

Noise Monitoring Plan

Keysbrook Leucoxene Project

Prepared For

Matilda Zircon Limited



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1 INTRODUCTION

This report provides a description of the initial Noise Monitoring Plan (NMP) proposed by Matilda Zircon Limited (Matilda) to ensure that noise impact at the proposed Keysbrook Leucoxene Project is managed in a responsible manner. The report may evolve over time once equipment is located on site and begins operation but does provide the basic outline. It will also be updated as the mine progresses and once approvals are obtained, the start date will be known and therefore more specific analysis of expected wind conditions for each quarter can be undertaken to assist in assessing the possible impacts.

Appendix A provides the mine plans for the first 6 quarters and *Appendix D* provides definitions for the terminology used in this report.

2 NOISE MODELLING

In February 2006, Lloyd Acoustics (now Lloyd George Acoustics) undertook noise modelling to determine the likely impact from the proposed operations entitled *Noise Impact Assessment, Keysbrook Titanium Minerals Proposal*; Reference 511442-03c. Following a change of proposed equipment to provide more flexibility to the mining operations, further modelling was undertaken and reported in May 2008, entitled *Noise Impact Assessment, Keysbrook Titanium Minerals Proposal*; Reference 511442-09a (hereafter referred to as the Modelling Report).

The main outcomes of the Modelling Report were:

- The fixed plant can be designed and located in order to comply with the 'normal' assigned noise levels of the *Environmental Protection (Noise) Regulations 1997* (the Regulations); and
- The mobile equipment would be managed in such a way so as to comply with Bulletin 1269 (the Bulletin).

The Bulletin was subject to appeal and such an appeal did occur. The outcome was a new set of noise conditions including the following:

- Unless otherwise agreed in writing between the proponent and the owner and any occupier of noise sensitive premises:
 - The proposal must comply with the Noise Regulations at any building associated with a noise sensitive use at any noise sensitive premises; and
 - Outside the hours 0700 to 1900 Monday to Saturday, or on public holidays, no mining activity is to be undertaken within 1500 metres of any building associated with a noise sensitive use at any noise sensitive premises.

The new conditions have effectively reduced the allowable noise levels by 5 dB over those that were provided for in the Bulletin.

At this stage for simplicity, the L_{A10} values are discussed, however once monitoring is undertaken, the L_{A1} and L_{Amax} values will be analysed where appropriate. The criteria are discussed in *Section 3* in detail.

For the full proposed fleet (3 x Hitachi AH500 Haultrucks & 1 x Komatsu PC1000 Excavator), the required separation distances between the mine area and the residence are shown below in *Table 2.1* for the different times of day.

Table 2.1 – Distance from Mining Equipment Versus Noise Level

Noise Level, dB(A)	Wind	
	Calm	Downwind
35 ¹ (Night)	1000	2200
40 ¹ (Evening)	660	1500
45 (Day)	280	570

1. An allowance has been made for noise to be considered tonal which would result in a + 5 dB adjustment to measured noise levels.

The distances above have formed the basis of the mine management plan. Again, once equipment is on site and monitoring has been undertaken, these distances will be refined.

Attached in *Appendix A* are 6 figures which show the first 6 proposed 3 month periods of mining. An outcome of discussions between Olympia Resources (now Matilda Zircon Limited) and the Appeals Convenor's Office was for mining to commence in the least noise sensitive area, that is, a location where the distance to residences is reasonably great. These are discussed in detail in *Section 4*, including the monitoring proposed.

3 CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997*. Regulation 7 defines the prescribed standard for noise emissions as follows:

"7. (1) Noise emitted from any premises or public place when received at other premises –

- (a) Must not cause or *significantly contribute to*, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and
- (b) Must be free of –
 - i. Tonality;
 - ii. Impulsiveness; and
 - iii. Modulation".

A "...noise emission is taken to *significantly contribute to* a level of noise if the noise emission exceeds a value which is 5 dB below the assigned level..."

Tonality, impulsiveness and modulation are defined in Regulation 9 and in *Appendix D*. Noise is to be taken to be free of these characteristics if:

- (a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and
- (b) The noise emission complies with the standard after the adjustments of *Table 3.1* are made to the noise emission as measured at the point of reception.

Table 3.1 – Adjustments For Intrusive Characteristics

Tonality	Modulation	Impulsiveness
+ 5 dB	+ 5 dB	+ 10 dB

Note: The above are cumulative to a maximum of 15 dB.

The assigned levels (prescribed standards) are specified in Regulation 8 and are shown below in *Table 3.2*.

Table 3.2 – ‘Normal’ Assigned Noise Levels For Noise Sensitive Premises

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise Sensitive ¹	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor

1. Applies within 15 metres of a building associated with a noise sensitive use, as defined in Schedule 1, Part C.

The influencing factor, L_{A10}, L_{A1} and L_{Amax} are defined in *Appendix D*.

The influencing factors at the nearest residences have been assumed to be 0 such that the applicable criteria for noise present for more than 10% of the time is 45 dB L_{A10} during the day and 35 dB L_{A10} during the night. Note there will be some residences that are within 450 metres of the mine area and will therefore have an influencing factor. This would mean that instead of 35 dB L_{A10} being the assigned noise level at night, it may be 36 or 37 dB L_{A10}.

4 MINE AND MONITORING PLAN

Discussed below in *Sections 4.1 and 4.7* are the expected mine and monitoring procedures during the first 18 months of mining.

4.1 Pre-Mining

Once the appropriate approvals are obtained, Matilda will commence purchasing the required plant and equipment and engaging contractors. Each supplier/contractor will be provided with the following noise requirement, specific to their plant, as part of the Specifications, with the example below being for the Booster Pump.

Noise Requirements

The sound power level, measured in accordance with the appropriate Australian or International Standard, must not exceed the level shown below.

Sound Power Level Not to Be Exceeded, dB(A)

Item	Octave Band Centre Frequency								Overall
	31.5	63	125	250	500	1k	2k	4k	
Booster Pump	40	52	66	72	81	82	79	75	87

An appropriate test report by a qualified testing company shall support the submission as evidence to the above including detailing any measures that were required to achieve these noise levels (e.g. acoustic enclosures etc).

Note that for the mobile equipment, the expected Australian Standard would be AS2012.1-1990 *Acoustics - Measurement Of Airborne Noise Emitted By Earth-Moving Machinery And Agricultural Tractors - Stationary Test Condition - Determination Of Compliance With Limits For Exterior Noise* and for pumps and the like, the expected Australian Standard would be AS1217.5 *Acoustics - Determination of sound power levels of noise sources - Engineering methods for free-field conditions over a reflecting plane.*

The sound power levels provided in the specification will be taken from *Table 4.2* of the Modelling Report.

During this time (i.e. before any equipment is located on site), a *BarnOwl* noise monitor will be set-up at House 3B (refer *Appendix B*), being the closest house in the first quarter of mining. This will allow background noise levels to be measured for a minimum period of 1-month. The logger will be positioned between 3 metres and 15 metres from the residence, dependent on local features including avoidance of any local structures or local noise sources.

4.2 Quarter 1

Appendix A contains Figure 1, which shows the area within Lot 63 that is proposed to be mined. The area to be mined is shown as a red circle denoting the 100m x 100m grid that will be mined. In this first quarter, 36 blocks are scheduled for mining. These are contained within areas designated acceptable for Day and Evening Mining and Day, Evening and Night Mining based on the distances nominated in Table 2.1. Matilda has specifically not nominated any of the areas within the Day Only to be mined to ensure a 'soft start', essentially enabling time for calibration of the model and operational and management procedures enforced.

Stripping of topsoil will utilise the same equipment (or acoustically equivalent) as mining operations and will be managed in the same way as the mining activities. During the day period, mining will only be undertaken in the area designated as Day and Evening, with preference given to those mining blocks closest to the Day only area as far as practicable. During the evening, mining will only be undertaken in the area designated as Day and Evening, with preference given to those furthest from the Day only area as far as practicable. During the night, only those mine blocks within the Day, Evening and Night designated area will be mined. Because of this mine scheduling, the wind conditions become irrelevant, assuming the Table 2.1 distances are proven to be correct by the on site measurements. That is, the distances in Table 2.1 assume downwind conditions so that even if these do occur, compliance with the Regulations will be achieved. Matilda will still utilise best practice by mining preferentially during upwind conditions where practicable in order to minimise the impact.

Trucks will haul from the mine area to the hopper location marked as "H", which will then feed the wet concentrator plant marked as "A". The concentrator plant was previously referred to as Location 1 – Wet Plant North. The proposed hopper location is a rationalised position and has not been examined previously.

The closest residence to the mine area is House 3B to the northeast, noting that an agreement has been reached with House 5 on Lot 62 and is therefore excluded. House 3B is a distance of approximately 1000-2200 metres from the mine, 1600 metres from the hopper and 1700 metres from the wet plant. Provided below are the expected sound pressure levels to House 3B for the various items of plant under various wind conditions.

Table 4.2.1 – Noise Levels [dB, L_{A10}] from Wet Concentrator Plant at House 3B

Wind								
N	NE	E	SE	S	SW	W	NW	Calm
13	17	22	22	22	22	16	12	12 - 22

Note: The noise levels with wind assume a speed of 3m/s and Pasquill Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F.

Table 4.2.2 –Noise Levels [dB, L_{A10}] from Hopper at House 3B

Scenario	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Hopper Only	0	0	5	9	9	9	9	2	0 - 8
Hopper & FEL	23	23	29	32	32	32	32	26	22 – 32

Note: The noise levels with wind assume a speed of 3m/s and Pasquill Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F. A 2 metre high bund surrounds the hopper. No bund is assumed around the loader.

Table 4.2.3 –Noise Levels [dB, L_{A10}] from Mining Plant at House 3B

Location	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Closest	33	30	31	36	40	40	40	39	30 – 39
Furthest	23	20	20	25	29	29	29	29	20 – 29

Note: The noise levels with wind assume a speed of 3m/s and Pasquill Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F.

The modelling indicates noise from the fixed plant will be below the most stringent night-time assigned noise level at all times and is unlikely to be audible given the relatively low levels. At the times where the loader is required during the night, a minimum 4-metre high stockpile is to be maintained on the northern side of the loader.

Noise from the mobile plant will always comply during the day with the Regulations. Compliance during the evening and night will be dependent on the presence of tonality, the wind direction and proximity to the house.

The above provides the expected noise levels based on the modelling. Once the plant is operational, a noise monitoring programme will commence.

The first step of the NMP will be to review the wind monitoring that has been undertaken on the site to date for the 3 months in which Quarter 1 mining will occur. This will enable monthly and day/night trends to be determined.

The *BarnOwl* (or similar) monitor is to remain at House 3B for the duration of Quarter 1 and be downloaded and analysed on a fortnightly basis. The analysis is to include the recorded wind speed and direction as well as mining information (specific part of mine area being mined, any downtime, number of equipment operating etc). The *BarnOwl* (or similar) will be set to focus in on the direction of the mine area (approximately between 45 and 70 degrees).

On site observations and measurements will also be undertaken during the first 2-weeks during the daytime. Prior to the measurements, Matilda will identify the specific grid that will be mined (i.e. one within the first week of mining). A total of 9 survey pegs will be positioned in the ground in groups of three at distances of 500 metres, 1000 metres and 1500 metres.

One group of three will be located in the downwind direction, the other upwind and the other crosswind. One possible limitation will be that microphone noise becomes significant at around 5m/s so wind speeds will need to be less than this at the time of measurements.

Another 6 survey pegs will be positioned, with 3 in line at 250 metres, 500 metres and 1000 metres on either side of the haul track at the approximate location of 2/3 from the mine area, that is 1/3 of the distance to the hopper.

A further 8 survey pegs will be positioned, with 2 in each line at 50 metres and 150 metres from the hopper, separated by 90 degrees with one set of pegs in the expected downwind direction. Similarly, this same configuration will be set-up around the wet concentrator plant, except the distances will be 250 metres and 750 metres.

Refer to *Appendix C* for the measurement locations.

For each of the noise sources, near-field measurements will also be undertaken. For instance, each haultruck and the excavator will be measured at a distance of around 15 metres whilst individual pumps and the like may be measured at around 1-3 metres. These will be used to determine an indicative sound power level for modelling purposes and confirm the information provided by the suppliers.

During the first and second week of mining, observations and measurements will be undertaken during the night (one night during each week) near the *BarnOwl* (or similar) location at House 3B (assuming permission can be obtained).

The first report will be produced 1-month after mining has commenced. This will enable the first 2-weeks of monitoring to be analysed and included as well as the measurements undertaken to calibrate the model. The report will also include any revisions necessary to the separation distances specified in *Table 2.1*, the results of the night-time monitoring and documentation of any noise-related complaints.

A second report will be produced after 1-½ months of mining. This will report the results of the *BarnOwl* (or similar) during the first month of mining, any noise-related complaints and the results of night-time observations and measurements during weeks 3 & 4 (one during each week).

Further reports will follow on a monthly basis, which would provide the results and analysis of the *BarnOwl* (or similar) and any noise-related complaints.

4.3 Quarter 2

Appendix A contains *Figure 2*, which shows the area within Lot 63 that is proposed to be mined. The area to be mined is shown as a blue circle denoting the 100m x 100m grid that will be mined. In this second quarter, 37 blocks are scheduled for mining. These are contained within areas designated acceptable for Day Only, Day and Evening Mining and Day, Evening and Night Mining.

Stripping of topsoil will utilise the same equipment (or acoustically equivalent) as mining operations and will be managed in the same way as the mining activities. During the day period, mining will only be undertaken in the area designated as Day Only, with preference given to mining the north-eastern most areas under easterly winds where practicable.

During the evening period, mining will only be undertaken in the area designated as Day and Evening and during the night, the only mined area will be within that designated Day, Evening and Night. As per Quarter 1, prior to each day and night of mining, wind conditions will be checked.

The hopper and wet concentrator plant remain unchanged compared to Quarter 1 mining.

House 3B is again the closest residence with mining between 550 metres and 2200 metres. Provided below are the expected sound pressure levels to House 3B for the mining operation with those for the hopper and wet plant unchanged from Quarter 1.

Table 4.3.1 –Noise Levels [dB, L_{A10}] from Mining Plant at House 3B

Location	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Closest	45	39	37	38	44	46	46	46	37 - 45
Furthest	23	20	20	25	29	29	29	29	20 – 29

Note: The noise levels with wind assume a speed of 3m/s and Pasquill Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F.

Noise from the mobile plant will need to be managed at all times of the day based on the previously advised distances depending on the presence of tonality and expected weather conditions.

During the first and second weeks of mining, observations and measurements will be undertaken at House 3B during the day, since daytime mining will be just over 500 metres from the residence. For the first month, *BarnOwl* (or similar) will be downloaded fortnightly and then monthly after that with reports produced at Weeks 4, 8, 13 and at the start of Quarter 4.

4.4 Quarter 3

Appendix A contains Figure 3, which shows the area within Lots 62, 63 & 6 that are proposed to be mined. The area to be mined is shown as a black circle denoting the 100m x 100m grid that will be mined. In this third quarter, 38 blocks are scheduled for mining. These are contained within areas designated acceptable for Day Only, Day and Evening Mining and Day, Evening and Night Mining.

Stripping of topsoil will utilise the same equipment (or acoustically equivalent) as mining operations and will be managed in the same way as the mining activities. During the day period, mining will only be undertaken in the area designated as Day Only, with preference given to mining the northern most areas under northerly winds. During the evening period, mining will only be undertaken in the area designated as Day and Evening and during the night, the only mined area will be within that designated Day, Evening and Night.

The hopper and wet concentrator plant remain unchanged compared to Quarters 1 & 2 mining.

House 3B is again the closest residence with mining between 565 metres and 2200 metres. Provided below are the expected sound pressure levels to House 3B for the mining operation with those for the hopper and wet plant unchanged from Quarter 1.

Table 4.4.1 –Noise Levels [dB, L_{A10}] from Mining Plant at House 3B

Location	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Closest	38	40	46	48	48	48	47	41	38 - 47
Furthest	22	20	22	29	30	30	30	30	20 - 30

Note: The noise levels with wind assume a speed of 3m/s and Pasquill Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F.

Noise from the mobile plant will need to be managed at all times of the day based on the previously advised distances depending on the presence of tonality and expected weather conditions.

Downloading of the *BarnOwl* and reporting of data will continue on a monthly basis through this period.

4.5 Quarter 4

Quarter 4 mining is similar to that of Quarter 3 mining and House 3B will again be the closest, although mining is progressively getting closer to Houses 3 and 4 – refer *Appendix A Figure 4*. As such the *BarnOwl* will be relocated to House 3, which is the next closest. By the end of this quarter, Lot 63 mining is complete.

Trucks will still haul from the mine area to the same hopper location and the wet plant will still be the same as the earlier quarters.

House 3 is 800 metres from the closest part of the mine area and 3300 metres from the furthest part of the mine area during Quarter 4. The house is 1800 metres from the hopper and 1500 metres from the wet plant. Provided below are the expected sound pressure levels to House 3 for the various items of plant under various wind conditions.

Table 4.5.1 –Noise Levels [dB, L_{A10}] from Wet Concentrator Plant at House 3

Wind								
N	NE	E	SE	S	SW	W	NW	Calm
16	18	24	24	24	24	22	17	14 - 24

Note: The noise levels with wind assume a speed of 3m/s and Pasquill Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F.

Table 4.5.2 –Noise Levels [dB, L_{A10}] from Hopper at House 3

Scenario	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Hopper Only	0	0	1	8	8	8	8	4	0 - 7
Hopper & FEL	21	21	24	30	30	30	30	27	20 – 30

Note: The noise levels with wind assume a speed of 3m/s and Pasquil Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F. A 2 metre high bund surrounds the hopper. No bund is assumed around the loader.

Table 4.5.3 –Noise Levels [dB, L_{A10}] from Mining Plant at House 3

Location	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Closest	34	32	34	41	42	42	42	41	32 – 41
Furthest	16	14	15	22	24	24	24	24	14 - 24

Note: The noise levels with wind assume a speed of 3m/s and Pasquil Stability Factor Type F. For calm conditions, a range is provided being for Pasquil Stability Factor Type B to F.

The modelling indicates noise from the fixed plant will be below the most stringent night-time assigned noise level at all times and is unlikely to be audible given the relatively low levels. Although noise from the loader, without a bund, is acceptable at House 3, the stockpile would still be required for House 3B.

Noise from the mobile plant during topsoil removal and mining operations will need to be managed at all times of the day based on the previously advised distances depending on the presence of tonality and expected weather conditions.

Noise levels at this house are expected to be no different from those at House 3B and as such, no on site observations are proposed, although the *BarnOwl* will continue to monitor noise levels.

4.6 Quarter 5

Appendix A contains Figure 5, which shows the area within Lots 62 & 6 that are proposed to be mined. The area to be mined is shown as a blue circle denoting the 100m x 100m grid that will be mined. In this fifth quarter, 38 blocks are scheduled for mining. These are contained within areas designated acceptable for Day Only, Day and Evening Mining and Day, Evening and Night Mining.

Stripping of topsoil will utilise the same equipment (or acoustically equivalent) as mining operations and will be managed in the same way as the mining activities. During the day period, mining will only be undertaken in the area designated as Day Only, with preference given to mining the northern most areas under northerly winds. During the evening period, mining will only be undertaken in the area designated as Day and Evening and during the night, the only mined area will be within that designated Day, Evening and Night.

The hopper and wet concentrator plant remain unchanged compared to previous Quarters.

The *BarnOwl* will remain at House 3, which will be between 600 metres and 3500 metres from the mine area. Provided below are the expected sound pressure levels for the mining operations to House 3.

Table 4.6.1 –Noise Levels [dB, L_{A10}] from Mining Plant at House 3

Location	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Closest	36	36	41	45	45	45	45	39	35 - 44
Furthest	14	12	15	23	23	22	22	22	12 - 22

Note: The noise levels with wind assume a speed of 3m/s and Pasquil Stability Factor Type F. For calm conditions, a range is provided being for Pasquil Stability Factor Type B to F.

Noise from the mobile plant will need to be managed at all times of the day based on the previously advised distances depending on the presence of tonality and expected weather conditions.

Downloading of the *BarnOwl* and reporting of data will continue on a monthly basis through this period.

4.7 Quarter 6

Quarter 6 mining is similar to that of Quarter 5 mining, however House 4 becomes the closest - refer *Appendix A Figure 6*. As such the *BarnOwl* will be relocated to House 4.

Trucks will still haul from the mine area to the same hopper location and the wet plant will still be the same as the earlier quarters.

House 4 is 500 metres from the closest part of the mine area and 3600 metres from the furthest part of the mine area during Quarter 6. The house is 2000 metres from the hopper and 1300 metres from the wet plant. Provided below are the expected sound pressure levels to House 4 for the various items of plant under various wind conditions.

Table 4.7.1 –Noise Levels [dB, L_{A10}] from Wet Concentrator Plant at House 4

Wind								
N	NE	E	SE	S	SW	W	NW	Calm
16	16	21	25	25	25	25	19	15 - 24

Note: The noise levels with wind assume a speed of 3m/s and Pasquil Stability Factor Type F. For calm conditions, a range is provided being for Pasquil Stability Factor Type B to F.

Table 4.7.2 –Noise Levels [dB, L_{A10}] from Hopper at House 4

Scenario	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Hopper Only	0	0	0	6	7	7	7	7	0 - 7
Hopper & FEL	21	19	21	28	29	29	29	29	19 – 29

Note: The noise levels with wind assume a speed of 3m/s and Pasquill Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F. A 2 metre high bund surrounds the hopper. No bund is assumed around the loader.

Table 4.7.3 –Noise Levels [dB, L_{A10}] from Mining Plant at House 4

Location	Wind								
	N	NE	E	SE	S	SW	W	NW	Calm
Closest	40	37	39	44	47	47	47	46	37 – 46
Furthest	14	12	14	22	22	22	22	23	12 – 23

Note: The noise levels with wind assume a speed of 3m/s and Pasquill Stability Factor Type F. For calm conditions, a range is provided being for Pasquill Stability Factor Type B to F.

The modelling indicates noise from the fixed plant will be below the most stringent night-time assigned noise level at all times and is unlikely to be audible given the relatively low levels. Although noise from the loader, without a bund, is acceptable at House 3, the stockpile would still be required for House 3B.

Noise from the mobile plant during topsoil removal and mining operations will need to be managed at all times of the day based on the previously advised distances depending on the presence of tonality and expected weather conditions.

Observations and noise measurements will be undertaken at House 4 during the day whilst mining occurs in the north-eastern most point. *BarnOwl* monitoring and report will continue on a monthly basis.

5 SUMMARY OF NOISE MONITORING PLAN

Outlined below are simplistic dot points of the proposed monitoring plan:

Prior to Mining

- Ensure suppliers provide certificates of evidence showing noise specifications are met.
- Set-up *BarnOwl* monitor at House 3B and measure background noise for a minimum 1-month period.
- Results of background monitoring are to be downloaded and presented in report format.

Quarter 1

- Review historical wind data for relevant months to gain an understanding of expected wind directions, strengths and the monthly and day/night trends;
- Q1 Week 1
 - Identify area that will be mined on a particular day and have in place the necessary survey pegs to ensure known distances from the mine and equipment;
 - Undertake noise level measurements during the day at these survey pegs to gain an understanding of the sound level over time and under different wind directions;
 - Undertake noise level measurements during the night at House 3B.
- Q1 Week 2
 - Undertake noise level measurements during the night at House 3B;
 - Download *BarnOwl*.
- Q1 Week 3
 - Undertake a night-time measurement at House 3B;
 - Analyse *BarnOwl* measurements and night-time measurements.
- Q1 Week 4
 - Undertake a night-time measurement at House 3B;
 - Continue to analyse measurements, calibrate noise model and present results in Report;
 - Download *BarnOwl*.
- Q1 Weeks 5-6
 - Data analysis and Report including analysis up to Week 4;
 - Download *BarnOwl*.
- Q1 Weeks 7-10
 - Data analysis and Report including analysis up to Week 6;
 - Download *BarnOwl*.
- Q1 Weeks 11-13 to Q2 Weeks 1 to 2
 - Data analysis and Report including analysis to end of Quarter 1 (Week 13);
 - Download *BarnOwl*.

Quarter 2

- Review historical wind data for relevant months to gain an understanding of expected wind directions, strengths and the monthly and day/night trends.

- Q2 Week 1
 - Undertake measurements during the day at House 3B, assuming the mining area will be that closest to the house during this time.
- Q2 Week 2
 - Undertake measurements during the day at House 3B, assuming the mining area will be that closest to the house during this time.
 - Report for Quarter 1 monitoring;
 - Download *BarnOwl*.
- Q2 Weeks 3-4
 - Analyse and report first 2 weeks of monitoring including *BarnOwl* and site observations and measurements;
 - Download *BarnOwl*.
- Q2 Weeks 5-8
 - Analyse and report first 4 weeks of *BarnOwl* monitoring;
 - Download *BarnOwl*.
- Q2 Weeks 9-13
 - Analyse and report Weeks 5-8 *BarnOwl* monitoring;
 - Download *BarnOwl*.

Quarter 3

- Review historical wind data for relevant months to gain an understanding of expected wind directions, strengths and the monthly and day/night trends.
- Q3 Weeks 1-4
 - Analyse and report Q2 Weeks 9-13;
 - Download *BarnOwl*.
- Q3 Weeks 5-9
 - Analyse and report Q3 Weeks 1-4;
 - Download *BarnOwl*.
- Q3 Weeks 10-13
 - Analyse and report Q3 Weeks 5-9;
 - Download *BarnOwl*.

Quarter 4

- Review historical wind data for relevant months to gain an understanding of expected wind directions, strengths and the monthly and day/night trends.
- Relocate *BarnOwl* to House 3.

- Q4 Weeks 1-4
 - Analyse and report Q3 Weeks 10-13;
 - Download *BarnOwl* .
- Q4 Weeks 5-9
 - Analyse and report Q4 Weeks 1-4;
 - Download *BarnOwl*.
- Q4 Weeks 10-13
 - Analyse and report Q4 Weeks 5-9;
 - Download *BarnOwl*.

Quarter 5

- Review historical wind data for relevant months to gain an understanding of expected wind directions, strengths and the monthly and day/night trends.
- Q5 Weeks 1-4
 - Analyse and report Q4 Weeks 10-13;
 - Download *BarnOwl*.
- Q5 Weeks 5-9
 - Analyse and report Q5 Weeks 1-4;
 - Download *BarnOwl*.
- Q5 Weeks 10-13
 - Analyse and report Q5 Weeks 5-9;
 - Download *BarnOwl*.

Quarter 6

- Review historical wind data for relevant months to gain an understanding of expected wind directions, strengths and the monthly and day/night trends.
- Q6 Weeks 1-4
 - Undertake measurements during the day at House 4, assuming the mining area will be that closest to the house during this time.
 - Analyse and report Q5 Weeks 10-13;
 - Download *BarnOwl*
- Q6 Weeks 5-9
 - Analyse and report Q6 Weeks 1-4;
 - Download *BarnOwl*

- Q6 Weeks 10-13
 - Analyse and report Q6 Weeks 5-9;
 - Download *BarnOwl*
- Q7 Weeks 1-2
 - Relocate logger where appropriate;
 - Review expected noise levels and repeat above analysis;
 - Analyse and report Q6 Weeks 10-13.

6 DAILY OPERATIONAL PROCEDURE

Prior to the start of each shift, Matilda personnel will:

- Check expected wind conditions;
- Based on these wind conditions, identify areas to be worked during the day, evening & night periods. Where night period is identified as being restricted, ensure stockpile has sufficient ore to allow front end loader direct feed to the hopper. Confirm noise impacts with reference to the *Noise Impacts* spreadsheet¹;
- The site supervisor will use a hand held GPS unit to locate the appropriate mine area for each shift. The excavator will then be located in this area. Where the mine area is close to a critical line (e.g. cross-over between Day, Evening, Night and Day, Evening areas), this lined would be pegged.
- As above, identifying a haul route to minimise noise impacts;
- Debrief the operational staff, including:
 - Discussion of any noise complaints from earlier shifts and the outcomes etc;
 - Identification of area to be mined;
 - Identification of haul route (i.e. to maximise separation distance to houses);
 - Expected wind conditions and therefore locations of critical residences).

In addition to the above, work areas will contain a wind mast to show the current wind direction. The fixed wind monitoring station will also continually record this data and should either show a significant change of direction (> 45 degrees) during a shift, the noise impacts and therefore current mining area would be re-examined.

¹ It is planned to develop an Excel spreadsheet to be used by Matilda personnel that will allow them to enter the mine area coordinates and wind conditions before each shift (or as conditions change). The spreadsheet will then advise the likely noise levels at the residences so that Matilda can make active decisions about least sensitive mine areas.

7 COMPLAINTS RESPONSE PROCEDURE

The Environmental Officer is responsible for ensuring that all complaints (noise and dust) are recorded, investigated and that feedback is provided to the complainant in a reasonable time period.

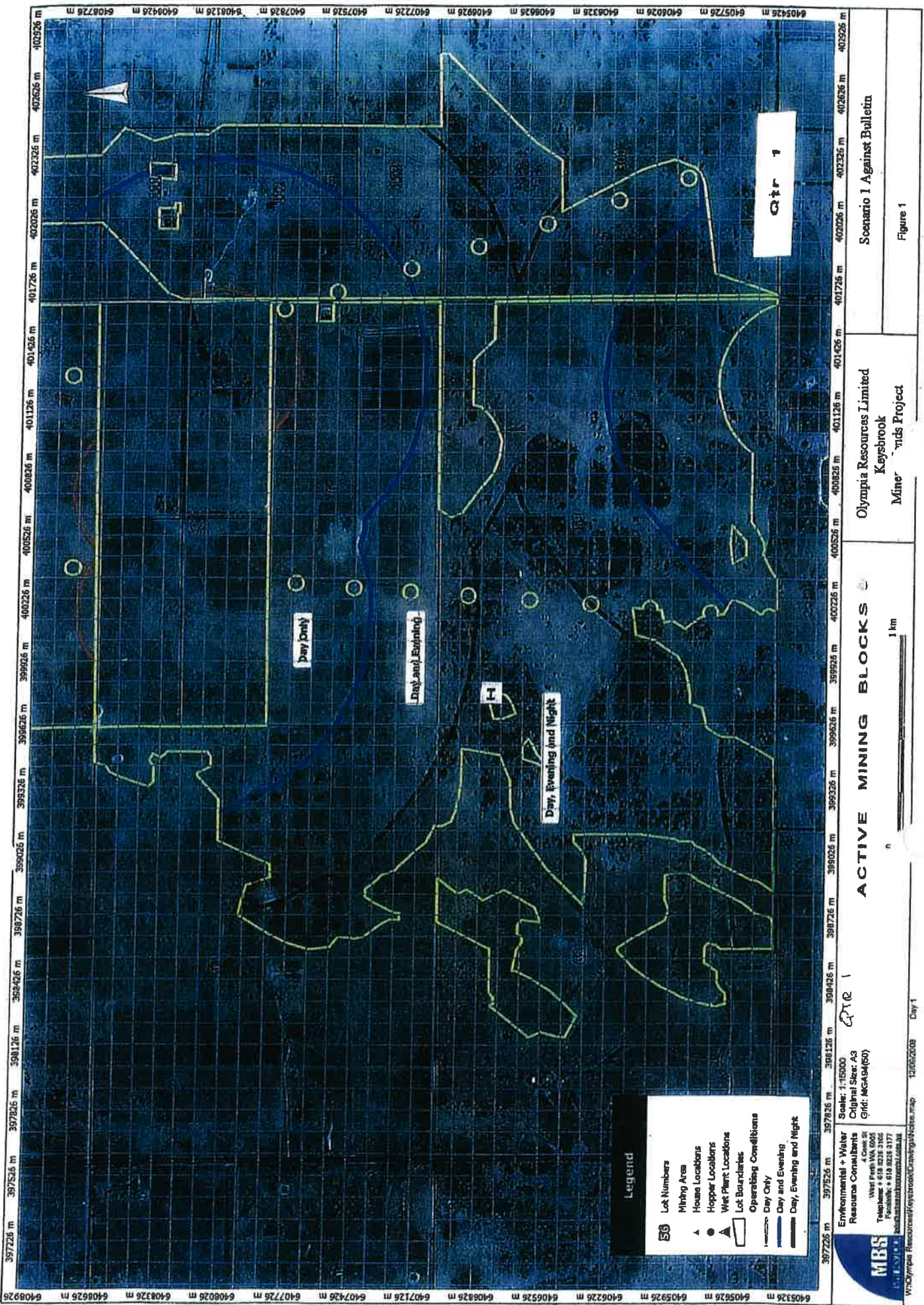
The Environmental Officer is responsible for ensuring that:

- All complaints (noise and dust) from members of the public and landowners are documented on the site complaint form. This is to include the person's details including name, address, contact number, time of complaint and description.
- Completed forms are filed in the Environmental Records file.
- Once a complaint is received, the time of the complaint is compared to dust/noise monitoring, the equipment locations and wind speeds and direction to determine the validity of the complaint.
 - Possible sources of the noise/dust are to be identified and investigated.
 - Where necessary, the Environmental Officer will attend the residence. Where the complaint is related to noise, the on-site sound level meter will be used to record the L_{A90} , L_{A10} , L_{A1} and L_{Amax} values with 1/3-octave band plot where necessary. Where relevant, the *BarnOwl* outputs will be noted and provided.
 - Any plant or equipment found to be causing excessive noise/dust will cease operation until the necessary modifications are made.
 - Where the noise/dust is not considered excessive, but practicable modifications can be made to lessen the impact, such changes will be implemented.
- Actions arising from the investigation which lead to amendments to site procedures are recorded and reported in the AER.

A blank pro-forma complaint form will be posted on the Matilda Zircon website (<http://www.matildazircon.com.au>), along with site contact details.

APPENDIX A

Quarters 1 to 6 Mine Plans



Legend

- 50 Lot Numbers
- Mining Area
- ▲ House Locations
- Hopper Locations
- ▲ Wet Plant Locations
- Lot Boundaries
- Operating Conditions
- Day Only
- Day and Evening
- Day, Evening and Night

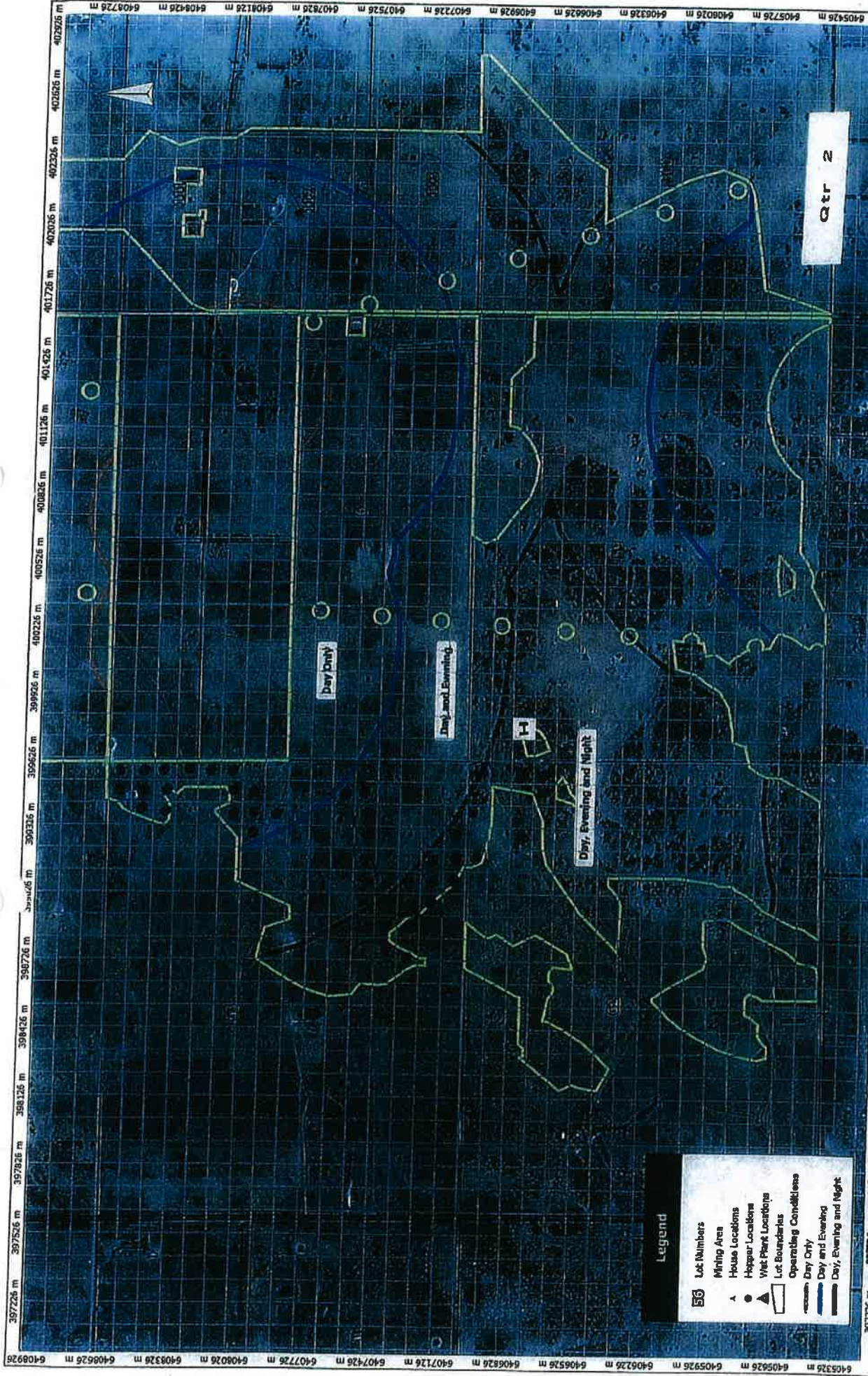
Scale: 1:15000
 Original Size: A3
 Grid: MGA64(50)
 West Perth WA 0005
 Telephone: +61 8 9238 3165
 Facsimile: +61 8 9238 3177
 Email: info@olympiaresources.com.au

ACTIVE MINING BLOCKS

Olympia Resources Limited
 Keysbrook
 Minerals Project

Scenario 1 Against Bulletin

Figure 1



Legend

- 56 Lot Numbers
- Mining Area
- House Locations
- Hopper Locations
- Wet Plant Locations
- Lot Boundaries
- Operating Conditions
 - Day Only
 - Day and Evening
 - Day, Evening and Night

Environmental + Water
 Resource Consultants
 1100 West Park Crescent
 Vancouver, BC V6P 3R8
 Telephone: +1 604 278 3188
 Fax: +1 604 278 3187
 Email: info@erwrc.com

Scale: 1:10000
 Original Size: A3
 GNT: MGA04650

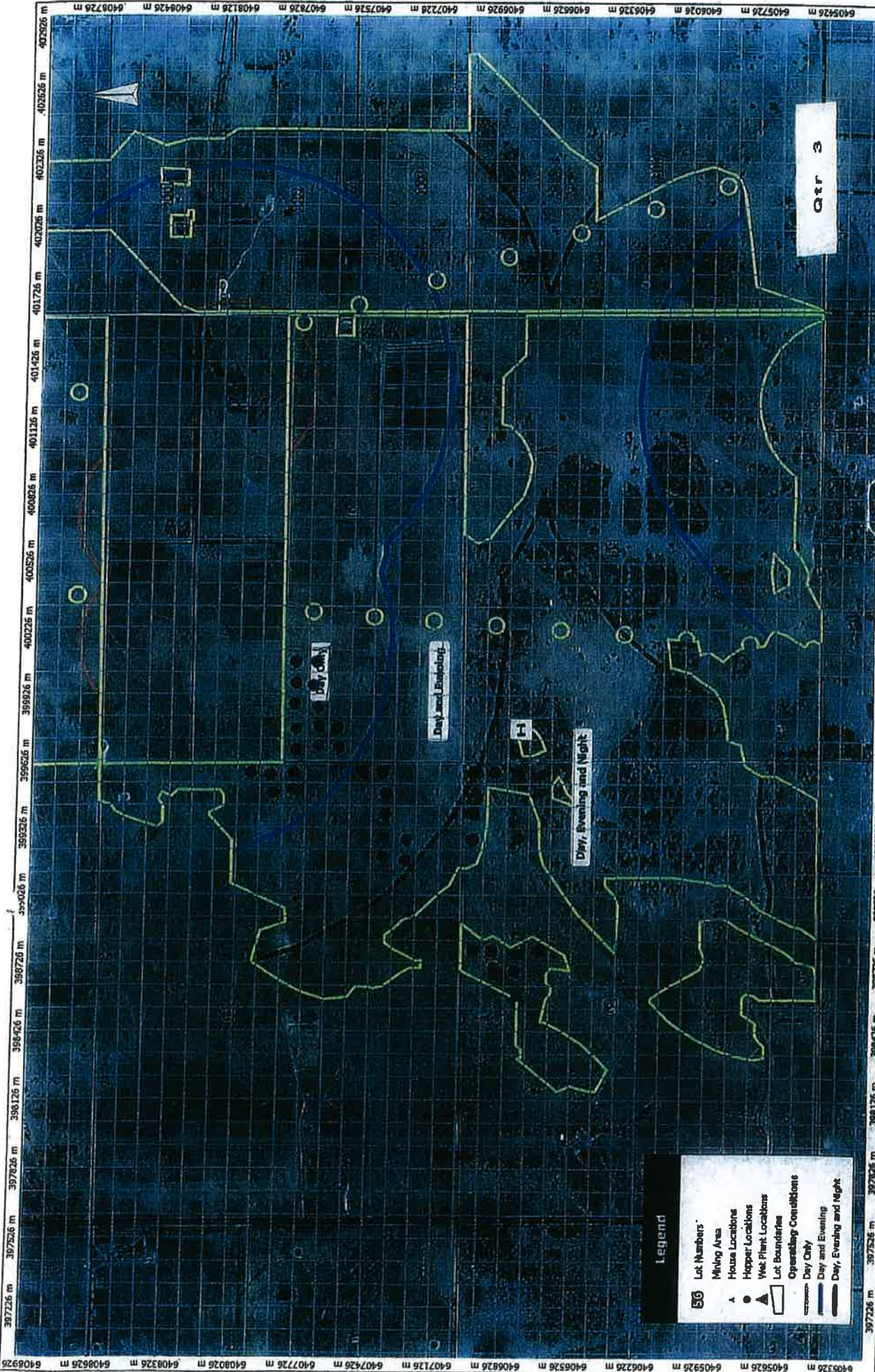
ACTIVE MINING BLOCKS

0 1 km

Olympia Resources Limited
 Keysbrook
 Mineral Sands Project

Scenario 1 Against Bulletin

Figure 2



Legend

- 50 Lot Numbers
- Mining Area
- House Locations
- Hopper Locations
- Wet Plant Locations
- Lot Boundaries
- Operating Conditions
- Day Only
- Day and Evening
- Day, Evening and Night

Scale: 1:15000
 Original SRS: A3
 Grid: MGA84(20)

MBS
 Environmental + Water
 Resource Consultants
 4 Creek Rd
 West Park VA 22686
 Telephone: 810 228 3166
 Email: info@mbresources.com
 www.mbresources.com

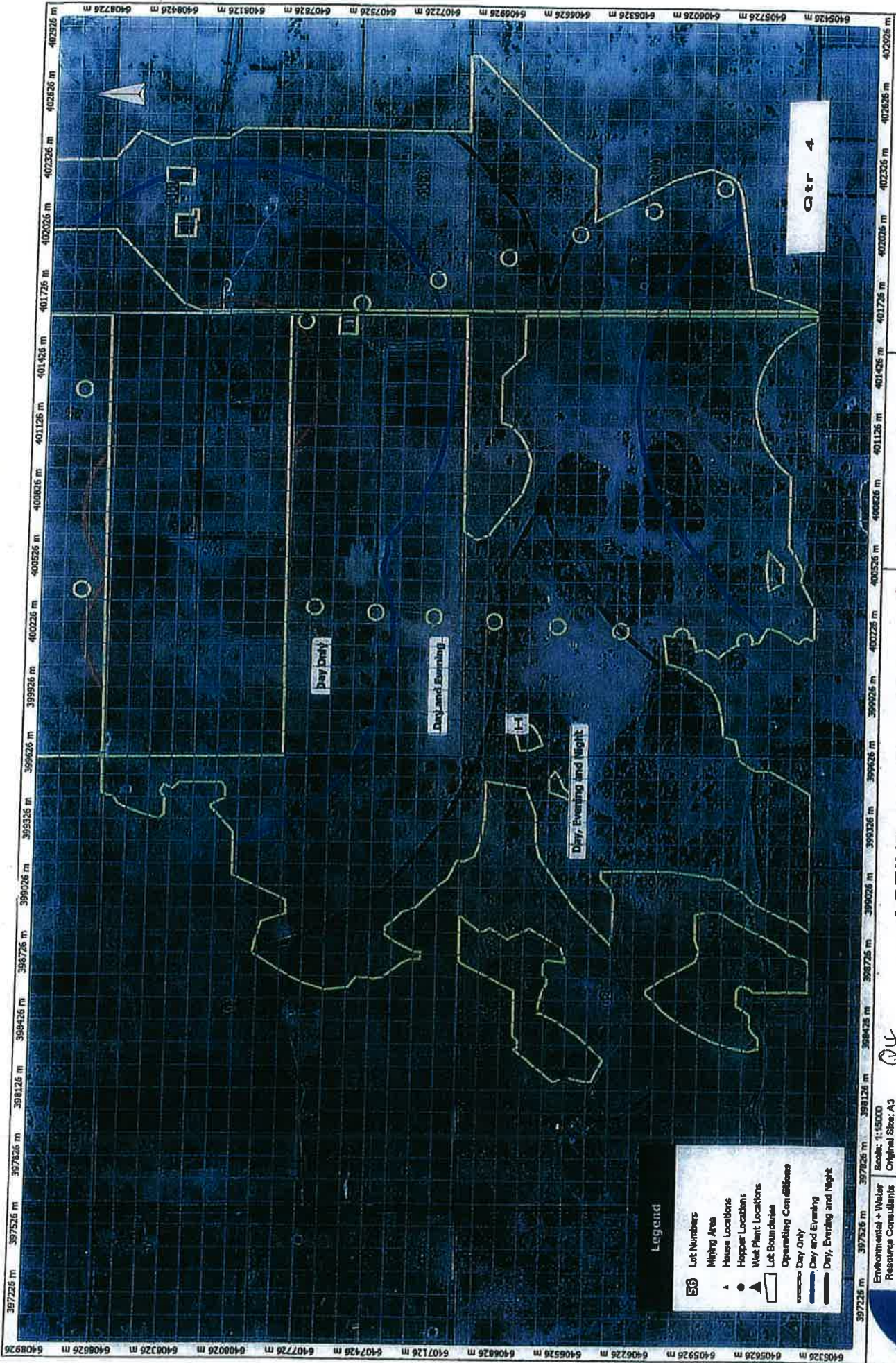
ACTIVE MINING BLOCKS

Olympia Resources Limited
 Keybrook
 Miner's Ponds Project

1 km

Scenario 1 Against Bulletin

Figure 3



Legend

- 50 Lot Numbers
- Mixing Area
- Houra Locations
- Hopper Locations
- Wet Plant Locations
- Lot Boundaries
- Operating Cont. @ Mines
- Day Only
- Day and Evening
- Day, Evening and Night

MBS
 Environmental + Water
 Resource Consultants
 4 Cava
 West Pooka WA 6005
 Telephone: +61 8 9228 5166
 Facsimile: +61 8 9228 5177
 info@mbsresources.com.au

Scale: 1:45,000
 Original Size A3
 Grid: MGA04(60)

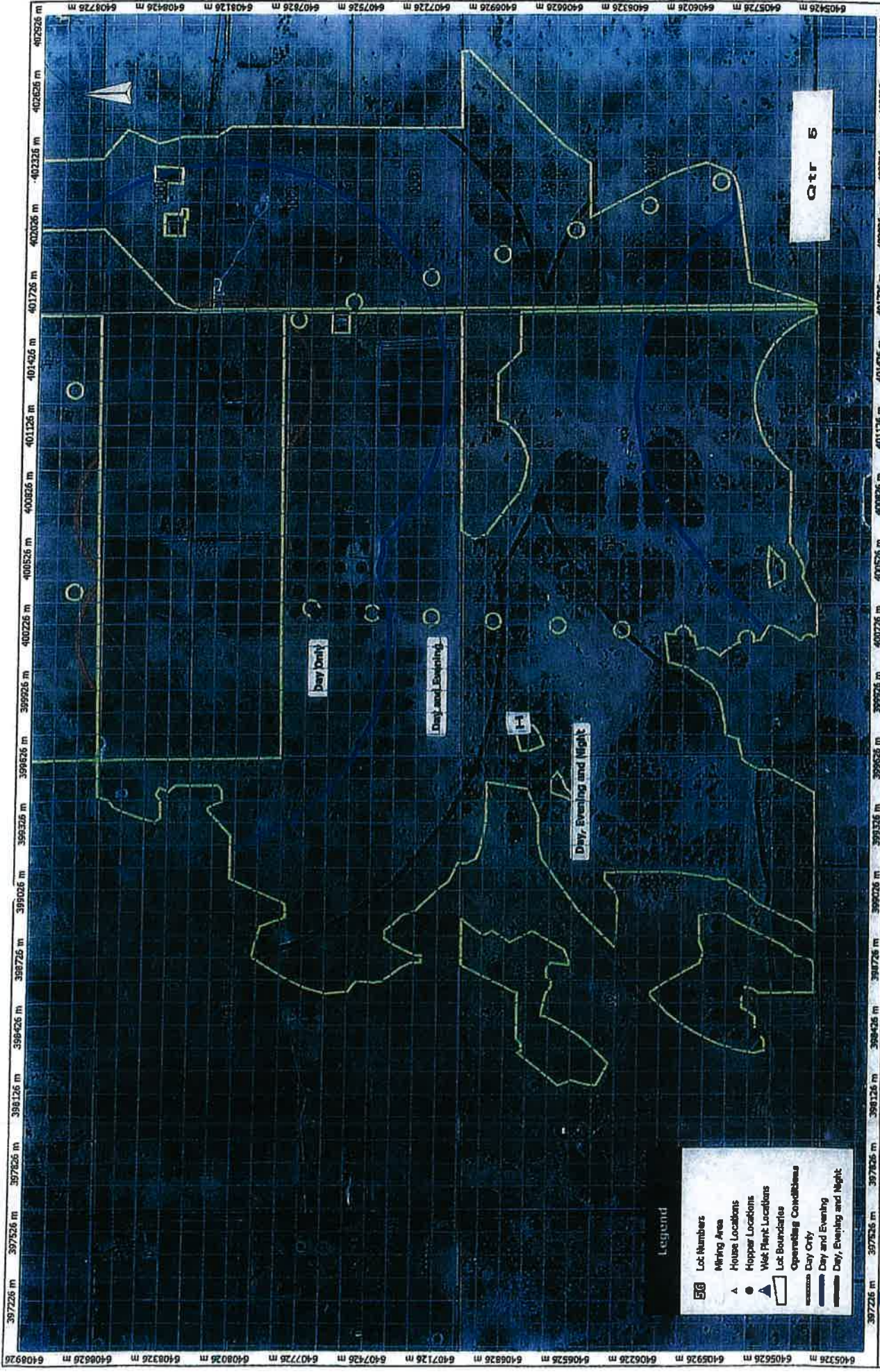
ACTIVE MINING BLOCKS



Olympia Resources Limited
 Keysbrook
 Mineral Sands Project

Scenario 1 Against Bulletin

Figure 4



Legend

- 56 Lot Members
- Mining Area
- House Locations
- Hopper Locations
- Wet Plant Locations
- Lot Boundaries
- Operating Conditions
- Day Only
- Day and Evening
- Day, Evening and Night

Scale: 1:15000
 Original Sbr: A3
 Grid: MGA84(50)

ACTIVE MINING BLOCKS

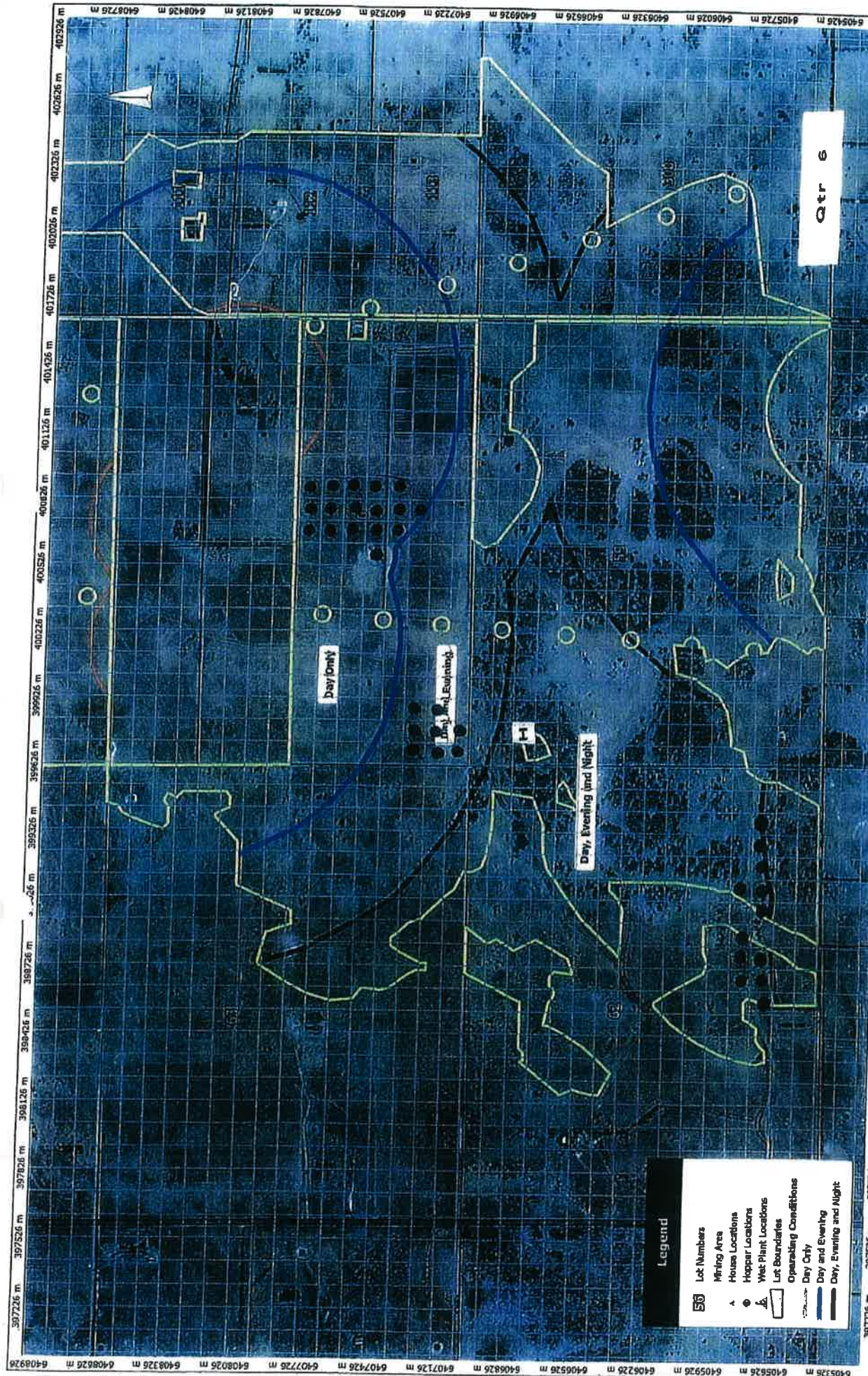
Olympia Resources Limited
 Keysbrook
 Minerals Project

Scenario 1 Against Bulletin

Figure 5

1 km

W:\Olympia Resources\Keysbrook\Mining\Noise.mxd 12/06/2008 Day 1



Qtr 6

Day Only

Day and Evening

Day, Evening and Night

Legend

- 56 Lot Numbers
- Mining Area
- House Locations
- Hopper Locations
- Wet Plant Locations
- Lot Boundaries
- Operating Conditions
 - Day Only
 - Day and Evening
 - Day, Evening and Night

MBS
 Environmental & Water
 Resource Consultants
 Scale: 1:15000
 Original Block A3
 Grid MGA94(50)
 Visit web site at
 www.mbs.com.au
 Telephone: + 618 8228 3188
 Facsimile: + 618 8228 3177
 Email: info@mbs.com.au

ACTIVE MINING BLOCKS

Olympia Resources Limited
 Keystroke
 Mineral Sands Project

Scenario 1 Against Bulletin

Figure 6

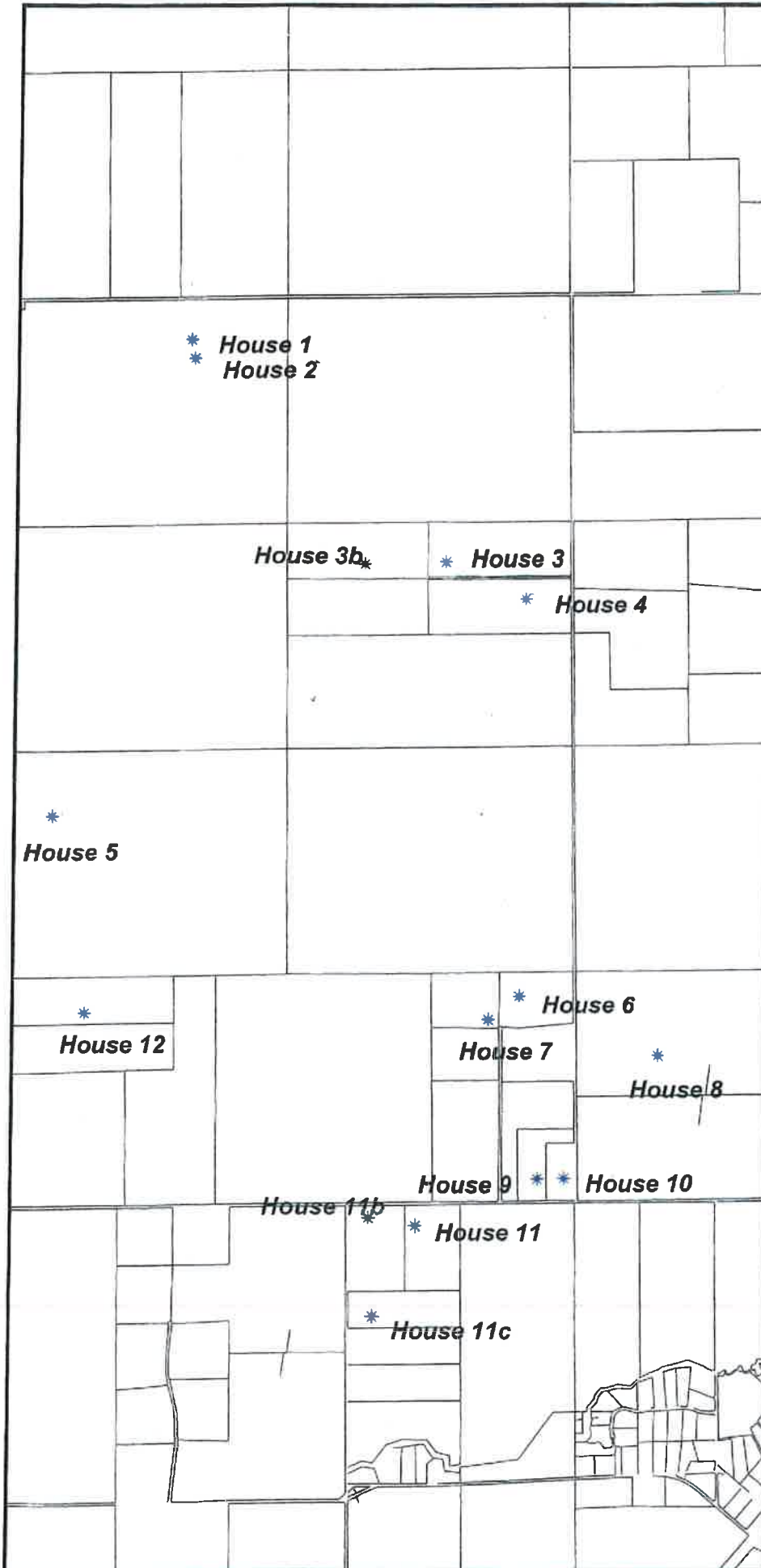
APPENDIX B

House Locations

Figure Ref: B01

OLYMPIA RESOURCES
Keysbrook Mineral
Sands Project

House Locations



Job No. 511442
Client: MBS Environ
Project Engineer: TG



Signs and symbols
* Receiver



Length scale 1:40000



APPENDIX C

Quarters 1 Measurement Locations



- Legend**
- Lot Boundaries
 - Lot Numbers
 - Mining Area
 - Haul Road
 - Initial Mining Block
 - Wet Plant Locations
 - Hopper Locations
 - House Locations
 - Operating Conditions
 - Day Only
 - Day, Evening and Night
 - Day, Evening and Night
 - Noise Peg Locations
 - Excavator Noise Pegs
 - Haul Road Noise Pegs
 - Hopper Noise Pegs
 - Wet Plant Noise Pegs

MBS
 MINERAL
 W:\Olympia Resources\Keybrook\Drawings\Noise2.map SW 10/2008 Day 1

Environmental + Water
 Resources Consultants
 Scale: 1:15000
 Original Size: A3
 Grid: MGA94(60)

West Perth: 100
 Perth: 100
 Telephone: + 618 9228 3158
 Fax: + 618 9228 3177
 Email: info@resources.com.au

0 1 km

Olympia Resources Limited
 Keybrook
 Mineral Sands Project

Measurement Locations (Assume Southwesterly Winds)

Figure 1

APPENDIX D

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)

The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

Sound Power Level (L_w)

Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.

Sound Pressure Level (L_p)

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

L_{ASlow}

This is the noise level in decibels, obtained using the A frequency weighting and the S time weighting as specified in AS1259.1-1990. Unless assessing modulation, all measurements use the slow time weighting characteristic.

L_{AFast}

This is the noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. This is used when assessing the presence of modulation only.

L_{APeak}

This is the maximum reading in decibels using the A frequency weighting and P time weighting AS1259.1-1990.

L_{Amax}

An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

L_{A1}

An L_{A1} level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{A10}

An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "intrusive" noise level.

L_{Aeq}

The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

L_{A90}

An L_{A90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "background" noise level.

One-Third-Octave Band

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.

L_{Amax} assigned level

Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time.

L_{A1} assigned level

Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period.

L_{A10} assigned level

Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period.

Tonal Noise

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

the presence in the noise emission of tonal characteristics where the difference between —

- (a) the A-weighted sound pressure level in any one-third octave band; and
- (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

Modulating Noise

A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of tonality is:

a variation in the emission of noise that —

- (a) is more than 3 dB $L_{A \text{ Fast}}$ or is more than 3 dB $L_{A \text{ Fast}}$ in any one-third octave band;
- (b) is present for at least 10% of the representative

Impulsive Noise

An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of tonality is:

a variation in the emission of a noise where the difference between $L_{A \text{ peak}}$ and $L_{A \text{ Max slow}}$ is more than 15 dB when determined for a single representative event;

Influencing factor

$$= \frac{1}{10} (\% \text{ Type A}_{100} + \% \text{ Type A}_{450}) + \frac{1}{20} (\% \text{ Type B}_{100} + \% \text{ Type B}_{450})$$

where:

$\% \text{ Type A}_{100}$ = the percentage of industrial land within
a 100m radius of the premises receiving the noise

$\% \text{ Type A}_{450}$ = the percentage of industrial land within
a 450m radius of the premises receiving the noise

$\% \text{ Type B}_{100}$ = the percentage of commercial land within
a 100m radius of the premises receiving the noise

$\% \text{ Type B}_{450}$ = the percentage of commercial land within
a 450m radius of the premises receiving the noise

+ Traffic Factor (maximum of 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 100m

Representative Assessment Period

Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

Background Noise

Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

Ambient Noise

Means the level of noise from all sources, including background noise from near and far and the source of interest.

Specific Noise

Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.