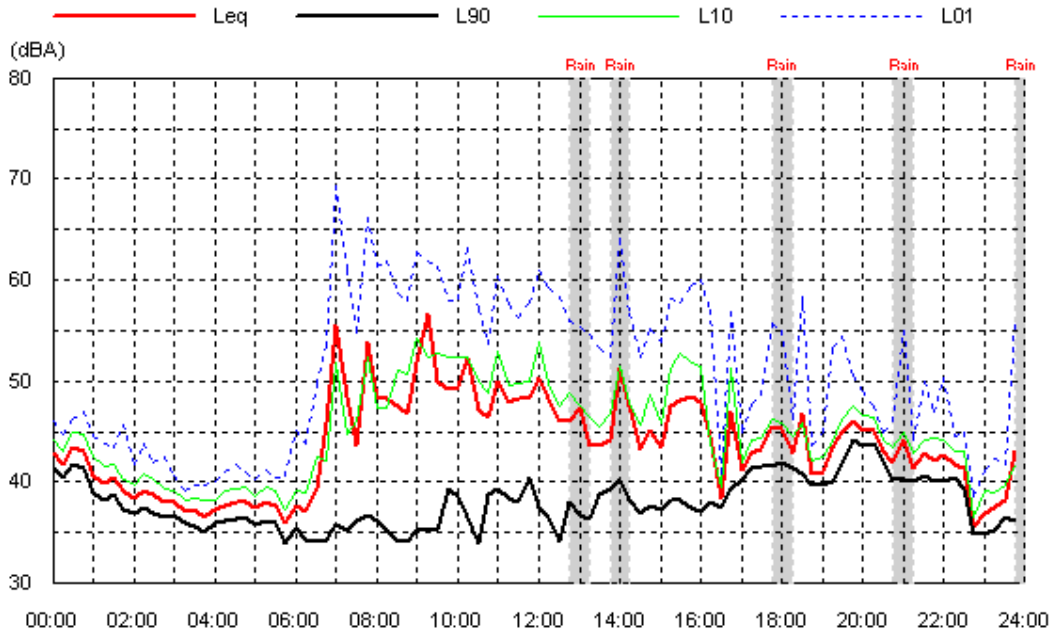

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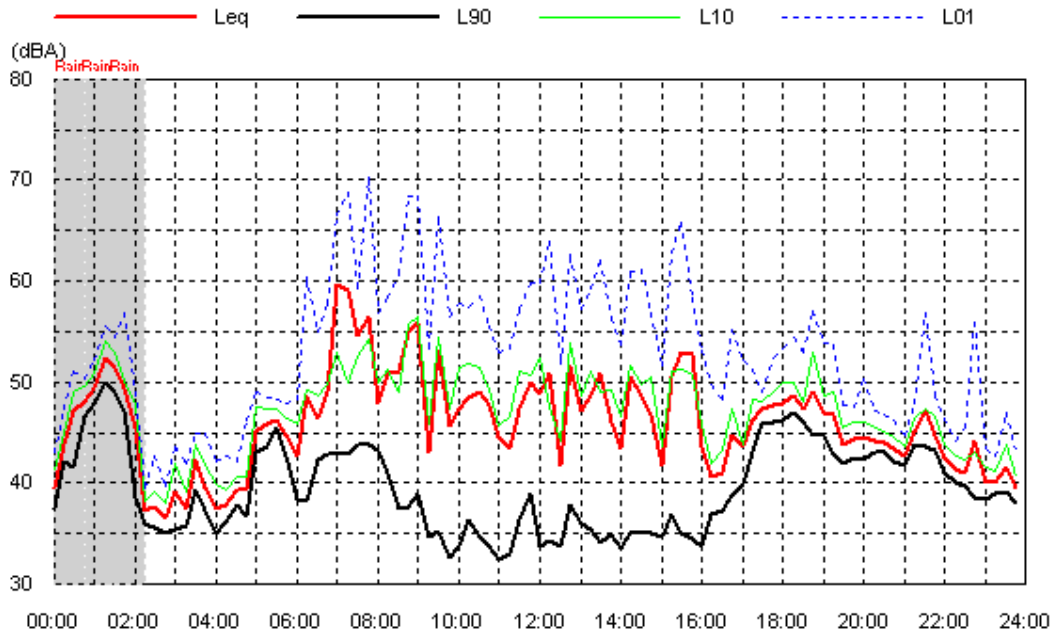

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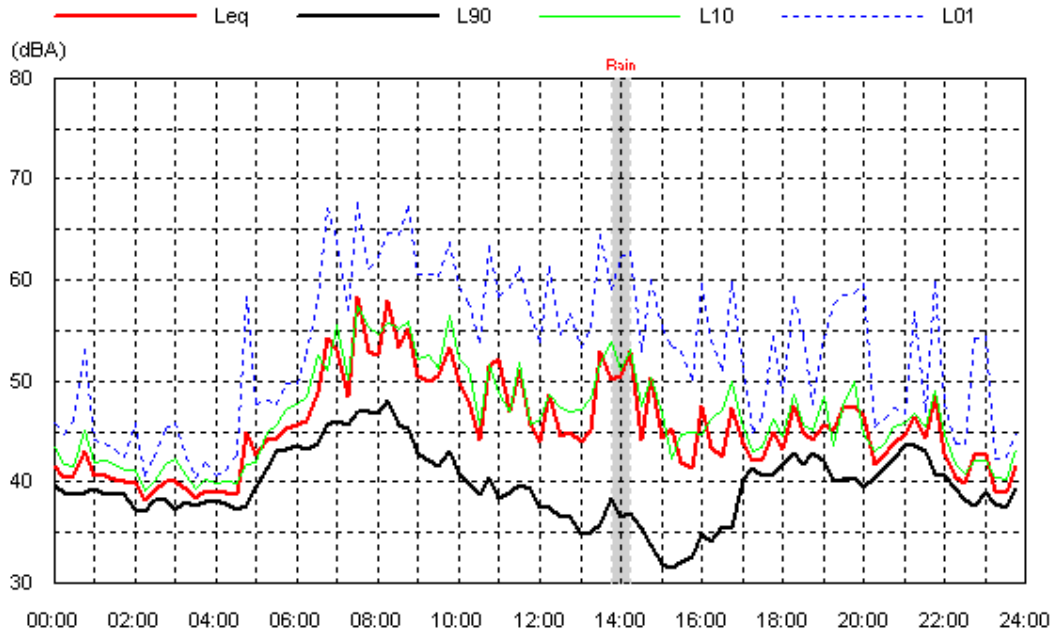

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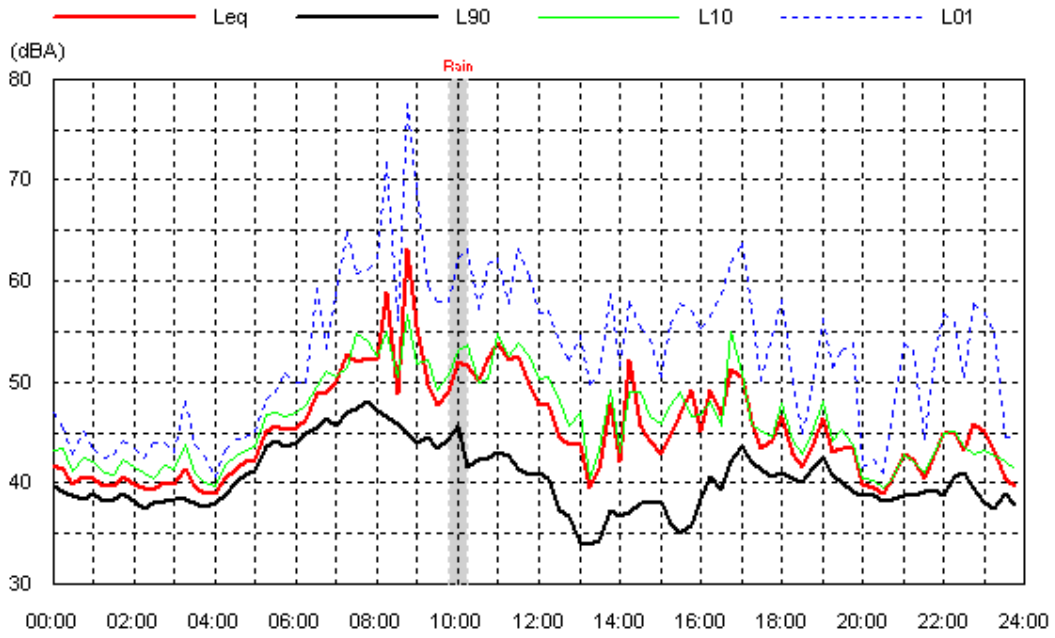

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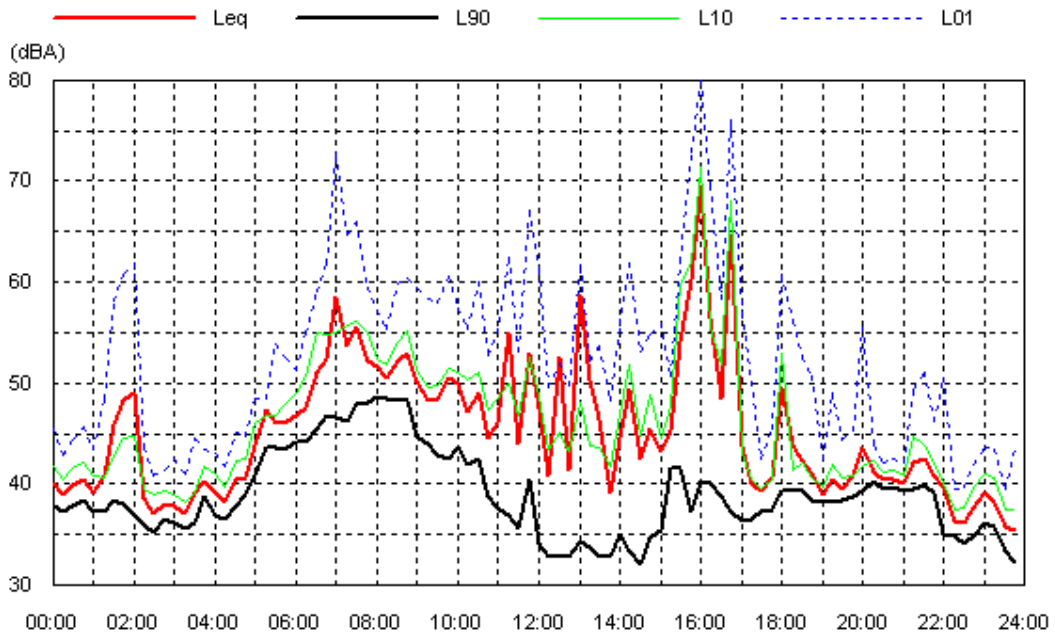

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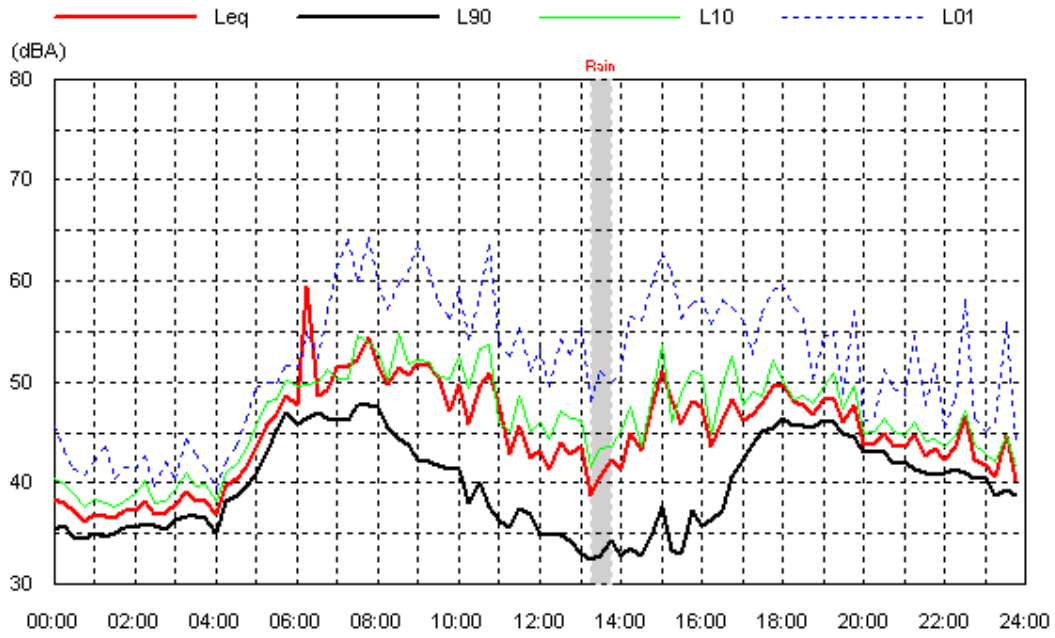

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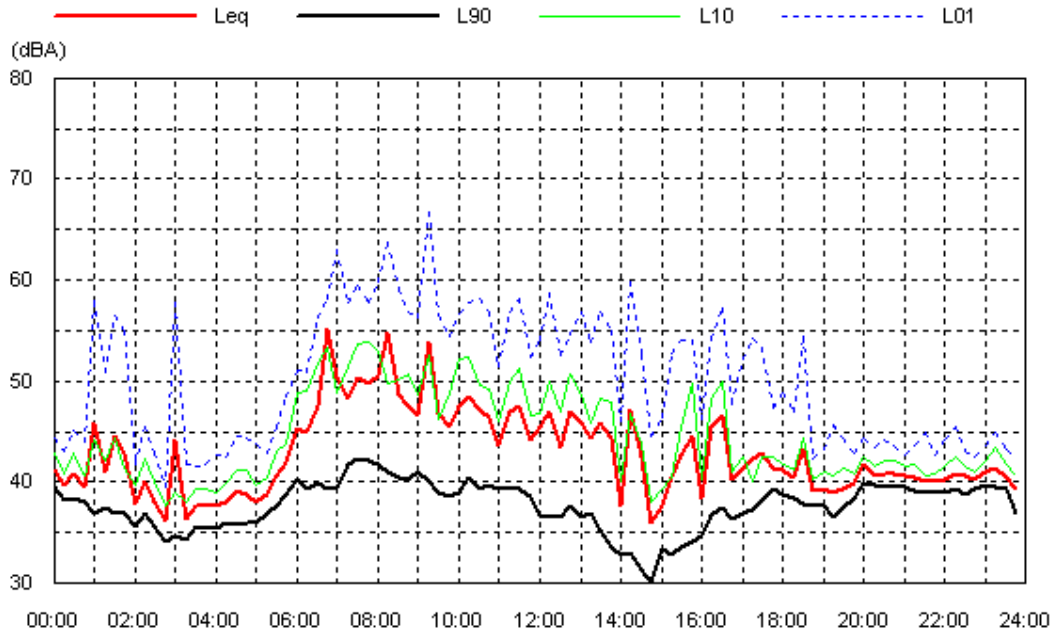

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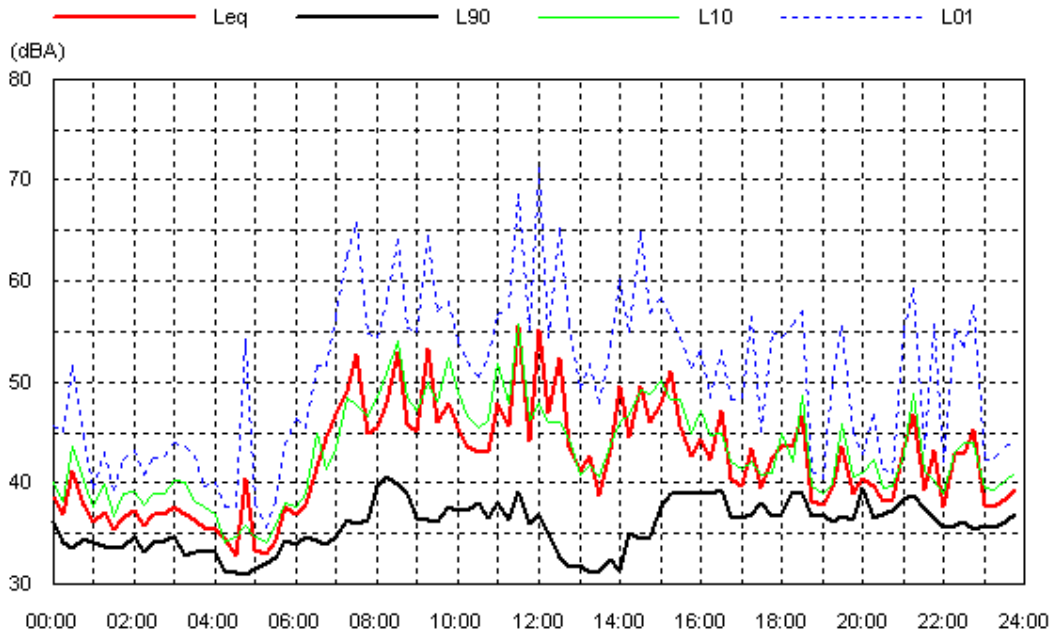

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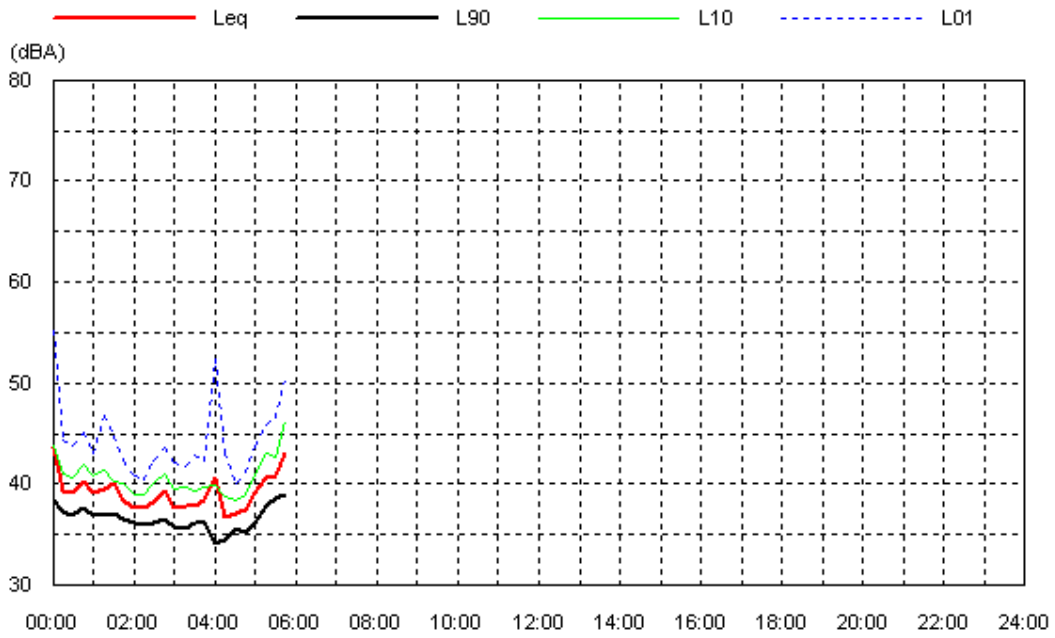

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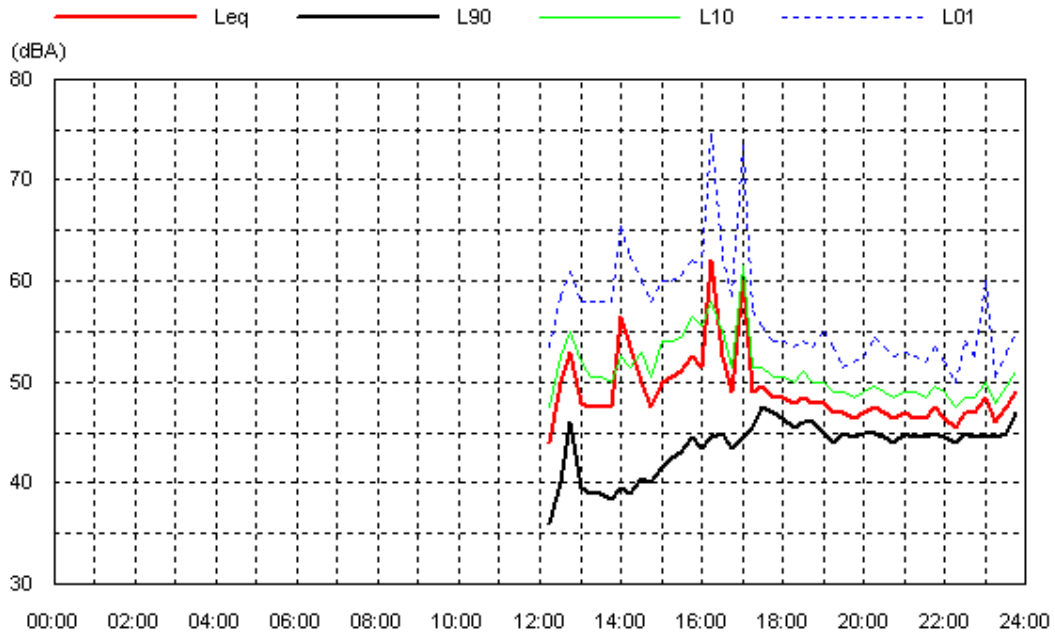

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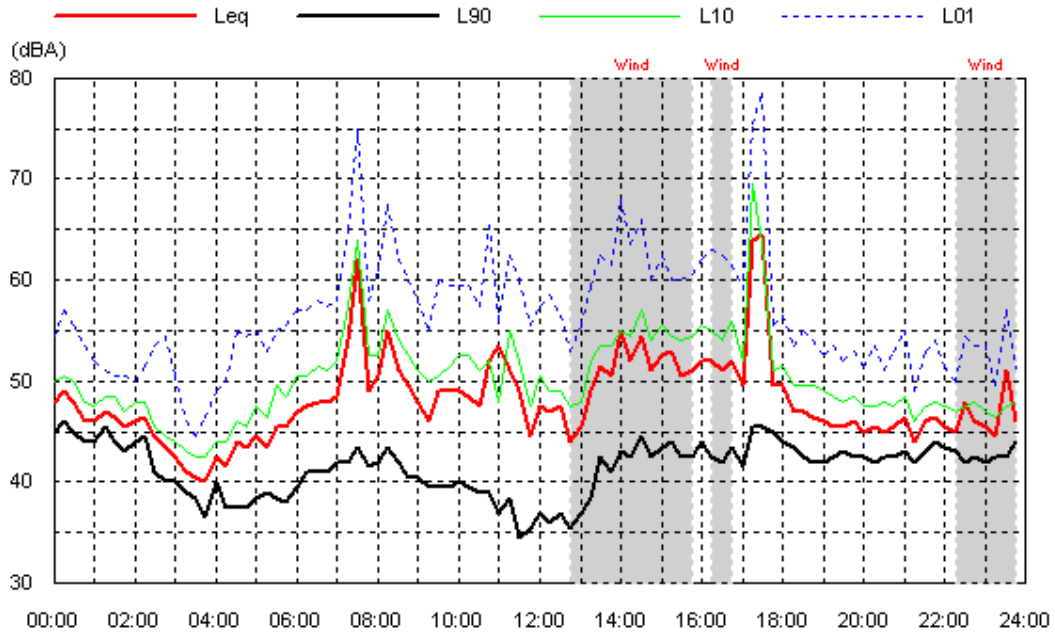

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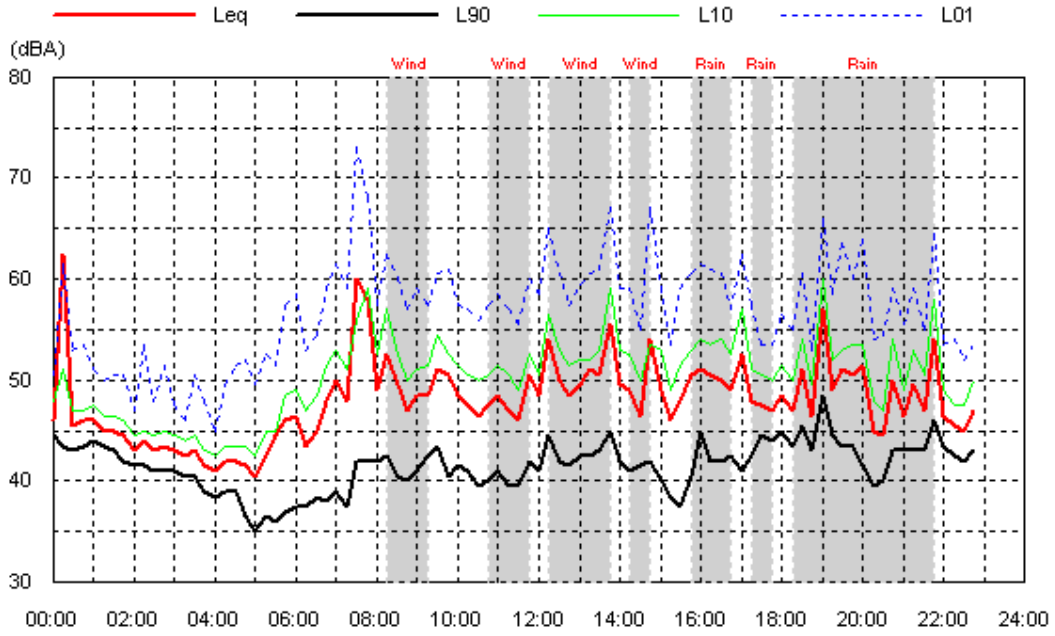

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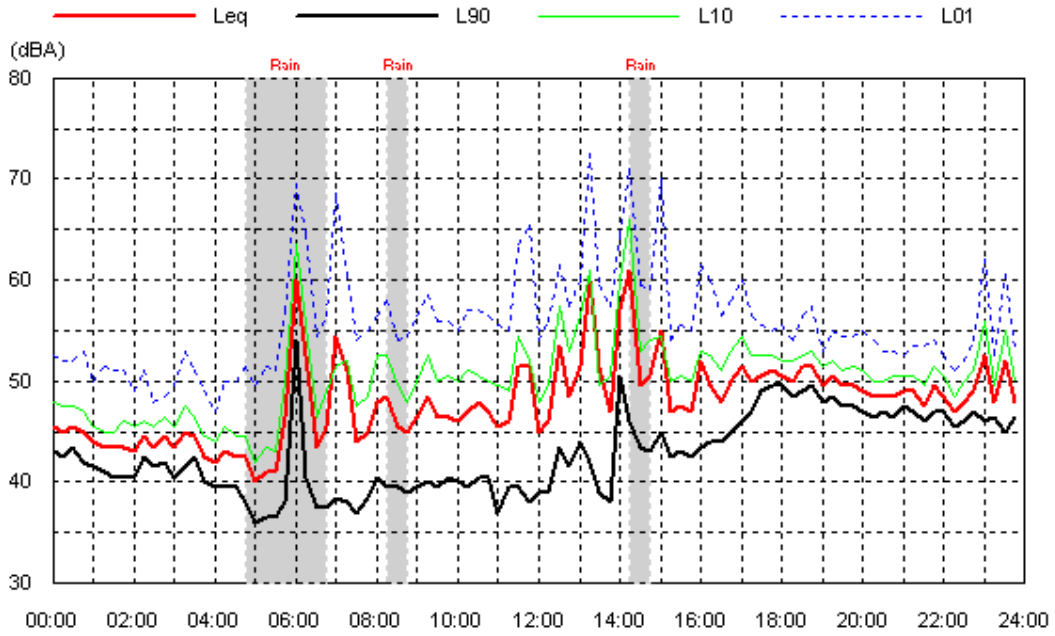

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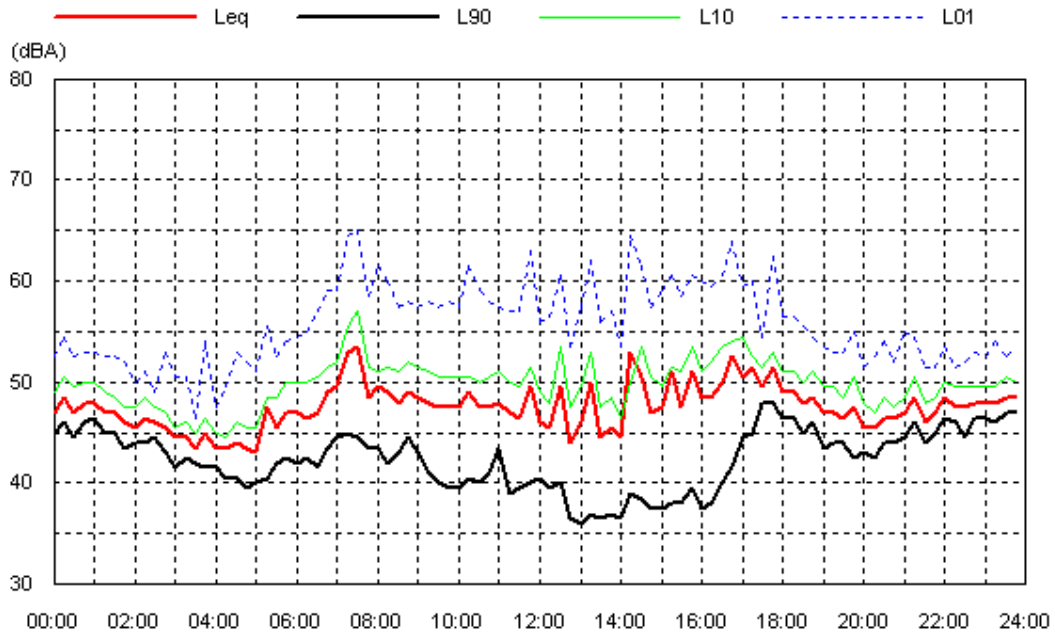

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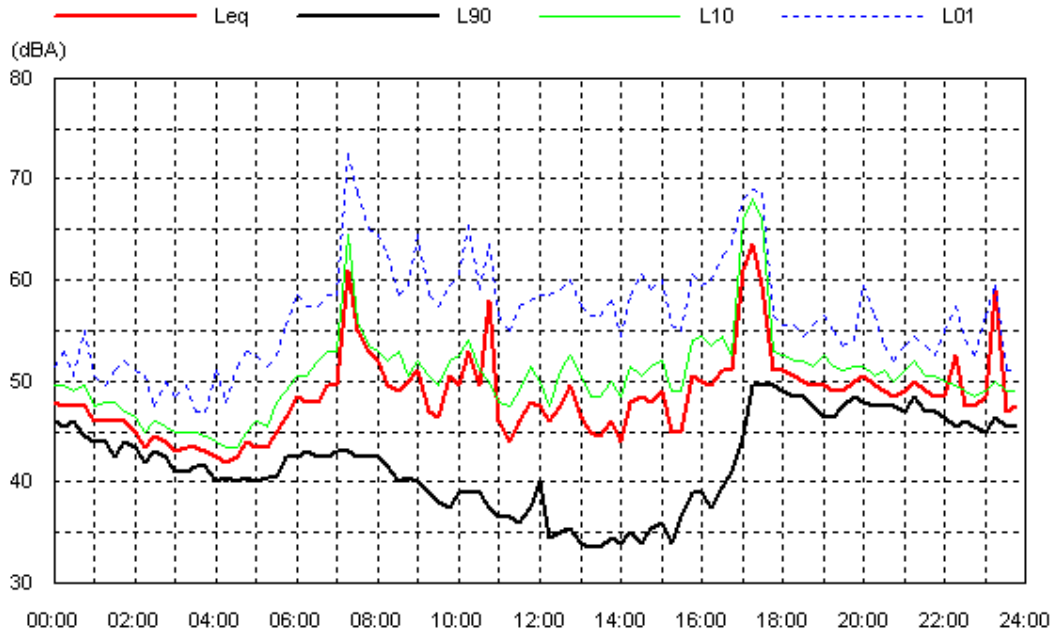

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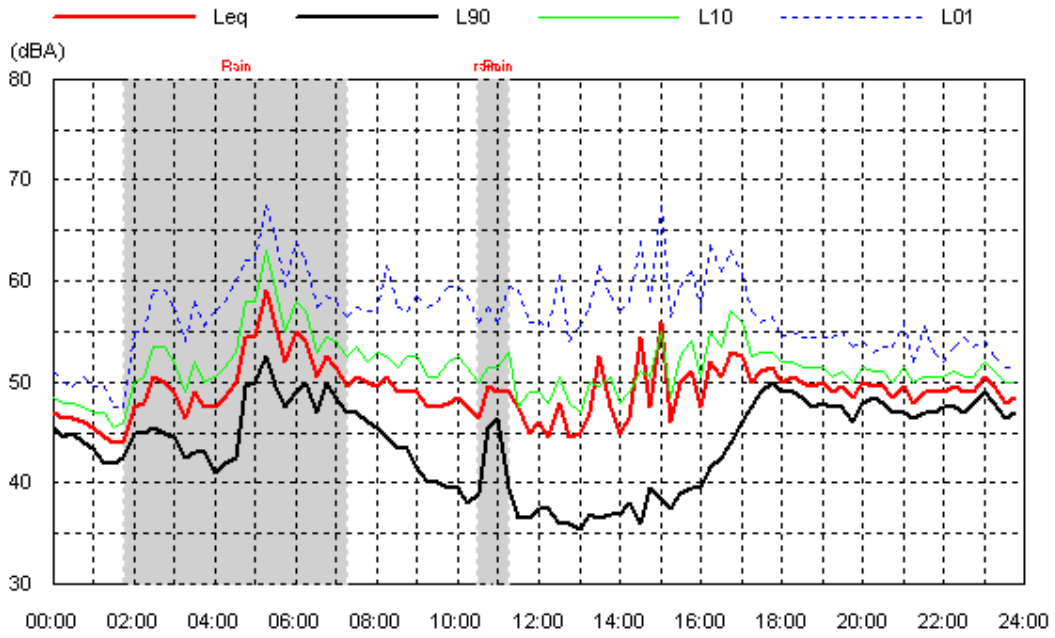

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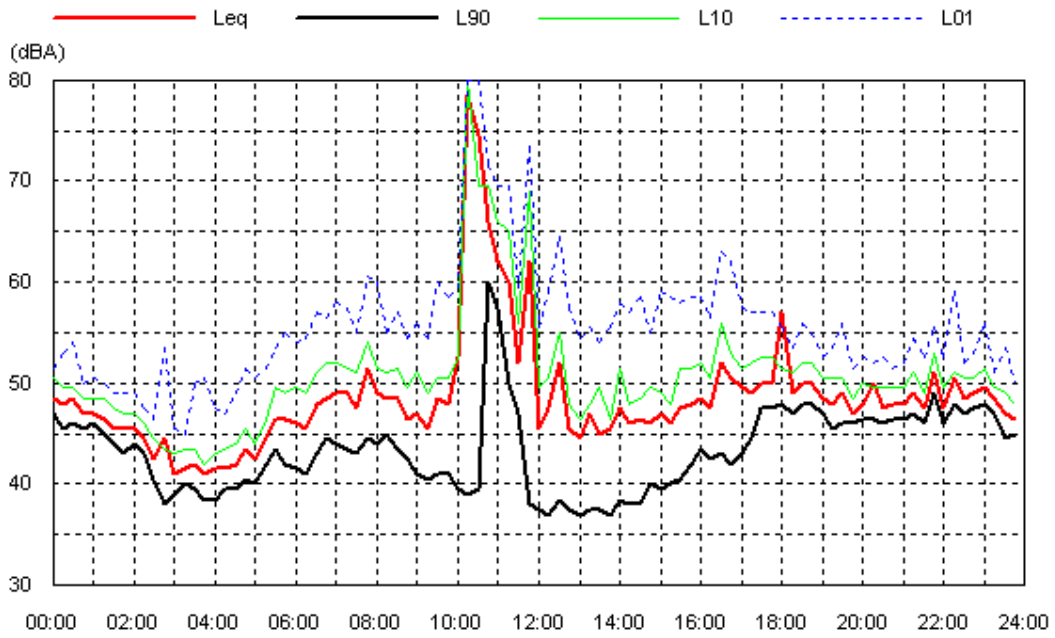

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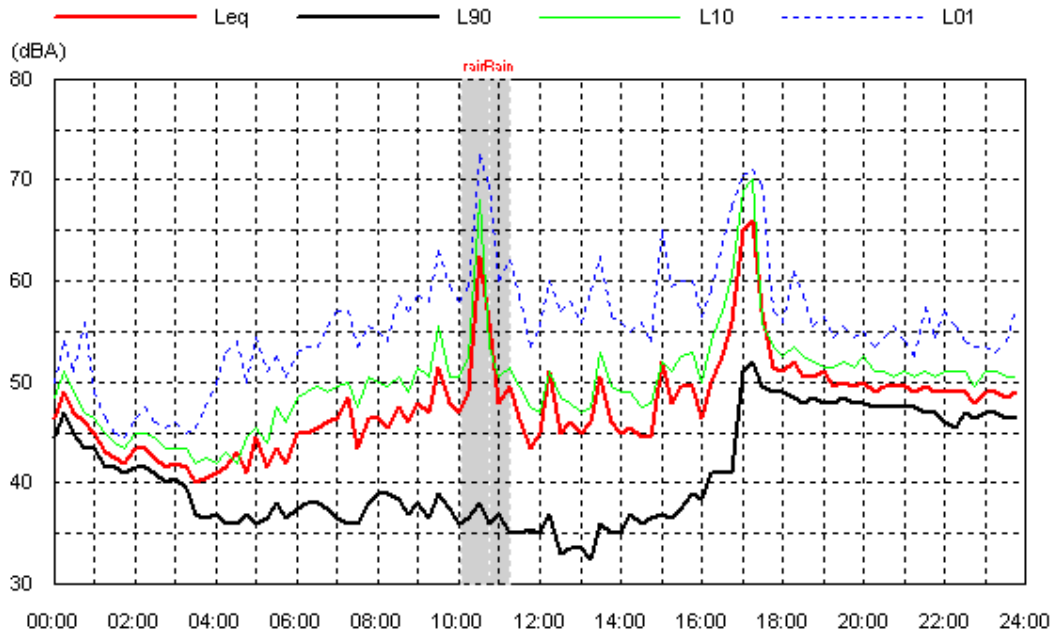

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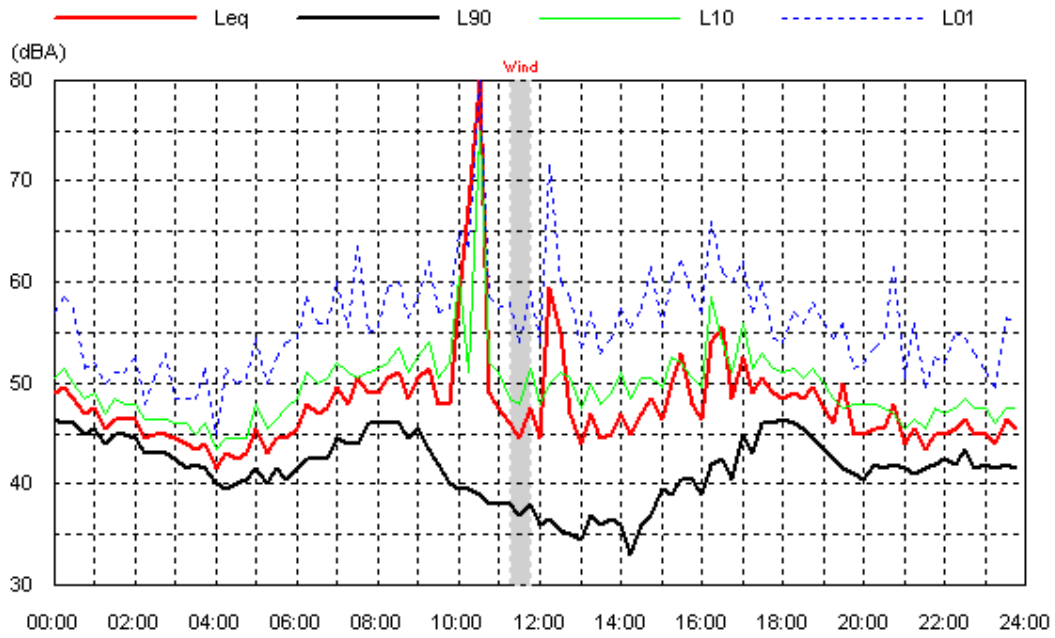

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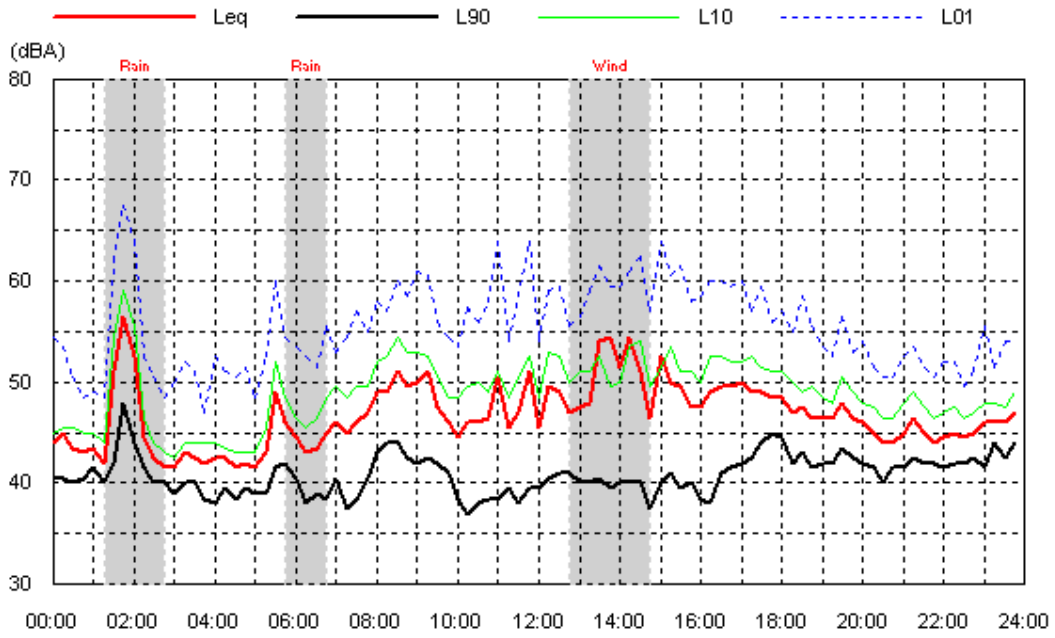

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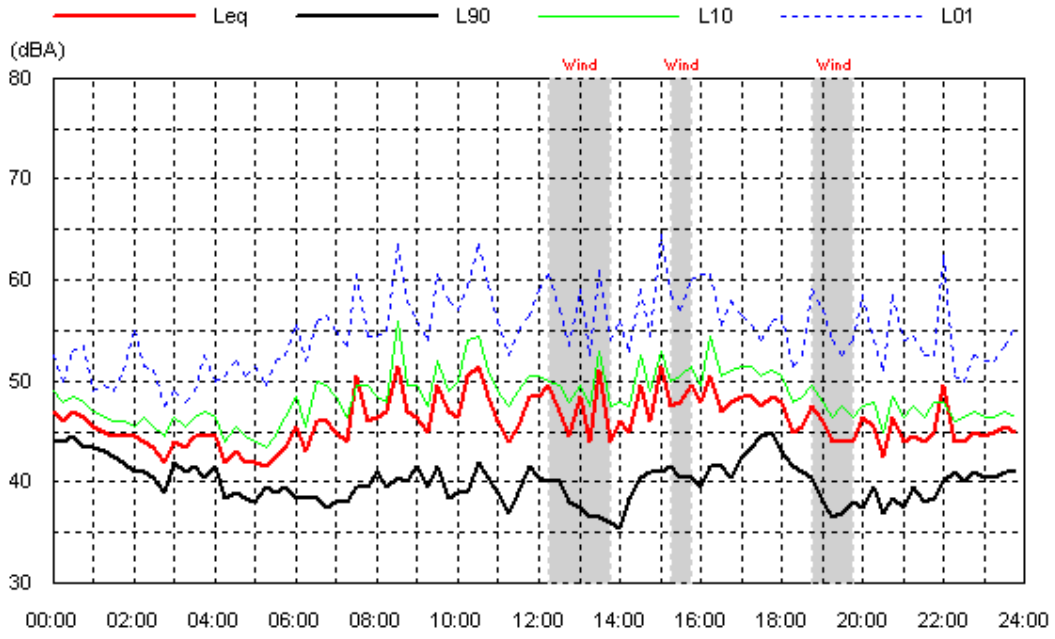

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Data shaded: rain; Wind; Rain

Tue 09 Jun 09