

ORICA VILLAWOOD REMEDIATION

NOISE AND VIBRATION ASSESSMENT

ACOUSTICS AND AIR

REPORT NO. 09295
VERSION C

WILKINSON  MURRAY

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PREPARED FOR

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1 INTRODUCTION

The site at 2 Christina Road, Villawood, has been used for many years for various chemical industries. Some of the site's soil and groundwater require remediation. This process will take approximately one year.

This report assesses noise and vibration impact of the project. Noise would be generated by the water and soil treatment plants, and by earthmoving machinery used to shift the soil to the treatment plant.

Whilst the project will only last one year, the noise has generally been assessed as industrial noise rather than construction noise. However, some aspects of the noise are considered as construction noise due to their temporary nature.

The site is surrounded by commercial and industrial neighbours. The nearest residences are approximately 100m from the site boundaries, which are approximately 100m from the process plant.

Transportation noise is also assessed, even though we note that there is very little traffic generation by the project.

Vibration generated by the project is assessed at the residential and commercial neighbours.

2 ASSESSMENT REQUIREMENTS

2.1 Department of Planning

The NSW Department of Planning (DOP) Director General's Requirements (DGRs), reference S09/1443, include noise as a key issue for assessment. The assessment of noise should include construction/excavation, operation and traffic.

The DGRs reference the documents listed in Section 2.3.

2.2 Department of Environment, Climate Change and Water

The NSW Department of Environment, Climate Change and Water (DECCW) requirements for the Environmental Assessment (EA) include detailed assessment guidelines for noise.

The requirements include:

- Identification of noise sensitive receivers;
- Establishment of noise criteria based on monitoring of background noise levels;
- Noise modelling to predict noise levels
- Assessment of noise impacts, and provision of noise mitigation if necessary.

The EA requirements reference the documents listed in Section 2.3.

2.3 Referenced Documents

The DOP and DECCW requirements both reference the following DECCW documents:

- *Industrial Noise Policy (INP)*
- *Environmental Criteria for Road Traffic Noise (ECRTN)*
- *Environmental Noise Control Manual (ENCM)*

In addition, as some of the works are considered as construction noise, the following guideline published by the DECCW in July 2009 will be referenced:

- *Interim Construction Noise Guideline (ICNG)*

3 PROJECT DESCRIPTION

3.1 Overview

The proposed project relates to remediation of the former chemical manufacturing facility at 2 Christina Road Villawood, NSW (the Site). The Site has been used for a variety of munitions and chemical manufacturing between 1941 and 2000.

Numerous investigations have been undertaken since 2000 on site soils and groundwater, and several zones of impacted soil and groundwater plumes have been identified. Orica plans to remediate the site to a standard suitable for ongoing industrial use. Clean up to site specific risk based criteria with onsite treatment by a directly-heated thermal desorption (DTD) plant was identified as the preferred strategy for soil on the site given the nature of the soil and contaminants. Source removal to the extent practicable followed by monitored natural attenuation is the preferred strategy for remediation of the groundwater plumes.

3.2 Project Schedule

The remediation process is expected to take approximately 14 months to complete including site establishment, pre-treatment, treatment, validation, decommissioning and reinstatement.

The breakdown of this program is generally as follows:

- Site establishment and construction – approximately 26 weeks;
- Excavation and treatment – approximately 20 weeks;
- Decommissioning and demobilisation – approximately 12 weeks; and
- Reinstatement of excavated areas – approximately 12 weeks
(NB: concurrent with demobilisation).

It is anticipated that construction and demobilisation hours would be between the hours of 7.00am and 6.00pm Monday to Friday, and 7.00am to 1.00pm Saturdays. No construction work would occur on Sundays and Public Holidays.

Operation hours for the excavation activities would be between 7.00am to 5.00pm, six days per week. Operation hours for the pre-treatment building (PTB) and the DTD Plant would be 24 hours per day, seven days a week, with maintenance days scheduled as required.

A water treatment plant (WTP) could also operate 24 hours per day, seven days a week with scheduled maintenance days. Continuous operation throughout the project was assumed for this assessment.

4 LOCATION AND SENSITIVE RECEIVERS

4.1 Site Location and Context

The Site is approximately 12.6 hectares in size, is surrounded on three sides by light industrial facilities and to the south by Christina Road. The southern side of Christina Road is used for commercial purposes and those premises back onto the Bankstown / Inner West railway line.

The Villawood Immigration Detention Centre is located several hundred metres north of the Site and the closest residences are approximately one hundred metres to the east. The Chester Hill High School is several hundred metres to the north east Figure 4-1.

Figure 4-1 Location of Project



LEGEND:

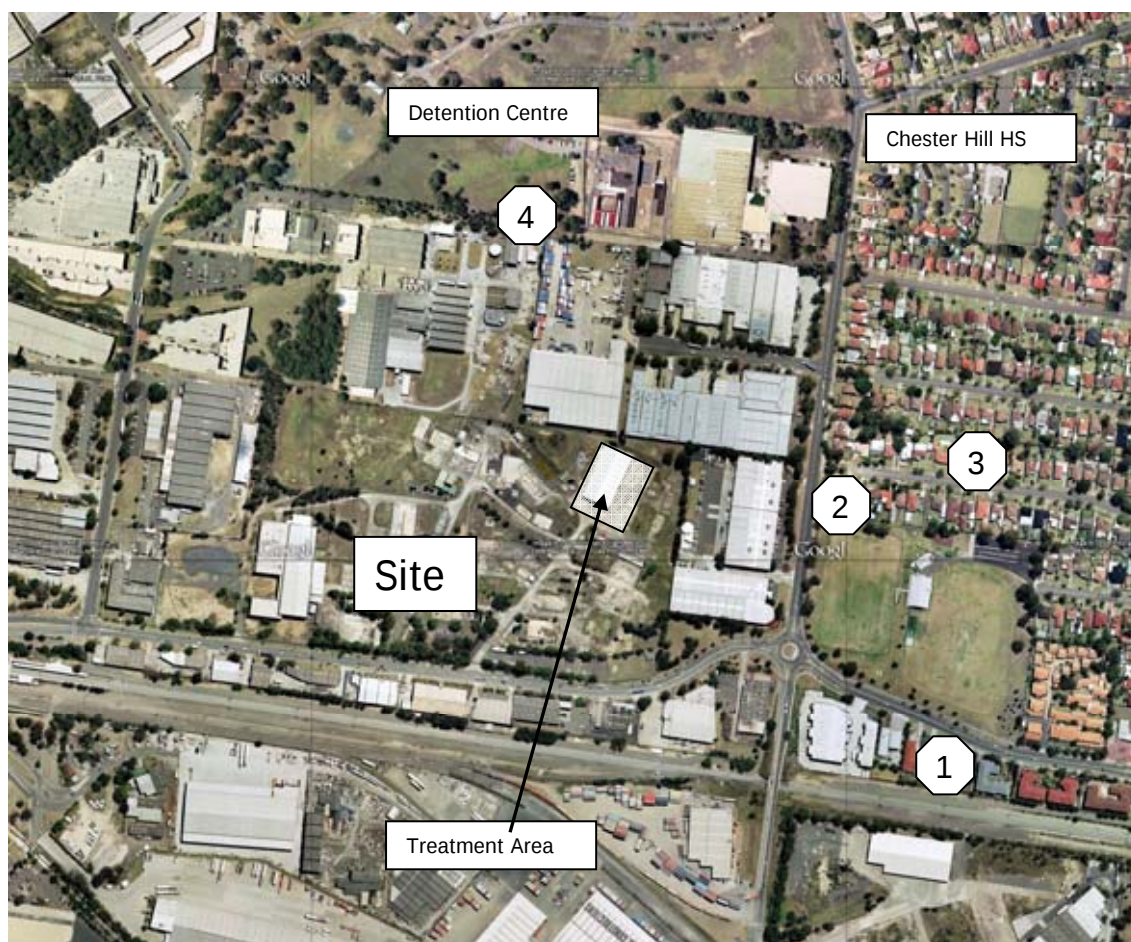
PROJECT LOCATION	
CHESTER HILL HS	
DETENTION CENTRE	

The nearest residential noise sensitive receivers are shown on Figure 4-2. The receiver addresses are given in Table 4-1. Receiver 3, despite being further from the site than Receiver 2, is impacted because it is less shielded from the site by the Miller Road commercial buildings.

Table 4-1 Noise Sensitive Receivers

Receiver Number	Receiver Name
1	212 Waldron Road
2	183 Miller Street
3	190 Virgil Avenue
4	Epic Place - Detention Centre

Figure 4-2 Location of Noise Sensitive Receivers



5 NOISE CRITERIA

5.1 Industrial Noise Policy

Appropriate noise criteria are specified in the NSW DECCW's *Industrial Noise Policy (INP)*. The criteria depend on whether existing noise levels in an area are close to recommended amenity levels for different types of residential receiver areas (i.e. urban, rural, near existing roads).

For residential receivers, two criteria are specified in the *INP*: the intrusiveness criterion and the amenity criterion.

In general, the intrusiveness criterion requires the L_{Aeq} noise level from such sources should not exceed the Rating Background Level (RBL) by more than 5dBA.

The amenity criterion sets an upper limit to control the total L_{Aeq} noise level from all industrial sources. In this case, the potentially affected residences in the area would be classified as "Suburban", therefore the relevant recommended "acceptable" amenity criteria for $L_{Aeq,period}$ are 50, 45 and 40dBA for daytime, evening and night time periods respectively. "Maximum" recommended levels are all 5dBA higher. The amenity criterion is assessed over an entire period (day, evening and night). In this case, no significant sources of industrial noise were noted at any residential location, so the amenity criteria are set at the acceptable level – that is, the intrusiveness criterion is applied over any 15-minute period, and will be used to assess total noise emission from the site.

5.1 Background Noise Levels

Noise levels were monitored continuously from 12 October to 22 October 2009 at receiver locations 2 and 4 as shown on Figure 4-2 using unattended environmental noise loggers. Location 2 is the upstairs balcony of 183 Miller Street representing the closest affected residents in the easterly direction. Location 2 was on the boundary between the Wridgways container storage yard and the detention centre. The result charts of the logging are shown in Appendix B.

These two locations were chosen as they represent the closest residential receivers to the site in the eastern and northern directions. Background noise was generally due to local traffic, and distant traffic on Christina Road. There was no obvious continual industrial noise at any location despite the proximity of light industrial buildings.

Noise monitoring equipment used for these measurements consisted of an environmental noise logger set to A-weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The loggers determine L_{A1} , L_{A10} , L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1} , L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Appendix A for definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. This is used for the assessment of sleep disturbance. The L_{A90} level is normally taken as the background noise level during the relevant period.

Table 5-1 gives the measured RBL results and the derived criteria. The site specific criteria are the lowest of the amenity and intrusive criteria, and are shown in bold in the table. Operational noise assessment will be determined by the intrusive criterion in daytime. Night time and evening operations will be determined by the amenity criterion.

Table 5-1 Measured RBL and Noise Criteria (Site Specific in Bold)

Receiver Number	Receiver Name	RBL Day/Evening/Night	Intrusive Criterion, $L_{Aeq,15min}$ Day/Evening/Night	Amenity Criteria, $L_{Aeq,period}$ Day/Evening/Night
2	183 Miller Street	46/42/38	51/47/43	55/ 45/40
4	Epic Place	43/42/39	48/47/44	55/ 45/40

Whilst the background noise levels were measured at the most potentially impacted locations, they should also be applied to Locations 1 and 3. As potential noise impacts are likely to be most evident at night, the lowest measured night time RBL (from Location 2) will be applied at these locations. As Location 1 is on Christina Road, and it would probably have a higher RBL than that measured at Location 2, this is considered conservative.

5.2 Noise Criteria for Chester Hill High School

For schools, the *INP* criterion is that noise should not exceed L_{Aeq} 35dBA during the busiest hour of the day when the school is in use.

5.3 Noise Criteria for Industrial and Commercial Neighbours

For commercial neighbours, the criterion is that the noise should not exceed L_{Aeq} 65dBA, when in use.

For industrial neighbours the criterion is that the noise should not exceed L_{Aeq} 70dBA when in use.

5.4 Noise Criterion for Abbott Park

Abbott Park is an area for active recreation on the eastern side of Miller Road. The criterion is that the noise should not exceed L_{Aeq} 55dBA when in use.

5.5 Sleep Disturbance

Maximum noise levels between 10.00pm-7.00am should be assessed to assess the possibility of sleep disturbance. The DECCW recommends that the L_{A1} noise level should not exceed the background L_{A90} level by more than 15dBA. Assessment against this criterion is a DECCW requirement for this project. The criteria are given in Table 5-2.

Table 5-2 Sleep Disturbance Criteria

Receiver Number	Receiver Name	RBL	Criterion, L _{A1,1min} dBA
1	212 Waldron Road	38	53
2	183 Miller Street	38	53
3	190 Virgil Avenue	38	53
4	Epic Place - Detention Centre	39	54

5.6 Construction Noise Goals

The DECCW *Interim Construction Noise Guideline* recommends the following noise objectives:

Recommended standard hours of work

- Monday to Friday 7.00am to 6.00pm
- Saturday 8.00am to 1.00pm
- No work on Sundays or Public Holiday

Management Noise Goals

Noise goals are detailed in Table 5-3.

Table 5-3 Noise at Residences using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,15min}^*$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm	Noise affected RBL + 10dB(A)	- The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured $L_{Aeq,15min}$ 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.
Saturday 8am to 1pm No work on Sundays or Public Holidays	Highly noise affected 75dB(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 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.

The noise criteria specific to this project are shown in Table 5-4.

Table 5-4 Measured RBL and Intrusiveness Criteria

Location Number	Location Name	RBL Day/Evening/Night	Construction Noise Criterion, $L_{Aeq,15min}$ Day/Evening/Night
1	212 Waldron Rd	46/42/38	56/47/43
2	183 Miller St	46/42/38	56/47/43
3	190 Virgil	46/42/38	56/47/43
4	Epic Place – Detention Centre	43/42/39	53/47/44

5.7 Traffic Noise Criteria

The *Environmental Criteria for Road Traffic Noise (ECRTN)* sets out criteria for assessment of noise from vehicles on public roads. These are used for assessment of the impact of additional vehicles using the surrounding road network.

The *ECRTN* sets out noise criteria for 'arterial', 'sub-arterial', 'local roads' and 'collector roads'. Ash Avenue would be considered as a collector road, and the remaining streets surrounding the site as local roads. Criteria for "land use developments with potential to create additional traffic" are as follows:

- Collector Roads (Christina Road and Waldron Road)
 - Daytime (7.00am-10.00pm) $L_{Aeq,1hr} = 60\text{dBA}$
 - Night Time (10.00pm-7.00am) $L_{Aeq,1hr} = 55\text{dBA}$
- Local Roads (Miller Street and other local roads)
 - Daytime (7.00am-10.00pm) $L_{Aeq,1hr} = 55\text{dBA}$
 - Night Time (10.00pm-7.00am) $L_{Aeq,1hr} = 50\text{dBA}$

Where existing levels exceed these criteria, the development should not increase existing levels by more than 2dBA.

6 NOISE MODEL

6.1 Overview of Scope of Work

Most of the material will be treated on site and remain on site. From a noise point of view the operations are:

- Constant 24 hour operation of the PTB, DTD and WTP;
- Daytime operation of heavy equipment breaking up concrete and soil, then moving it to stockpiles.
- A concrete crusher operating in the later stages of the project.
- Most of the concrete will be broken up using an excavator. Very little use is expected of hydraulic hammer attachments, though this cannot be ruled out.

Even though the project is temporary, it is required to assess it according to the INP. Notwithstanding this, some noise sources could be considered as construction noise. Construction noise has a higher daytime criterion due to its shorter duration.

For the purposes of this assessment the following will be considered construction:

- Construction and decommissioning of PTB, DTD and WTP;
- Any brief periods of hammering using rock hammers.

6.2 Staged Operations

This section gives more detail concerning the works staging described in Section 3.2, and how the staging relates to noise emissions. The stages described relate to noise generating activity and are not meant to describe fully the entire remediation process.

The site is broken into areas designated by letters as shown in Figure 6-1. A general description of the stages of work is given in Table 6-1, which form the basis of the noise prediction scenarios.

Figure 6-1 Site Areas



Table 6-1 Scope of Works in Stages

Stage of Works	Area	Approx. Duration in Weeks	Works	Noise Sources in Model
1A	G	1	Excavation. Concrete demolition and transport.	Excavator, 2x Moxi
1B	G	10	Construction of ECS and DTD. Treat contaminated material.	Not modelled as noise less than 1A
2	I, H, B	10	Demolish concrete, excavation and transport to PTB. Treat contaminated material.	Front end loader in PTB, Front end loader or bulldozer, excavator. DTD. WTP, 2x haul truck
3	H, B, D, F, E, G	8	Demolish concrete, excavation and transport to PTB, Treat contaminated material	Front end loader in PTB, Front end loader or bulldozer, excavator. DTD. WTP, 2x haul truck
4	G, H	13	Decon and dismantle PTB, DTD, ECS, WTP. Crush concrete.	Front end loader in PTB, Front end loader or bulldozer, excavator. DTD. WTP, 2x haul truck, Crusher

6.3 Noise Prediction

Predicted noise was modelled using CadnaA noise prediction software using CONCAWE algorithms. This software takes into account noise source level, distance from sources to receivers, shielding by topography and buildings, and the effects of meteorology on propagation.

6.4 Meteorology

The *INP* requires consideration of any prevailing meteorological conditions which could enhance noise levels at sensitive receivers for significant periods. Typically, this includes winds less than 3m/s or temperature inversions.

If temperature inversion occur for more than 30% of night time during winter, then temperature inversion should included in the noise model. If the receiver is topologically lower than the noise source then drainage winds should also be considered.

If winds of less than 3m/s occur for more than 30% of any assessment period (day, evening or night) during any season, then they should be modelled.

For this project, the hourly meteorological data for Bankstown airport for the year 2008 was analysed. It was found that:

- Based on the stability class, temperature inversions of 3°/100m occurred for 73% of winter night time periods.
- Winds less than 3m/s from WSW occurred for approximately 30% of evening periods in spring and autumn.
- There were no significant periods of wind and temperature inversion combined.

Therefore the following conditions were modelled:

- Still, isothermal (no wind, no temperature inversion);
- Still, 3°/100m temperature inversion for night time only;
- Isothermal, 3m/s winds WSW for evening only.

7 EQUIPMENT NOISE SOURCE LEVELS

Equipment to be used will depend on the stage of the operation. The Thermal plant, water treatment pumps, and Pre-Treatment building will operate 24 hours a day. Daytime operations will also include other activity on site. Source noise levels for plant are given in Table 7-1. Initial analysis showed that a fan with sound power level 116dBA, as measured at a similar installation (Botany Carpark Encapsulation), would require approximately 13dBA mitigation to achieve night time noise goals. The mitigated level of 103dBA has been assumed in the noise predictions. This mitigation could be achieved by attenuation at the fan, or appropriate siting of the fan to achieve greater shielding in the direction of residents.

Table 7-1 Source Noise Levels

Plant	Sound Power Level (dBA)	Sound Pressure Level at 7m (dBA)
Front End Loader	111	86
Smooth Drum Roller	107	82
Spoil, Materials or Concrete Truck	109	84
Truck-mounted Shotcrete Pump	106	81
Excavator or Bobcat	107	82
Concrete Cutter	109	84
30t Excavator operating with hydraulic hammer	122	97
Articulated Dump Truck (Moxi)	113	88
Handheld Jackhammer	113	88
Thermal Plant (Fan at 2m source height)	116	91
Thermal Plant (Mitigated Fan at 2m source height)	103	78
Thermal Plant (Plant at 10m source height)	104	79
Thermal Plant (Stack tip at 30m source height)	92	67
Water Treatment Pumps	101	76
Tracked Crusher	113	88

8 PREDICTED NOISE LEVELS

8.1 Daytime Operational Noise Levels

Predicted daytime noise levels at each receiver are given in Table 8-1. For each scenario the table presents the criterion, the predicted noise level, and a reference to the noise contour figure for that scenario.

The predicted levels comply with the noise criteria at all locations for all Stages of work, except at Receiver 4 during Stage 1 work. This is when work occurs closest to the Receiver 4 and a 2dBA exceedance is predicted. This would be barely noticeable and only a marginal impact is predicted.

Table 8-1 Predicted Operational Noise Levels, $L_{Aeq,15min}$

Rec. No.	Receiver Name	Criterion, $L_{Aeq,15min}$ dBA	Stage 1	Stage 2	Stage 3A		Stage 4	
			Area G	Area I, B, H	Area E	Area D	Earthworks and Crusher in Area G	Earthworks Area H with Crusher in Area G
			Figure 8-1	Figure 8-2	Figure 8-3	Figure 8-4	Figure 8-5	Figure 8-6
1	212 Waldron Rd	48	33	39	43	43	37	39
2	183 Miller St	51	31	41	34	33	34	40
3	190 Virgil	48	34	40	39	38	38	40
4	Epic Place - Detention Centre	48	49	42	47	45	49	41

In the following contour figures, the bands of colour represent areas where noise lies within the same 5dBA band. Typically, noise reduces as the distance to the receivers increases from the noise source. On Miller Street, the noise is slightly lower at the nearest receivers due to shielding from the large commercial buildings between them and the Orica site.

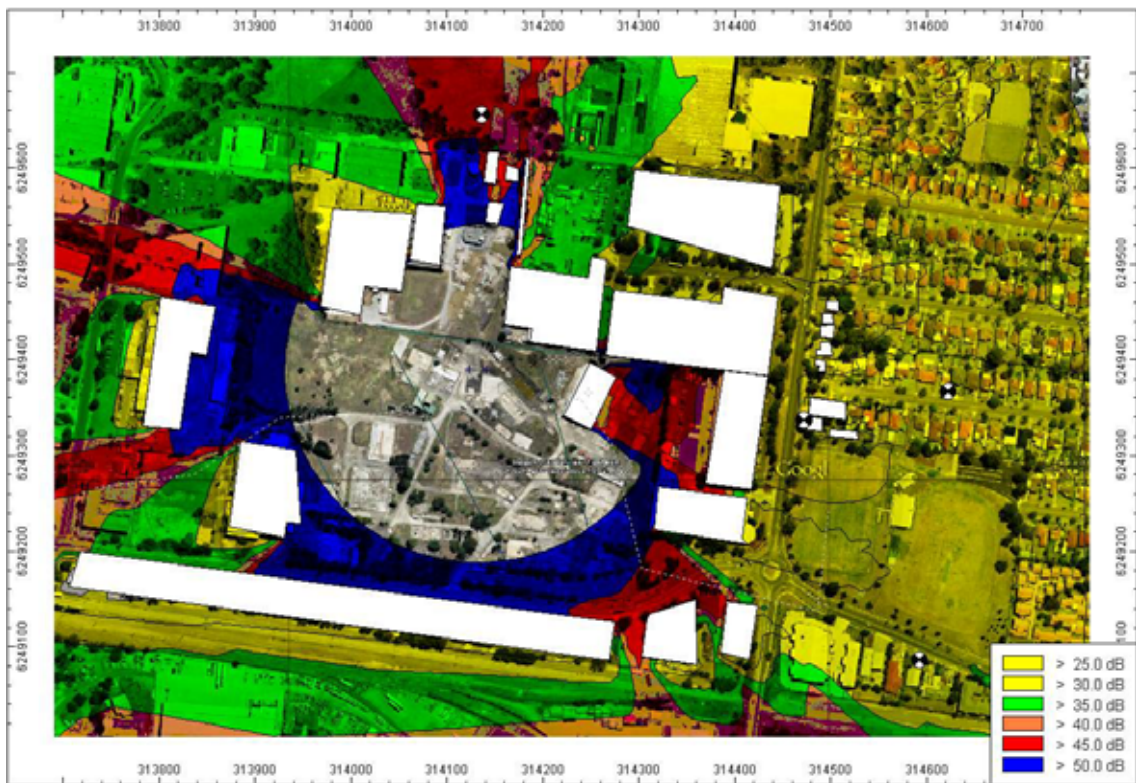
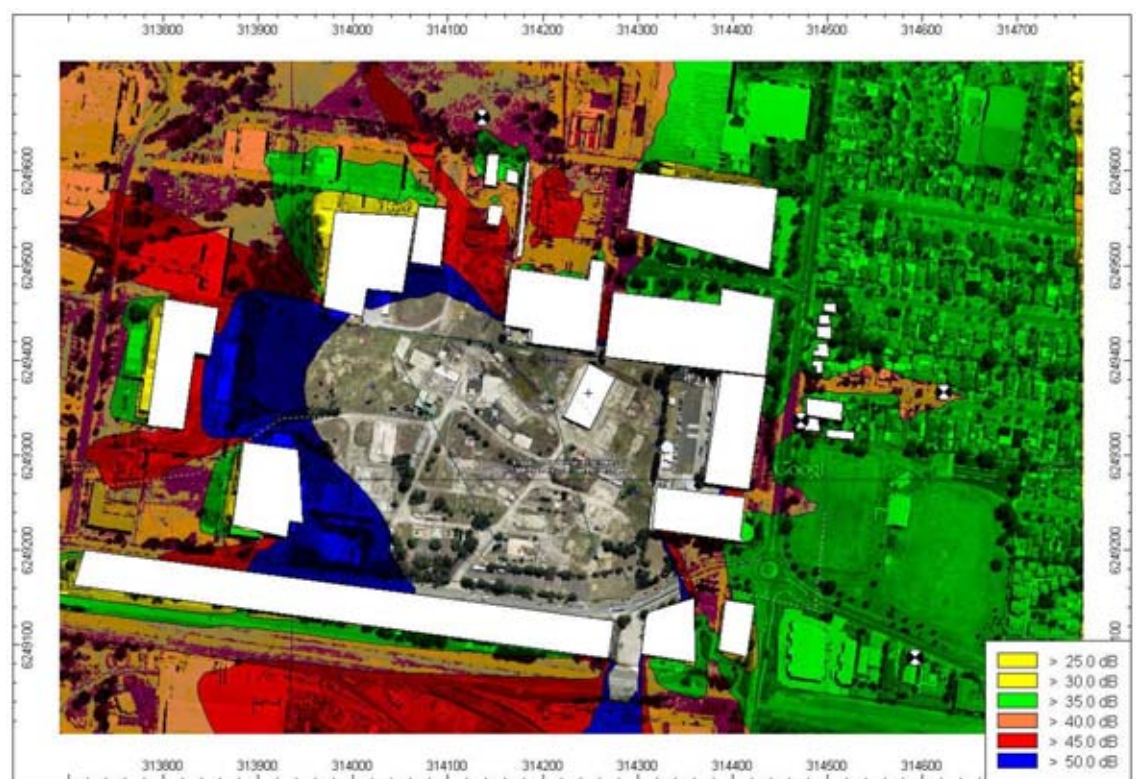
Figure 8-1 Noise Contours – Stage 1 L_{Aeq} dBA**Figure 8-2 Noise Contours – Stage 2 L_{Aeq} dBA**

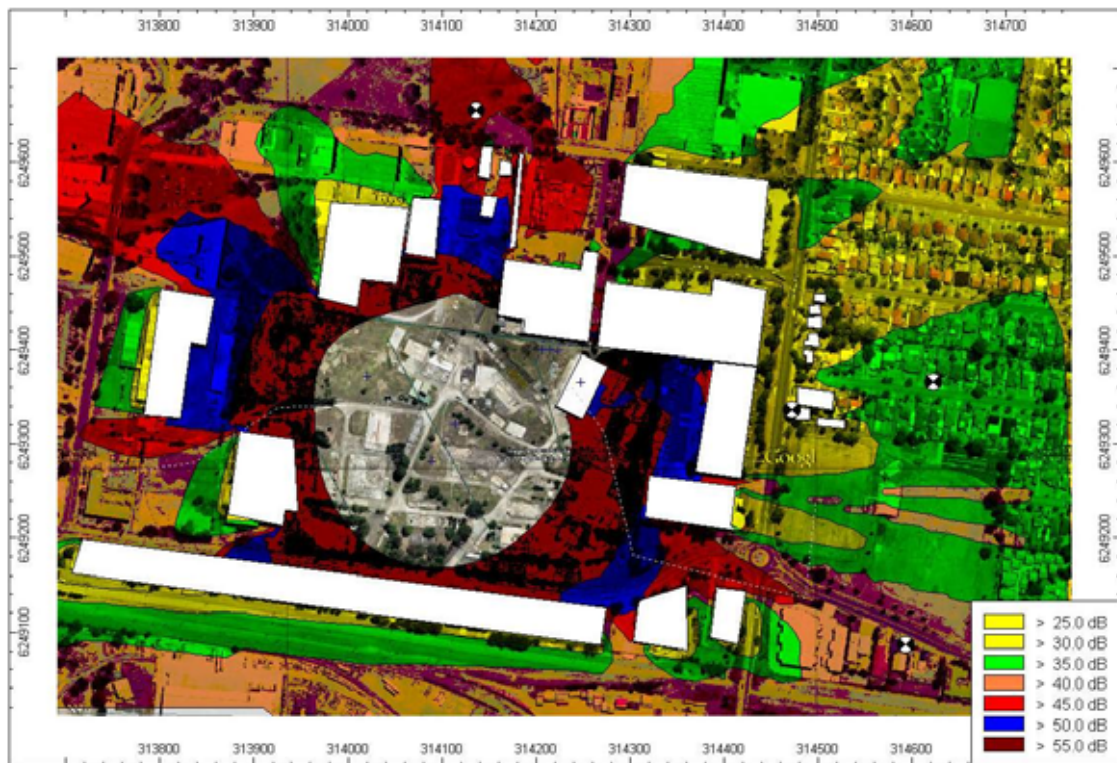
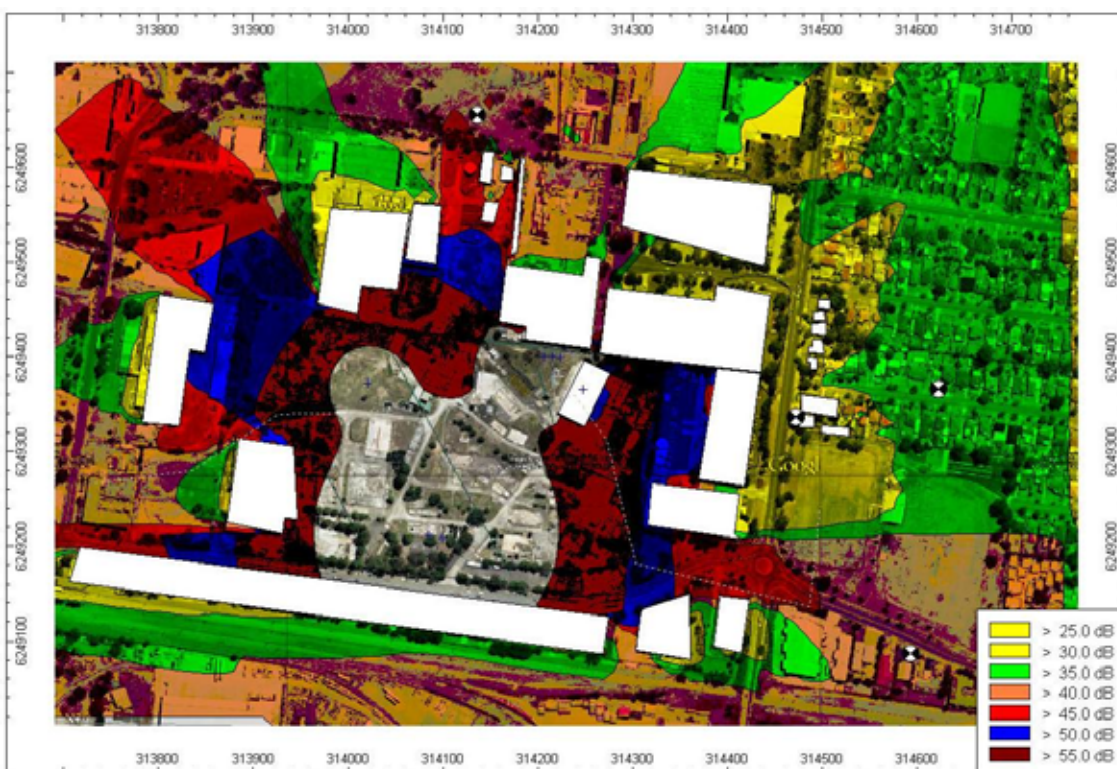
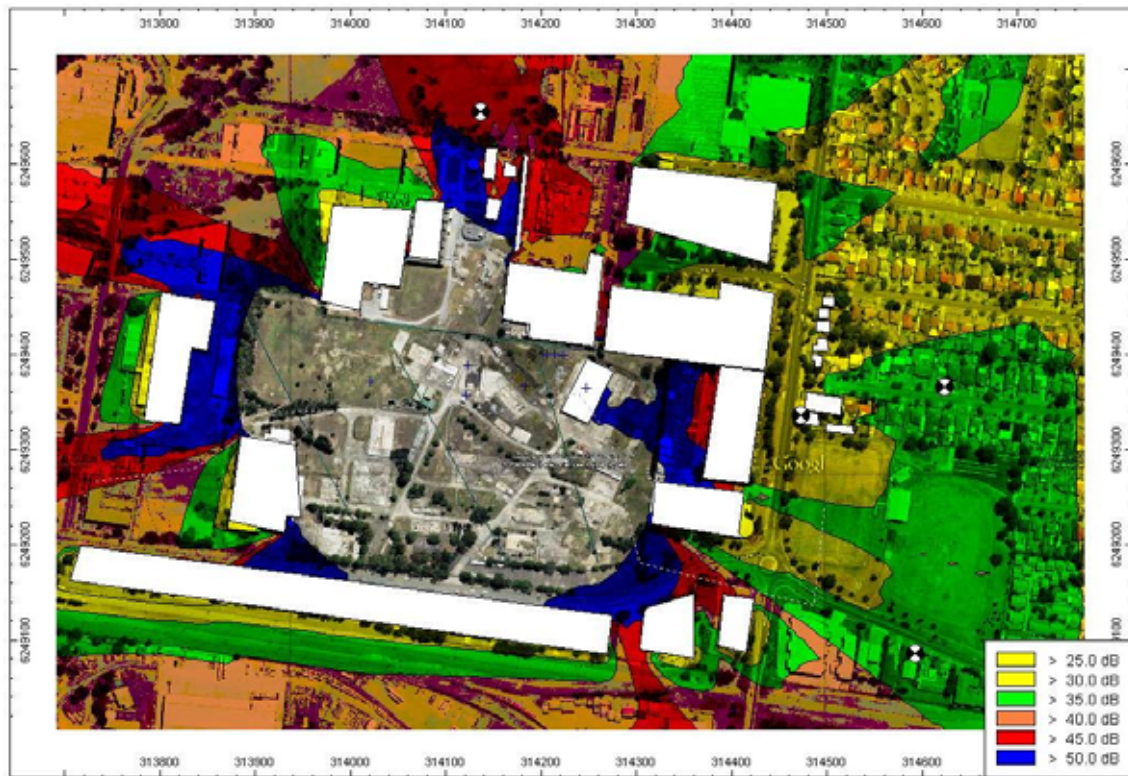
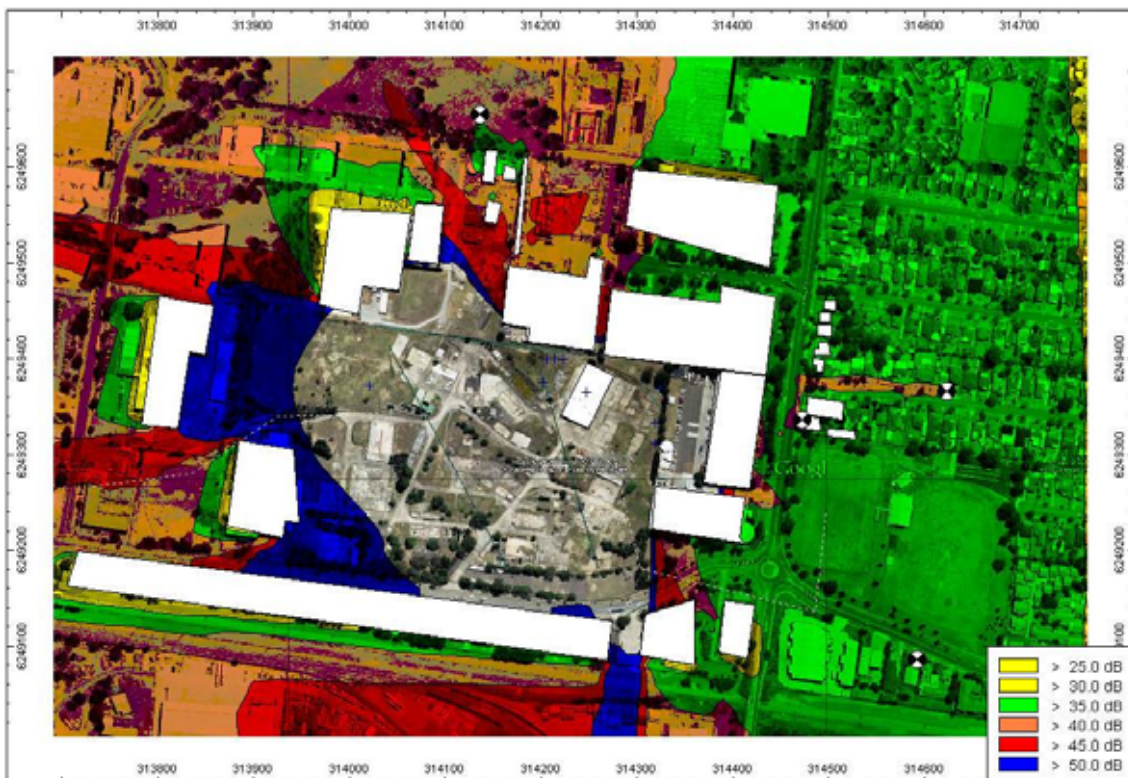
Figure 8-3 Noise Contours – Stage 3 Area E**Figure 8-4 Noise Contours – Stage 3 Area D**

Figure 8-5 Noise Contours – Stage 4 – Earthworks Area G, Crusher Area G**Figure 8-6 Noise Contours – Stage 4 – Earthworks Area H, Crusher Area G**

8.2 Mitigation of Daytime Noise Levels

The only predicted exceedance occurs at Receiver 3 during Stage 1 works. Mitigation would be possible by placing acoustic screens on the northern boundary of the site. However, as the exceedance is only 2dBA, and occurs for only 1 week, it is considered only a marginal impact. At the time of noise logging in October 2009, the nearest residences at the Detention Centre were under construction. It is understood that the centre is now complete and will be occupied during the remediation process.

8.3 Night Time and Evening Operational Noise Levels

During evenings and night time only, the PTB (including a front end loader working inside the building), DTD and WTP will operate.

Noise during evening and night time assessment includes the effect of meteorological propagation enhancement as discussed in Section 6.4.

The predicted noise levels are given in Table 8-2. Because the noise continues at a constant level through the night, the determining criteria are the amenity criteria. No exceedances of the noise criteria are predicted at any location.

Table 8-2 Predicted Noise Level, Evening and Night Time, $L_{Aeq,period}$ dBA

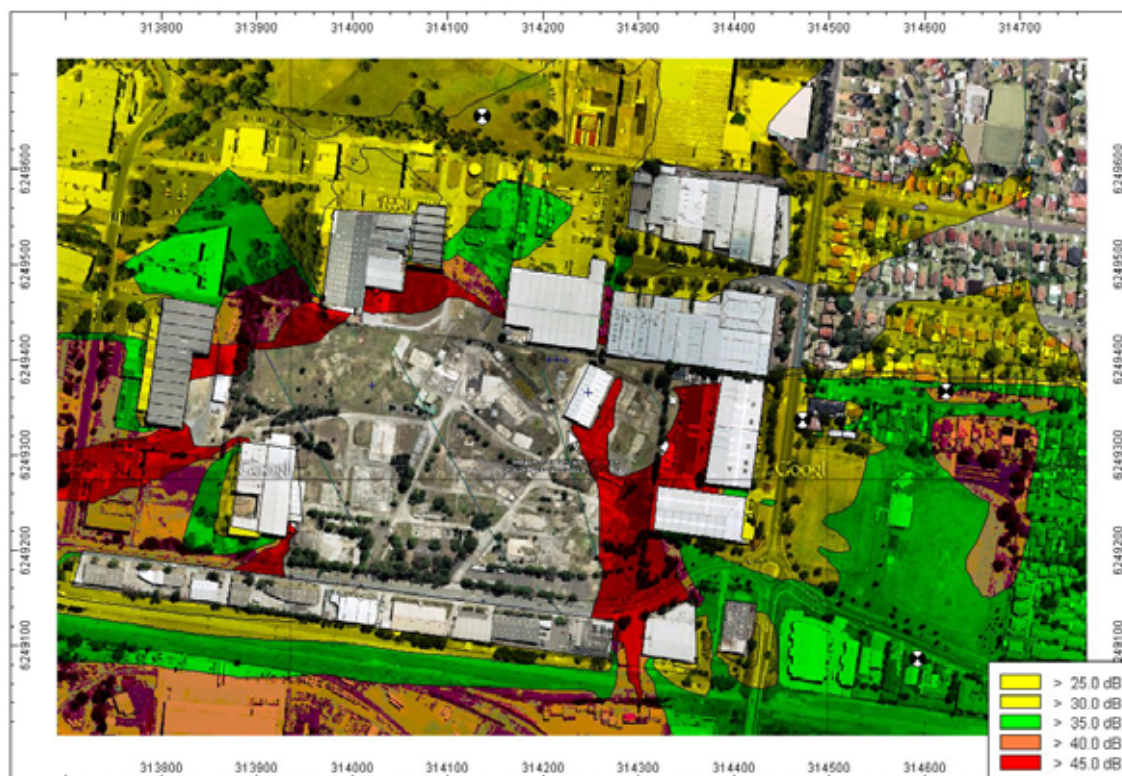
Rec. No.	Receiver Name	Evening Criterion, $L_{Aeq,4hr}$ dBA	Night Time Criterion, $L_{Aeq,9hr}$ dBA	Meteorological Conditions		
				Isothermal, Still	Calm, Temperature Inversion 3°/100m	Isothermal, Wind 3m/s WSW
1	212 Waldron Road	45	40	34	38	39
2	183 Miller Street	45	40	30	33	34
3	190 Virgil Avenue	45	40	36	40	40
4	Epic Place – Detention Centre	45	40	36	30	39

Noise contours are shown on:

- Figure 8-7 for calm, isothermal conditions;
- Figure 8-8 for calm conditions with temperature inversion; and
- Figure 8-9 for isothermal conditions with 3m/s WSW wind.

Figure 8-7 Evening and Night Time Contours – Calm Isothermal, L_{Aeq} dBA**Figure 8-8 Evening and Night Time Contours – Calm with Temperature Inversion, L_{Aeq} dBA**

Figure 8-9 Evening and Night Time Contours – Isothermal and 3m/s WSW Wind, L_{Aeq} dBA



8.4 Sleep Disturbance Assessment

Night time noise emission will be relatively continuous. Hence the maximum noise levels are expected to be similar to the L_{Aeq} noise levels, as shown in Table 8-2. These are repeated in Table 8-3 and shown with the sleep disturbance criteria. The noise complies at all locations.

Table 8-3 Predicted Maximum Night Time Noise Level

Rec. No.	Receiver Name	Night Time Sleep Disturbance Criterion, $L_{A1,1min}$ dBA	Meteorological Conditions		
			Isothermal, Still	Still, Temperature Inversion 3°/100m	Isothermal, Wind 3m/s WSW
1	212 Waldron Road	53	34	38	39
2	183 Miller Street	53	30	33	34
3	190 Virgil Avenue	53	36	40	40
4	Epic Place – Detention Centre	54	36	30	39

8.5 Construction Noise Levels

Although the life of the project is less than one year it is being assessed conservatively against the INP as if it were industrial noise. However, certain aspects of the project will be much more temporary, and it is considered appropriate to assess them as construction noise.

Some of those activities where cranes and hand tools are used, including building and demolishing the PTB, will be quieter than general works and are not assessed further as they will comply with the more stringent *INP* criteria.

Occasionally there may be some use of excavator mounted rock breakers. The predicted noise levels, and the construction noise criteria, are given in Table 8-4. The noise levels include all plant as in previous scenarios, with the excavator breaking concrete in the Area noted. In general the noise complies with the construction noise criterion except at Receiver 4 where exceedances up to 8dBA are predicted. Given the brevity and infrequency of this activity, any impact is expected to be minor.

Table 8-4 Predicted Construction Noise with Rock Breaker

Rec. No.	Receiver Name	Criterion, dBA	Stage 1	Stage 2	Stage 3A		Stage 4	
			Area G	Area I, B, H	Area E	Area D	Earthworks and Crusher in Area G	Earthworks Area H with Crusher in Area G
1	212 Waldron Road	53	46	48	54	54	47	48
2	183 Miller Street	56	42	48	42	42	43	48
3	190 Virgil Avenue	53	46	49	47	48	47	48
4	Epic Place – Detention Centre	53	60	48	57	56	61	48

8.6 Assessment at Chester Hill High School

The noise criterion at Chester Hill High School is that noise should not exceed 35dBA in the classroom.

The predicted noise level at the school is 35-40dBA, depending on the stage of operation and the receiver location in the school.

The typical noise reduction into a building with windows open is 10dBA. That is a predicted noise of 40dBA outside would give a noise of 30dBA inside if windows were normally open for ventilation.

Hence, the noise is predicted to comply at all locations within Chester Hill High School during all stages of operation.

8.7 Assessment at Commercial and Industrial Neighbours

At the commercial premises across Christina Road the predicted noise levels are always below 65dBA, which complies with the criterion.

At industrial premises adjacent to the site, predicted noise levels will generally comply with the criteria. Some exceedances are predicted when the earthmoving equipment is within 20m of the facades. However, the neighbouring facades are all masonry and only minor impacts are predicted.

8.8 Assessment at Abbott Park

At Abbott Park predicted noise levels are always below 55dBA, which complies with the criterion.

9 TRAFFIC NOISE

9.1 Traffic Generation

Traffic to and from the site will be limited to deliveries, arrival of occasionally used equipment such as cranes, and the light vehicle traffic of staff. The site remediation strategy does not include movement of material onto or off the site. Typically less than 10 heavy vehicles per day would enter and leave the site from Christina Road.

9.2 Existing Traffic Noise Levels

9.2.1 Miller Street

Existing traffic noise levels on Miller Street were determined from the noise logger at 183 Miller Street. The criteria are in terms of $L_{Aeq,1hr}$, which varies throughout the day. The charts in Appendix B show that the $L_{Aeq,1hr}$ on weekdays varies typically from $L_{Aeq,1hr}$ 60-65dBA. The typical level is $L_{Aeq,1hr}$ 63dBA, which exceeds the criterion of $L_{Aeq,1hr}$ 55dBA for local roads. As this residence is typical of those along Miller Street, the traffic noise level would be similar at other houses.

9.2.2 Christina Road and Waldron Road

Noise measurements were not done on Christina Road as there are no residences along Christina Road.

Noise measurements were not done on Waldron Road. The existing level can be determined approximately by applying the *Calculation of Road Traffic Noise (CORTN)* procedures to existing traffic flow.

A traffic impact assessment by Thompson Stanbury Associates for the Metal Recycling Facility at 191 Miller Road Chester Hill discussed existing traffic flow near the project site. The study assessed the suitability of the road network for a proposed increase of 18 heavy vehicle movements, and 40 passenger vehicle movements, per hour from the Metal Recycling Facility. The report showed:

- There were 9,123 heavy vehicle movements per week on Miller Road south of Christina Street during September 2003.
- RTA data for average annual daily traffic (AADT) on Miller Road, south of Christina Road, which was 9,332 in 2006. While AADT figures for Christina Road are not quoted, an intersection count at the roundabout at the corner of Miller Road and Christina Road indicate that Christina Road carries a similar amount of traffic to Miller Road south, and Miller Road north (where the sensitive receivers for this project are located) carries approximately half the traffic of Miller Road south.
- The peak hour flows on Waldron Road were 1199 vehicles during the AM peak hour, and 1543 vehicles during the PM peak hour.
- The vehicle speed on Waldron Road is 60kmph.
- Heavy vehicles comprise approximately 16% of the traffic mix.
- It was concluded that the road network “operates with a reasonable level of service and is more than capable of accommodating the additional heavy and passenger vehicular traffic to be generated by the proposal.”

Using the quoted peak hour flows, speed, and heavy vehicle mix, the predicted noise levels at the closest residences to Waldron Road are $L_{Aeq,1hr}$ 70dBA during the AM peak hour and $L_{Aeq,1hr}$ 71dBA during the PM peak hour.

Given this level of traffic on the local network, the addition of up to ten heavy vehicles per day, and the arrival and departure of staff, is predicted to increase traffic noise by less than 0.1dBA, well below the 2dBA criterion. No traffic noise impact is predicted.

10 VIBRATION ASSESSMENT

10.1 Vibration Criteria

The DECCW publication Assessing Vibration: a technical guideline (February 2006) considers impacts from vibration in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). The guideline gives “preferred” and “maximum” vibration levels at buildings exposed to continuous and impulsive vibration. For construction noise the guideline is to apply the criteria for maximum continuous vibration. These levels are summarised in Table 10-1.

In relation to building damage from vibration, suitable levels are determined from German Standard DIN 4150 and BS 7385: Part 2 – 1993, and British Standard BS 6472. The limits interpreted from these Standards are included in Table 10-1.

Table 10-1 Vibration Criteria

Receiver	Vibration Criteria, Maximum Peak Velocity (mm/s)		
	Human Comfort, Preferred	Human Comfort, Maximum	Building Damage
Residential during daytime	0.28	.56	10
Residential night time	0.20	0.40	10
Offices	0.56	1.1	10
Critical Areas (e.g. hospital operating theatres, precision laboratories)	0.14	0.28	10

10.2 Vibration Source Levels

Table 10-2 provides some estimated vibration levels at a range of distances from the various construction activities. The attenuation with distance is dependant on the nature of the rock strata at the site, so the levels are a guide only.

Table 10-2 Typical Vibration Emission Levels from Construction Plant

Source	PPV Vibration Level (mms ⁻¹) at Distance					
	5m	10m	20m	30m	40m	50m
Heavy Rock Breaker (typical)	4.5	1.3	0.4	0.2	0.12	0.085
Heavy Rock Breaker (worst known)	4.5	2.5	0.5	-	-	-
Light Rock Hammer (e.g. 600kg)	0.2	0.06	0.02	0.01	-	-
Ripping (measured in Sydney sandstone)	0.7	0.15	0.03	-	-	-
Ripping (measured in Sydney sandstone)	0.7	0.15	0.03	-	-	-

10.3 Predicted Vibration Assessment

10.3.1 Impact at Residences

The nearest residential premises to the project on Miller Road are approximately 100m from the closest work area of the site. The typical vibration levels at 100m, as seen in Table 10-2, would be below the lowest residential criterion and no impact is predicted for any activity at the project.

10.3.2 Impact at Commercial Premises

Commercial neighbours are approximately 10m from areas where earthworks would take place, and more than 20m from any area where rock breakers would be used. It is predicted that the criterion for human comfort will be met within all neighbouring premises during the works.

10.3.3 Building Damage

The criterion for building damage is 10mm/s. This criterion will be met at all receivers for all project activities, and no building damage impact is predicted.

11 CONCLUSION

Noise and vibration from the remediation of the Orica site at 2 Christina Road, Villawood has been considered.

Remediation will take approximately one year. Noise will be produced by the treatment plants, and by earthmoving machinery.

The treatment plants will run continuously, and maximum allowable sound power levels for equipment was specified in order to meet night time criteria at all residences under all meteorological conditions.

Daytime noise will vary depending on which area of the site is being worked. At the beginning of the project, work will be undertaken in the area nearest to the Detention Centre. A marginal exceedance of the noise criteria at the Detention Centre was predicted for approximately one week. It is not considered reasonable to provide noise mitigation for this marginal, brief exceedance.

Daytime noise is predicted to comply at all other receivers for the duration of the project.

No noise impact is predicted at Chester Hill High School.

The project generates very little traffic and traffic noise will comply with the criterion.

Vibration generated by the project will comply at all residential, commercial and industrial premises.

Note

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We are committed to and have implemented AS/NZS ISO 9001:2008 "Quality Management Systems – Requirements". This management system has been externally certified and Licence No. QEC 13457 has been issued.

AAAC

This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

Version	Status	Date	Prepared by	Checked by
A	Draft	28 May 2010	George Jenner	Glenn Homes
B	Draft	9 July 2010	George Jenner	Glenn Homes
C	Final	1 December 2010	George Jenner	Rob Bullen

APPENDIX A

GLOSSARY OF TERMS

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.

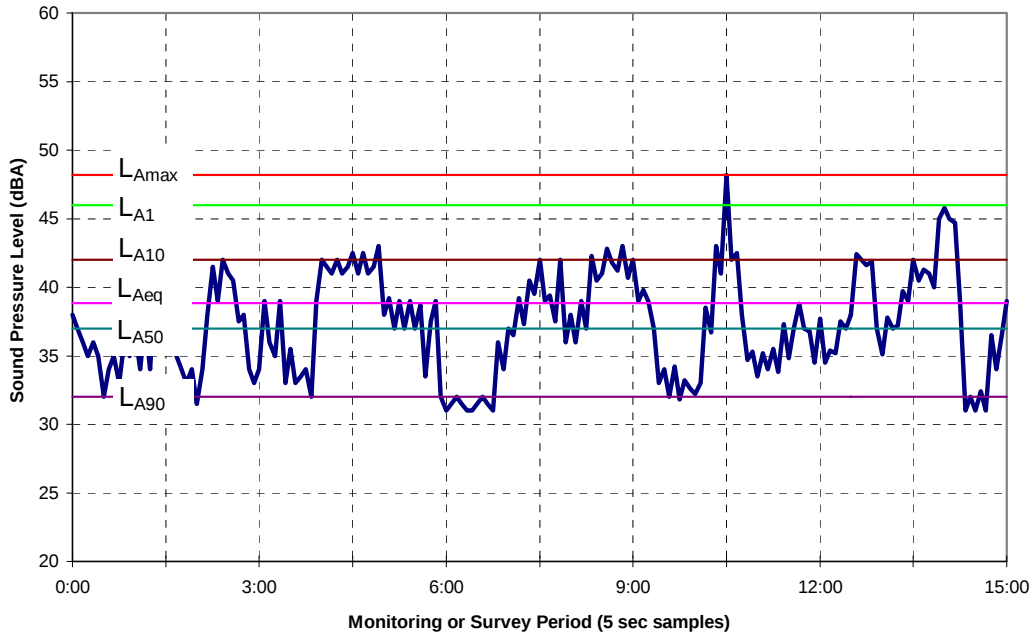
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise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

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

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.

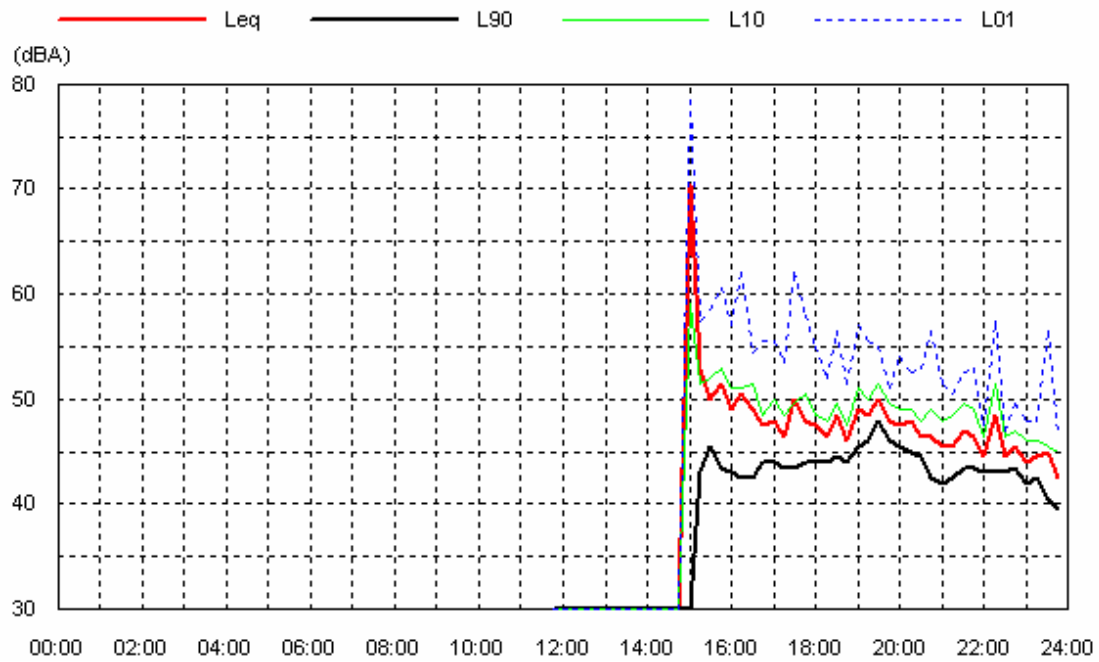
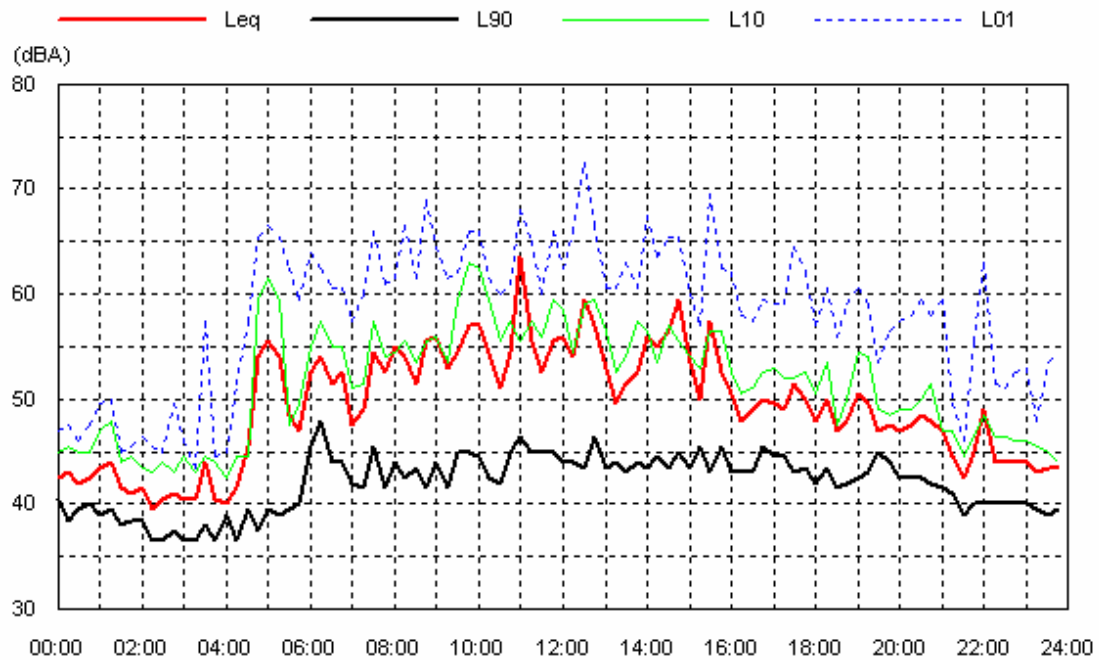
ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

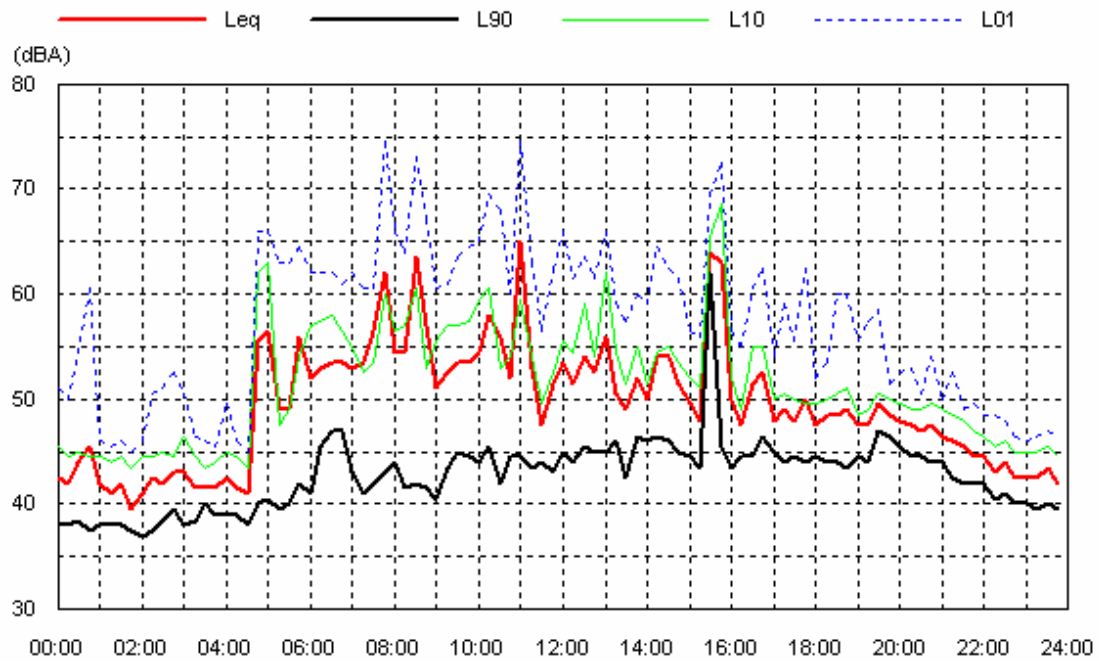
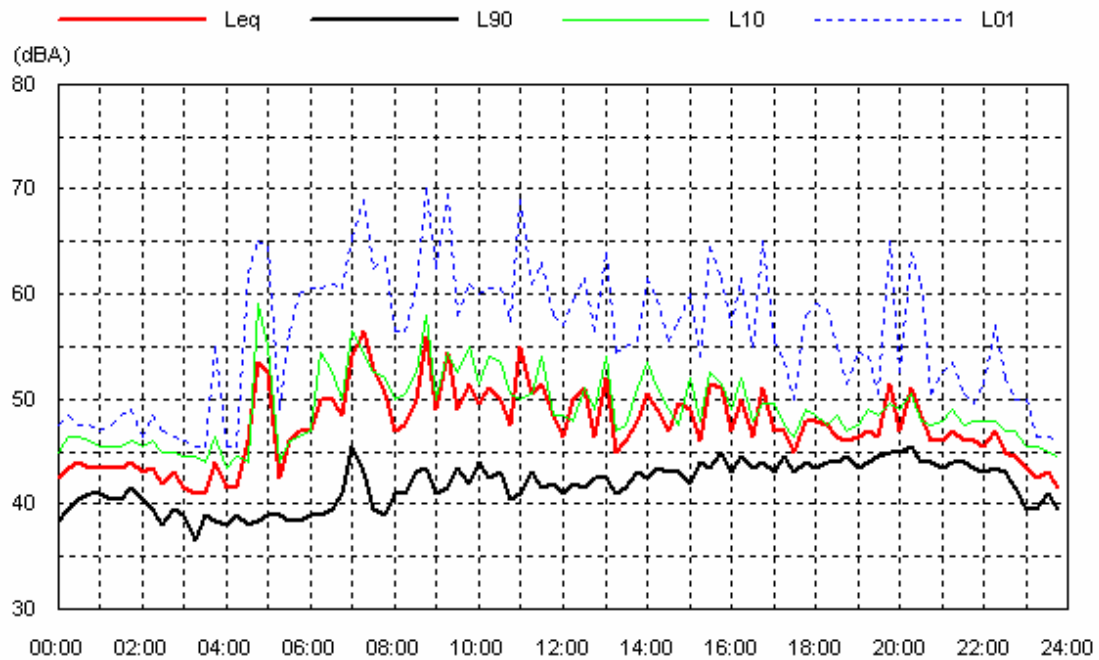
RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

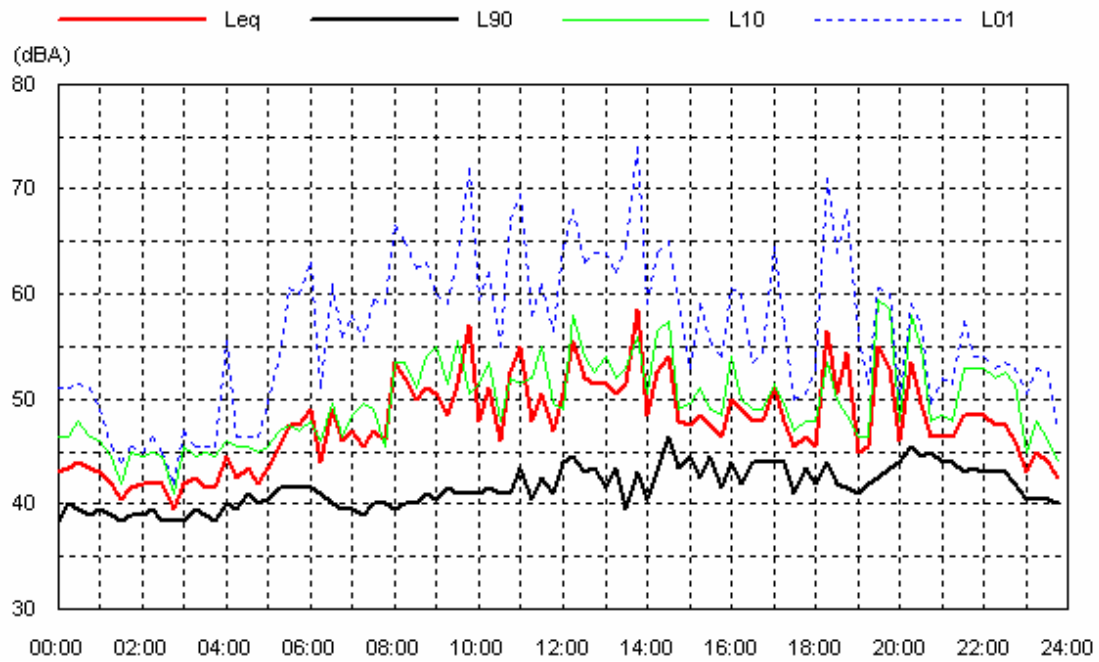
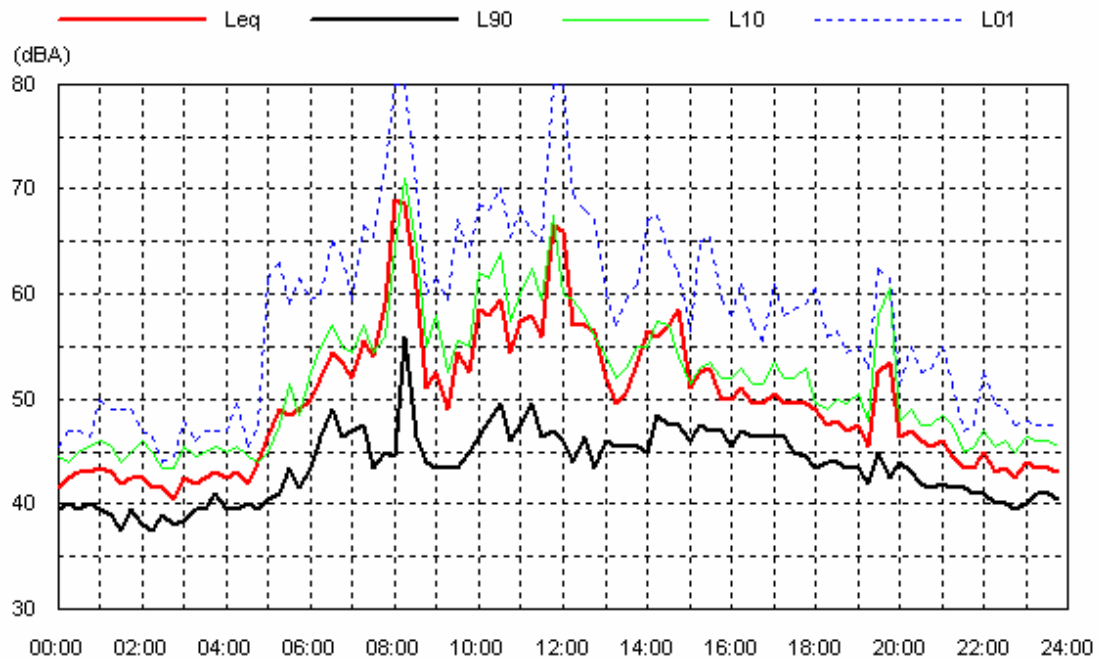


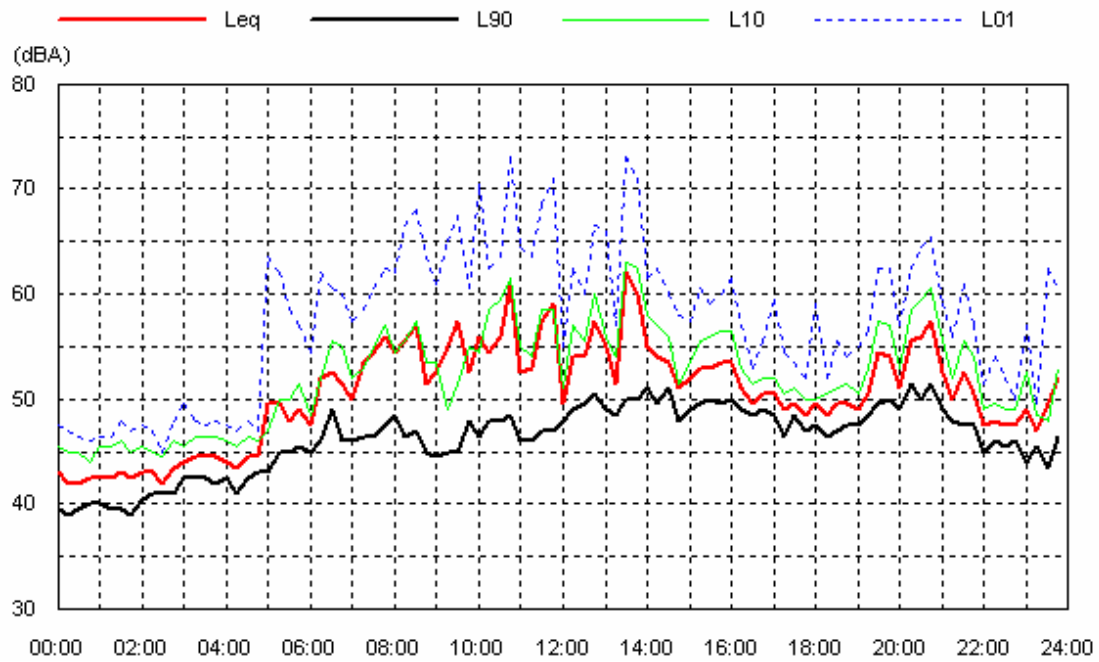
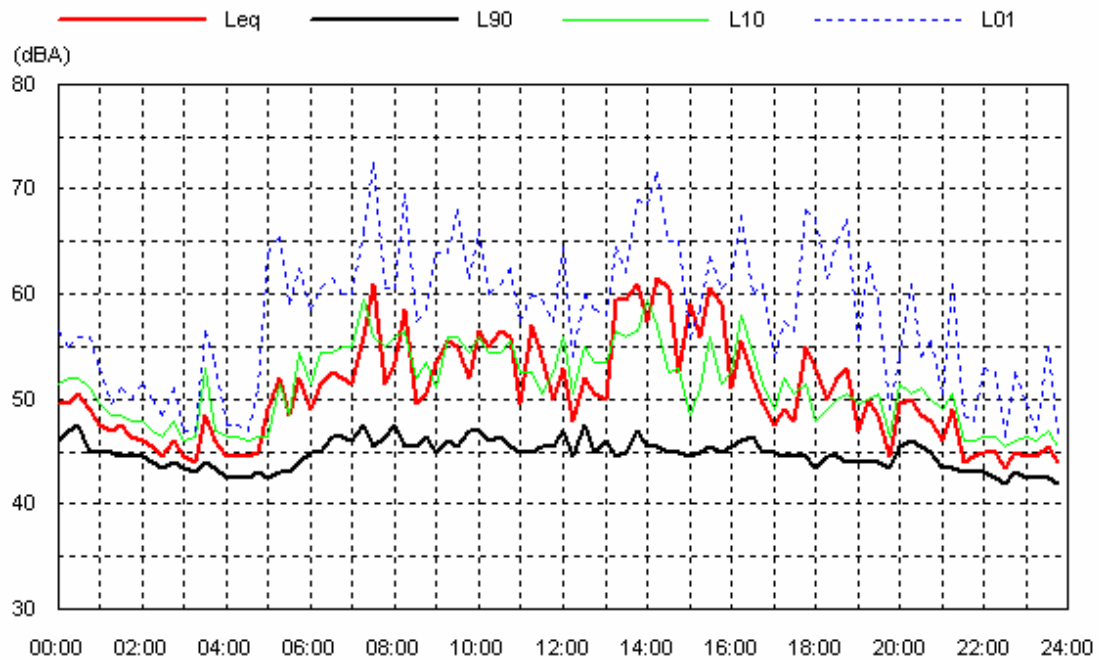
APPENDIX B

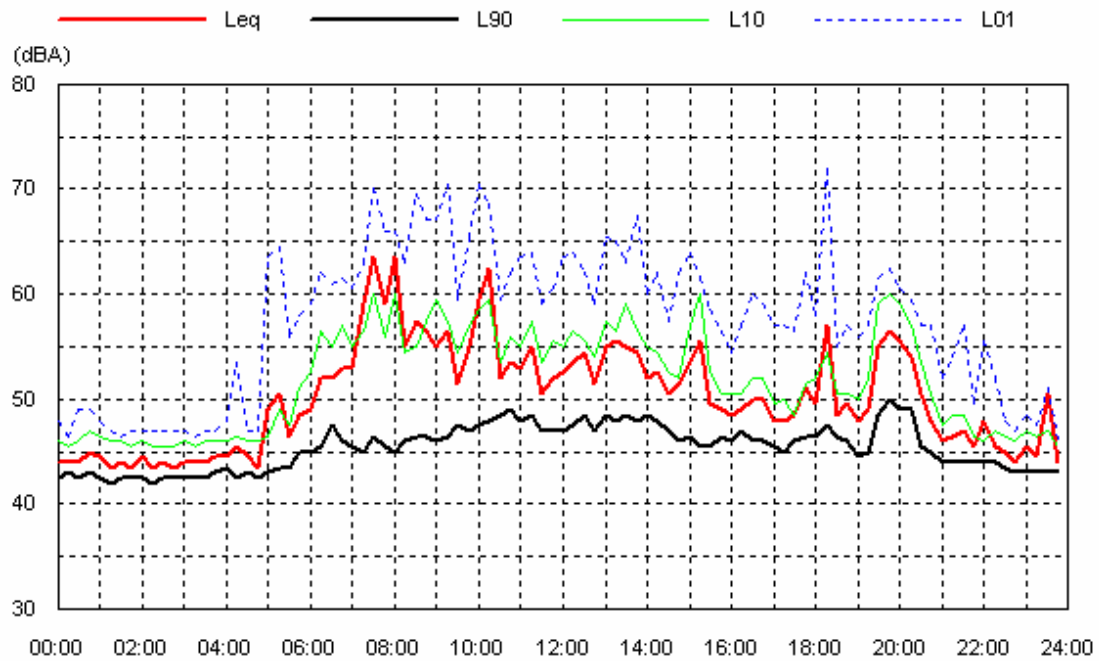
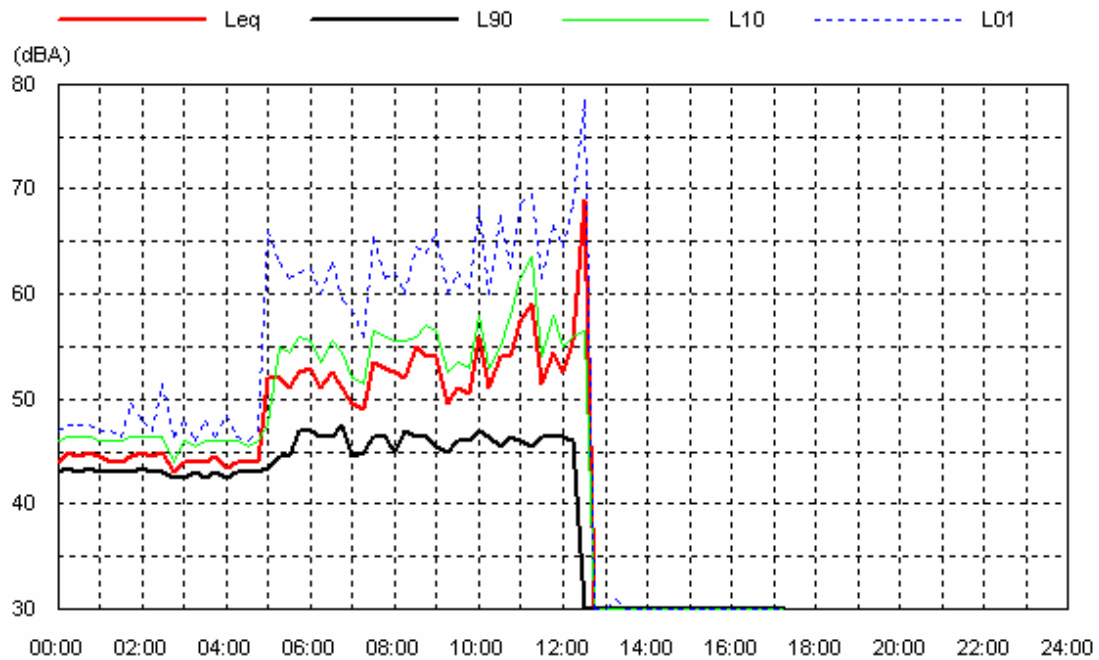
NOISE MEASUREMENT RESULTS

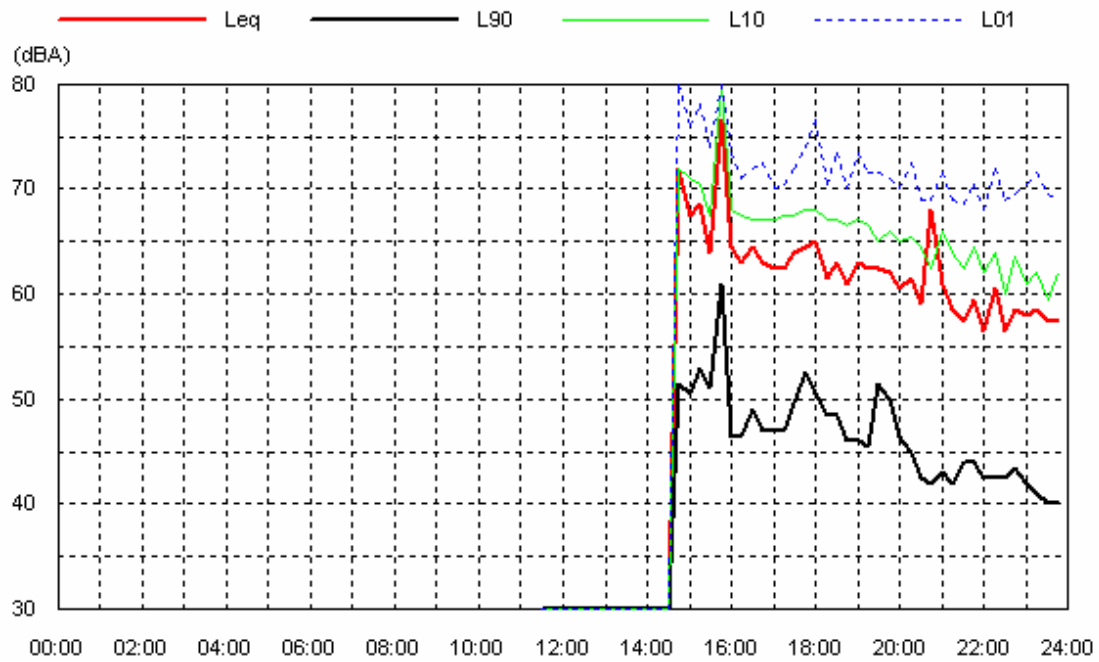
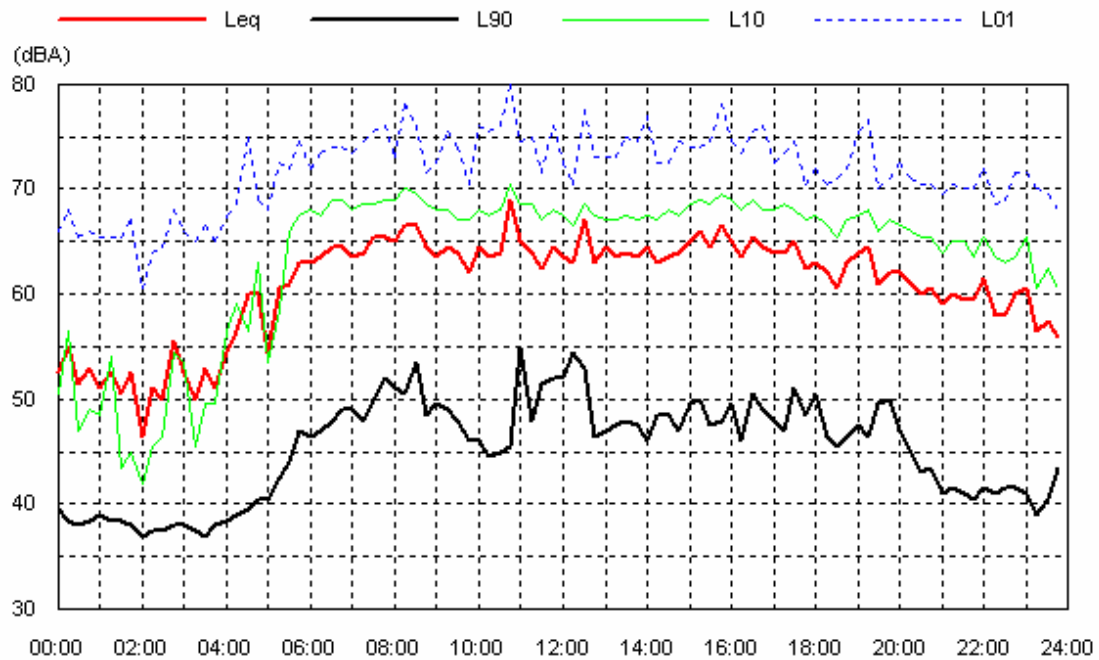
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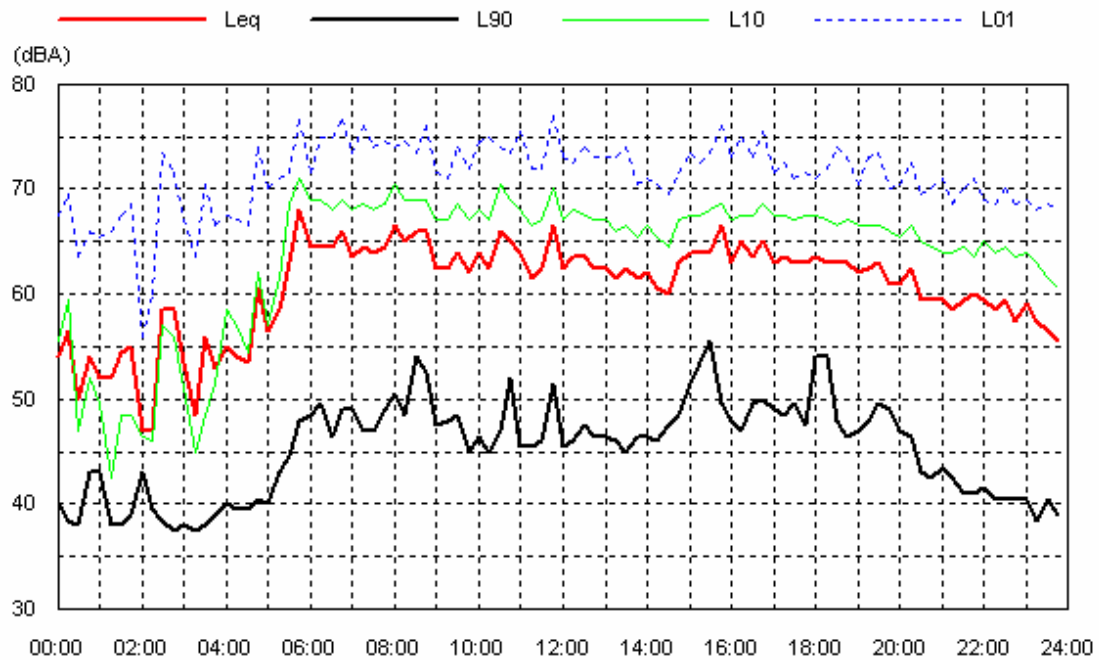
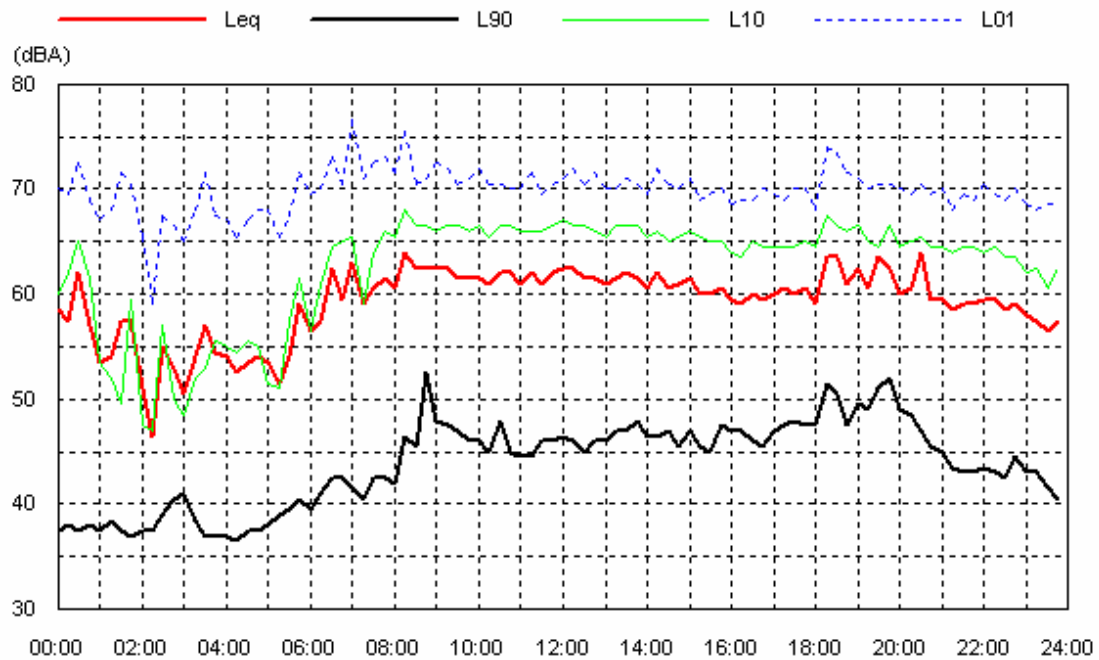
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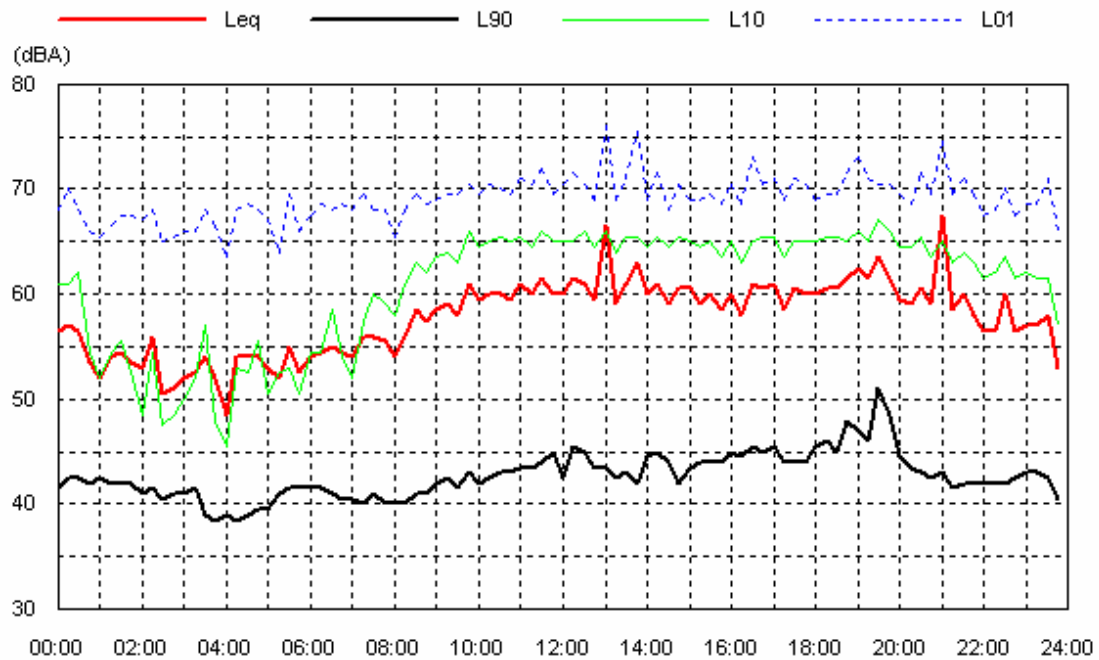
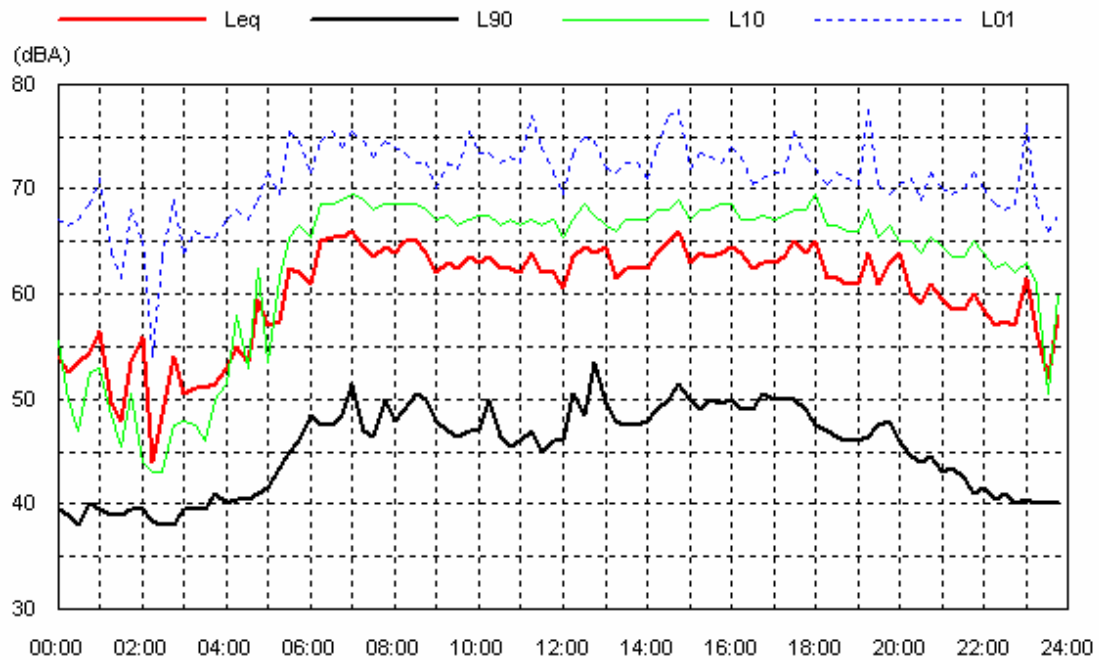
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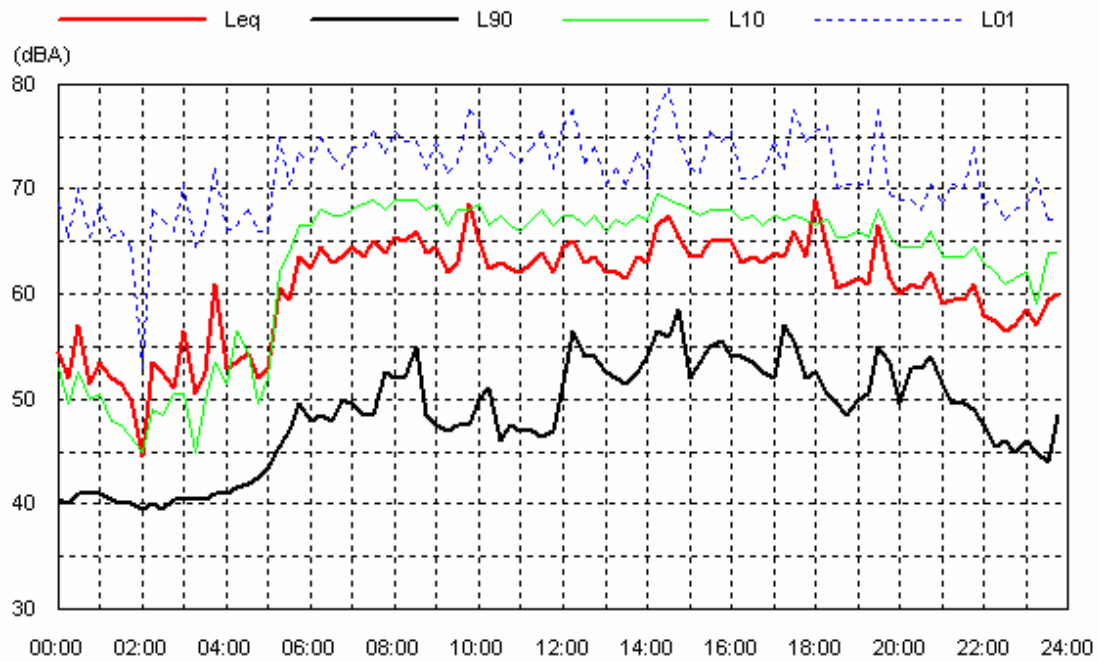
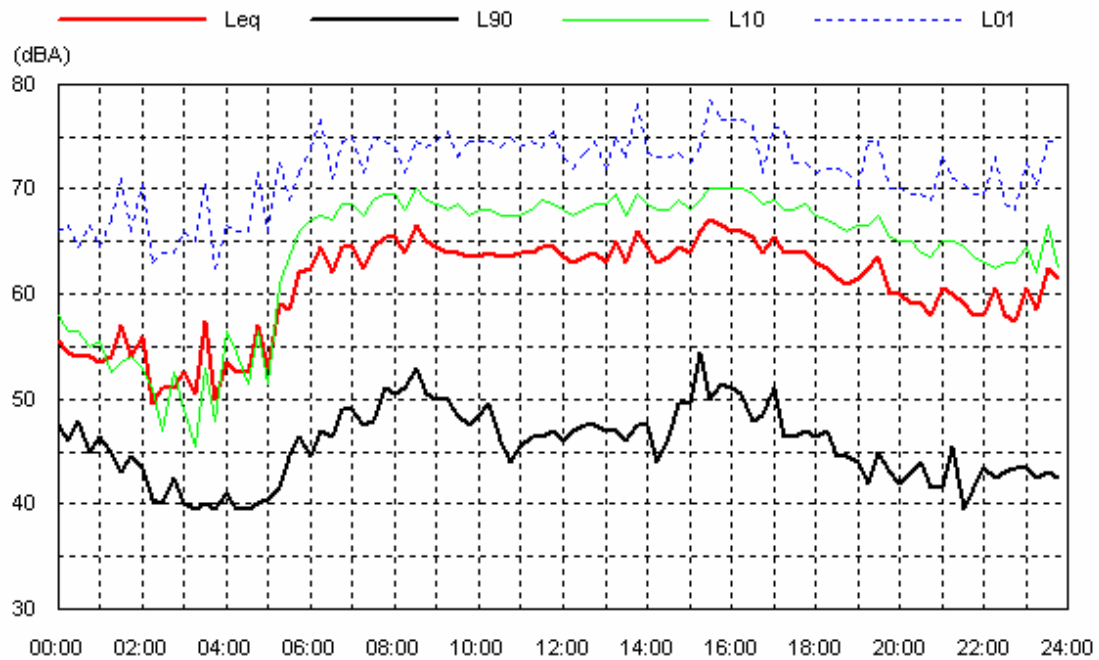
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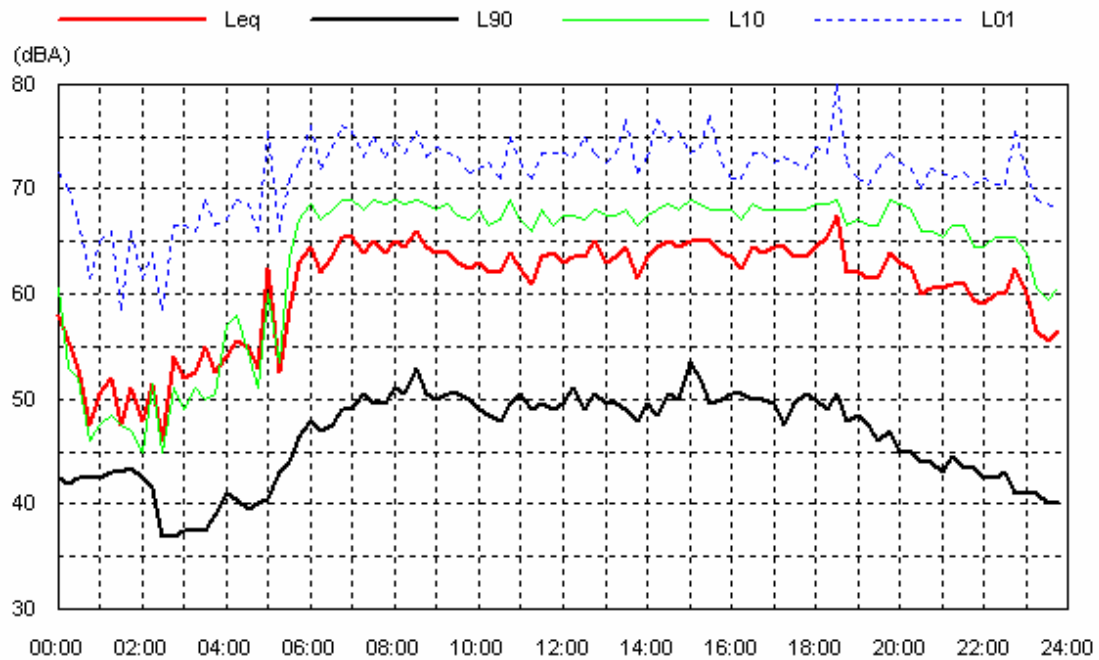
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Location: 183 Miller**Fri 30 Oct 09****Sat 31 Oct 09**

Location: 183 Miller**Sun 01 Nov 09****Mon 02 Nov 09**

Location: 183 Miller**Tue 03 Nov 09****Wed 04 Nov 09**

Location: 183 Miller**Thu 05 Nov 09****Fri 06 Nov 09**