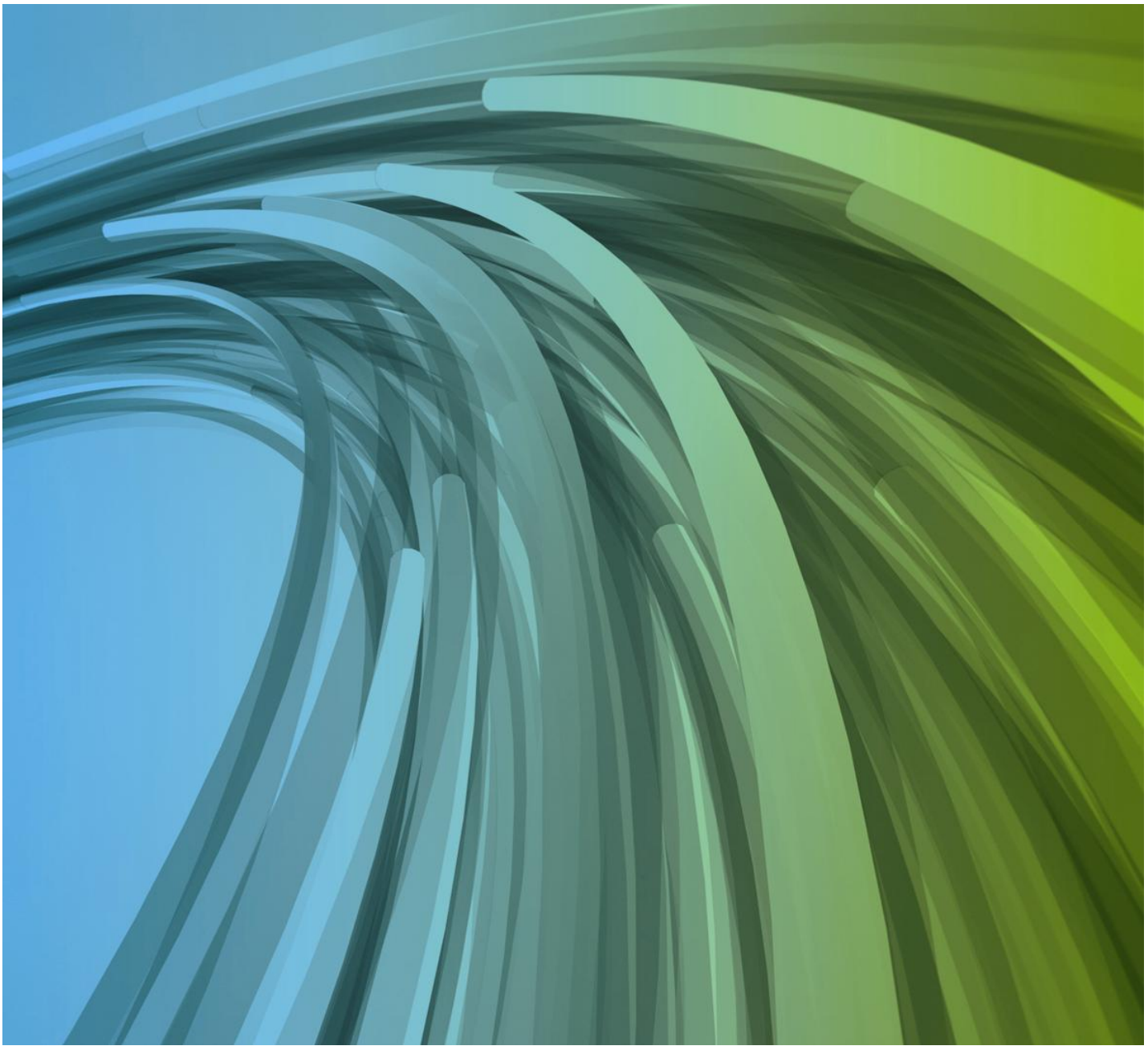
Maldon Employment Lands Rezoning

Noise Impact Assessment



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Noise Impact Assessment

Prepared for

Wollondilly Shire Council

Prepared by

AECOM Australia Pty Ltd
Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com
ABN 20 093 846 925

11 October 2011

60196806

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Quality Information

Document Maldon Employment Lands Rezoning

Ref 60196806

Date 11 October 2011

Prepared by Michael Allan

Reviewed by Patrick Martinez

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
00	14-Apr-2011	Draft for clients comments	Patrick Martinez Associate Director	
01	11-Oct-2011	Revised Draft	Patrick Martinez Associate Director	

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1.0 Introduction

1.1 Background

Wollondilly Shire Council (WSC) commissioned the "Maldon Industrial Lands Investigation" (TCG Planning, 2007), which assessed the need for additional industrial lands throughout the Shire and specifically within the Maldon locality. This investigation was initiated following the submission of a number of rezoning applications which sought to rezone land at Maldon for industrial purposes.

WSC is preparing a draft Local Environment Plan (LEP) for the proposed rezoning of rural land for industrial uses at Maldon. To assist in the development of this document, WSC require an investigation from the potential noise impacts associated with the proposed rezoning.

The proposed rezoning would affect nine lots within the Maldon local area, surrounding the Allied Mills site. Wollondilly Local Environmental Plan 2011 (WLEP 2011) was published in February 2011. Accordingly, the land is currently zoned RU2 Rural Landscape under WLEP 2011 and is immediately adjacent to land zoned IN3 Heavy Industrial. It is proposed that the parcels of land would be rezoned to either IN1 General Industrial with some land having environmental significance being zoned E3 Environmental Management.

Allied Mills has indicated a preference for their land to include uses related to cereals and flour processing allowing for the clustering of like and compatible industries associated with the existing flour mill. Although the adjoining uses are heavy industrial, WSC does not support the use of the site for the purpose of heavy or hazardous industry due to the environmental constraints on the site, the visual gateway issues and the proximity of the land to rural residential development.

The proposed rezoning is also adjacent to the Blue Circle Southern Cement Works and Allied Mills. The flour and maize mill has an annual capacity of 300,000 tonnes per annum and includes a rail spur and site access off Picton Road.

A decision to proceed with the rezoning of the land was authorised by a Council Resolution made on 17 March 2008.

AECOM Australia Pty Ltd (AECOM) has been commissioned by WSC to undertake a noise impact assessment investigation associated with the proposed rezoning.

1.2 Proposed rezoning land

The following Lots have been proposed to be rezoned. The locations of the lots are provided in Figure 1.

- Lot 2 DP 818975;
- Lot 1 DP 732582;
- Lot 2 DP 732582;
- Lot 3 DP 732582;
- Lot 1 DP 105348;
- Lot 31 DP 731012;
- Lot 30 DP 826690;
- Lot 31 DP 826690, and
- Part of Lot 1 DP 1128013.

For the purposes of this assessment the parcels of land have been divided into Parcels A through to H, representing differing allowable sound power levels. This is considered further in Section 4.1.

Additionally, representative sensitive receivers (namely residential receivers) have been identified in Figure 1. Compliance at these receivers ensures that all receivers in the surrounding area would comply with the appropriate noise criteria.

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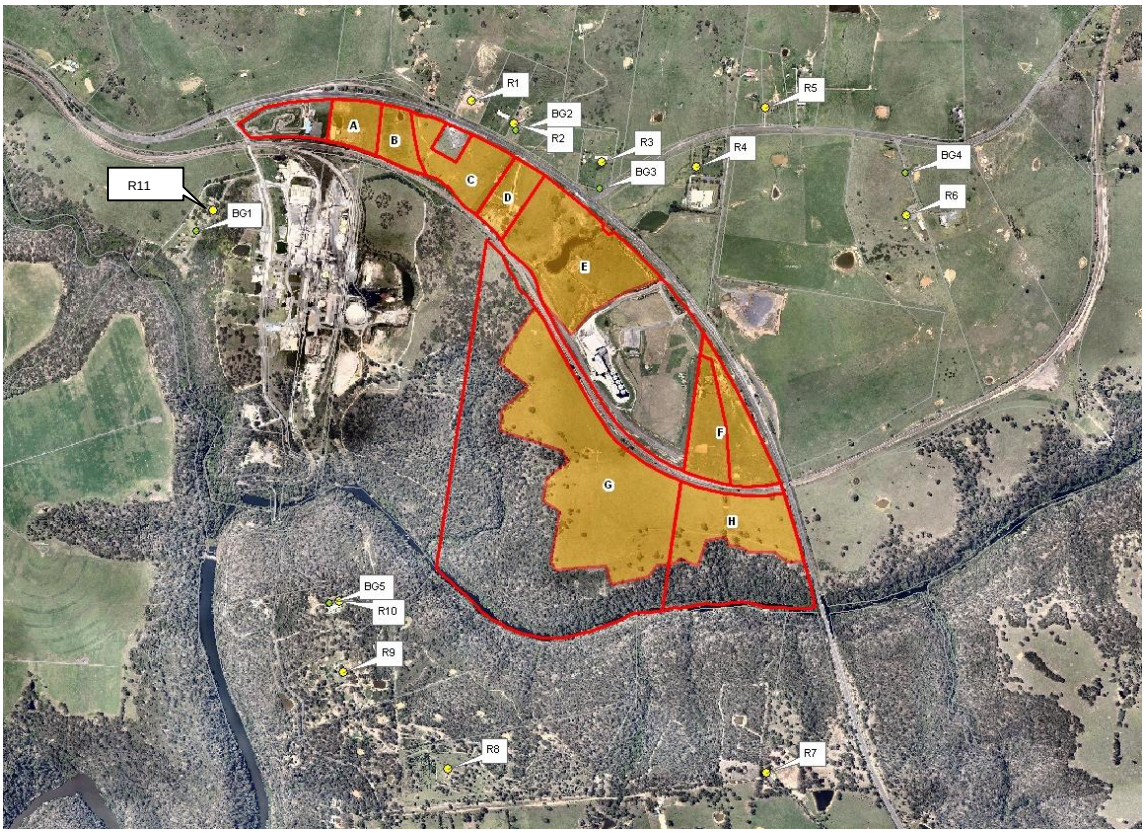
Figure 1 Parcels of land to be rezoned, sensitive receiver locations and background noise monitoring locations



1.3 Sensitive receivers

A total of 11 representative sensitive receivers (residential) have been identified in Figure 1. These receivers are summarised below in Table 1.

Table 1 Sensitive receivers

Receiver	Address
R1	275 Picton Road, Razorback
R2	291 Picton Road, Razorback
R3	1404 Menangle Park Road, Razorback
R4	3010 Remembrance Driveway, Razorback
R5	1350 Menangle Park Road, Razorback
R6	1315 Menangle Road, Razorback
R7	570 Picton Road, Wilton
R8	400 Wilton Park Road, Wilton
R9	440 Wilton Park Road, Wilton
R10	460 Wilton Park Road, Wilton
R11	Staff Road, Maldon

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2.0 Ambient Noise Measurements

2.1 Noise monitoring locations

Background noise logging was recently undertaken by AECOM for a Rail Terminal Facility at the existing Boral Cement Plant, 40 Maldon Bridge Road, Maldon.

In order to establish the existing noise environment adjacent to the project area, ambient noise monitoring was conducted at five representative locations (BG1 to BG5, identified in Figure 1). The five chosen monitoring locations are representative of other assessment locations within the area, this was determined from the site inspection and from aerial photographs depicting land use surrounding the site.

The noise monitoring was conducted in accordance with the NSW Office of Environment and Heritage (OEH) NSW Industrial Noise Policy (INP) (EPA, 2000) requirements. These locations were selected after a detailed inspection of the project area taking into consideration sensitive locations and other noise sources, which may influence the measurements.

Provided in Table 2 are details of the measurement locations.

Table 2 Ambient noise monitoring locations

Location Duration	Address	Instrumentation	Comments
BG1 Start: 01 Mar 10 Finish: 05 Mar 10	Staff Road	SVAN 949 sound analyser	Noise sensitive residential receiver. Chosen to determine operational and construction noise emissions criteria. Assessment location to determine noise levels impacting on residential receivers. Noise logger located approximately 1.5 m above ground level.
BG2 Start: 01 Mar 10 Finish:08 Mar 10	291 Picton Road	SVAN 949 sound analyser	Noise sensitive residential receiver. Chosen to determine operational and construction noise emissions criteria. Assessment location to determine noise levels impacting on residential receivers. Noise logger located in front garden approximately 1.5 m above ground level.
BG3 Start: 04 Feb 10 Finish: 17 Feb 10	1404 Menangle Road	RION NL-21	Noise sensitive residential receiver. Chosen to determine operational and construction noise emissions criteria. Assessment location to determine noise levels impacting on residential receivers. Noise logger located approximately 10 m from the side of Menangle Road.
BG4 Start: 04 Feb 10 Finish: 17 Feb 10	1285 Menangle Road	SVAN 949 sound analyser	Noise sensitive residential receiver. Chosen to determine operational and construction noise emissions criteria. Assessment location to determine noise levels impacting on residential receivers. Noise logger located in front garden approximately 1.5 m above ground level.
BG5 Start: 17 Feb 10 Finish:25 Feb 10	460 Wilton Road	RION NL-21	Noise sensitive residential receiver. Chosen to determine operational and construction noise emissions criteria. Assessment location to determine noise levels impacting on residential receivers. Noise logger located approximately 1.5 m above ground level.

2.2 Unattended noise logging

Five loggers were used to continuously measure background noise levels in the local area. The selected locations are considered to be representative of the noise sensitive receivers in the area.

A noise logger measures the noise level over the sample period and then determines L_{A1}, L_{A10}, L_{A90}, L_{Amax} and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample period respectively. The L_{Amax} is indicative of maximum noise levels due to individual noise events. The L_{A90} is taken as the background noise level.

The results of the noise monitoring have been processed in accordance with the procedures contained in the INP and the OEH's NSW Road Noise Policy (RNP) (DECCW, 2011).

The assessment background level (ABL) is established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over the entire monitoring duration. The RBL is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level. The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

Graphical representation of the logging results are provided in Appendix B.

A summary of the calculated RBLs and existing L_{Aeq} ambient noise levels are presented in Table 3.

Table 3 Ambient noise measurement results

Noise Logging Location	Rating Background Levels L_{A90} (dBA)			Ambient L_{Aeq} (dBA)		
	Day[1]	Evening[2]	Night[3]	Day[1]	Evening[2]	Night[3]
BG1	48	52	44	69	69	58
BG2	44	43	43[4]	59	50	47
BG3	46	44	30	62	59	56
BG4	32	32	32[4]	53	51	49
BG5	34	34	31	48	42	39

Notes:

1. Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays & Public Holidays.
2. Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday & Public Holidays.
3. Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays & Public Holidays.
4. The NSW Industrial Noise Policy, Application Notes (DECC, 2006) recommends that when higher background noise levels (RBL) occur in the evening and night-time assessment periods, that the criteria are generally set to the lower daytime RBLs in accordance with community expectations.

2.3 Traffic noise

Location BG2 noise survey results have been used to determine existing traffic noise levels on Picton Road. Measured traffic noise levels are presented in Table 4.

Table 4 Measured traffic noise levels (R2)

Measurement Location	Measured Noise Level, dB(A)	
	Day, $L_{Aeq\ (15hr)}$	Night, $L_{Aeq\ (9hr)}$
291 Picton Road	62	59

Notes:

1. Day is defined as 7:00am to 10:00pm.
2. Night is defined as 10:00pm to 7am.

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3. The noise measurements were conducted in a “free field” environment without the influence of any noise reflected from a facade. Therefore the measured noise levels have been increased by 2.5 dB to account for the facade reflections in accordance with RNP guidelines.

2.4 Instrumentation

The long-term unattended noise logging was conducted using, RION NL-21 and SVAN 949 sound analyser equipment, designated as a Type 2 instrument having an accuracy suitable for field. The long-term noise loggers were calibrated before and after the measurements with a drift in calibration not exceeding ±0.5 dB.

Attended noise measurements were conducted using a Brüel & Kjær Type 2250 integrating sound level meter. The Brüel & Kjær Type 2250 integrating sound level meter is also designated as Type 1 accuracy. The sound level meter was calibrated before and after the measurements with a drift in calibration not exceeding ±0.5 dB.

All equipment used for this assessment has current calibration certificates (i.e. calibrated in the last two years).

2.5 Noise assessment locations

Provided below in Table 5 is a summary of the noise assessment locations, and the relative noise logging results.

Table 5 Assessment locations

Assessment Location	Equivalent Noise Monitoring Location
R1	BG2
R2	BG2
R3	BG3
R4	BG3
R5	BG3
R6	BG4
R7	BG5
R8	BG5
R9	BG5
R10	BG5
R11	BG1

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3.0 Noise and Vibration Criteria

3.1 Operational noise criteria

3.1.1 Industrial noise

The INP provides guidance and recommendations on the assessment of noise impacts from industrial and commercial facilities.

The assessment procedure for industrial noise sources has two components that must be satisfied:

- Controlling intrusive noise impacts in the short term for residences; and
- Maintaining noise level amenity for residences and other land uses.

Intrusive noise impacts

The INP states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (L_{Aeq}), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB. This is termed the *Intrusiveness Criterion*. The *Rating Background Level* (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in Section 3.1 of the INP. Adjustments are to be applied to the level of noise produced if the noise at the receiver contains annoying characteristics such as tonality or impulsiveness.

Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from industrial noise sources should not normally exceed the acceptable noise levels specified in *Table 2.1* of the INP. That is, the background noise level should not exceed the level appropriate for the particular locality and land use. This is termed the Amenity criterion.

The sensitive receivers in this study have been regarded as 'Rural' in accordance with the LEP. For residential receivers in rural and urban areas, the amenity criteria are shown in **Table 7**.

Table 6 Recommended L_{Aeq} noise levels from industrial noise sources

Type of receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level dB(A)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45

Where there are high levels of existing industrial or transportation noise then noise from the new source must be controlled to preserve the amenity of the area. Modification factors for areas with existing high levels of industrial or transportation noise are provided in **Table 2.2** of the INP.

The INP application notes state:

Where the ambient noise levels are below the Acceptable Noise Level (ANL), then ideally the measurement of the existing level of noise should include only noise from industrial sources. In these situations, however, it may be acceptable to include noise from other sources (for example, roads, neighbourhood). The reasons for this are that:

- *including noise from other sources typically results in assessing the worst case for impacts on amenity; and*

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- *strictly excluding noise from sources other than industry can be difficult and costly and may not be necessary if the development meets the criteria.*

Furthermore, the application notes go on to state:

Where the predicted amenity noise level is lower than the intrusive level for the proposed development, the proponent needs to ensure that both levels will be satisfied. In this situation, noise limits specified in the licence conditions will include both the intrusive and amenity noise levels predicted to be achieved by the proposal to ensure that the community is protected from intrusive noise impacts at all times.

Attended noise measurements undertaken for the Boral Cement Plant on Picton Road and Menangle Park Road indicate that noise levels are controlled by traffic noise. Consistent with Section 2.2.3 of the INP, the amenity criteria for BG3 is 10 dB(A) below the L_{Aeq} noise level for each period.

Noise contributed from industrial sources on Wilton Road, would generally be quite low. AECOM's report for Maldon Rail Terminal Noise and Vibration Assessment (ref 60142623.RPT01.02) predicted existing noise levels from Boral activities alone (during normal weather conditions) as 33 dB(A), 31 dB(A) and 30 dB(A) during the day evening and night-time periods respectively. The remaining noise is controlled by fauna and flora, and traffic noise emanating from Picton Road. On this basis the appropriate amenity criteria is provided in Table 2.1 of the INP, and reproduced below in Table 7.

Noise levels on Staff Road are typically dominated by a combination of noise from Boral's operations and traffic noise on Picton Road. The amenity criteria provided below is a result of the existing contribution from Boral's activities.

Provided below in Table 7 is the appropriate criteria for each of the measurement locations.

Table 7 Operational noise criteria

Location	Assessment Period	ANL	RBL (L_{A90})	$L_{Aeq(15min)}$	Intrusive Criteria	Amenity Criteria
BG1	Day	50	48	66	53	50
	Evening	45	48	60	53	42
	Night	40	44	58	49	32
BG2	Day	50	44	59	49	50
	Evening	45	43	50	48	45
	Night	40	43	47	48	40
BG3	Day	50	46	62	51	52
	Evening	45	44	59	49	49
	Night	40	40	56	45	46
BG4	Day	50	32	53	37	50
	Evening	45	32	51	37	45
	Night	40	32	49	37	40
BG5	Day	50	34	48	39	50
	Evening	45	34	42	39	45
	Night	40	31	39	36	40

The particular operating conditions of each site are as yet unknown. As such, it has been assumed that L_{Aeq} noise sources would be relatively constant over each period (day, evening and night). On this basis the more stringent of the amenity and intrusive noise criteria is considered the appropriate noise criteria for each receiver location.

The final applicable noise criteria at residential sensitive receiver locations are provided below in Table 8.

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Table 8 Final noise criteria

Receiver Location	L_{Aeq} Noise Criteria dB(A)		
	Day	Evening	Night
BG1	50	42	32
BG2	49	45	40
BG3	51	49	45
BG4	37	37	37
BG5	39	39	36

3.1.2 Operational road traffic noise criteria

RNP has been used to assess the noise arising from traffic generated by the proposed development. The RNP guidelines are applicable for traffic movements generated as a result of the additional traffic generated during the operational phase.

The main road providing access to the proposed development is Picton Road. This road would be classified as an arterial road. Table 9 presents the road traffic noise criteria from the RNP for land use developments with a potential to create additional traffic on existing freeways or motorways/ arterial roads. The external noise criteria are applied 1 m from the external facade of the affected building.

Table 9 Road traffic noise criteria – Freeways / Arterial roads

Period	Parameter	Criterion
Freeway or motorway/Arterial Roads		
Day (7:00 am – 10:00 pm)	$L_{Aeq\ (15hr)}$	60 dB(A)
Night (10:00 pm – 7:00 am)	$L_{Aeq\ (9hr)}$	55 dB(A)

Note that where the criteria have already been exceeded the RNP recommends that:

> *"Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of the project by applying the relative increase criteria.*
>
> *In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*
>
> *For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'."*

The existing traffic noise along Picton Road already exceeds the recommended design criteria for this type of road, refer to Section 2.3 for measured traffic noise levels. Therefore, application of the RNP criteria would then be to ensure that, at a minimum, traffic arising from the proposed development would not lead to an increase in existing noise levels of more than 2 dB(A).

3.1.3 Rail movement noise

The OEH's Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects (IGANRIP) (DECC, 2007) guideline provides procedures for the assessment and approval process for rail infrastructure developments that have the potential for rail noise and vibration impacts on sensitive receivers.

The IGANRIP states that:

"Redevelopment of an existing rail line applies where residential or noise sensitive receivers are subject to existing rail noise at or above the noise trigger levels in Table 1 in Chapter 2 for a new rail line development.

Typically this will be an existing rail line where it is proposed to carry out works that will increase its capacity to carry rail traffic or alter the track alignment through design or engineering changes."

Typical works that increase a rail lines capacity includes adding additional lines (such as duplications or quadruplications) or modifying the existing alignment by providing passing loops or other operational changes.

Additionally IGANRIP states:

"Redevelopment does not cover minor works such as crossovers, sidings, turnouts, yards, loops, refuges, relief lines, straightening curves or the installation of track signalling devices where these works will not result in an increase in existing rail noise level and a level of rail noise beyond the noise trigger levels.."

The Maldon Rail Terminal project is upgrading the sites yard facilities. Rail work will be limited to the BC site and as such will not increase the capacity of the existing Main Southern Rail Line. On this basis the rail operations of this project does not require an assessment consistent with the requirements of IGANRIP. However the DECCW's website provides guidance on assessing the proposed development. The website states:

"Land-use developments that are likely to generate additional rail traffic were previously assessed with reference to the Environmental Noise Control Manual. This manual is no longer in print and does not represent current government policy.

When reviewing the Environmental Assessments, Environmental Impact Statements, Statements of Environmental Effects, or Reviews of Environmental Factors for land-use developments, DECCW will assess these developments against the following requirements:

- *The typical offset distance/s of sensitive receivers from the rail line/s that are likely to be affected by increased rail movements should be identified.*
- *The existing level of rail noise at the offset distances identified in point one above should be quantified using the noise descriptors LAeq,24hr and LAmax (95th percentile) dB(A).*
- *The cumulative rail noise level (i.e. from existing, plus proposed, rail movements) should be predicted using a calibrated noise model (based on predicted increased rail movements) at the offset distances identified above.*
- *The cumulative noise level should be compared with the rail noise assessment trigger levels: LAeq,24hr 60dB(A) and LAmax (95th percentile) 85dB(A).*
- *Where the cumulative noise level exceeds the noise assessment trigger levels, and project-related noise increases are predicted, all feasible and reasonable noise mitigation measures should be implemented. As a general principle, where the reduction of existing noise levels can be achieved through feasible and reasonable measures, a reduction in noise levels to meet the noise assessment trigger levels is the primary objective. In all cases where the LAeq noise level increases are more than 2dB(A), strong justification should be provided as to why it is not feasible or reasonable to reduce the increase."*

3.1.4 Sleep disturbance criteria

The INP has recently been updated with application notes which discuss sleep disturbance and its objective assessment.

To minimise the risk of sleep disturbance as a result of industrial type operations during the night-time period, the INP application notes recommends that, the $L_{A1(1\ minute)}$ noise level outside a bedroom window should not exceed the L_{A90} background noise level by more than 15 dB(A) during the night-time period (10.00 pm to 7.00 am). DECCW considers it is appropriate to use this metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

The INP application notes recommends reference to the OEH's Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999) for some guidance in assessing the potential for sleep disturbance.

The ECRTN contains an assessment of sleep disturbance which represents NSW DECCW advice on the subject of sleep disturbance due to noise events. Section B5 of Appendix B concludes, having considered the results of four research papers by *Pearson et al (1995)*, *Bullen et al (1996)*, *Griefahn (1992)* and *Finegold et al (1994)* with the statement, *'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions'*.

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Therefore, given that an open window provides 10 dB(A) noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

Based on the measured background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are presented in Table 10.

Table 10 Night-time sleep disturbance criteria

Location	Measured RBL $L_{A90,\ 15\ mins}$ dB(A)	Sleep Disturbance Criteria $L_{A1\ (1\ minute)}$ dB(A)	
		Screening Level	Awakening Reaction
BG1	44	59	60 - 65
BG2	44	59	60 - 65
BG3	40	55	60 - 65
BG4	35	50	60 - 65
BG3	31	46	60 - 65

3.2 Construction noise criteria

In July 2009 the OEH published the *Interim Construction Noise Guidelines (ICNG)* (DECCW, 2009) for use in construction noise assessment. This document replaces the previous publication the *Environmental Noise Control Manual (ENCM)* and is used as the basis for establishing construction noise management levels (NMLs) for the proposed development.

Under the existing OEH policy a construction noise management plan is required to be compiled by the Contractor, prior to construction commencing. NMLs must be set for the standard working hours periods (refer to Table 11), and must be complied with where reasonably practicable. Work that is proposed outside of standard working hours, as defined in the *ICNG*, generally requires strong justification.

The noise management plan should detail the '*best practice*' construction methods to be used, presenting a reasonable and feasible approach. The plan should identify the extent of the residential area affected and assess the impact on residents. The plan should detail any community relation programs that are planned e.g. prior notification for particularly noisy activities, letter box drop regarding out of hours construction work to be undertaken and a 24 hour contact phone number for residents to call should they have any complaints or questions.

The *ICNG* defines what is considered to be feasible and reasonable as follows:

> *"Feasible*
>
> *A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.*
>
> *Reasonable*
>
> *Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure."*

The *ICNG* recommends that a quantitative assessment is carried out for all *'major construction projects that are typically subject to the EIA process'*. A quantitative assessment, based on a likely '*worst case*' construction scenario, has been carried out for this project.

Predicted noise levels at nearby sensitive receivers (residential, commercial and industrial premises) are compared to the levels provided in Section 4 of the *ICNG*. Where an exceedance of the noise management levels is predicted the *ICNG* advises that the proponent should apply all feasible and reasonable work practises to minimise the noise impact.

Noise management levels for residential receivers are set using the information in Table 11.

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Table 11 Noise at residences using quantitative assessment

Time of Day	Management Level $L_{Aeq\ (15min)}$[1]	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 meet the noise affected level. - 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(A)	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 relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: - times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences - if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
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. - For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Notes:

1. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

3.2.1 Construction noise management levels

It is assumed that the construction activities will take place predominantly during recommended standard working hours (7.00 am – 6.00 pm Monday to Friday and 8.00 am – 1.00 pm Saturday). However, oversized loads and emergency work may need to be conducted outside recommended standard working hours.

Construction noise management levels for the most affected residential receivers are shown in Table 12.

Table 12 Construction noise management levels – Residential receivers

Residential Receivers	Recommended Standard Hours RBL L_{A90} dB(A)	Recommended Standard Hours Noise Management Levels L_{Aeq} dB(A)	Outside Recommended Standard Hours RBL L_{A90} dB(A)	Outside Recommended Standard Hours Noise Management Levels L_{Aeq} dB(A)
BG1	47	57	44	49
BG2	43	53	43	48

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Residential Receivers	Recommended Standard Hours RBL L_{A90} dB(A)	Recommended Standard Hours Noise Management Levels L_{Aeq} dB(A)	Outside Recommended Standard Hours RBL L_{A90} dB(A)	Outside Recommended Standard Hours Noise Management Levels L_{Aeq} dB(A)
BG3	46	56	40	45
BG4	32	42	34	39
BG5	34	44	30	35

Noise management levels for other sensitive land uses, such as schools, places of worship are shown in Table 13.

Table 13 Construction noise management levels – Sensitive land uses other than residential

Land Use	Management Level, $L_{Aeq\ (15\ min)}$ (applies when properties are in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas(characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

Noise management levels for industrial (e.g. Allied Mills) and commercial premises are shown below:

- Industrial premises: external $L_{Aeq\ (15min)}$ 75 dB(A), and
- Offices, retail outlets: external $L_{Aeq\ (15min)}$ 70 dB(A).

3.2.2 Sleep disturbance criteria

Refer to Section 3.1.4

3.3 Construction vibration criteria

Unlike the criteria applicable to noise emissions, vibration criteria are the same for both the construction and operational phases of this project. The OEH's '*Assessing Vibration: a technical guideline*', (DECC, 2006) has been designed to be used in evaluating and assessing the effects on amenity of vibration emissions from industry, transportation and machinery. The guideline is used in assessments of vibration impacts caused by the construction and operation of new developments.

Vibration criteria are set primarily according to whether the particular activities of interest are continuous in nature or intermittent, whether they occur during the daytime or night-time and the type of receiver to be assessed e.g. commercial or residential.

The effects of vibration in buildings can be divided into three main categories:

- Those in which the occupants or users of the building are inconvenienced or possibly disturbed, i.e. human disturbance or discomfort;
- Those in which the integrity of the building or the structure itself may be prejudiced; and
- Those where the building contents may be affected.

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Therefore, vibration levels at sensitive receiver locations must be controlled so as to prevent discomfort and regenerated noise, and in some extreme cases, structural damage.

For the proposed site, the nearest residential receivers (vibration sensitive) are located more than 350 m from the proposed development site. At such distances, the risk of discomfort, regenerated noise and structural damage impacting receivers is extremely low and needs not to be considered further.

Vibration levels on residential receivers due to additional traffic generated by the proposed development during the construction phase are considered insignificant predominantly due to the large offset distances and existing traffic flows on Picton Road. Therefore, from a vibration perspective, the issue of impacts caused by the construction and operation of the proposed Rail Terminal Facility need not be considered further.

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4.0 Operational Noise Assessment

4.1 Methodology

The overall noise criteria provided in Section 3.0 is applicable for the entire parcel of land to be rezoned. To provide an equitable noise limit for each development, the noise criteria should be dependent on the size of land the development occupies. This ensures that a larger development is allotted a noise allowance proportional to its size.

Furthermore, the noise limits provided in Section 3.0 are applicable at the receiver location. This means that of two equally sized developments, if one is located twice as far as another from the receiver it could produce noise levels approximately 3 dB(A) higher (disregarding ground and air absorption) , resulting in equal noise levels at the receiver.

The proposed redevelopment area has been divided into areas A to H, as provided in Figure 1. Source noise levels have been calculated based on a roughly even distribution of sources throughout the area. It is highly likely that the size of these parcels would be subdivided further as a result of the development. If this is the case, the noise criteria for the specific portion of land should be reduced using the formula:

$$Criteria_{development} = Criteria_{division} + 10 \times log_{10}(\frac{Area\ of\ Development}{Total\ Area\ of\ Division})$$

Where the division is one of the nominated divisions (A through to H) in Figure 1.

The noise levels were calculated at each sensitive receiver using the CONCAWE sound propagation algorithm, implemented by SoundPLAN V7.0. The CONCAWE algorithm uses octave band propagation factors. When octave band sound power levels are not available, CONCAWE recommends standard adjustments for each octave band. For the purposes of this assessment, the CONCAWE adjustments have been implemented, and are reproduced below in Table 14.

Table 14 Octave band spectrum shape

Octave Band Centre Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Octave Band Power Level minus A-weighted Sound Power Level	+2	-1	-2	-5	-6	-7	-9	-14

4.2 Meteorological effects

Weather data has been provided by Wollondilly Shire Council, sourced from Picton Sewage Treatment Plant. The weather data comprises the period of January 2001 to December 2003.

The occurrence of temperature inversions was considered to determine if they represented a significant noise impact. Between 6 pm and 7 am during the winter months of June, July and August temperature inversions were found to occur for approximately 26% of the time. On this basis and consistent with the INP, further assessment of temperature inversions is not required.

The INP considers wind effects to be assessed when source-to-receiver wind speeds of 3 m/s or below occur for at least 30% of the assessment period in any season. Some receivers were found to be wind affected during each assessment period. To provide a conservative assessment, wind affects were considered at all sensitive receiver locations.

It was determined that wind is not a feature in all directions, during all time periods. However, considering the nature of the development is not confirmed and to provide a conservative assessment, the effects of wind have been considered at all sensitive receiver locations.

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4.3 Noise emission limits

The noise emission limits have been calculated at each sensitive receiver. The limits are provided below in Table 15. Noise contours are also provided in Appendix C, indicating the potential impact if each parcel of land was to emit noise at its maximum noise limit under adverse weather conditions.

Table 15 Maximum sound power levels

Parcel of Land	Noise Limits - Sound Power Level dB(A)		
	Daytime	Evening	Night-time
A	101	101	101
B	100	97	97
C	103	98	98
D	100	96	96
E	103	103	103
F	102	102	102
G	106	106	106
H	102	102	102

Provided below in Table 16, Table 17 and Table 18 are the calculated noise levels at each identified representative sensitive receiver if each parcel of land was to emit noise at is maximum Sound Power Level as presented in Table 15.

Table 16 Daytime noise levels

Parcel	A	B	C	D	E	F	G	H	Overall dB(A)	Criteria dB(A)
SWL	101	100	103	100	103	102	106	102		
R1	38	40	45	38	36	27	32	25	48	49
R2	35	37	46	42	39	28	33	26	49	49
R3	31	32	38	39	42	31	35	28	46	51
R4	28	28	34	33	37	32	34	29	42	51
R5	26	26	31	29	33	30	31	27	39	51
R6	23	23	27	25	30	31	31	29	37	37
R7	18	18	22	20	25	29	33	32	37	39
R8	21	20	24	21	25	26	33	28	36	39
R9	23	22	25	23	27	26	34	27	37	39
R10	24	24	27	24	28	27	35	27	38	49
R11	35	32	33	28	30	24	30	23	40	49

Table 17 Evening noise levels

Parcel	A	B	C	D	E	F	G	H	Overall dB(A)	Criteria dB(A)
SWL	101	97	98	96	103	102	106	102		
R1	38	37	40	34	36	27	32	25	45	45
R2	35	34	41	38	39	28	33	26	45	45
R3	31	29	33	35	42	31	35	28	44	49
R4	28	25	29	29	37	32	34	29	41	49
R5	26	23	26	25	33	30	31	27	38	49
R6	23	20	22	21	30	31	31	29	37	37

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Parcel	A	B	C	D	E	F	G	H	Overall dB(A)	Criteria dB(A)
SWL	101	97	98	96	103	102	106	102		
R7	18	15	17	16	25	29	33	32	37	39
R8	21	17	19	17	25	26	33	28	36	39
R9	23	19	20	19	27	26	34	27	36	39
R10	24	21	22	20	28	27	35	27	37	45
R11	35	29	28	24	30	24	30	23	39	45

Table 18 Night-time noise levels

Parcel	A	B	C	D	E	F	G	H	Overall dB(A)	Criteria dB(A)
SWL	93	89	90	92	99	100	101	100		
R1	30	29	32	30	32	25	27	23	38	40
R2	27	26	33	34	35	26	28	24	40	40
R3	23	21	25	31	38	29	30	26	40	45
R4	20	17	21	25	33	30	29	27	37	45
R5	18	15	18	21	29	28	26	25	34	45
R6	15	12	14	17	26	29	26	27	33	37
R7	10	7	9	12	21	27	28	30	34	36
R8	13	9	11	13	21	24	28	26	32	36
R9	15	11	12	15	23	24	29	25	32	36
R10	16	13	14	16	24	25	30	25	33	36
R11	27	21	20	20	26	22	25	21	33	32

4.4 Cumulative Impact

The noise criteria detailed above has considered the cumulative impact of all existing industrial noise. The criteria has been divided up amongst the various land areas to ensure that if a range of industrial sites emit noise at their maximum criteria, the overall noise levels would comply with the noise criteria at each rural residence in the local area.

The criteria have been derived to ensure that the noise allowance of each area of land is split equitably.

4.5 Road traffic noise assessment

A traffic study has been undertaken by GHD, entitled '*Report for Maldon Employment Lands Rezoning, Traffic and Transport Study*'. Peak AM and PM traffic movements have been taken from GHD's report to determine the likely impact from increased traffic as a result of the proposed development.

Provided below in Table 19 are the existing and future AM and PM peak traffic flows on Menangle Park Road. The Year 2016 and Year 2036 traffic volumes include a natural growth of 2.8% per year and increase in traffic as a result of the rezoning and development of Maldon Employment Lands area.

Table 19 Peak hour traffic volumes

Location	Direction	AM Peak		PM Peak	
		Light	Heavy	Light	Heavy
Year 2011 Traffic Volumes					
West of Menangle Road	EB	474	59	349	43
	WB	249	31	449	55

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Location	Direction	AM Peak		PM Peak	
		Light	Heavy	Light	Heavy
East of Menangle Road	EB	512	63	438	54
	WB	303	38	449	56
East of Allied Mills Access	EB	498	61	440	54
	WB	289	36	368	46
Year 2016 Traffic Volumes					
West of Menangle Road	EB	597	71	481	81
	WB	388	55	590	55
East of Menangle Road	EB	645	71	564	92
	WB	456	55	487	54
East of Allied Mills Access	EB	611	74	601	94
	WB	476	57	465	56
Year 2036 Traffic Volumes					
West of Menangle Road	EB	953	95	724	112
	WB	605	72	975	73
East of Menangle Road	EB	1027	95	861	129
	WB	698	72	819	71
East of Allied Mills Access	EB	928	100	1000	133
	WB	847	77	710	76

Provided below is a summary of the predicted increase in noise from the proposed development.

Table 20 Increase in noise levels

Location	AM Peak		PM Peak	
	Light	Heavy	Light	Heavy
Year 2016 Predicted increase in noise				
West of Menangle Road	1.3 dB(A)	1.5 dB(A)	1.3 dB(A)	1.4 dB(A)
East of Menangle Road	1.3 dB(A)	1.0 dB(A)	0.7 dB(A)	1.2 dB(A)
East of Allied Mills Access	1.4 dB(A)	1.3 dB(A)	1.2 dB(A)	1.8 dB(A)
Year 2036 Predicted increase in noise				
West of Menangle Road	3.3 dB(A)	2.7 dB(A)	3.3 dB(A)	2.7 dB(A)
East of Menangle Road	3.3 dB(A)	2.2 dB(A)	2.8 dB(A)	2.6 dB(A)
East of Allied Mills Access	3.5 dB(A)	2.6 dB(A)	3.3 dB(A)	3.2 dB(A)

The increase in noise levels from natural growth (2.8% traffic increase per year) is 0.6 dB(A) in five years from 2011 to 2016 and 3.0 dB(A) in twenty five years from 2011 to 2036. The numbers above indicate that in 2011 the maximum increase in noise as a result of the Maldon Employment Lands development would be approximately 1 dB(A). The maximum increase in noise in Year 2036 as a result of the Maldon Employment Lands development would be less than 0.5 dB(A).

The RTA's Environmental Noise Management Manual (ENMM) provides guidance on the significance of impact:

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'A "significant contribution to road traffic noise exposure" from a road development or upgrading proposal is defined as an increase in road traffic noise at any exposed façade of more than 2 dB(A) compared to the road traffic noise level from the existing road.'

On the basis that noise levels would not increase by more than 2.0 dB(A) as a result of the proposed development, the increase in noise levels from additional traffic is considered to comply with the appropriate road noise criteria.

4.6 Train main line movements

At this point the proposed rezoning has not identified an increase in rail movements. If an individual development has the potential to increase rail noise, a noise assessment would be required at the Development Application stage.

4.7 Sleep disturbance

The INP Application Notes recommend that sleep disturbance is assessed based on the emergence of the $L_{A1\ (1\ minute)}$ noise level over the corresponding $L_{A90\ (15\ minute)}$ noise level.

The following screening criterion for sleep disturbance is recommended for the assessment of sleep disturbance:

$$L_{A1\ (1\ minute)} < L_{A90\ (15\ minute)} + 15\ dB(A)$$

The potential for sleep disturbance is highly dependent on the activities to be undertaken during the night-time period. The potential impact on sleep disturbance can be controlled through effective noise management and mitigation techniques at each new development. If a development is to operate during the night-time period, a detailed sleep disturbance assessment should be undertaken for each new site at the Development Application stage to ensure it would not adversely impact on sleep disturbance at nearby sensitive receivers.

4.8 Construction noise assessment

At this stage of the rezoning process no information is available on the proposed construction activities which would be undertaken on site. As such, a construction noise assessment would be required at the Development Application stage.

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5.0 Conclusions

This report provides a noise impact assessment of the proposed Maldon Employment Lands Rezoning. The proposed rezoning would affect nine lots within the Maldon local area, surrounding the Allied Mills site. The land is currently zoned RU2 Rural Landscape under WLEP 2011 and is immediately adjacent to land zoned IN3 Heavy Industrial.

Background noise logging has been previously undertaken at five locations in the area for the Maldon Rail Terminal (located adjacent to the proposed land to be rezoned). Appropriate noise goals have been determined based on the results of the noise logging data, in accordance with the INP.

Specific details of future development are not currently known. Hence a noise impact study has been undertaken to determine the maximum noise generation from the proposed development to comply with the established criteria. The development has been divided into eight land packages to define the appropriate noise criteria. The noise criteria for each subdivision has been based on the size of the division and the distance to nearby sensitive receivers (incorporating air and ground absorption). This has provided an equitable assessment ensuring that developments with larger footprints and those located further from sensitive receivers would be able to emit comparatively higher noise levels. Guidance has also been provided to divide the noise criteria of a division between multiple developments.

The noise assessment has considered the cumulative noise impact of all existing industrial developments in addition to those proposed in this development.

The noise emission limits are the maximum allowable limit for each parcel of land to achieve the appropriate noise criteria at nearby receivers. The existing industrial development has already taken a portion of this noise allowance. The criteria proposed in this report define the remaining allowable noise from new development. The criteria have been derived to ensure that the remaining noise allowance is split equitably amongst the land size.

The assessment has found that the divisions can generate sound power levels between 100 dB(A) and 106 dB(A) during the daytime period and from 96 dB(A) to 106 dB(A) during the evening and 89 dB(A) to 101 dB(A) during the night-time periods.

Road traffic noise was found to increase by as much as 1 dB(A) as a result of the proposed development. This increase in noise is not considered to be significant and as such complies with the appropriate noise criteria.

The potential to impact on sleep disturbance would be dependent on the nature of each development. Sleep disturbance should be assessed individually by each development at the Development Application stage to ensure sensitive receivers would not be adversely impacted as a result of the proposal.

At this stage of the rezoning process no information is available on the proposed construction activities which would be undertaken on site. Therefore, a construction noise assessment would be required at the Development Application stage.

This noise impact assessment has identified that it is highly likely that industrial developments in the proposed area to be rezoned would be capable of installing noise attenuation and implementing noise management procedures to ensure sensitive receivers are not adversely impacted. Noise emissions should be assessed by each proposal at the development application stage to ensure compliance with the criteria provided in this report.

All reasonable and feasible noise mitigation should be installed by each development to ensure the potential noise impacts on nearby existing rural properties is minimised. If the proposal is to be operational during the night-time period, the development must be able to show that it would not result in sleep disturbance at nearby properties.

Appendix A

Acoustic Terminology

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Appendix A Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
L_{max}	The maximum sound pressure level measured over the measurement period
L_{min}	The minimum sound pressure level measured over the measurement period
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.
L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.

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Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{90} sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for **each day** of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the **entire length** of noise monitoring.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 *"Acoustics – Glossary of terms and related symbols"*, the DECC's NSW Industrial Noise Policy and the DECC's Environmental Criteria for Road Traffic Noise.

Appendix B

Noise Logging Charts

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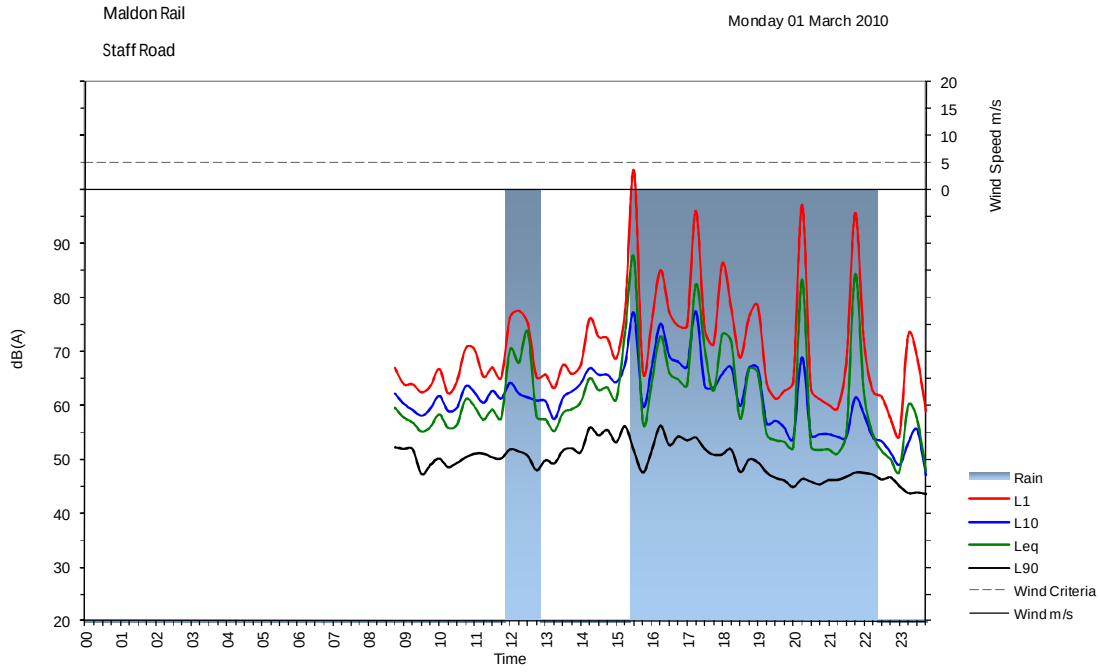
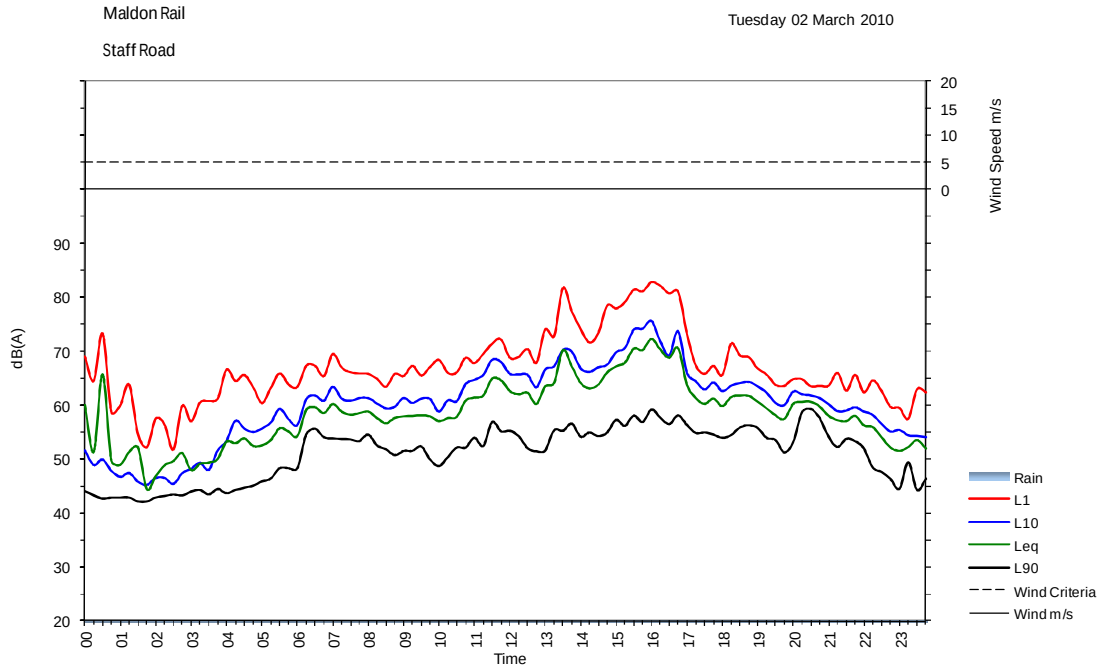
Appendix B Noise Logging Charts

R1 – Staff Road





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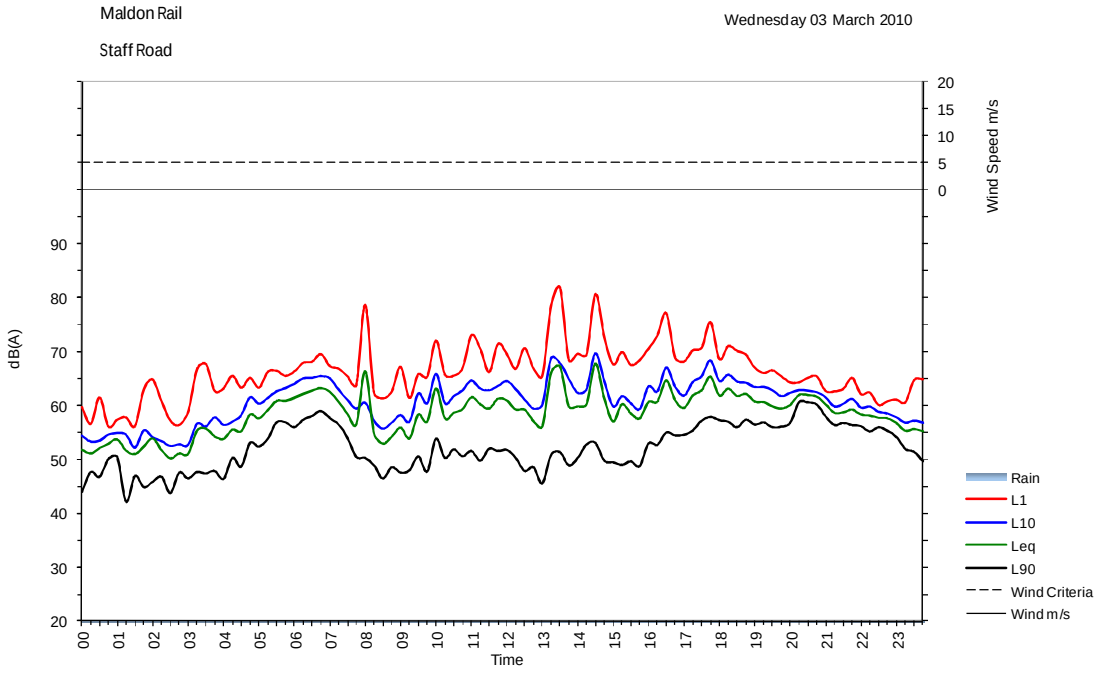
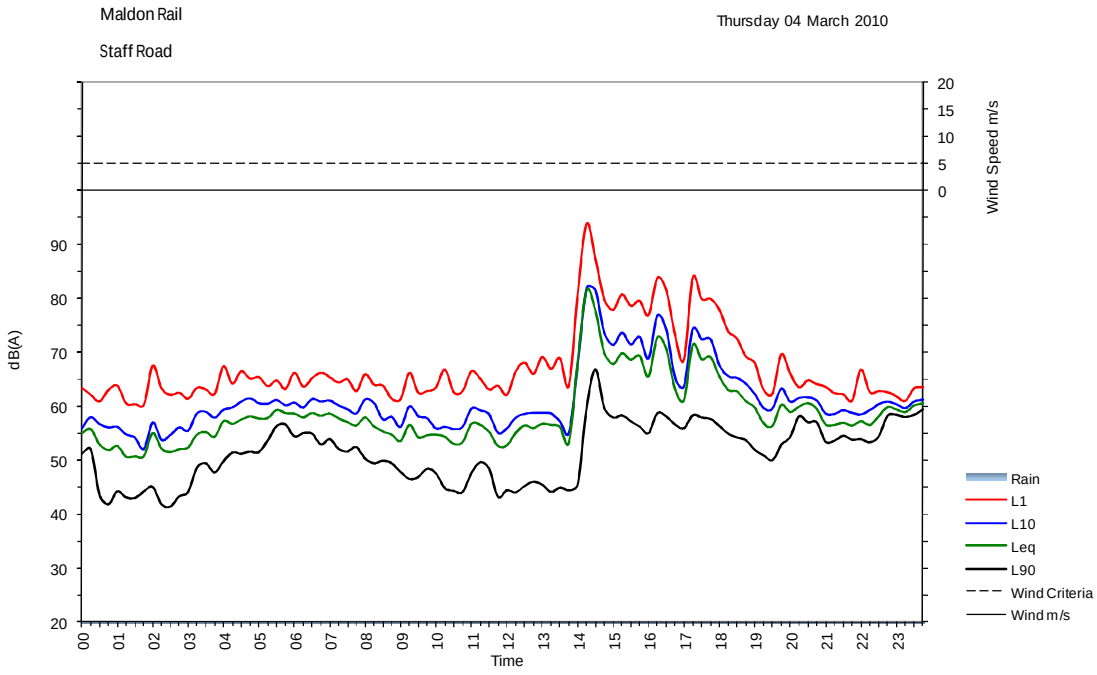
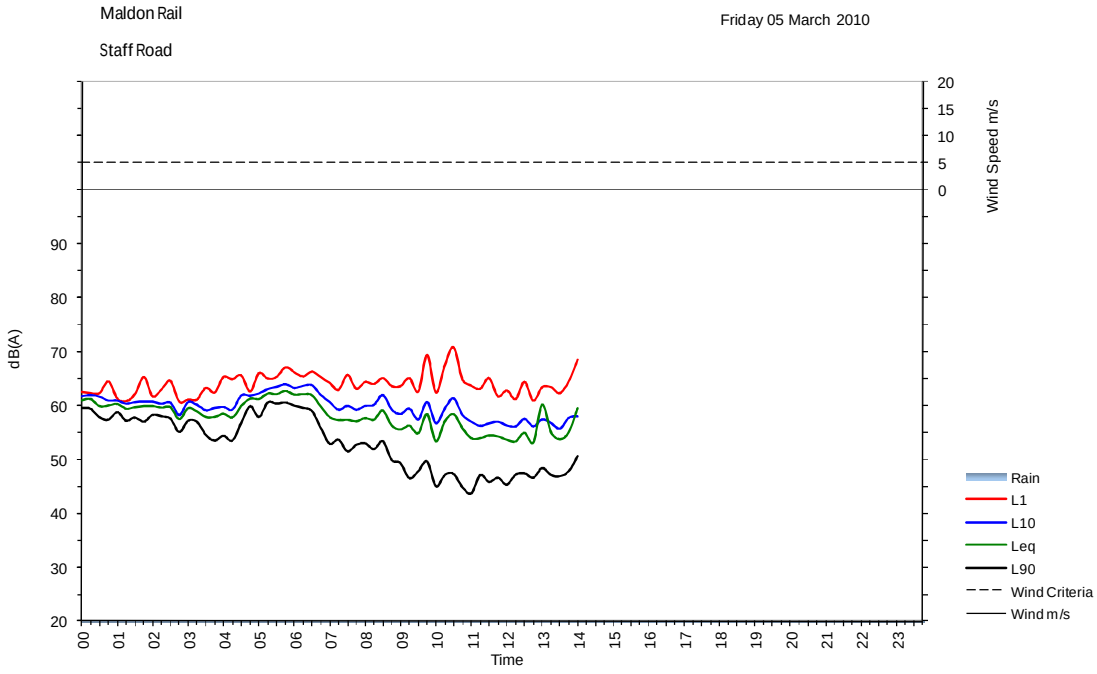

Maldon Rail
Staff Road
Wednesday 03 March 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Maldon Rail
Staff Road
Thursday 04 March 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

D R A F T


Maldon Rail
Staff Road
Friday 05 March 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

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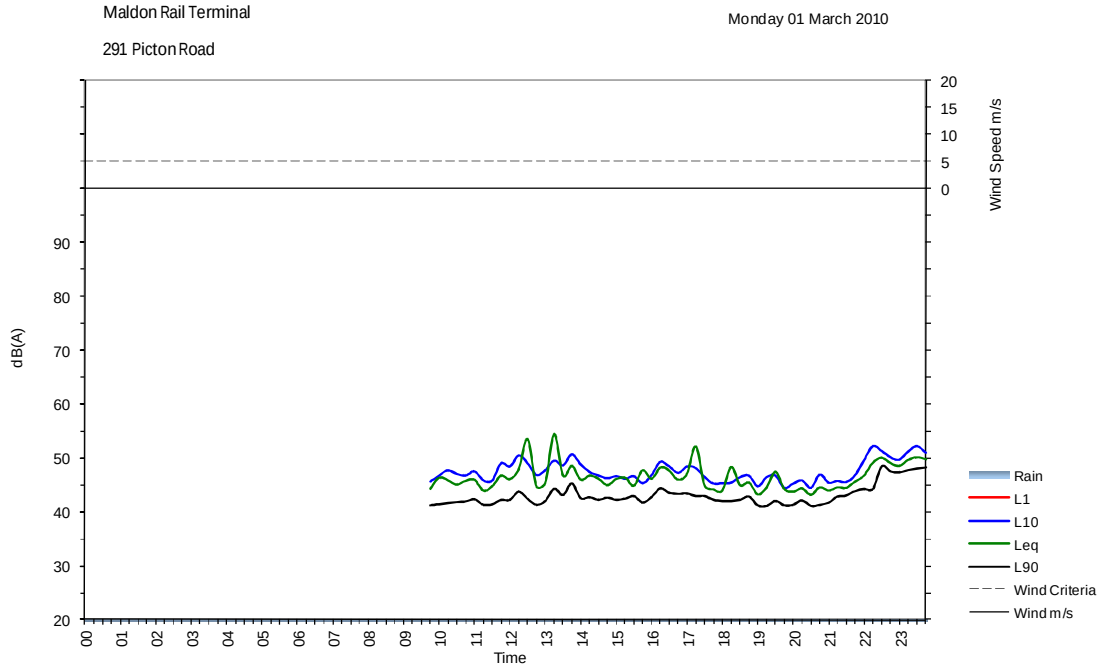
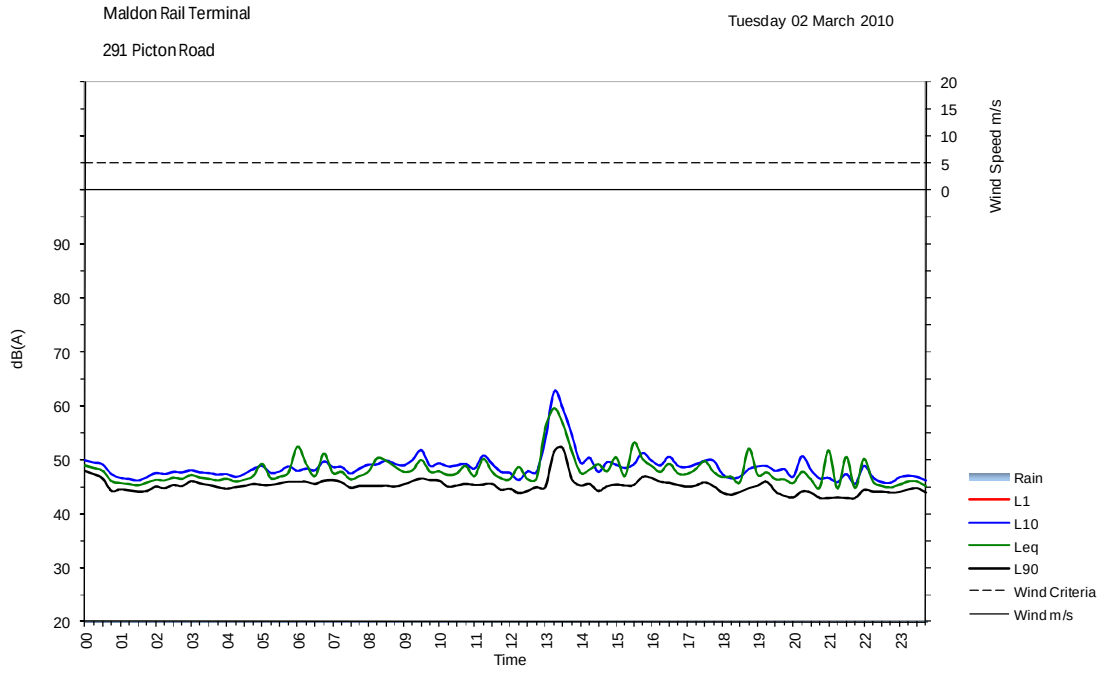
R2 – 291 Picton Road





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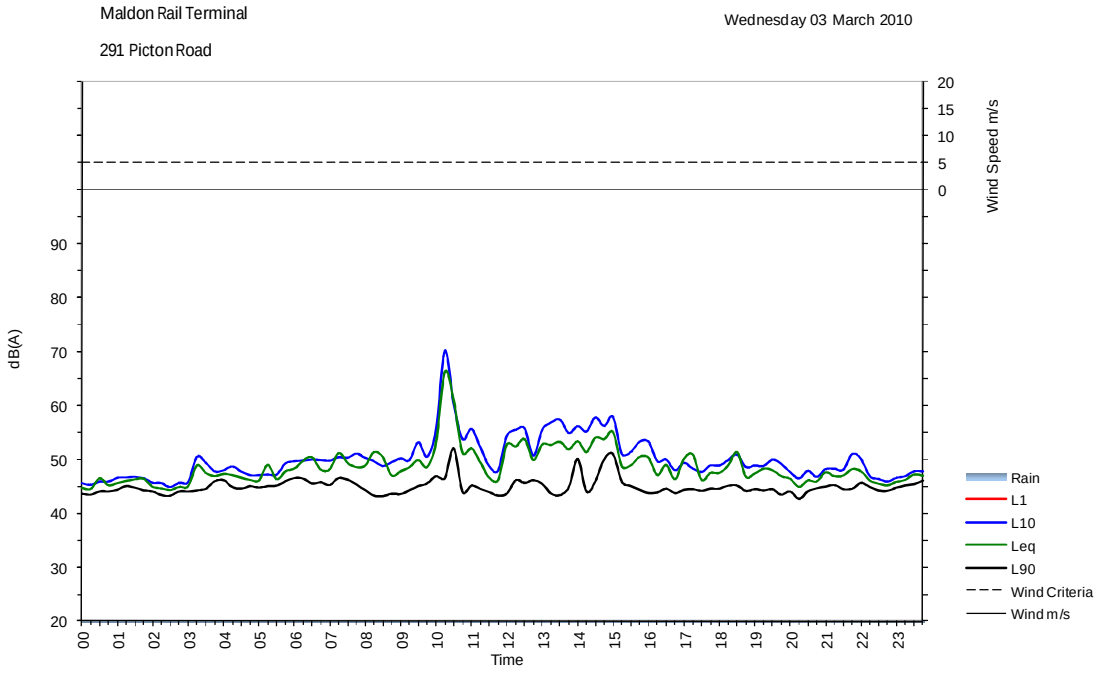
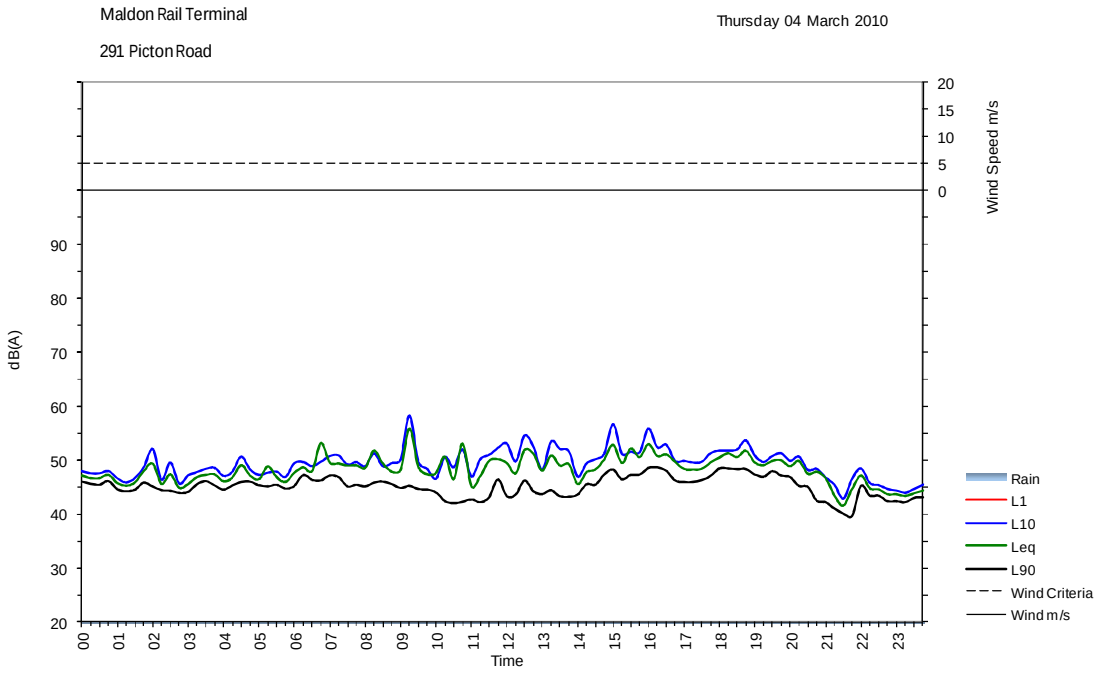
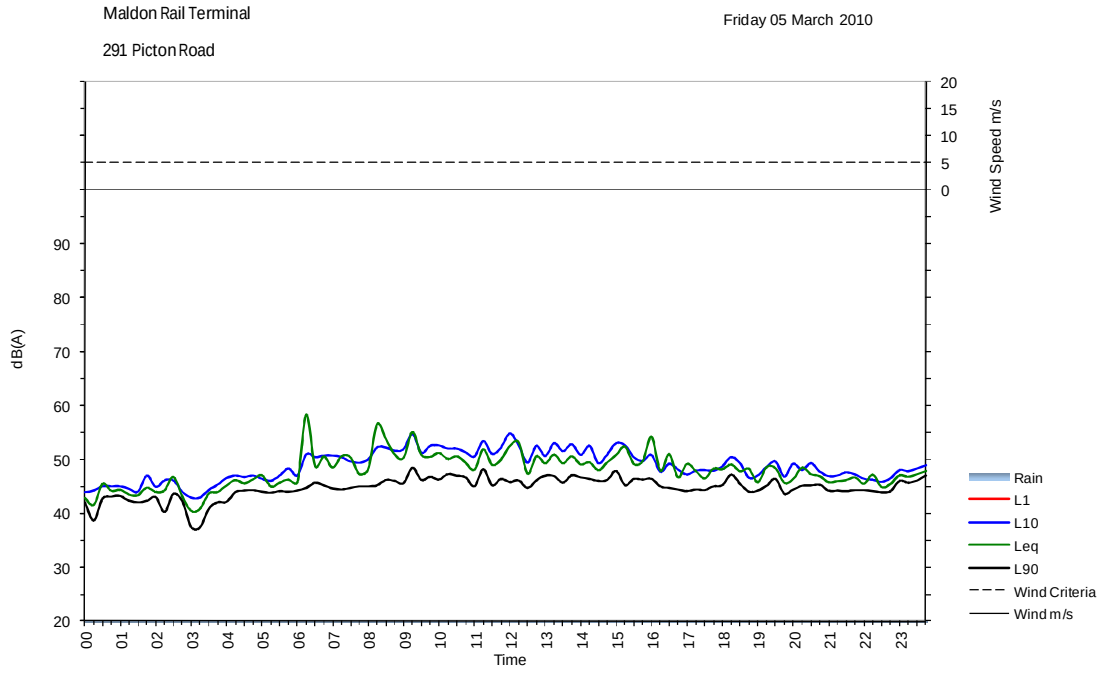

Maldon Rail Terminal
291 Picton Road
Wednesday 03 March 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Maldon Rail Terminal
291 Picton Road
Thursday 04 March 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

D R A F T


Maldon Rail Terminal
291 Picton Road
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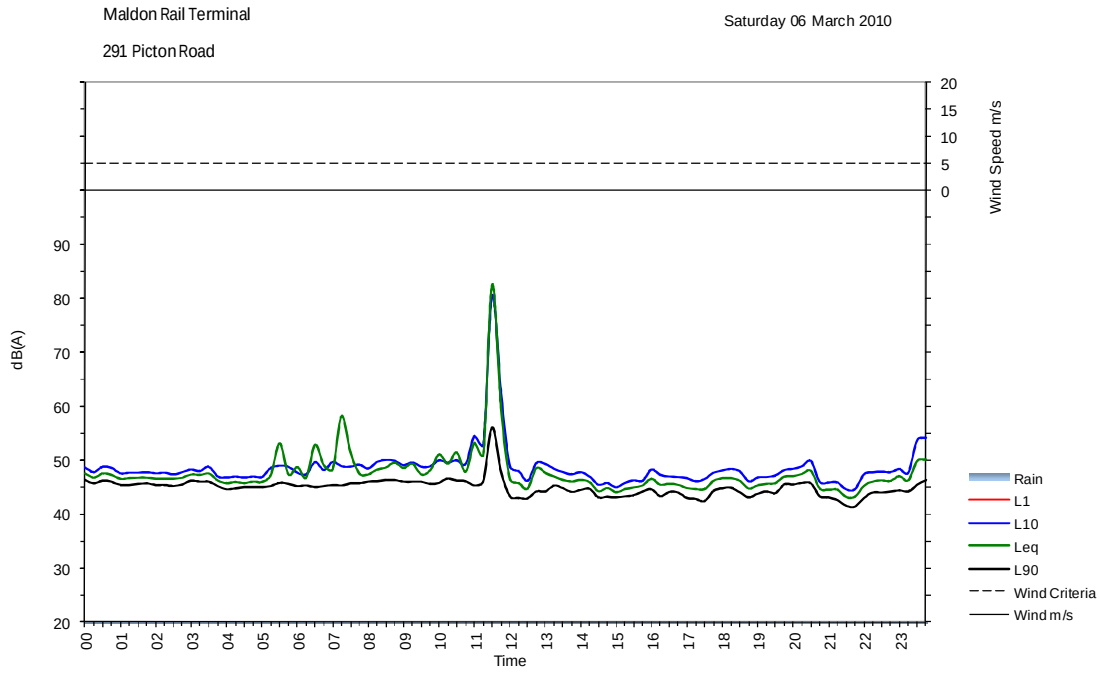
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Maldon Rail Terminal
291 Picton Road
Saturday 06 March 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

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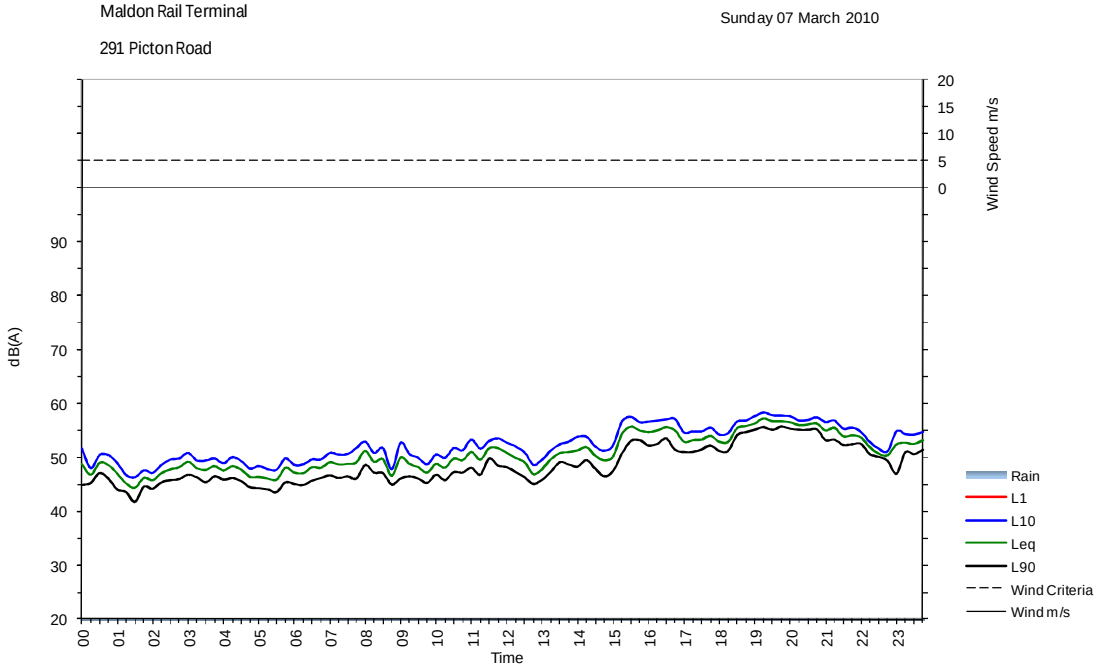
Maldon Rail Terminal
291 Picton Road
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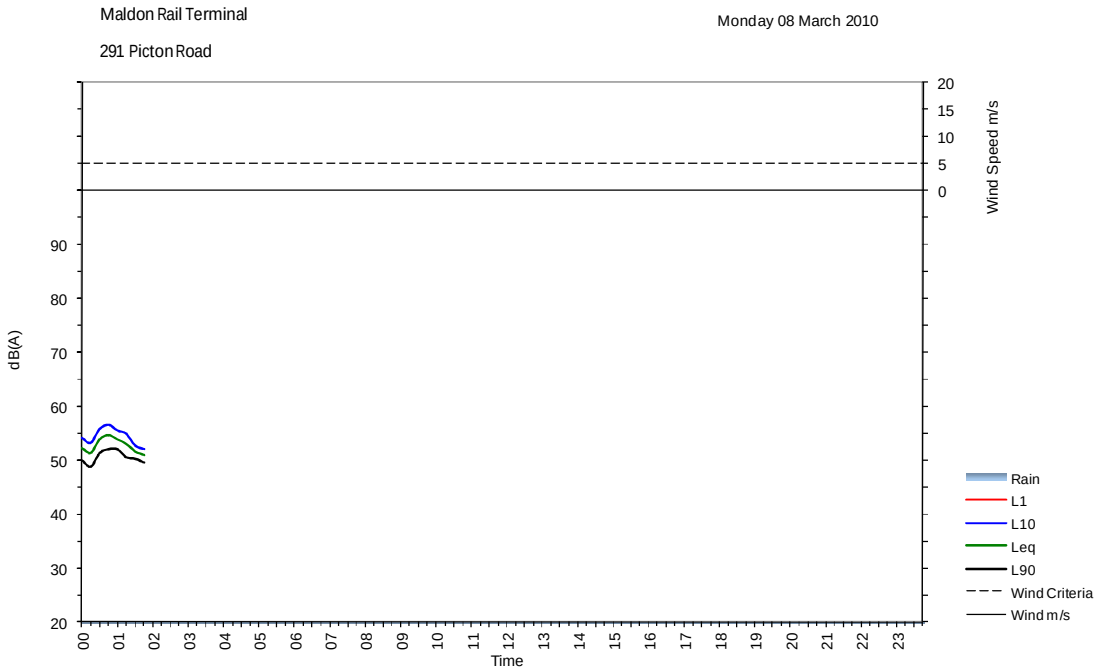
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Maldon Rail Terminal
291 Picton Road
Monday 08 March 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

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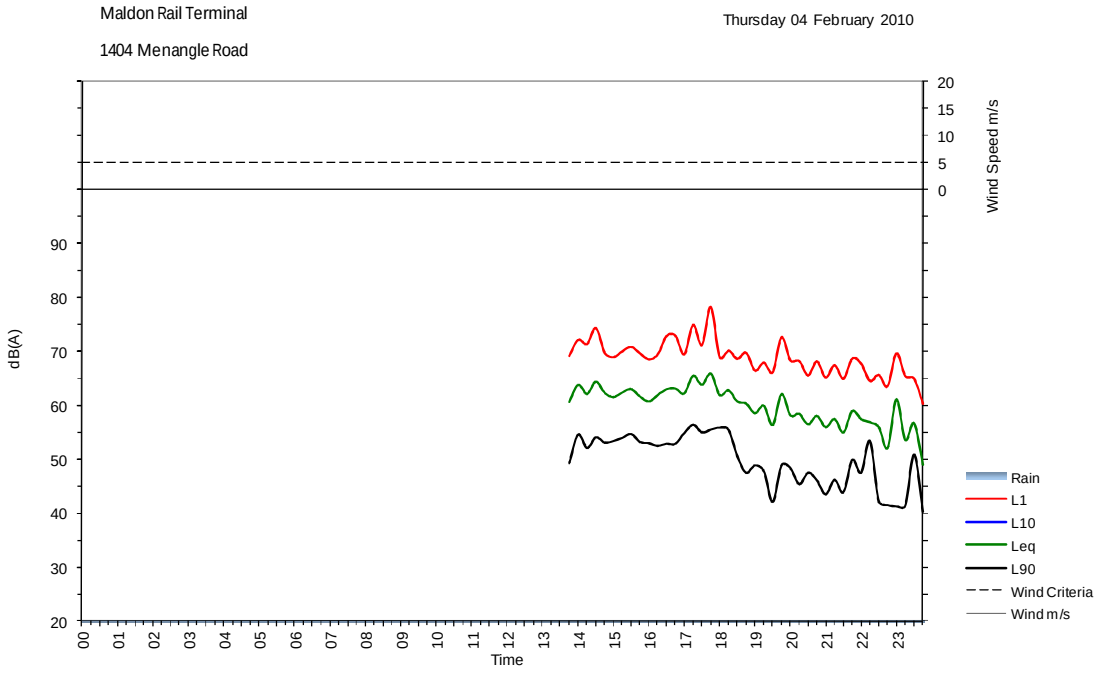
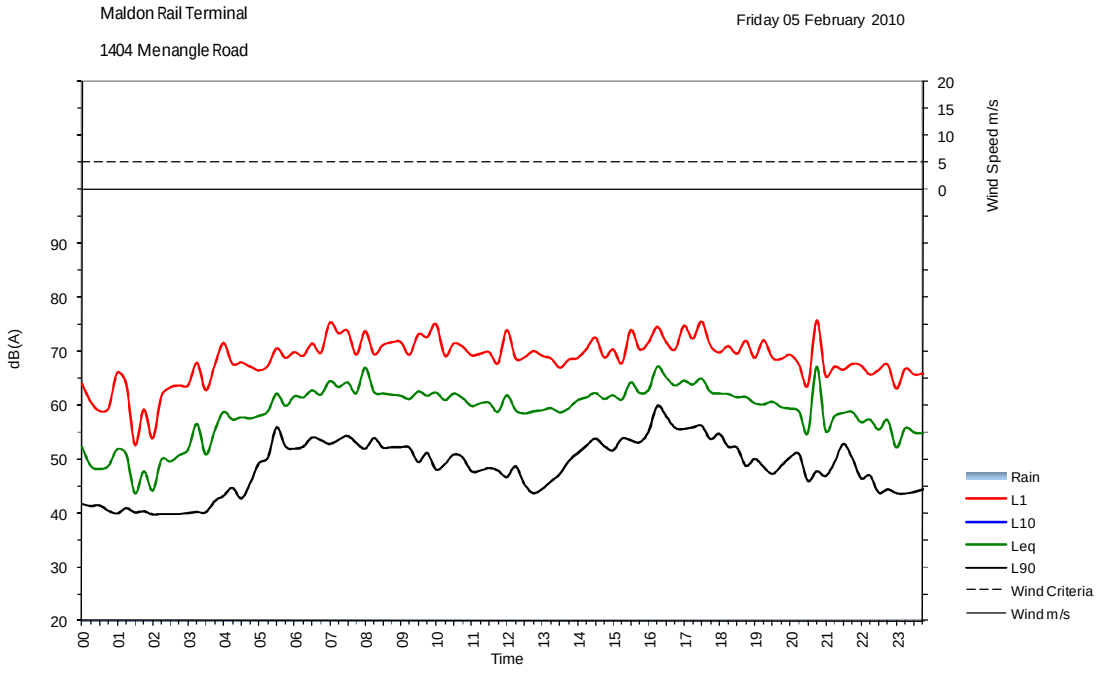
R3 – 1404 Menangle Road





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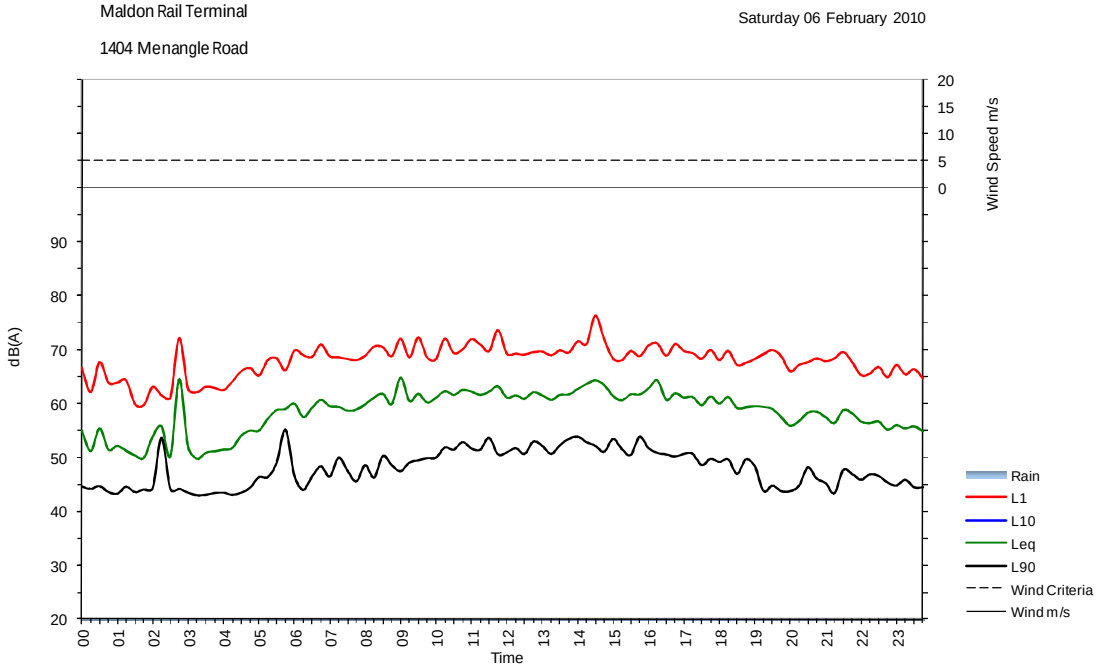
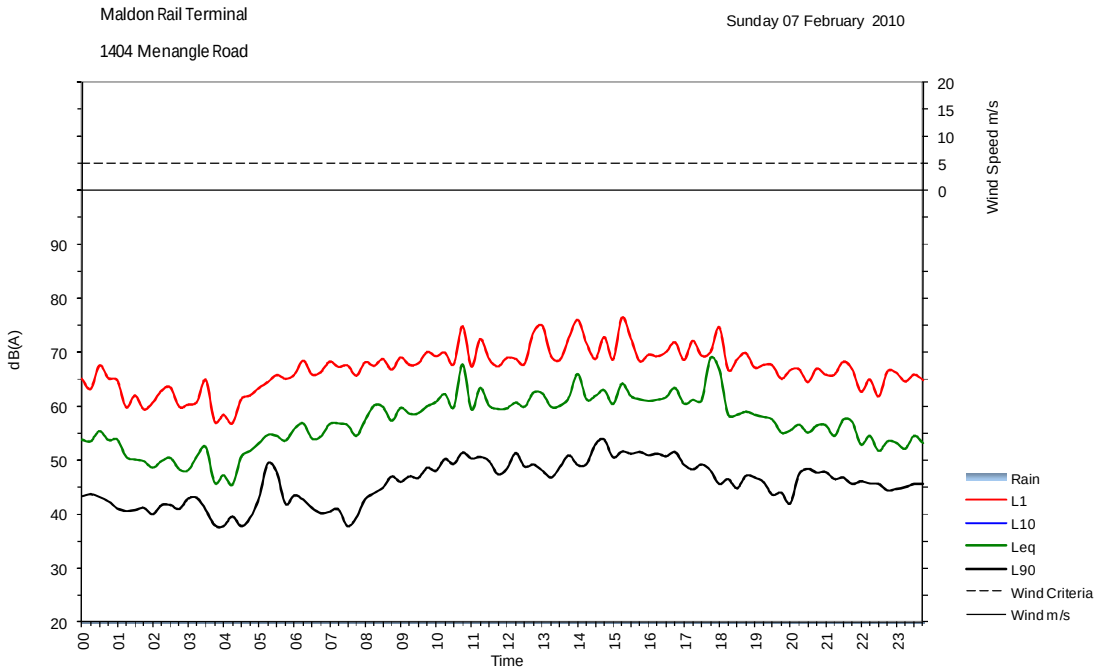

Maldon Rail Terminal
1404 Menangle Road
Saturday 06 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

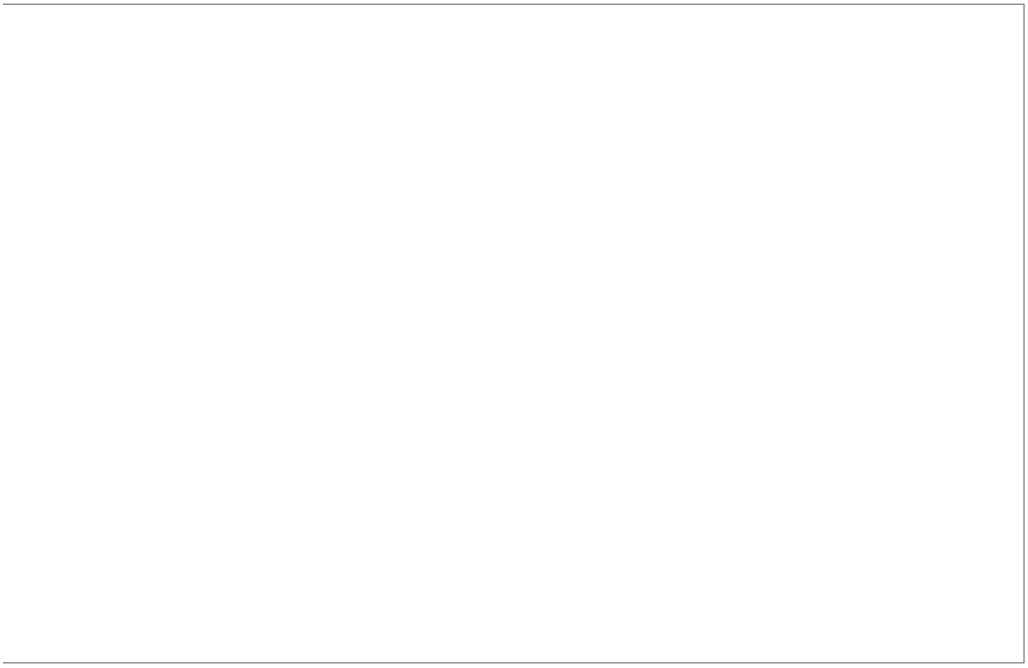

Maldon Rail Terminal
1404 Menangle Road
Sunday 07 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

D R A F T

Maldon Rail Terminal

1404 Menangle Road

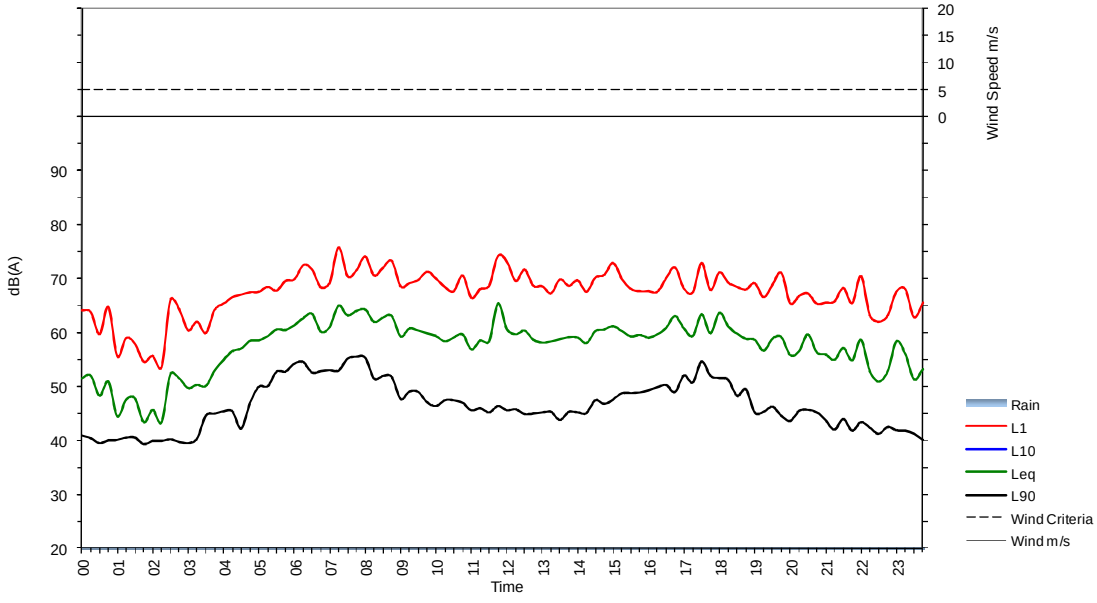
Monday 08 February 2010



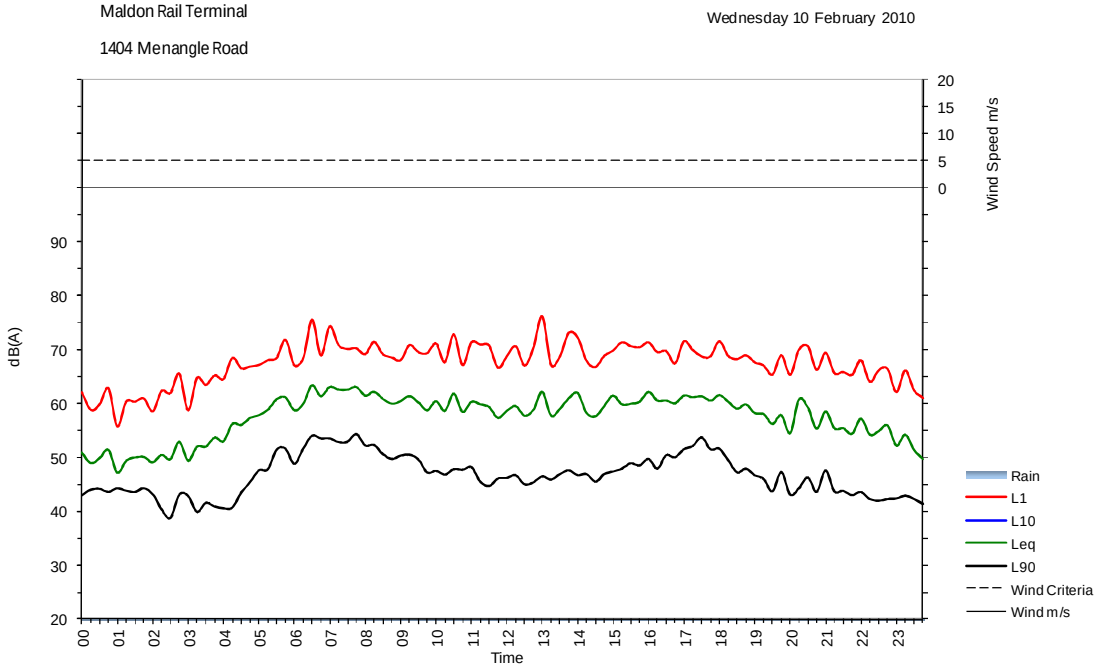
Maldon Rail Terminal

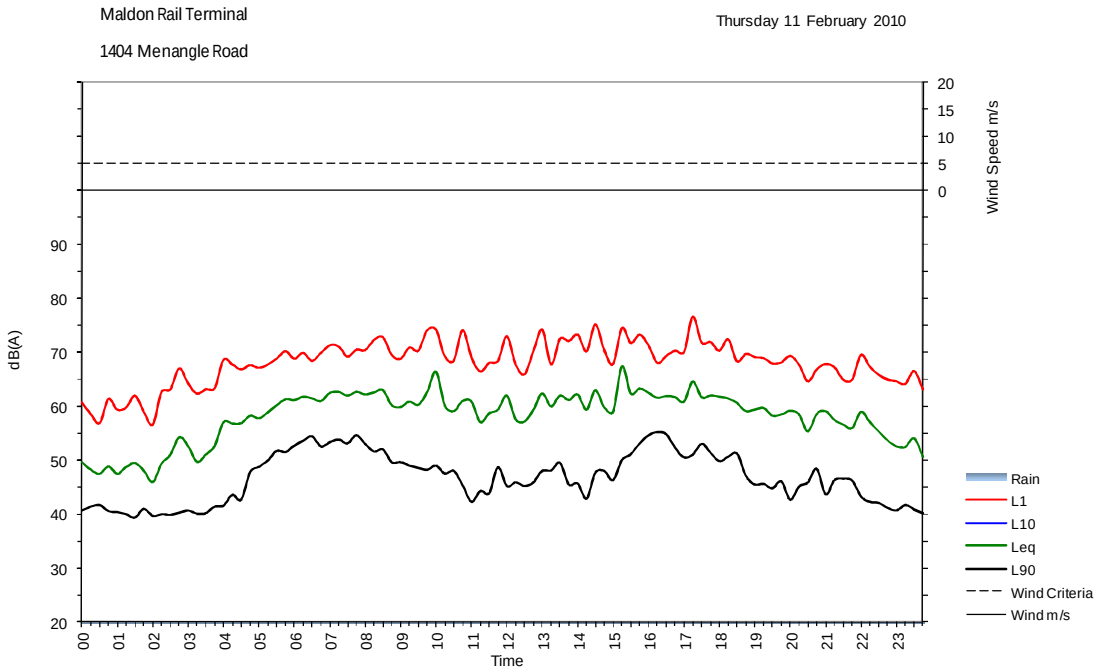
1404 Menangle Road

Tuesday 09 February 2010

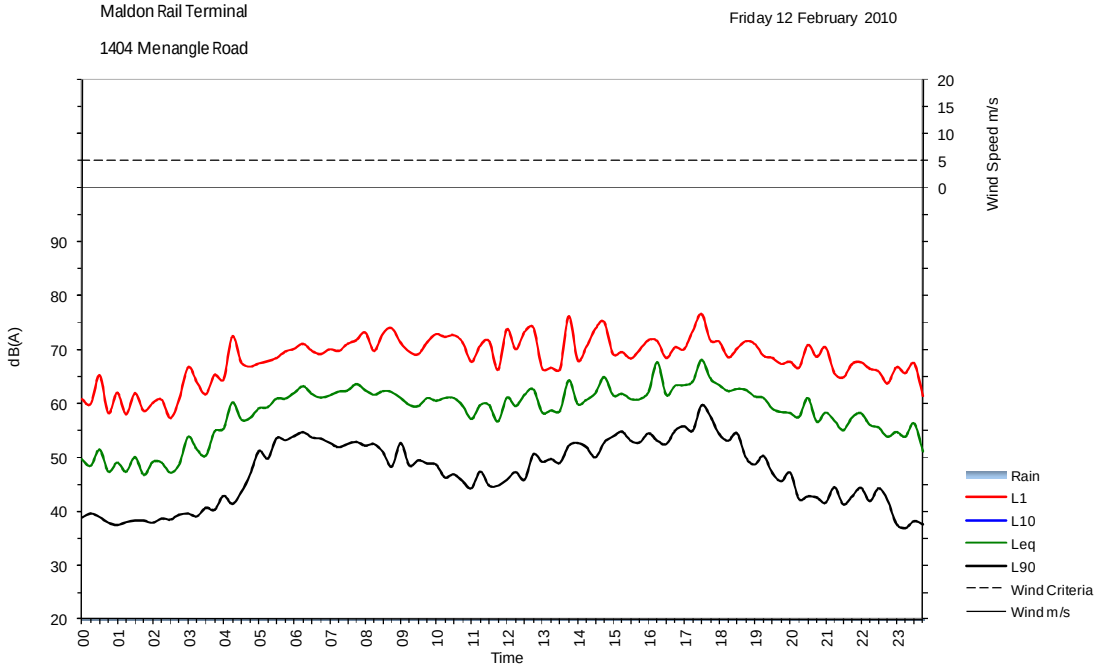


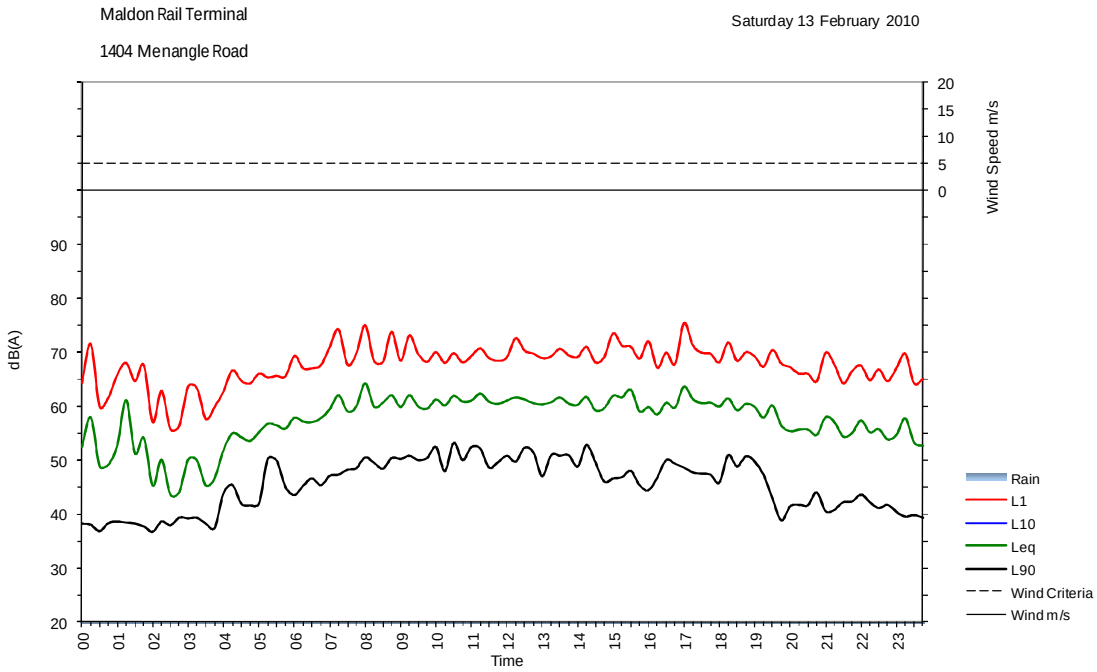
D R A F T


Maldon Rail Terminal
1404 Menangle Road
Wednesday 10 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

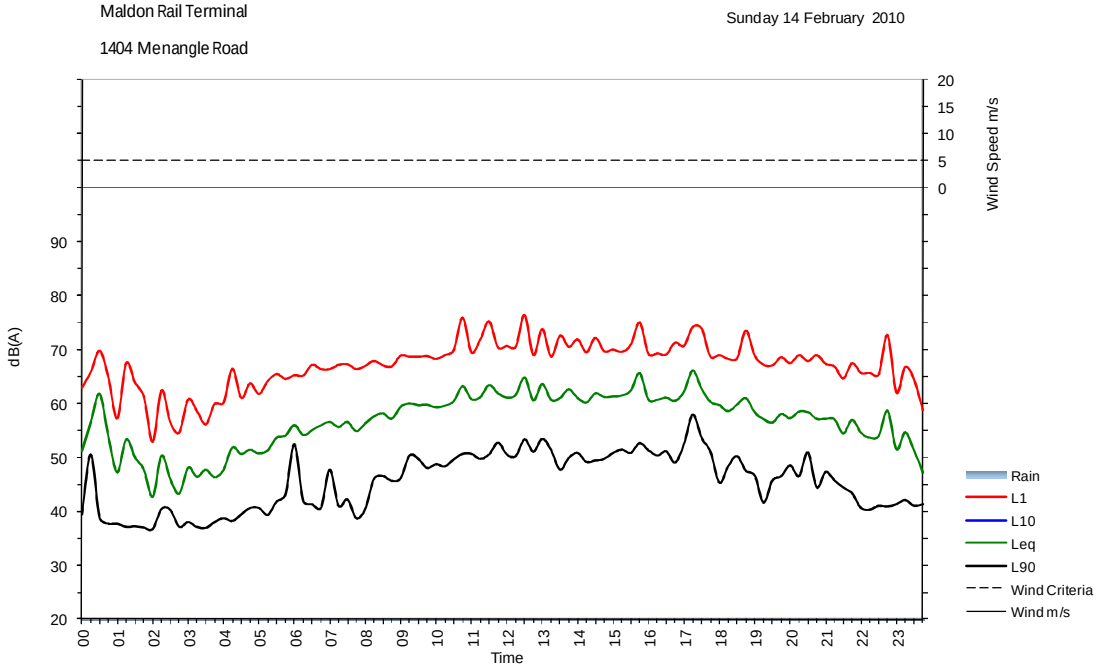

Maldon Rail Terminal
1404 Menangle Road
Thursday 11 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

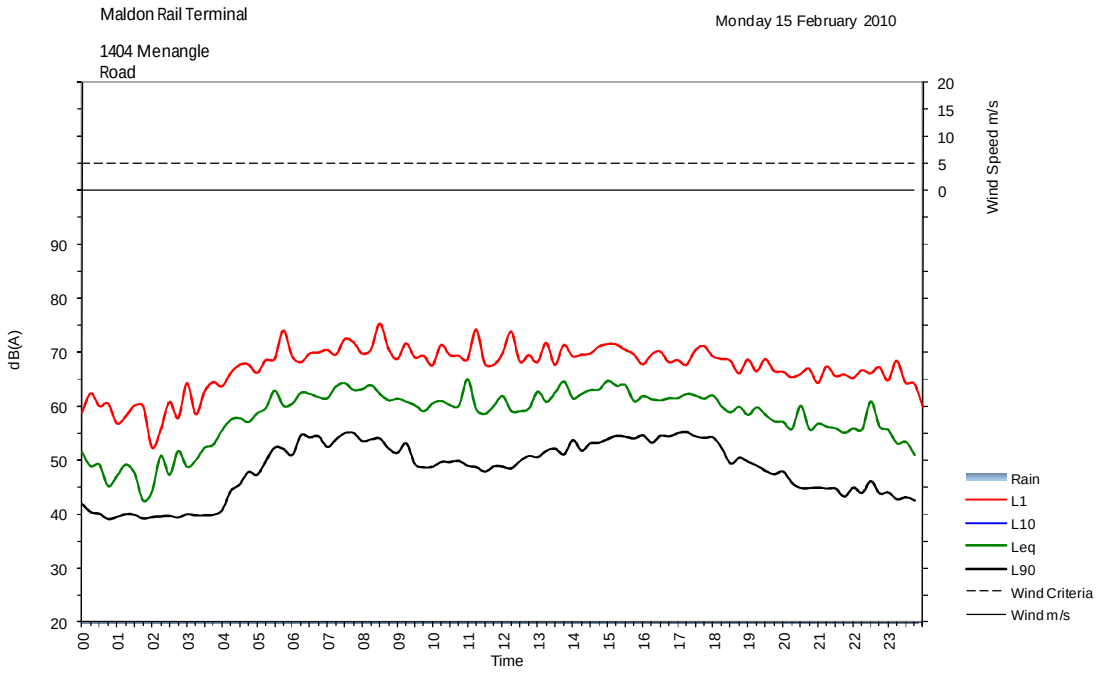
D R A F T


Maldon Rail Terminal
1404 Menangle Road
Friday 12 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

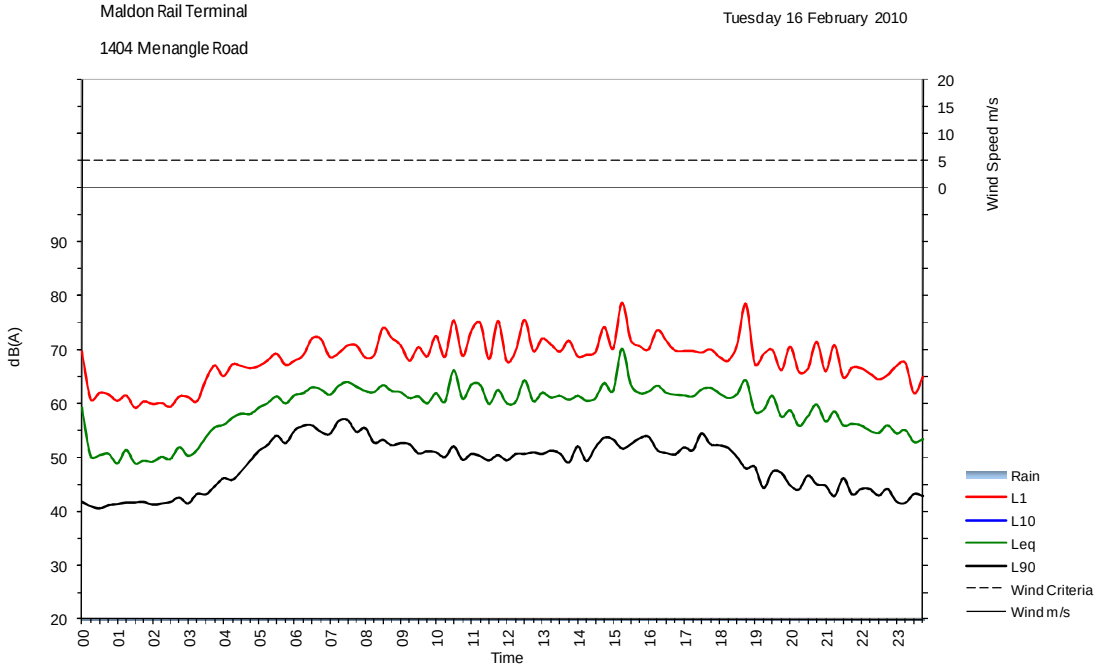

Maldon Rail Terminal
1404 Menangle Road
Saturday 13 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

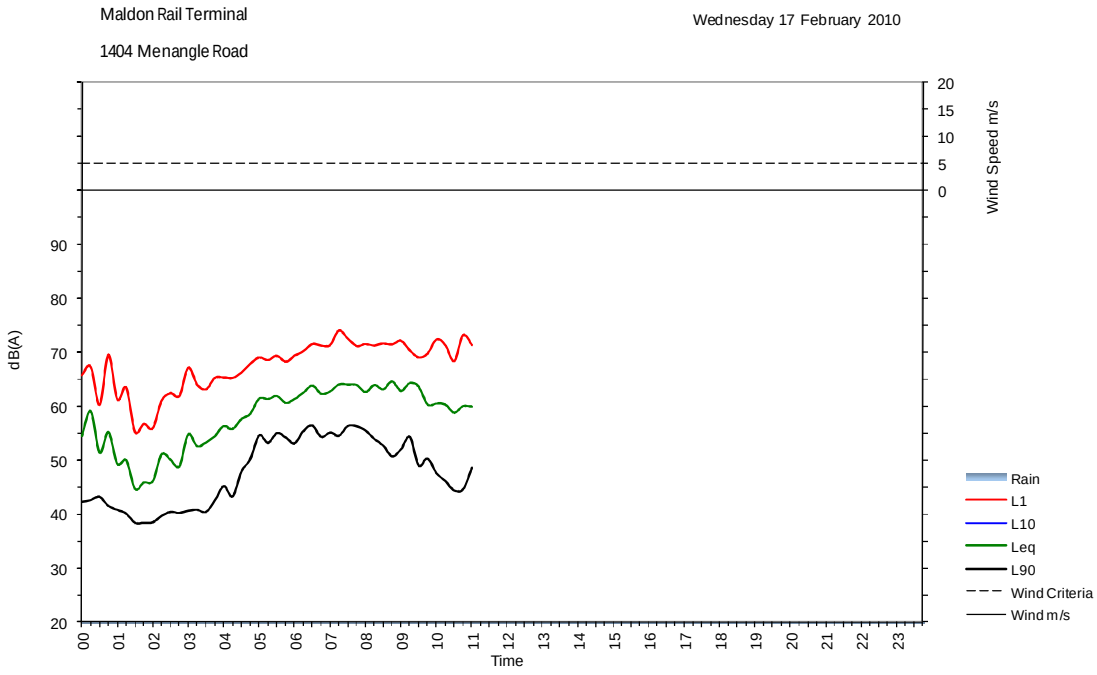
D R A F T


Maldon Rail Terminal
1404 Menangle Road
Sunday 14 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Maldon Rail Terminal
1404 Menangle Road
Monday 15 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

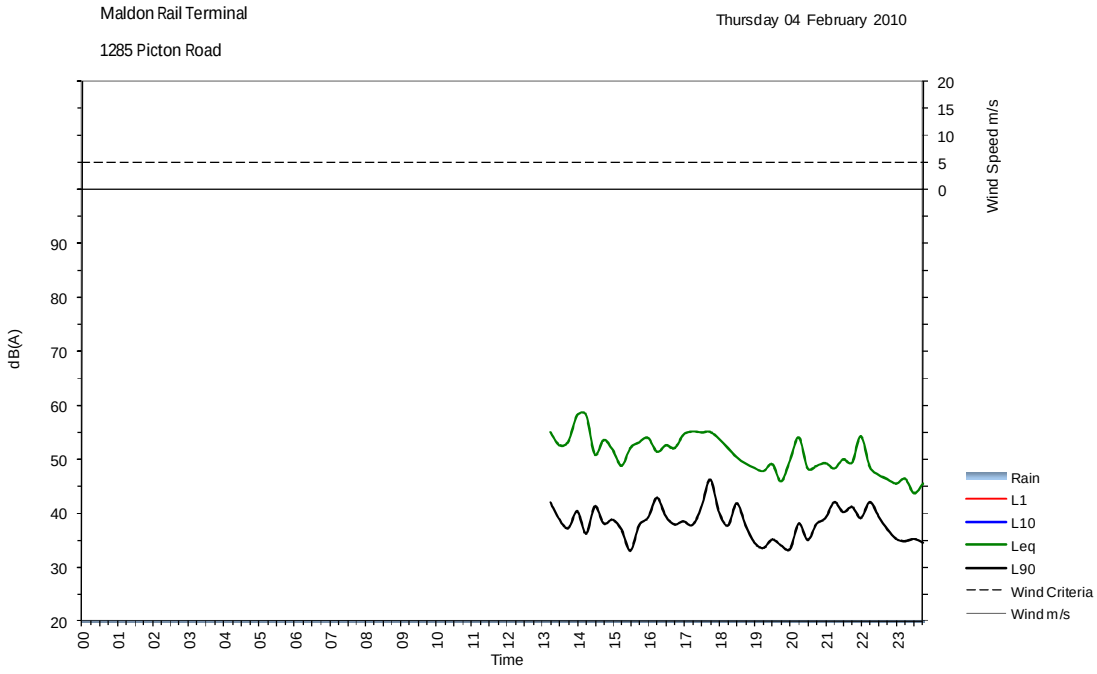
D R A F T

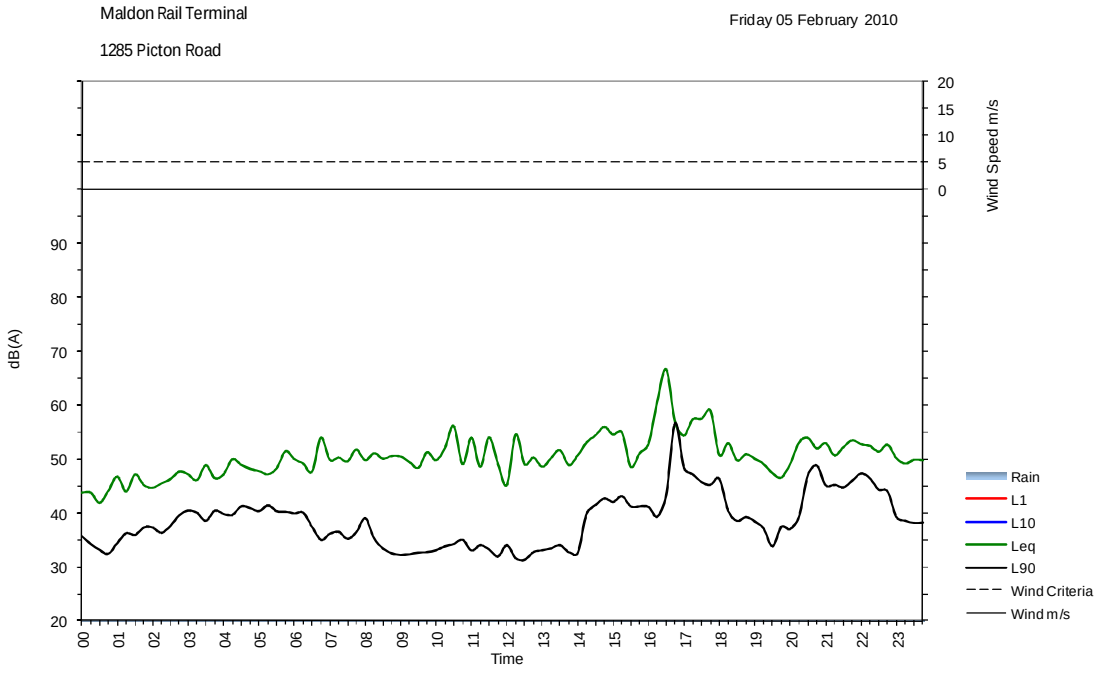

Maldon Rail Terminal
1404 Menangle Road
Tuesday 16 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Maldon Rail Terminal
1404 Menangle Road
Wednesday 17 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

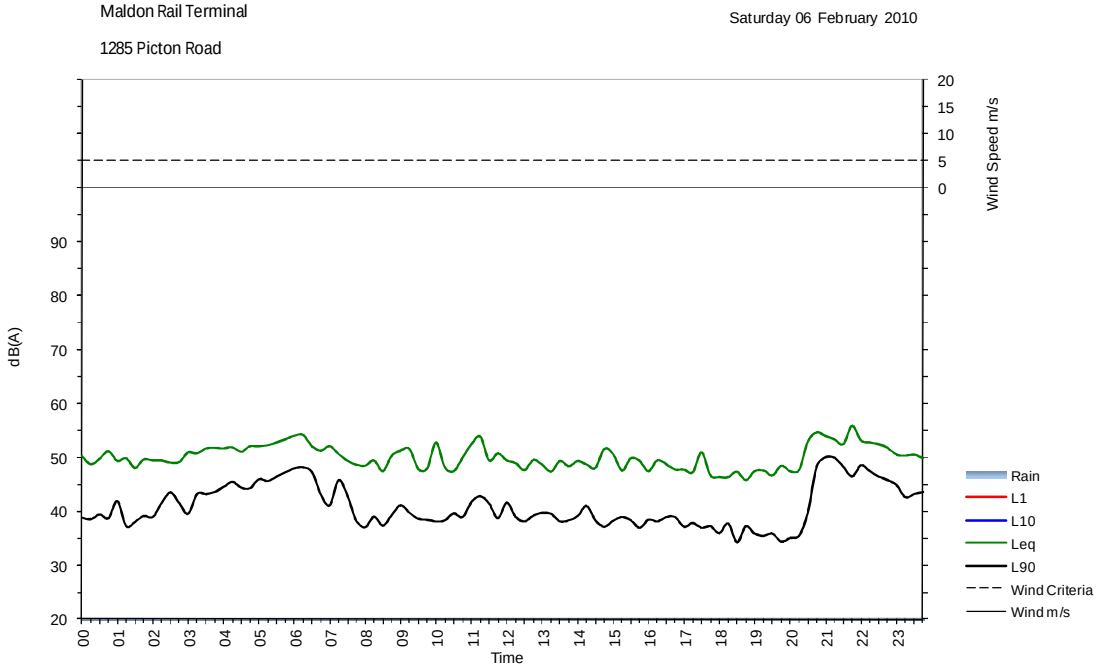
D R A F T

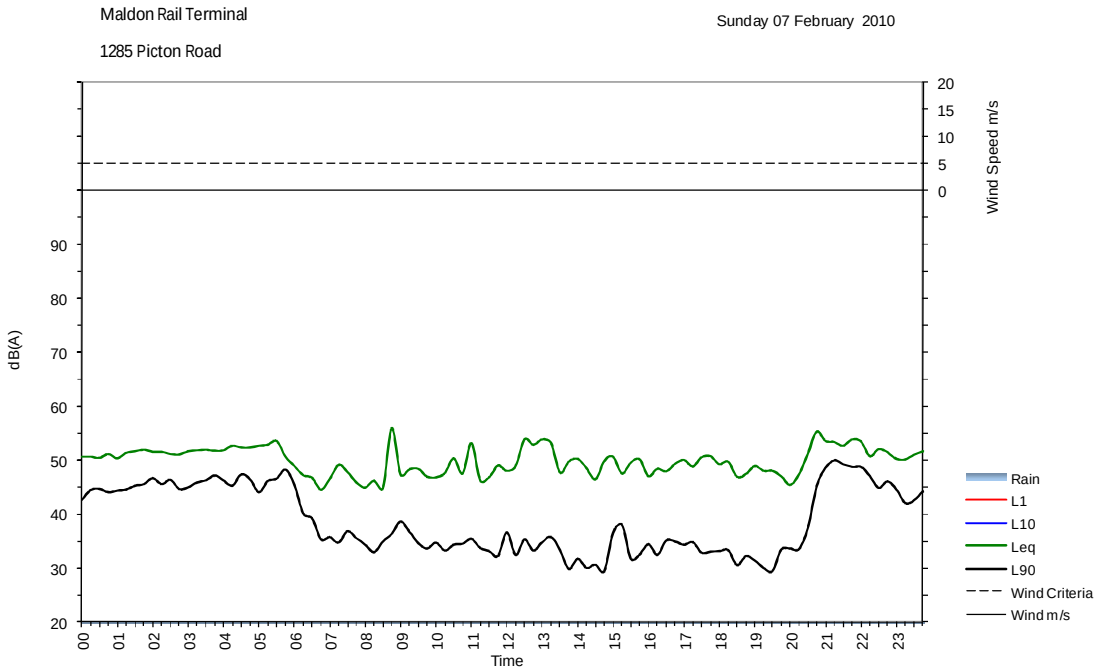
R4 – 1285 Menangle Road



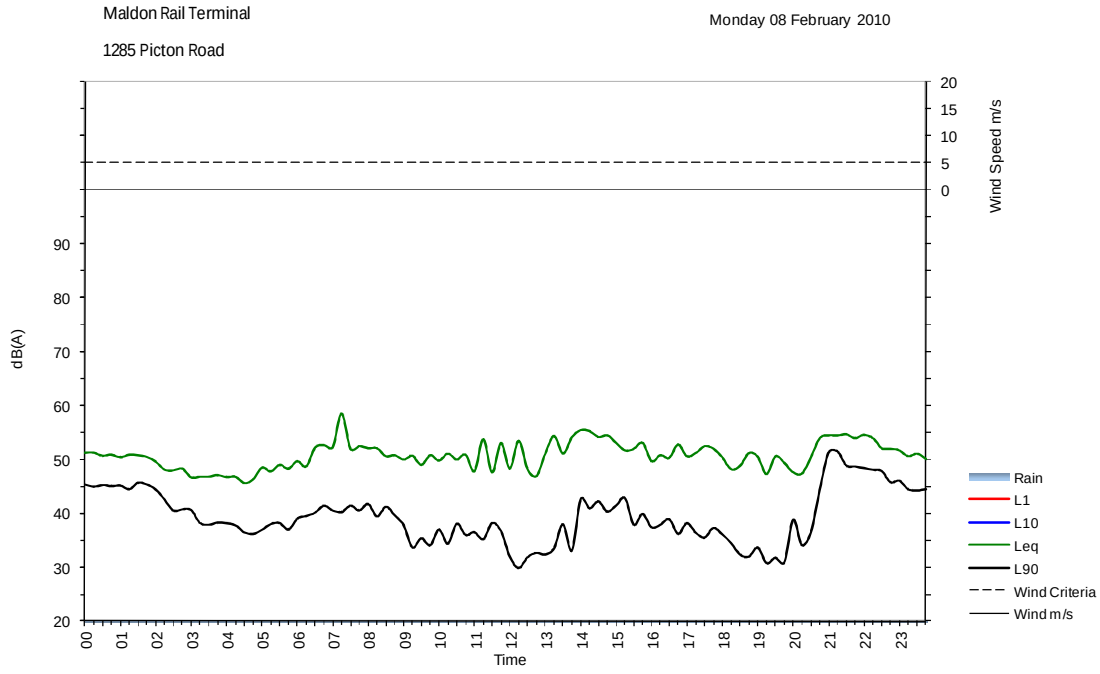


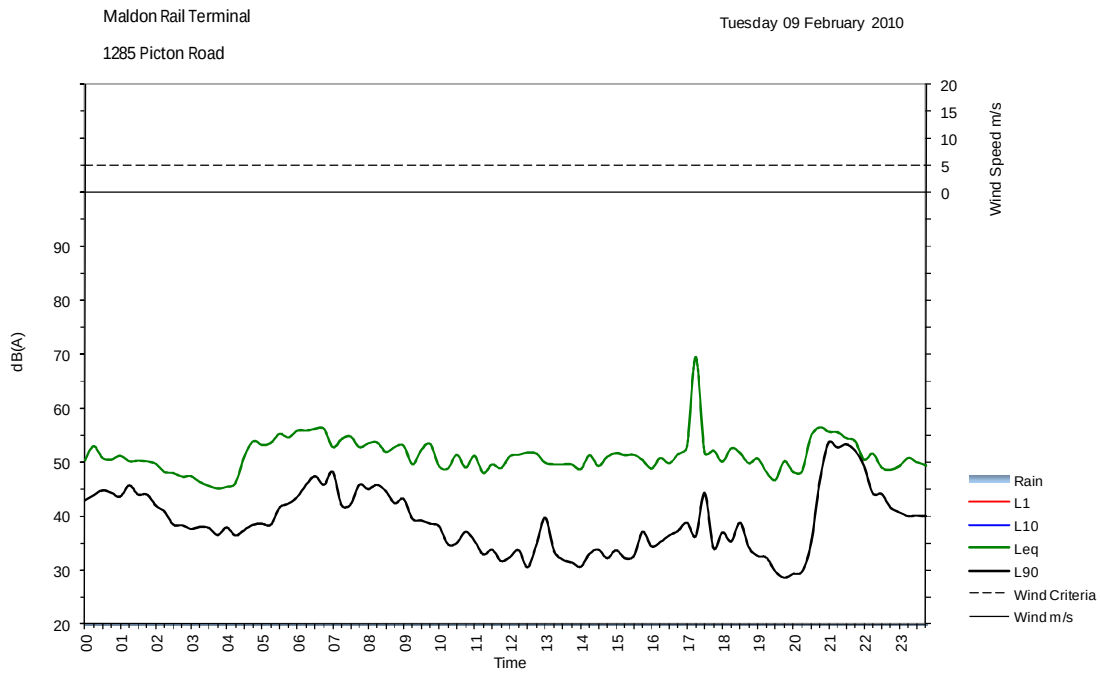
D R A F T


Maldon Rail Terminal
1285 Picton Road
Saturday 06 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

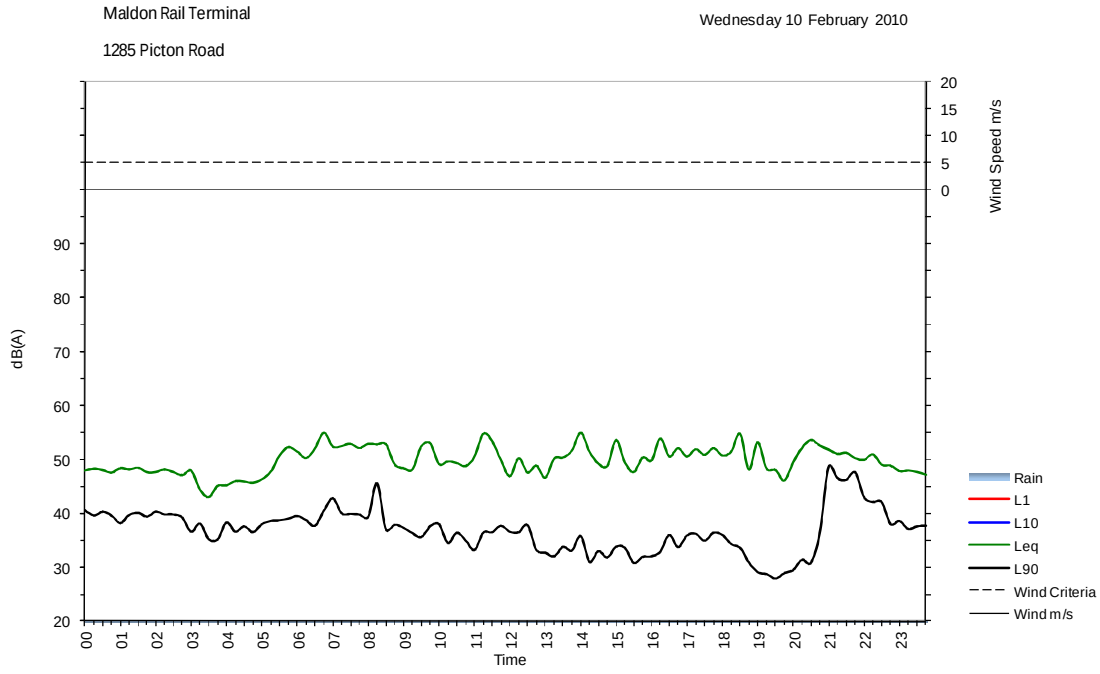

Maldon Rail Terminal
1285 Picton Road
Sunday 07 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

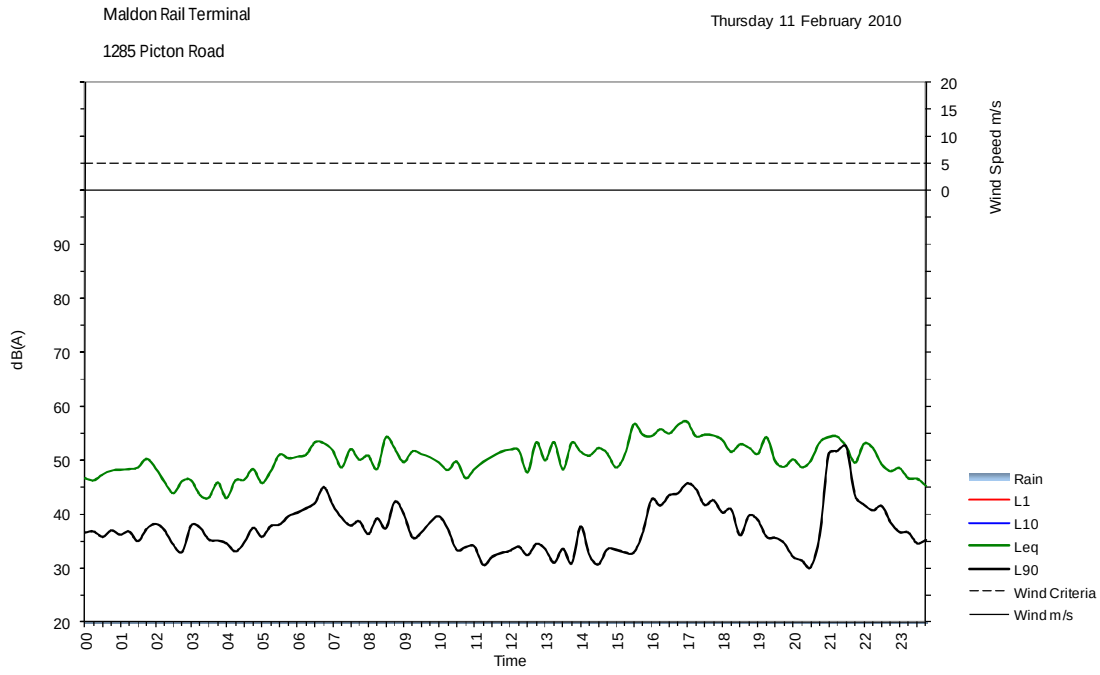
D R A F T


Maldon Rail Terminal
1285 Picton Road
Monday 08 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

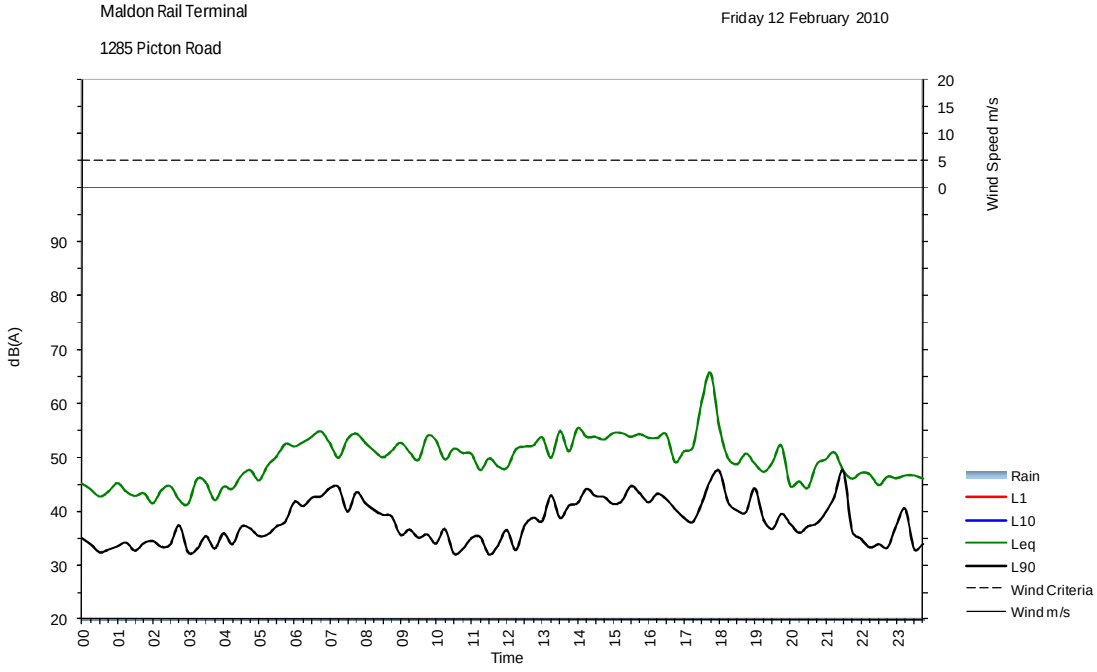

Maldon Rail Terminal
1285 Picton Road
Tuesday 09 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

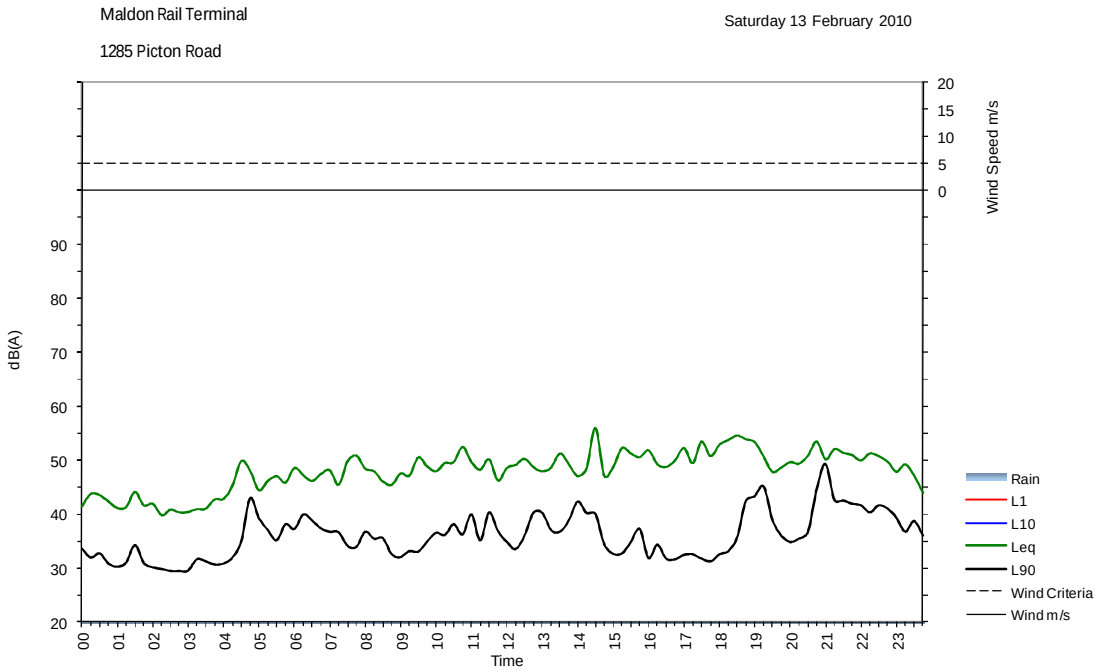
D R A F T


Maldon Rail Terminal
1285 Picton Road
Wednesday 10 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

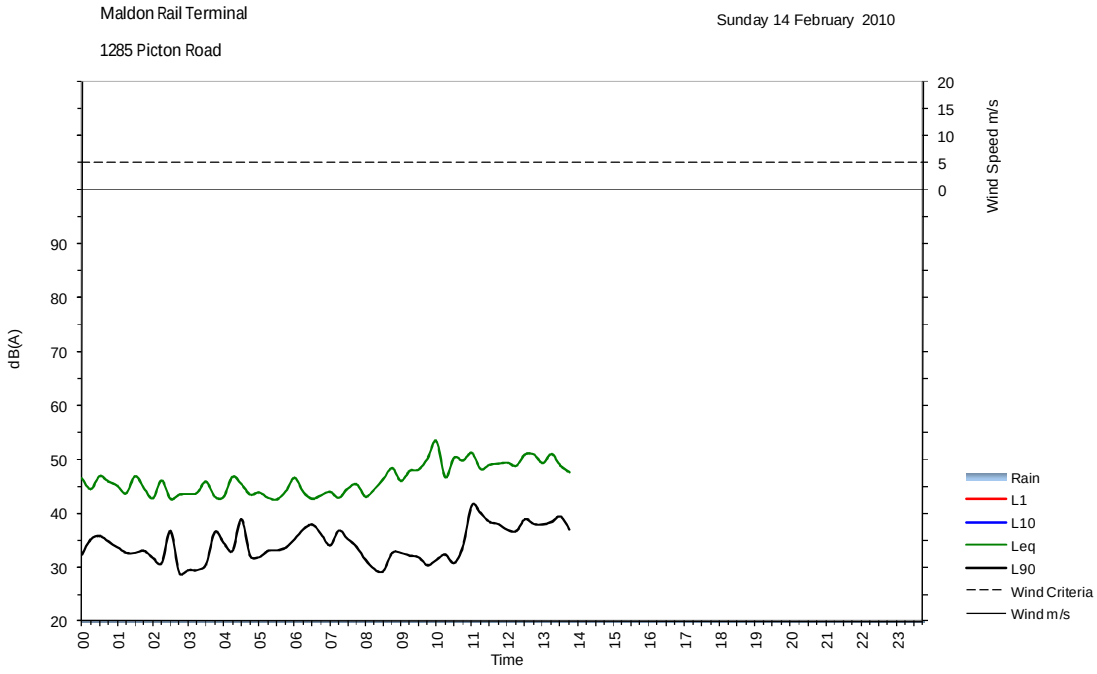

Maldon Rail Terminal
1285 Picton Road
Thursday 11 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

D R A F T


Maldon Rail Terminal
1285 Picton Road
Friday 12 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

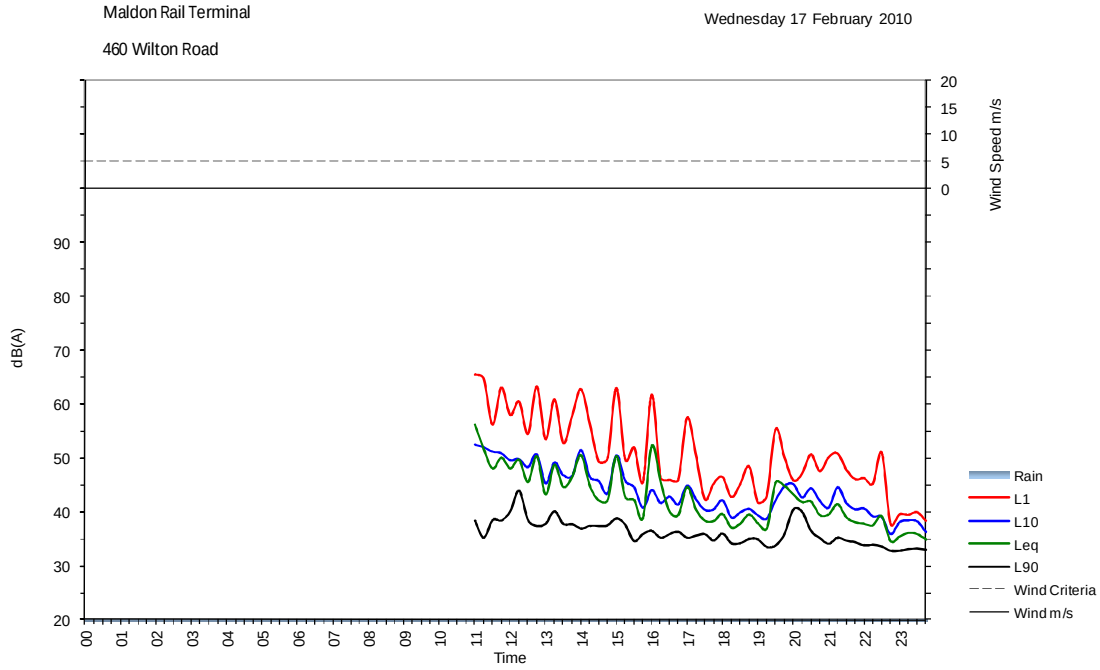

Maldon Rail Terminal
1285 Picton Road
Saturday 13 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

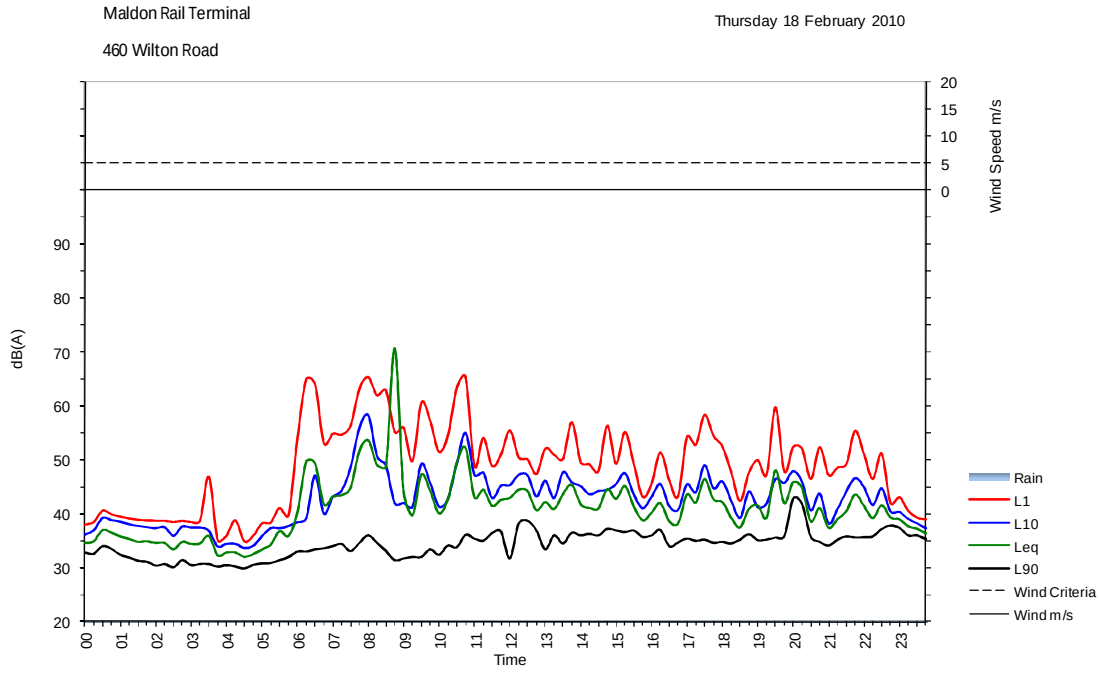
D R A F T


Maldon Rail Terminal
1285 Picton Road
Sunday 14 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

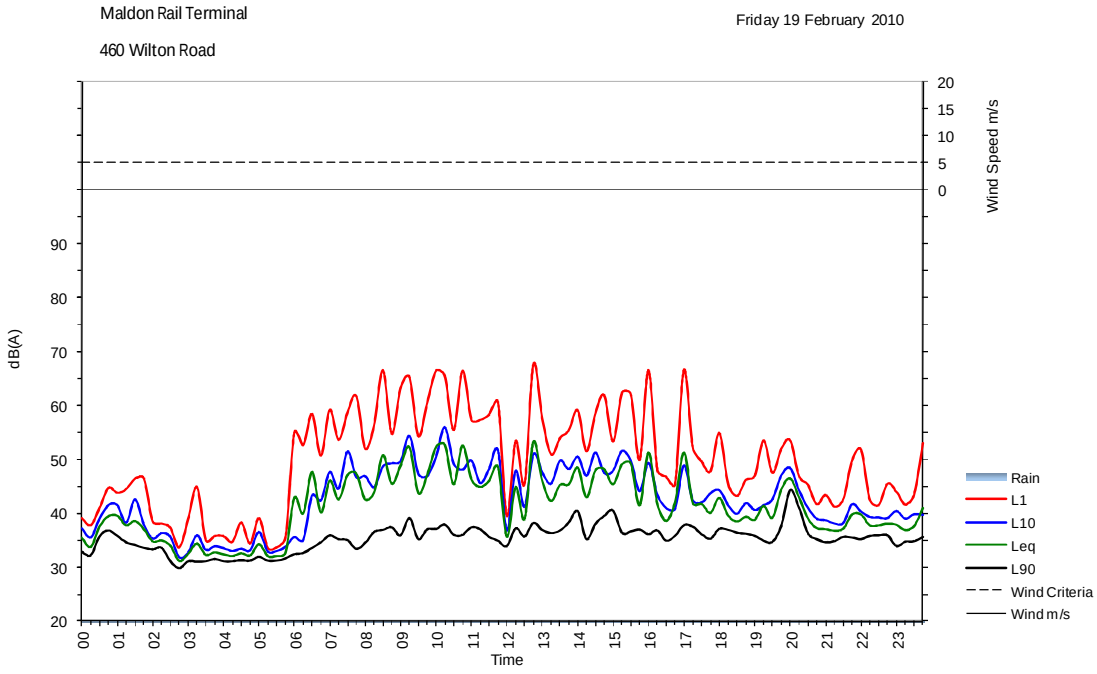
D R A F T

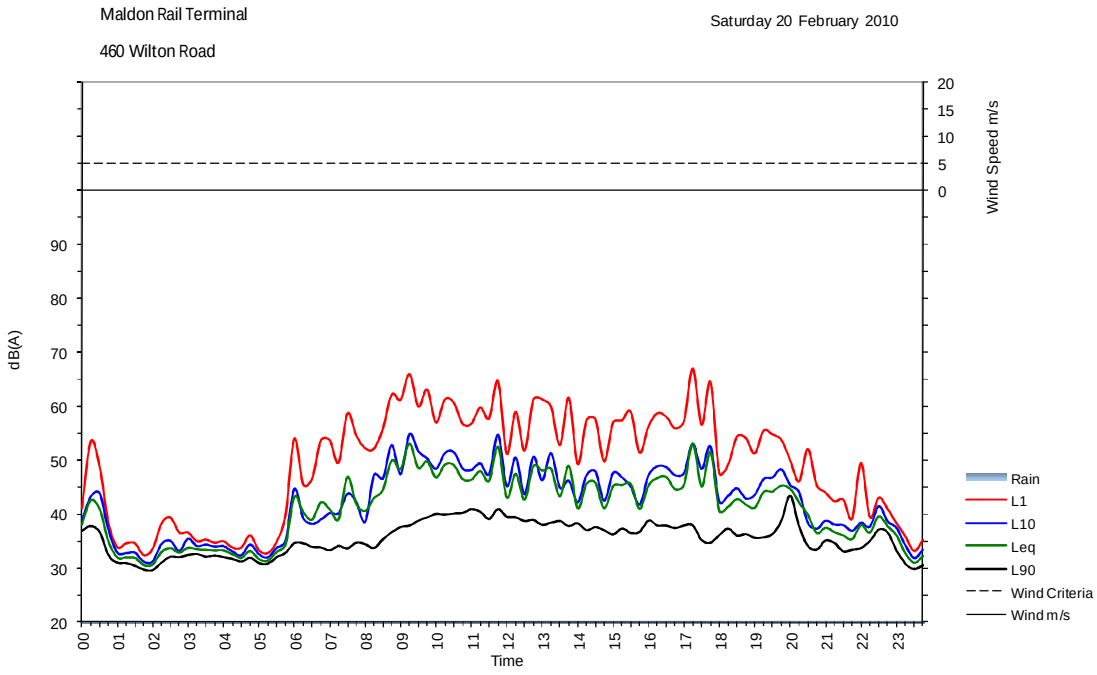
R5 – 460 Wilton Road



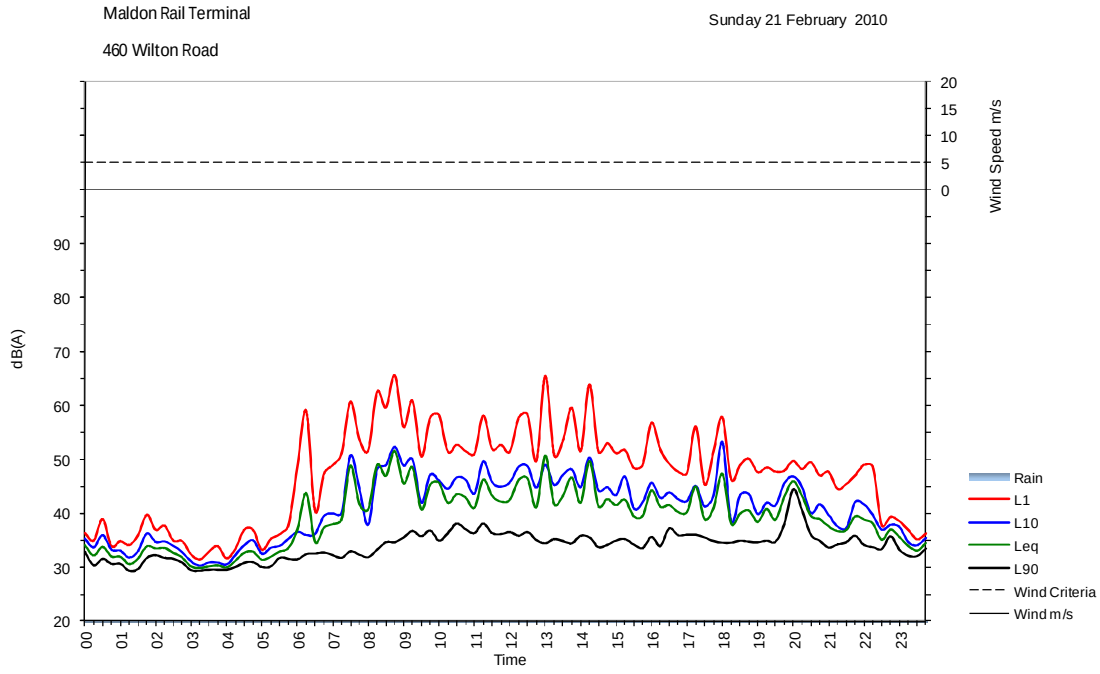


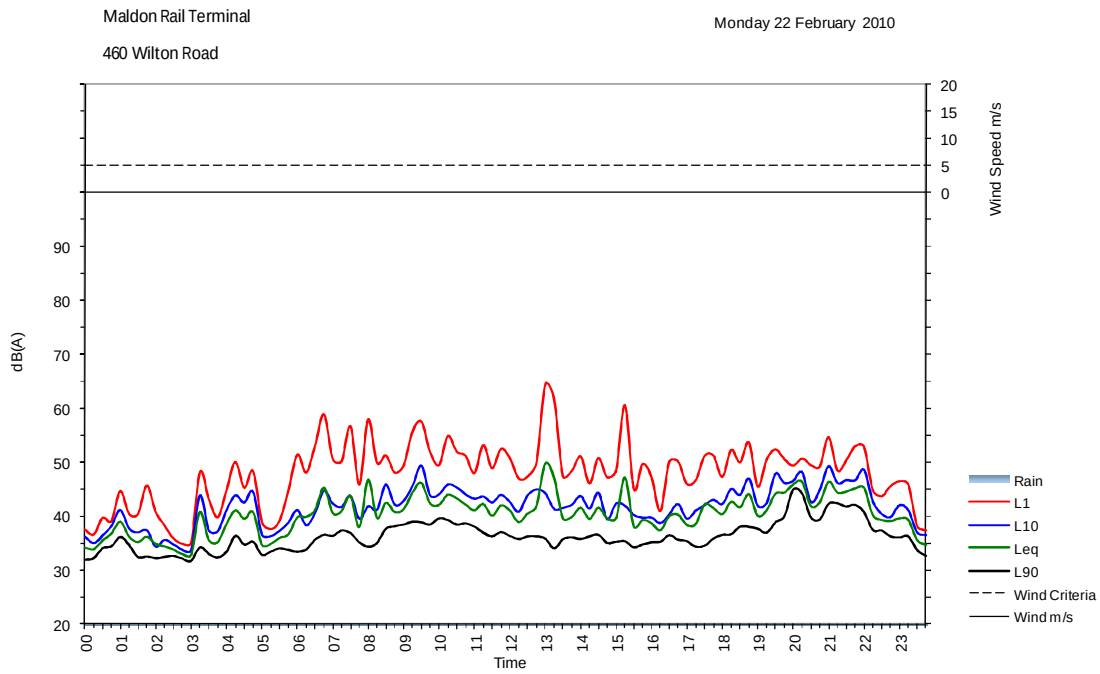
D R A F T


Maldon Rail Terminal
460 Wilton Road
Friday 19 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

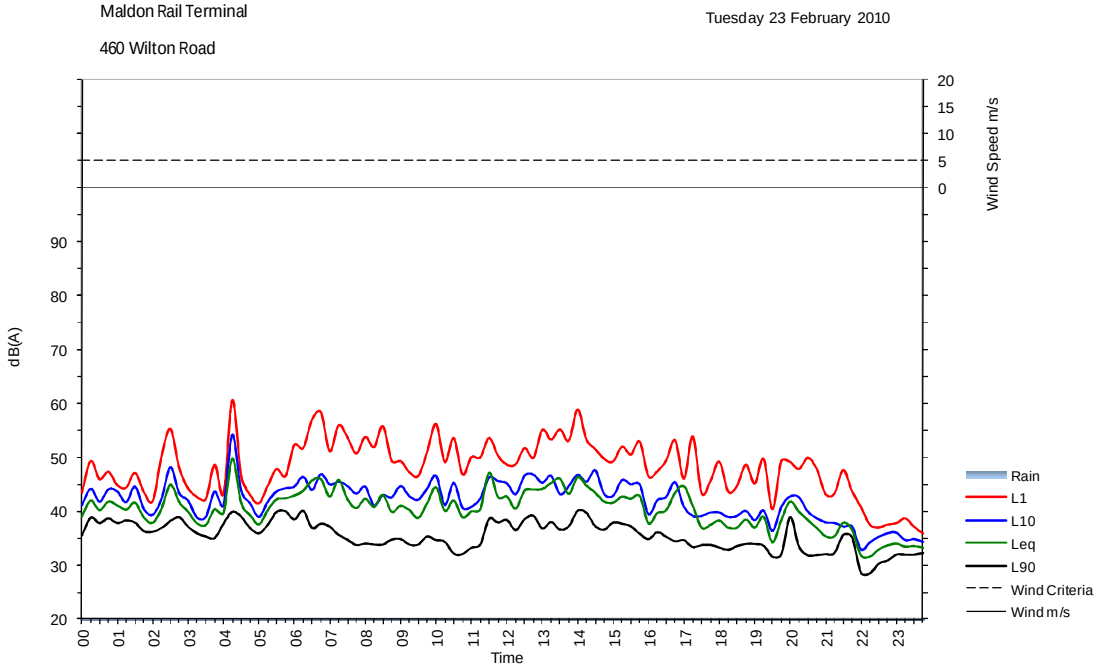

Maldon Rail Terminal
460 Wilton Road
Saturday 20 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

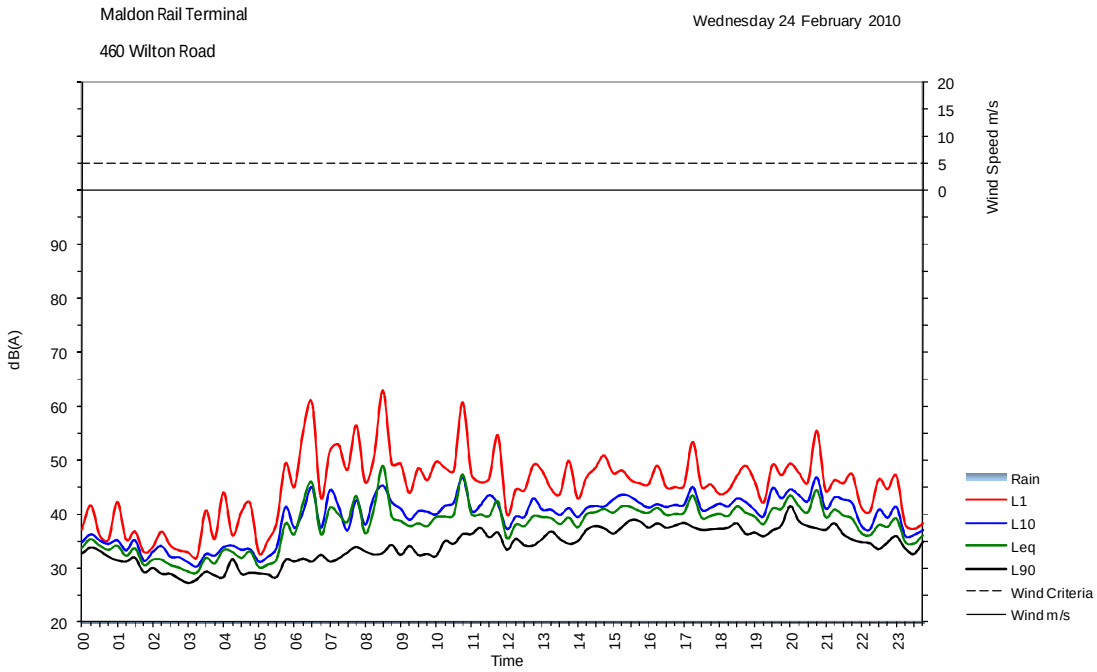
D R A F T


Maldon Rail Terminal
460 Wilton Road
Sunday 21 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

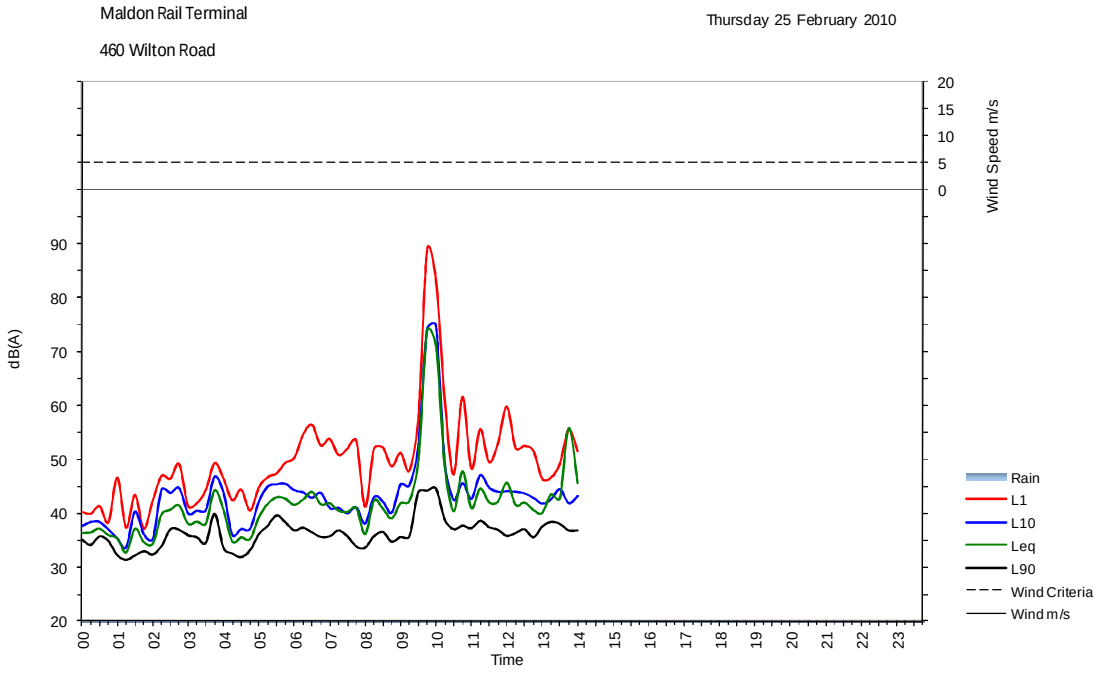

Maldon Rail Terminal
460 Wilton Road
Monday 22 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

D R A F T


Maldon Rail Terminal
460 Wilton Road
Tuesday 23 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Maldon Rail Terminal
460 Wilton Road
Wednesday 24 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

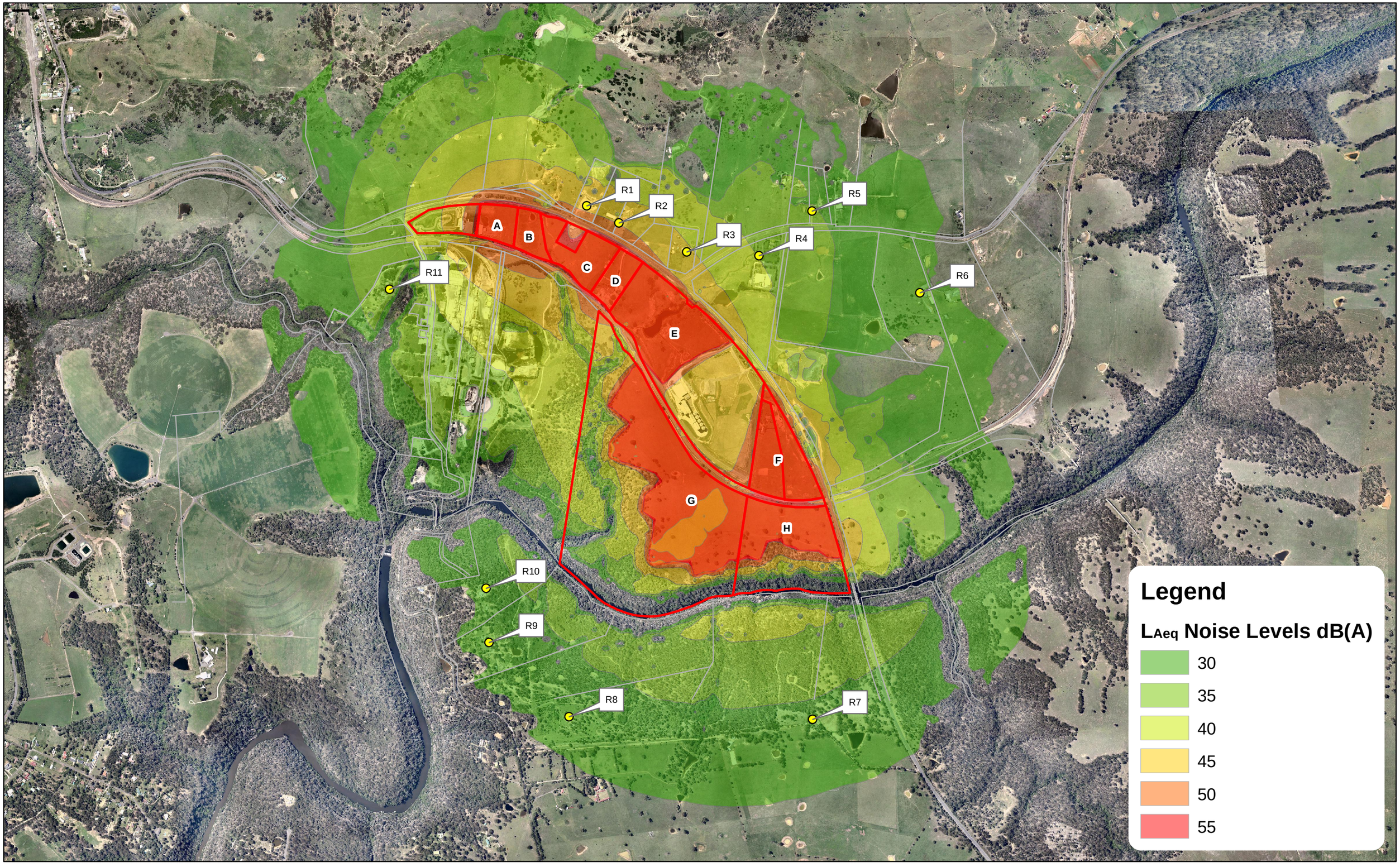
D R A F T


Maldon Rail Terminal
460 Wilton Road
Thursday 25 February 2010
dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

Appendix C

Noise Contours

AECOM



Maldon Employment Lands

Daytime Noise Contours - Adverse Weather Condiitons

Aerial Photography Source: Nearmap

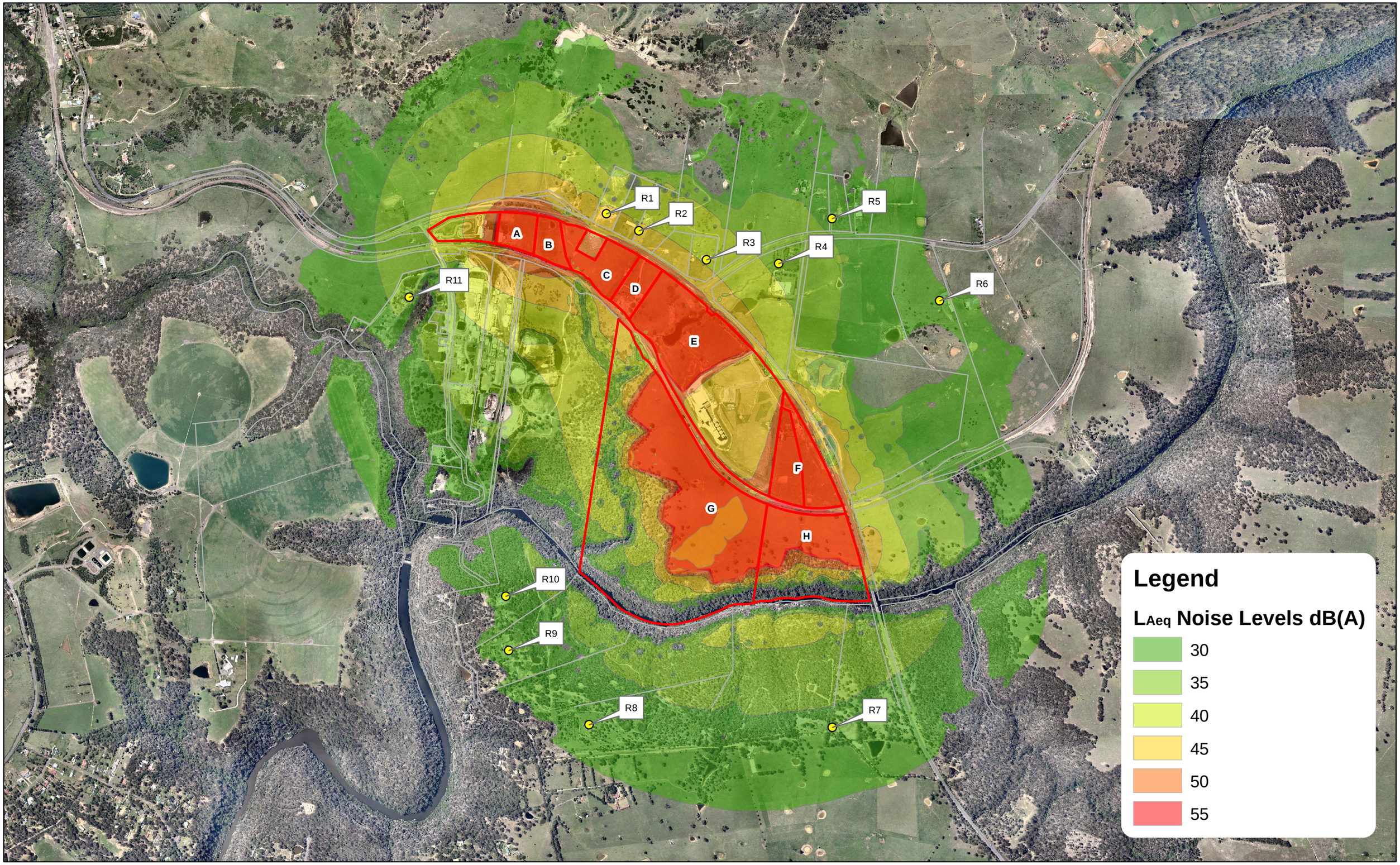
0 100 200 400 600 800 1,000 m

MAR 2010

60196806

Fig. **1**

AECOM



Maldon Employment Lands

Evening Noise Contours - Adverse Weather Conditions

Aerial Photography Source: Nearmap

0 100 200 400 600 800 1,000 m

APR 2010

60196806

Fig **1**