Italia Limestone
(Retaining Walls & Marine Civil Construction)
Roadstone Quarries
Donnybrook Stone Company

Italia Stone Group Pty Ltd
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Bibra Lake, Western Australia, 6163
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Email: info@italiastonegroup.com.au

Our Ref: 20180115NLA
15 January 2018

Shire of Northam
PO Box 613
NORTHAM WA 6401

Attention: Town Planning Department
Via email: records@northam.wa.gov.au

Sir / Madam,

APPLICATION FOR DEVELOPMENT APPROVAL AND EXTRACTIVE INDUSTRY LICENCE – PROPOSED SCREENING AND CRUSHING OF APPROXIMATELY 600,000 TONNES OF STOCKPILED HARD-ROCK MATERIAL – LOT 93 ON PLAN 23146, SPENCERS BROOK ROAD, MULUCKINE

Italia Stone is pleased to submit this application for a ten-year time-limited Development Approval under the Shire's Local Planning Scheme No. 6 and an Extractive Industry Licence to operate the quarry under the Shire's Extractive Industries Local Law.

Please find enclosed in support of the application the following:

- Completed and signed Application for Development Approval Form;
- Copy of Certificate of Title;
- The prescribed Application Fee ($739); and
- Electronic Copies of the following plans and documents:
  - ✓ Locality Plan
  - ✓ Certificate of Title
  - ✓ Contour Plot
  - ✓ Noise Sensitive Receiver Map
  - ✓ SPP2.4 'Resource Protection Map'
  - ✓ Acoustic Assessment Report

Hardcopies of the application can be provided upon request.

BACKGROUND
Italia Stone Group Pty Ltd ('Italia Stone') representatives have been negotiating with the landowners of Lot 93 on Plan 23146, Zippo Pty Ltd, to take over the existing hard-rock quarry located at Lot 93 Spencers Brook Road, Muluckine, and to assume responsibility for the ultimate rehabilitation of the quarry site.

We understand that the Council of the Shire of Northam has issued Yarnell Civil & Mining Pty Ltd ('Yarnell') – the current operators of the quarry – an amendment to their original approval (granted by Council at a Special Council Meeting held on 7th April 2010) at its Ordinary Council Meeting held

ABN 29 119 060 543 ACN 119 060 543

on 18th February 2015 (Application No. P1944). The amended approval permitted Yarnell to undertake crushing at the quarry for a maximum period of 12 months, and rehabilitate the site.

It is our understanding is that the previous operator has ceased operations and that their development approval, P1944, has expired on the 1st of June 2017, whereas the EIL is current until 18th January 2018.

This proposal respectfully seeks the following approvals from the Shire of Northam: -

- a ten-year time-limited Development Approval issued under *Shire of Northam Local Planning Scheme No. 6* for the screening and crushing of approximately six hundred thousand (600,000) tonnes of stockpiled hard-rock material at Lot 93 on Plan 23146 in the locations shown on the attached site plan (Figure 1); and
- a fresh ten-year Extractive Industry Licence to operate the quarry, issued under *Shire of Northam Extractive Industries Local Law 2008*.

PROPOSAL

Screening, Crushing and Rehabilitation

It is proposed to screen and crush approximately ninety thousand (90,000) tonnes of previously extracted stockpiled hard-rock per annum over a period of 7 years. Decommissioning and phased rehabilitation of the site will occur over a period of 3 years, with full rehabilitation / closure by January 2028.

No further extraction of hard rock will be undertaken.

Access

Vehicle access is provided from Spencers Brook Road from an existing sealed crossover.

The crossover provides good visibility and clear sightlines for vehicles turning back onto Spencers Brook Road. Spencers Brook Road has a bitumen seal and is suitably constructed for use by heavy vehicles.

Truck Route Along Local Government and State-Controlled Roads

Crushed material will be transported by semitrailer trucks (typical truck volume of 18m^3) from the site via Spencers Brook Road in a southerly direction towards Great Eastern Highway, and then via Great Eastern Highway in a westerly direction towards Perth Metropolitan Area.

Hours of Operation

Hours of operation will be from 07:00 hours to 17:00 hours, Monday to Saturday with haulage trucks arriving from 6:45 am. No work will occur on public holidays.

Note: The project is campaign-driven, and screening / crushing will typically be undertaken in three (3) month stints per annum.

Loads Per Day

Forty (40) truck loads per day, with a maximum of three (3) trucks present at the site at any given time.

Plant and Equipment

The following plant and equipment will be used at the site:

Table 1: Sound Power Level

Plant Type	Brand	Max. Sound Output dB(A)
Excavator	Komatsu PC 300	98
Crusher	Terex J 1175	113
Screening Plant (X3)	McCloskey R 155	101
Drill Rig	Tamrock CHA 1100	118
Dozer	CAT D9	109
Haulage Truck	Standard Semitrailer	102
Front End Loader	Komatsu W 320	105
Quarry Truck	CAT ADT 730	106

Storage of Chemicals (fuels)
Refuelling of vehicles and plant will take place at the site. It is proposed to erect a five thousand (5,000) litre aboveground diesel tank and store three thousand (3,000) litre engine oil (3X 1,000 litre tanks) at the site.

Water Supply
It is proposed to drop a water bore on the site to meet operational demands (e.g. dust management and fire-fighting).

SITE DETAILS

Location
The site is located on Spencers Brook Road in the locality of Muluckine approximately 2 kilometres south west of Northam townsite. A locality plan depicting the location of the site relative to Northam townsite, is attached (**Appendix 1**).

Land Description
The land is legally described as Lot 93 on Plan 23146 on Certificate of Title Vol. 2159, Fol. 986. Lot 93 has a land area of 50.150ha. Limitations, interests, encumbrances and notifications on the title include the following inscription:

> *"THE RIGHT TO MINES OF COAL OR OTHER MINERALS BEING EXCLUDED FROM PORTION OF THE SAID LAND"*

The Certificate of Title for the property is attached and marked as **Appendix 2**.

Lot	Certificate of Title	Area	Landowners
Lot 1 on Plan 23146	Volume 2159 Folio 986	18.150ha	Zippo Pty Ltd of RMB 120, Jennacubbine

Topography
The natural topography of some areas of the site have been disturbed by hard rock extraction activity. The site generally slopes in an east-westly direction (from approx. 158m AHD (west) to approx. 210m AHD (east)). Italia Stone recently engaged a Licensed Land Surveyor to accurately plot the contours of the quarry site. Please refer **Appendix 3**.

Surrounding Land Uses
The site is in a predominantly rural setting. The predominant land uses surrounding the quarry site are cropping, grazing and the agistment of horses. Neighbouring lots are zoned 'Rural' under the Shire's local planning scheme.

A plan has been prepared to identify dwellings and their approximate distances from the proposal. Refer **Appendix 4**.

Aboriginal, State and Local Heritage Considerations

Aboriginal

A search of the Aboriginal Heritage Inquiry System was conducted in November 2017 and no Registered Aboriginal Sites or Other Heritage Places were identified to be within Lot 93.

State Heritage List

A search of the State Heritage List was conducted in November 2017 and no sites of State Heritage significance were identified to be within Lot 93.

Shire of Northam Municipal Heritage Inventory

Lot 93 is not listed in the Shire's Municipal Heritage Inventory.

Bushfire Considerations

The quarried area is relatively clear of vegetation. Machinery will be parked within cleared areas on the site. It is considered that the proposed activities will neither be vulnerable to bushfire, nor would it introduce a bushfire hazard.

Lot 93 is identified on the *Map of Bush Fire Prone Areas 2016* within a bushfire prone area. Notwithstanding, the proposed activities do not include any buildings or dwellings.

LOCAL PLANNING FRAMEWORK

Shire of Northam Local Planning Strategy – July 2013

The Shire's Local Planning Strategy (LPS) acknowledges on p24 the importance and need to secure the long-term protection of mineral resources and basic raw materials in the Shire.

It is a key strategy in the LPS to ensure that the development and use of land in the Shire for extractive industry purposes *complies with all relevant legislation, policies, guidelines and codes of practice applicable at the time including any Extractive Industries Local Law*.

With regards to buffer areas, the LPS on p49 encourages and supports the appropriate management and monitoring of industries to ensure that emissions do not exceed acceptable levels at the outer boundary of their defined buffer areas.

Shire of Northam Local Planning Scheme No.6

Zoning

Lot 93 on Plan 23146 is zoned "Rural" under the Shire's Local Planning Scheme.

It is an objective of the Rural zone to *provide for horticulture, extensive and intensive agriculture, agroforestry, local services and industries, extractive industries and tourist uses which ensure conservation of landscape qualities in accordance with the capability of the land.*

Special Provisions

According to the Scheme Map, Lot 93 is located within the Landscape Protection Special Control Area (SCA2) of the Scheme.

The purpose of SCA2 is to -

- Preserve the visual amenity and landscape quality of the area;
- Avoid development which would negatively impact upon the ecological values and landscape qualities of the area; and

- Ensure that land use in the area, including grazing, mining activities and recreational activities does not degrade the area.

The term "industry – extractive" is defined as follows in the Scheme:

"industry - extractive" means an industry which involves the extraction, quarrying or removal of sand, gravel, clay, hard rock, stone or similar material from the land and includes the treatment and storage of those materials, or the manufacture of products from those materials on, or adjacent to, the land from which the materials are extracted, but does not include industry – mining;

General Development Requirements
Clause 4.25 of the Scheme sets out the circumstances under which extractive industries will be supported by the Shire (subclause 4.25.1), material to be accompanied by any development application (subclause 4.25.2), and the scope of conditions the Shire may consider imposing on any development approval.

Schedule 2 – Deemed Provisions for Local Planning Schemes of the Planning and Development (Local Planning Schemes) Regulations 2015
Several sections of the deemed provisions for local planning schemes are relevant to this proposal, and in particular the relevant sections of Clause 67 – Matters to be considered by local government.

Local Planning Policies
Shire of Northam Local Planning Policy Number 21 – Extractive Industry

The objectives of the Policy are to: -
- Assist Council in determining applications for Extractive Industries by providing general guidelines and outlining matters Council will have regard for in assessing applications;
- Outline the information to be provided by applicants when requesting Development Approval for Extractive Industry;
- Provide for appropriate 'buffers' between Extractive Industries and sensitive land uses;
- Protect and maintain the existing landscape character, native vegetation, productive agricultural uses and general amenity of the Shire;
- Ensure those portions of Shire of Northam controlled roads affected by the activities relating to Extractive Industries are maintained to a minimum acceptable standard at no extra burden of cost to Council;
- Prescribe an annual road maintenance contribution, applicable to all Extractive Industries within the Shire of Northam, for recovery of expenses towards maintenance and repair of roads due to heavy and/or extraordinary traffic associated with the operation of an Extractive Industry, in keeping with Sections 84 and 85 of the *Road Traffic Act 1974*; and
- Ensure that the prescribed road maintenance contribution correlates with activity and usage of the Shire of Northam road network.

The Policy also provides guidance on -
- the information to be submitted with a development application; and
- the matters the Shire will have regard for when considering an application for development approval.

STATE PLANNING FRAMEWORK

State Planning Policy 2.4 – Basic Raw Materials (SPP2.4)

SPP2.4 sets out the matters which are to be considered and given effect to by the Western Australian Planning Commission (WAPC) and local governments in considering zoning, subdivision and development applications for extractive industries.

The objectives of SPP2.4 are as follows:

- the location and extent of known basic raw material resources;
- protect priority resource locations, key extraction areas and extraction areas from being developed for incompatible land uses which could limit future exploitation;
- ensure that the use and development of land for the extraction of basic raw materials does not adversely affect the environment or amenity in the locality of the operation during or after extraction; and
- provide a consistent planning approval process for extractive industry proposals including the early consideration of sequential land uses.

Lot 93 has been identified as "Extraction Area" on the Policy Area – Resource Protection Map (Figure 2) in SPP2.4. Refer **Appendix 5**.

State Planning Policy 2.5 – Rural Planning

SPP2.5 is the basis for planning and decision-making for rural and rural living land across Western Australia.

It is a key-objective (Section 4(c)) of SPP2.5 *to secure significant basic raw material resources and provide for their extraction.*

SPP2.5 acknowledges that *basic raw materials are essential for the construction of buildings, roads and other infrastructure, and also for the sustainability of agricultural production*.

In accordance with Clause 5.12.1(b) of the Policy, *where a development is proposed for a land use that may generate off-site impacts, there should be application of the separation distances used in environmental policy and health guidance, prescribed standards, accepted industry standards and/or Codes of Practice, followed by considering –*

(i) whether the site is capable of accommodating the land use; and/or

(ii) whether surrounding rural land is suitable, and can be used to meet the separation distances between the nearest sensitive land use and/or zone, and would not limit future rural land uses; and

(iii) whether if clauses (i) and/or (ii) are met, a statutory buffer is not required;

State Planning Policy 4.1 – State Industrial Buffer

The objectives of this policy are:

- To provide a consistent state-wide approach for the definition and securing of buffer areas around industry, infrastructure and some special uses;
- To protect industry, infrastructure and special uses from the encroachment of incompatible land uses;
- To provide for the safety and amenity of land uses surrounding industry, infrastructure and special uses; and
- To recognise the interests of existing landowners within buffer areas who may be affected by residual emissions and risks, as well as the interests, needs and economic benefits of existing industry and infrastructure which may be affected by encroaching incompatible land uses.

RELEVANT PLANNING CONSIDERATIONS

Buffers

In accordance with Clause 5.12.1(c) of SPP2.5, where a development is proposed for a land use that may generate off-site impacts and does not meet the standard outlined in clause 5.12.1 (b) (refer State Planning Framework – Spp2.5 of this report), then more detailed consideration of off-site impacts will be required.

Noise emitted by quarry activities is governed by the *Environmental Protection (Noise) Regulations 1997* (the Regulations). Regulations 7, 8 and 9 cover such activities.

Italia Stone considers that noise and vibrations are aspects of the proposal that may generate off-site impacts. Italia Stone has consequently engaged SLR Consulting Australia Pty Ltd to to undertake a desktop assessment (modeling) of acoustic effects associated with the proposed activities, to evaluate compliance with relevant regulations, and if necessary, identify appropriate in-principle noise control measures to achieve compliance with the Regulations.

An acoustic assessment report titled "Northam Quarry Extension - Report Number 675.11297-R01" dated 18 December 2017 is attached. Refer **Appendix 6**.

Note: Dust modelling was not undertaken as it is considered that dust can be managed effectively at the site through the application of 'best practice' site management practices.

Methodology

The noise assessment methodology is set out under Part 4 of the report.

Findings

SLR's modelling identifies in Table 5 (page 9) that the cumulative noise levels from the operation of the drilling rig, screening plant and crusher would – if not mitigated – result in exceedance of the daytime criteria at both noise sensitive receiver (NSR) locations as follows:

Table 1 Predicted Noise Levels at NSRs (without mitigation)

NSR	Noise level L_{A10} dB				Expected outcome
	Daytime		Night-time		
	Predicted	Criteria	Predicted	Criteria	
NSR 1	52	45	23	35	Daytime Exceedance
NSR 2	53	45	25	35	Daytime Exceedance

Potential Mitigation Options for Achieving Compliance with the Regulations

Italia Stone intends to mitigate and control noise emissions from the operation of the drilling rig, screening plant and crusher by:

1. Staggering drilling, screening and crushing activities to maintain cumulative levels below the prescribed criteria and continuously monitor these noise levels to ensure compliance with the criteria.
2. Making use of localised bunding and/or screening. It is proposed to create bunds at least 1 metre higher than the noise generating element(s) of the plant, and by selecting optimum orientation for screening devices.

Based on the topography and plant location (refer to Figure 4 of the Report), SLR Consulting's calculations identify that screening would need to be approximately 3.5m high (or approximately 1m higher than the noise generating element of the plant) in order be sufficient to block the line-of-sight between the plant and both receivers and, therefore, acoustically effective.

SLR's modelling identifies in Table 6 (page 11) the predicted noise levels at the NSRs, incorporating the screening depicted in Figure 4, demonstrate compliance with the project criteria as follows:

Table 6 Predicted Noise Levels at NSRs (with mitigation)

NSR	Noise level L_{A10} dB				Expected outcome
	Daytime		Night-time		
	Predicted	Criteria	Predicted	Criteria	
NSR 1	45	45	23	35	Compliance
NSR 2	45	45	25	35	Compliance

Transport Management

Elimination of noise from truck movements will be achieved by moderating speed in difficult areas and keeping trucks well maintained. Regular inspections of trucks, specifically for noise sources such as mufflers and exhaust brakes will be carried out. The following must be adhered to on site:

- No use of compression or exhaust brakes in the quarry or on Spencers Brook Road;
- Maintenance of internal roads to avoid corrugations; and
- Use of broadband reversing alarms as an alternative to the beeper type.

With regards to the existing road network and its users, it is considered Spencers Brook Road and Great Eastern Highway is suitable to support the number of truck movements to and from the site.

The quarry site's access is located on a straight section of Spencers Brook Road with sufficient sight distance on either side, and trucks will be able to cross the road safely. Spencers Brook Road will not require upgrading.

Safety Management

All quarries operate under the provisions of the *Mines Safety and Inspection Act 1994 and Regulations 1995*. These are administered by the Department of Mines and Petroleum.

The regulation is achieved through the DMP Safety Regulations and Reporting Systems (SRS).

All quarries on commencement are required to register with the SRS system. As part of the registration a Project Management Plan is required to be produced and lodged online after all planning approvals are in place and prior to commencement.

Officers from the Safety Division of the DMP will regularly inspect the operations in relation to health and safety.

Site Rehabilitation

As outlined under 'Proposal' section of this report, decommissioning and phased rehabilitation of the site will occur over a period of 3 years, with full rehabilitation / closure by January 2028.

The primary objective of the rehabilitation of the site is to ensure that the site is closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the Shire. To achieve this, Italia Stone will rehabilitate the land to pasture safe for grazing by -

- Progressively removing all infrastructure, internal roads, hardstand areas, non-natural materials from the site at the end of the project;

- Removing all materials, equipment and plant associated with their operations at the end of excavation;
- Removing from the site all contaminated materials (if any – please note there will be no contaminating materials apart from fuel and lubricants present on the site) prior to closure;
- Ensuring landforms and other geomorphological features are compatible with the locality and end use (pasture), and be sustainable in the long term;
- Ensuring that weed levels will not to cause significant impacts on rehabilitation; and
- Monitoring the rehabilitation efforts to ensure that any areas not meeting completion criteria are added to or replaced as necessary to enable the relevant criteria to be met.

CONCLUSION

This application is proposed in a manner that is consistent with the objectives of the Rural zone of the Shire's Local Planning Scheme No. 6.

We consider that the enclosed information and plans are sufficient to enable Shire staff to advertise the proposal and for the Council to determine the application favourably. We respectfully request the application is tabled on the agenda for the next available Ordinary Council Meeting.

Should you require any additional information or have any questions regarding this proposal, please do not hesitate to contact the undersigned on (08) 9418 1437 or via email tinus@italiastonegroup.com.au.
Yours sincerely

TINUS NAGEL
General Manager
Italia Stone Group

LIST OF APPENDICES

Appendix 1 – Locality Plan

Appendix 2 – Certificate of Title

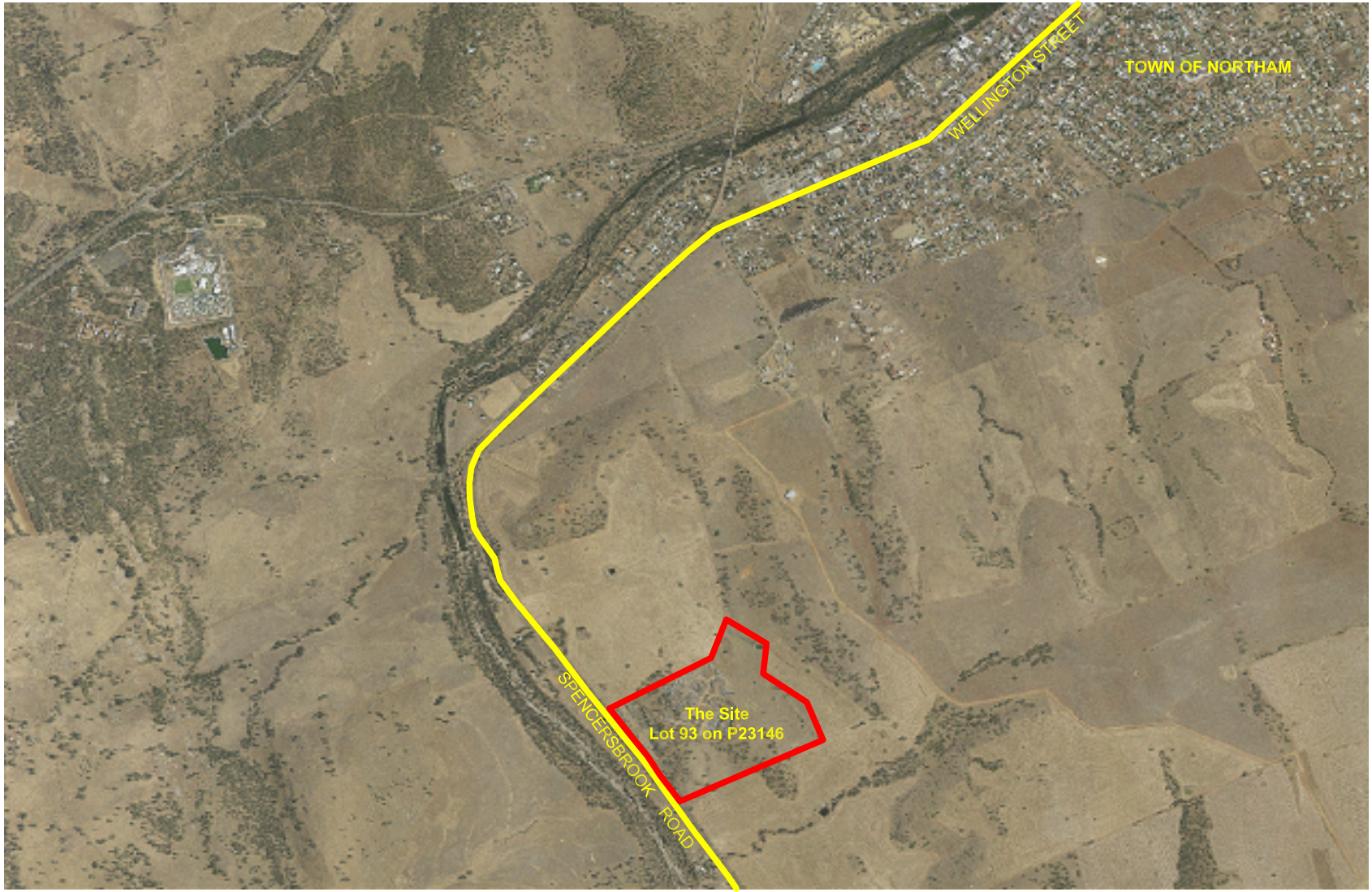
Appendix 3 – Contour Plot

Appendix 4 – Noise Sensitive Received Map

Appendix 5 – SPP2.4 ‘Resource Protection Map’

Appendix 6 – Acoustic Assessment Report

APPENDIX 1 – LOCATION PLAN



italia STONE GROUP

TITLE
LOT 93 ON P23146 SPENCERSBROOK ROAD, MULUCKINE

LOCATION PLAN

SIZE	CAGE CODE	DWG NO	REV
A3		L93A1	A

SCALE		SHEET
	NOT TO SCALE	

APPENDIX 2 – CERTIFICATE OF TITLE

WESTERN AUSTRALIA

REGISTER NUMBER	
93/P23146	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

VOLUME 2159 FOLIO 986

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 93 ON PLAN 23146

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

ZIPPO PTY LTD OF RMB 820, JENNACUBBINE

(A H093469) REGISTERED 29/4/1999

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. THE RIGHT TO MINES OF COAL OR OTHER MINERALS BEING EXCLUDED FROM PORTION OF THE SAID LAND

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	2159-986 (93/P23146)
PREVIOUS TITLE:	2159-983
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	SHIRE OF NORTHAM

APPENDIX 3 – CONTOUR PLOT

NORTHAM QUARRY - SPENCERS BROOK ROAD
CONTOUR PLOT

0 50 100 150 200
SCALE m

SURVEYS

ITALIA STONE GROUP

No.	DWG No.	REFERENCE DRAWINGS

DATE	No.	REVISION RECORD	DR.	CHK.	APP.
13-10-17	1	ISSUED FOR REVIEW	JS	LR	

DRAWING TITLE
NORTHAM QUARRY
SPENCERS BROOK ROAD
CONTOUR PLOT
2m CONTOURS

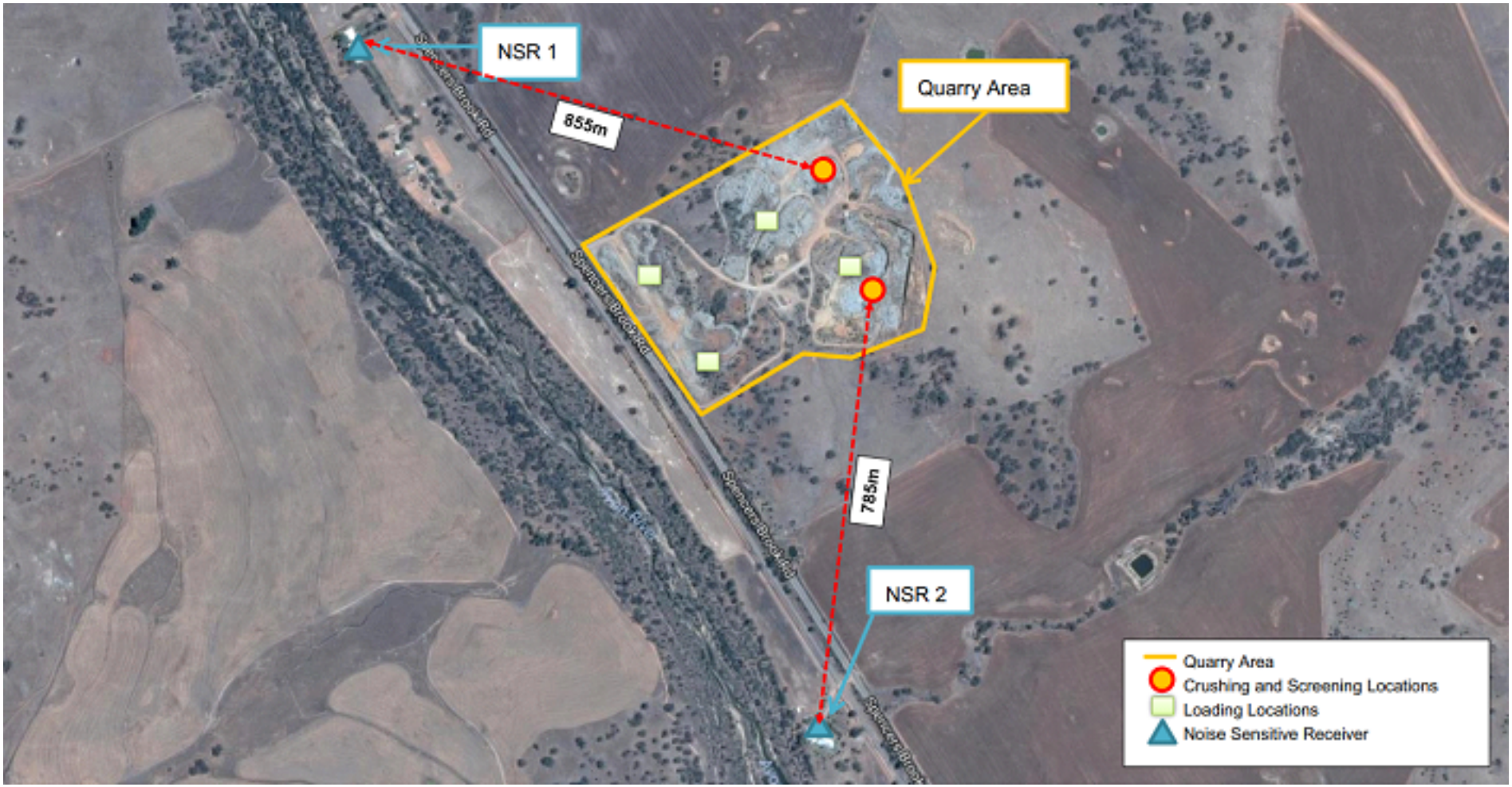
Co-ORDINATES: MGA 94 ZONE 50 | HEIGHTS: AHD | ACCURACIES: +/- 50mm | SHEET SIZE: A3

DRAWING NUMBER: BES-NQ-10141

SURVEYED: D. BAKER APP.
DRAWN: J. SUMPTON APP.
DRAWING CHECKED: L. ROGERS APP.
CIVIL ENGINEER: N/A APP.
SENIOR CIVIL ENGINEER: N/A APP.

DATE: 13-10-17 | SCALE: 1:2500 | REVISION NUMBER: 1

APPENDIX 4 – NOISE SENSITIVE RECEIVER MAP



italia STONE GROUP

TITLE
LOT 93 ON P23146 SPENCERSBROOK ROAD, MULUCKINE

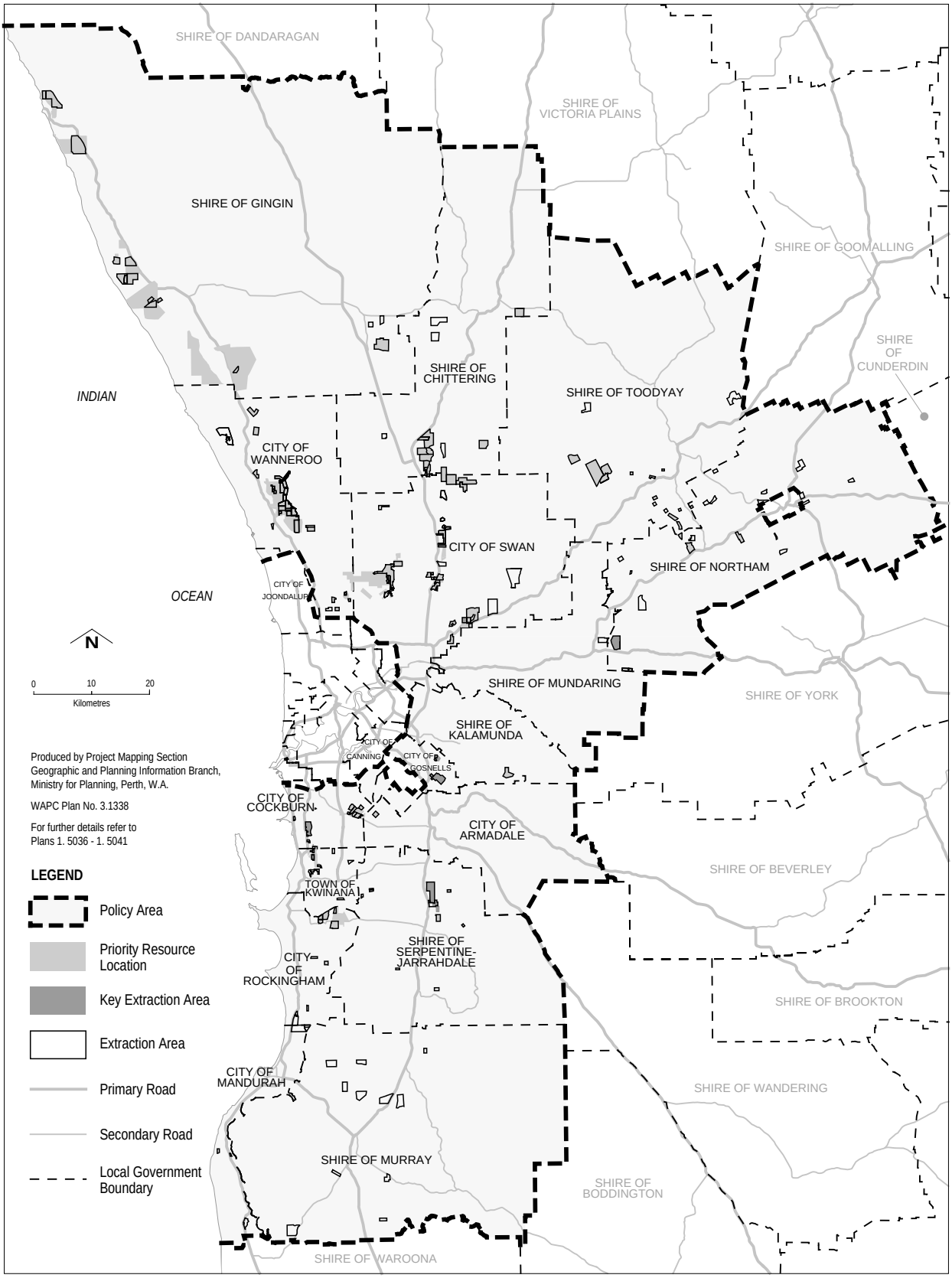
NOISE SENSITIVE RECEIVER MAP

SIZE	CAGE CODE	DWG NO	REV
A3		L93A4	A

SCALE NOT TO SCALE SHEET

APPENDIX 5 – SPP2.4 'RESOURCE PROTECTION MAP'

Policy Area for SPP No. 2.4



Resource Protection Map

Figure 2

APPENDIX 6 – ACOUSTIC ASSESSMENT REPORT

Northam Quarry Extension

Acoustic Assessment

Report Number 675.11297-R01

18 December 2017

Italia Stone Group Pty Ltd

55 Miguel Road

BIBRA LAKE

WA 6163

Version: v1.0

Northam Quarry Extension

Acoustic Assessment

PREPARED BY:

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Perth WA 6000 Australia

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perth@slrconsulting.com www.slrconsulting.com

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
675.11297-R01-v1.0	18 December 2017	Edmond Wu	Peter Runcie	Peter Runcie
675.11297-R01-v0.1	10 November 2017	Edmond Wu	Peter Runcie	Luke Zoontjens

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1 INTRODUCTION

Italia Stone Group Pty Limited (the Applicant) proposes to extend the Northam Quarry at 270 Spencers Brook Road in Muluckine Western Australia.

SLR Consulting Australia Pty Limited (SLR) has been commissioned to undertake a desktop assessment of acoustic effects associated with the proposed quarry extension, to evaluate compliance with relevant regulations, and if necessary, identify appropriate in-principle noise control measures to achieve compliance with the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

2 PROJECT OVERVIEW

2.1 Site Location

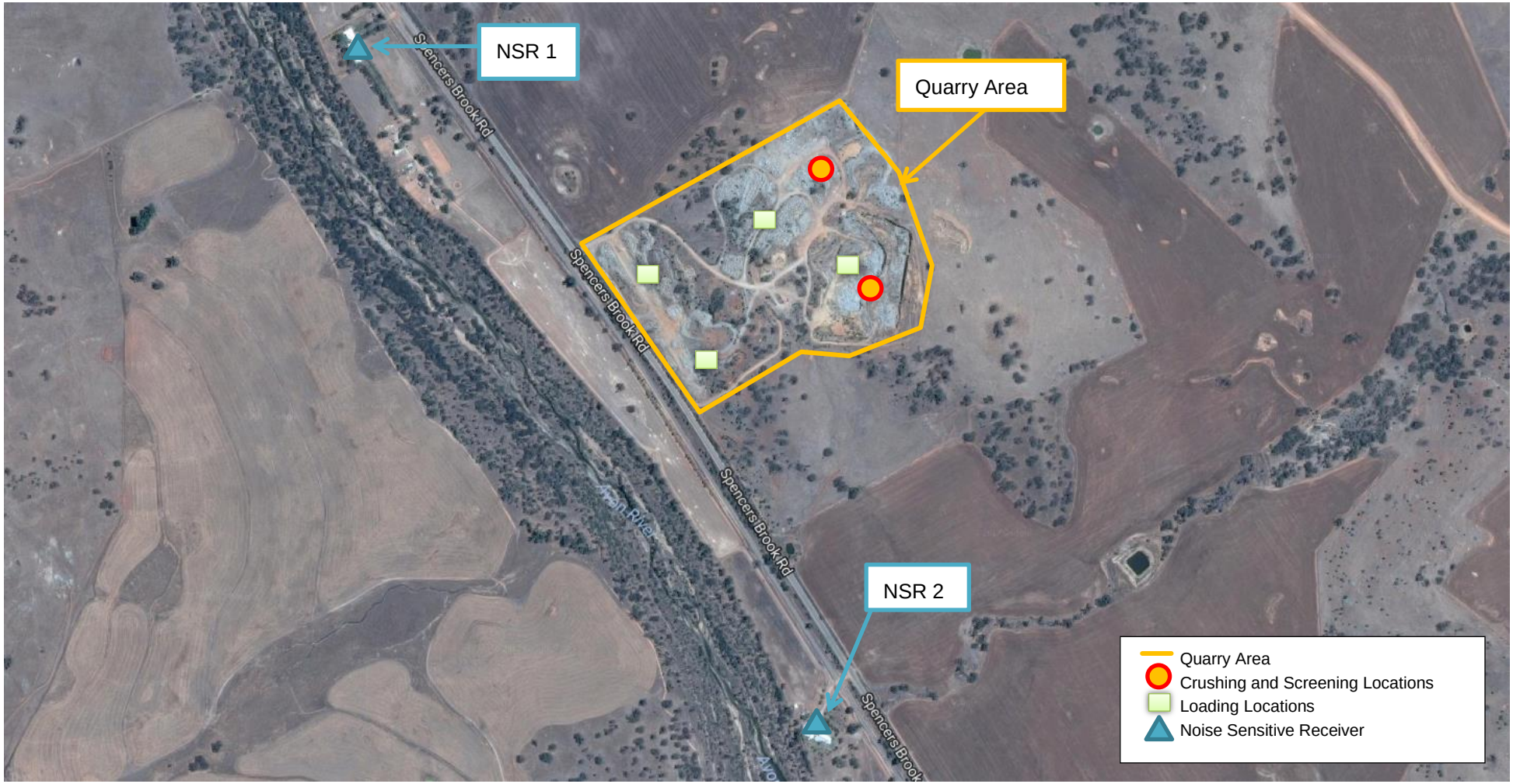
The proposed extension is located to the east of the Spencer Brook Road and surrounded by a mixture of agricultural and undeveloped land.

The most exposed noise sensitive receivers (NSRs) that have the potential to be affected by the noise from the proposed quarry operation are residential premises located approximately 550 m to the northwest and 600 m to the southeast of the quarry (see **Figure 1**).

2.2 Description of the Proposal

The quarry is proposed to operate from 7:00 am to 5:00 pm Monday to Saturday with haulage trucks arriving from 6:45 am. The Applicant has advised the approximate location of the quarry activities (crushing, screening and loading) as shown in **Figure 1**. The Applicant has advised that the crusher will not be operated every day and will only be operated in one of the locations at any one time.

Figure 1 Quarry Area, Activity Locations and Noise Sensitive Receivers Locations



3 ASSESSMENT CRITERIA

Noise emitted by quarry activities is governed by the *Environmental Protection (Noise) Regulations 1997* (the Regulations). Regulations 7, 8 and 9 cover such activities.

There are different assigned noise levels in the Regulations for sensitive, commercial and industrial type premises. The assigned noise levels for noise sensitive premises vary depending on the time of the day and how close the noise sensitive premises are to industrial and commercial areas and to major or secondary roads. The assigned noise levels always apply at the premises receiving the noise.

As there are no commercial and industrial premises or major or secondary roads in the vicinity of the receiver, no influencing factor for the assigned noise level of the noise sensitive receivers is applied. The levels of noise that are allowed to be received at the identified nearest NSR under the Regulations (assigned levels) are shown in **Table 1**. Given the proposed quarry extension is proposed to operate from 6:45 am to 5:00 pm Monday to Saturday, the relevant daytime and night-time noise criteria have been highlighted in **Table 1**.

Table 1 Table of Assigned Noise Levels

Type of premises receiving noise	Time of day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises (e.g. Residential)	7:00 am to 7:00 pm Monday to Saturday	45	55	65
	9:00 am to 7:00 pm Sunday and public holidays	40	50	65
	7:00 pm to 10:00 pm all days	40	50	55
	10:00 pm on any day to 7:00 am Monday to Saturday and 9:00am Sunday and public holidays	35	45	55

Regulation 7 of the Regulations requires that if noise emitted from any premises when received at any other premises cannot reasonably be free of intrusive characteristics of tonality, modulation and impulsiveness, then a series of adjustments must be added to the emitted levels (measured or calculated) and the adjusted level must comply with the assigned level. The adjustments are detailed in the following table and are further defined in Regulation 9(1):

Table 2 Table of Adjustments

Adjustment where noise emission is not music these adjustments are cumulative to a maximum of 15 dB		
Where tonality are present	**Where modulation is present**	**Where impulsiveness is present**
+5 dB	+5 dB	+10 dB

- Tonality is defined in Regulation 9(1) as being present where the difference between the A weighted sound pressure level in any one third octave band and the arithmetic average of the A weighted sound pressure levels in the two adjacent one third octave bands is greater than 3 dB in terms of $L_{Aeq,T}$ 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.
- Modulation is defined as a variation in the emission of noise that —
    - is more than 3 dB L_{AFast} or is more than 3 dB L_{AFast} in any one third octave band;
    - is present for at least 10% of the representative assessment period; and
    - is regular, cyclic and audible.

- Impulsiveness is defined as present where the difference between L_{Apeak} and L_{AmaxS} is more than 15 dB when determined for a single representative event.

Based on the source noise levels and types of activities, no adjustments to the assigned noise levels in **Table 1** are considered to be applicable in this instance.

4 NOISE ASSESSMENT

4.1 Methodology

A noise model was prepared based on the modelling platform SoundPLAN. The software allows the use of various internationally recognised noise prediction algorithms. The CONCAWE algorithm was selected for this assessment, as it enables meteorological influences to be assessed, and has been recognised by the Western Australian EPA Environmental Noise Guidelines as an appropriate algorithm for predicting environmental noise from industrial sources. The model takes into account the land topography.

The noise level predictions are undertaken for receivers with 1.5 m height above ground level.

4.1.1 Ground Absorption

To provide a conservative assessment approach, hard ground (100% sound reflective) was assumed for the quarry and processing areas; 70% sound absorptive ground has been assumed elsewhere in the surrounding area due to the surrounding area being farm land or undeveloped land.

4.1.2 Meteorological Conditions

The SoundPLAN model included the meteorological parameters outlined in the EPA *Guidance for the Assessment of Environmental Factors Environmental Noise*, *Draft No.8*; these parameters are highlighted in **Table 3**. The modelling assumed a worst case scenario wind, blowing in a direction from the source to the receiver.

Table 3 Meteorological Conditions Used In the Noise Predictions

Time of Day	Temperature	Relative Humidity	Wind Speed*	Pasquil Stability Category
Day (07:00 to 19:00)	20°C	50%	4 m/s	E
Night (22:00 to 07:00)	15°C	50%	3 m/s	F

* - Wind has been modelled orientated so that it blows from the source to the receiver.

4.1.3 Source Noise Levels

The source sound power levels used in the modelling are shown in **Table 4.** These levels are based on Applicant provided data, manufacturer published data, SLR in-house library data and relevant industry guidelines (e.g. *BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 1 Noise*).

Table 4 Source Sound Power Levels

Equipment	Octave Band Sound Power Level, dB (Unweighted)								Total A-weighted, dB
	63	125	250	500	1k	2k	4k	8k	
Excavator (32 ton e.g. Komatsu PC300)	102	105	104	101	101	100	95	88	106
Crusher (53 ton e.g. Finlay J-1175)	121	121	118	117	115	113	108	98	120[1]
Screening Plant (33 ton e.g. McCloskey R155)	126	119	112	111	108	104	102	95	114[1]
Drilling rig (18 ton e.g. Tamrock CHA 1100)	115	121	114	117	113	112	107	106	119
Dozer (48 ton e.g. CAT D9)	114	115	111	108	110	107	117	106	119
Haulage Truck (29 ton Standard Semi Trailer)	113	102	106	101	101	102	95	91	107
Front End Loader (14 ton e.g. Komatsu WA320)	121	111	103	101	101	102	92	89	107
Quarry Truck (31 ton e.g. CAT ADT730)	114	109	105	107	105	103	97	89	110

1 - Based on worst-case orientation of plant to receiver – i.e., side on.

4.1.4 Noise Modelling Scenarios

Based on the operational information provided by the Applicant, predictions were made of the following scenarios in the noise model. The worst case plant locations for each NSR were assumed based on the approximate activity locations shown in **Figure 1** (i.e., activities operating closest to each NSR represents the worst-case scenario for that receiver).

Night-time (6:45 am – 7:00 am)

- Loading Works:
    - Haulage Trucks arriving (up to 4 truck movements)

Daytime (7:00 am – 5:00 pm)

- Crushing and Screening Works:
    - 1 Crusher (continuous operation)
    - 1 Screening Plant (continuous operation)
    - 1 Drilling Rig (continuous operation)
    - 1 Front End Loader (40 lifts per hour)
    - 1 Excavator (continuous operation)
- Loading Works:
    - 1 Front End Loader (40 lifts per hour)
    - 1 Excavator (continuous operation)
    - 1 Dozer (15 pushes per hours)
    - Quarry Trucks (6 truck movements per hour)
    - Haulage Trucks (4 truck movements per hour)

The models included the following assumptions:

- All identified noise sources are operating simultaneously.
- The sound levels referred to in this report represent the L_{A10} emission level.

4.2 Results

The predicted unmitigated noise levels at the NSRs have been calculated according to the methodology detailed in **Section 4.1** and are shown in **Table 5**.

Table 5 Predicted Noise Levels at NSRs (without mitigation)

NSR	Noise level L_{A10} dB				Expected outcome
	Daytime		Night-time		
	Predicted	Criteria	Predicted	Criteria	
NSR 1	52	45	23	35	Daytime Exceedance
NSR 2	53	45	25	35	Daytime Exceedance

Due to the limited activity in the night-time hours, compliance with the night-time criteria is predicted.

However, our modelling identifies that the cumulative noise levels from the operation of the drilling rig, screening plant and crusher result in exceedance of the daytime criteria at both NSR locations.

If noise from these sources can be adequately controlled then compliance with the daytime criteria can be achieved. SLR has identified two potential options for controlling noise emissions from the proposed quarry activity.

4.3 Use of Quieter Plant

The selection and use of quieter crushing, screening and drilling rig plant with the following maximum published noise levels is the preferred approach to reducing noise levels. However, it is noted that sourcing plant with these lower noise levels may be difficult – particularly with respect to drilling rigs.

- Crusher – maximum SWL 110 dBA
- Screening Plant – maximum SWL 106 dBA
- Drilling rig – maximum SWL 110 dBA

Beware the risk of low frequency noise generation with respect to these items which can arise through excessive structural vibration. Specialist acoustics engineering input may be required in order to ensure emissions are appropriate.

4.4 Use of Bunding/ Screening

The use of acoustically effective localised noise bunding or noise barrier screening (hereafter referred to as screening) between the drilling rig, screening plant and crushing plant activity and both the NSRs is expected to reduce noise levels to compliance at the nearest NSRs. This is a commonly used type of mitigation to control noise from a source where it is possible to form a physical break between the noise source and the receiver(s).

Screening with sufficient height to block the line-of-sight between the noise source and the receiver can effectively reduce the level of noise at the receiver. Acoustic screening works by forcing noise to take a longer path from the source to the receiver. The efficacy of the screening depends on the screen height relative to the source and the receiver and the distances from source to the screen and the screen to the assessment point. **Figure 2** and **Figure 3** show a visual representation of the difference screening can make if the screening is sufficiently high enough to block the direct line-of-sight to receiver.

Figure 2 Cross Section Noise Map without Acoustically Effective Screening

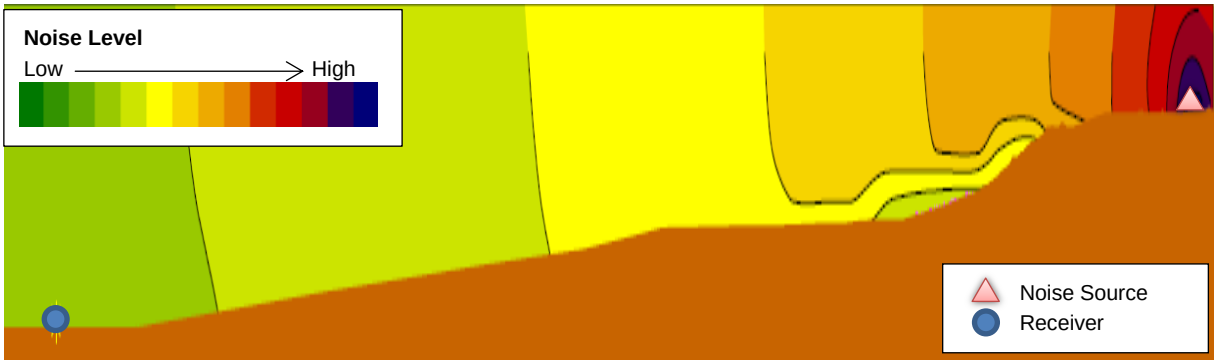
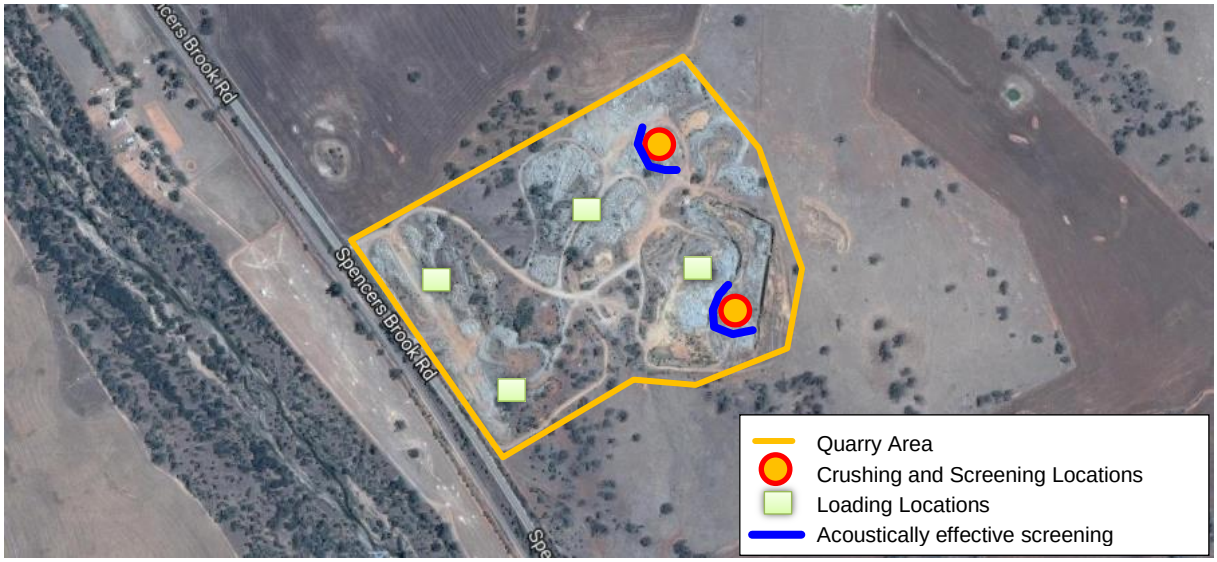


Figure 3 Cross Section Noise Map with Acoustically Effective Screening

Based on the topography and plant location information provided by the Applicant, our calculations identify that screening in the locations identified in **Figure 4** would need to be approximately 3.5 m high (or approximately 1 m higher than the noise generating element of the plant) in order be sufficient to block the line-of-sight between the plant and both receivers and, therefore, acoustically effective.

Figure 4 Approximate Location of Acoustically Effective Screening



The predicted noise levels at the NSRs, incorporating the above screening, are provided in **Table 6** and demonstrate compliance with the project criteria.

Table 6 Predicted Noise Levels at NSRs (with mitigation)

NSR	Noise level L_{A10} dB				Expected outcome
	Daytime		Night-time		
	Predicted	Criteria	Predicted	Criteria	
NSR 1	45	45	23	35	Compliance
NSR 2	45	45	25	35	Compliance

5 CONCLUSION

SLR has been commissioned to undertake a desktop acoustic assessment of the proposed quarry extension of Northam Quarry at 270 Spencers Brook Road in Muluckine Western Australia.

Noise emitted from the proposed quarry extension has been considered with regard to the *Environmental Protection (Noise) Regulations 1997*.

The predicted unmitigated noise levels generated by the proposed quarry extension, which take into account the land topography, show that the quarry operation can comply with the night-time criteria but generates exceedance of the daytime criteria. The predicted exceedance is principally due to the use of the drilling rig, crusher and screening plant – being the noisiest plant items.

SLR has identified potential mitigation options to control noise levels at the surrounding receivers; the use of localised bunding/screening and/or selection of quieter plant have been demonstrated as capable of controlling quarry activity noise levels to achieve full compliance.

ACOUSTIC TERMINOLOGY

1 Sound Level or Noise Level

The terms "sound" and "noise" are almost interchangeable, except that in common usage "noise" is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2E-5 Pa.

2 "A" Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120 110	Heavy rock concert Grinding on steel	Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerbside of busy street Loud radio or television	Loud
60 50	Department store General Office	Moderate to quiet
40 30	Inside private office Inside bedroom	Quiet to very quiet
20	Unoccupied recording studio	Almost silent

Other weightings (e.g. B, C and D) are less commonly used than A weighting. Sound Levels measured without any weighting are referred to as "linear", and the units are expressed as dB(lin) or dB.

3 Sound Power Level

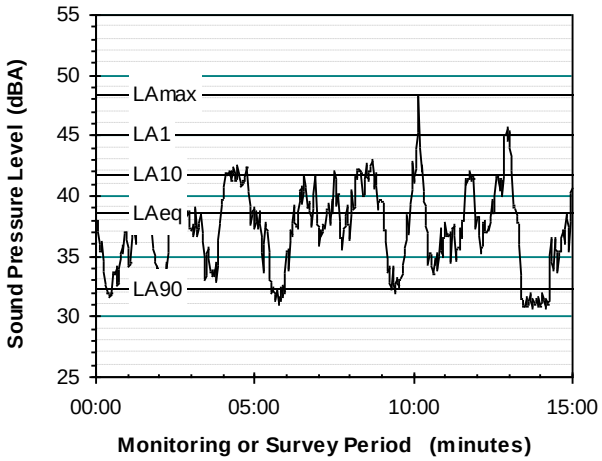
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 1E-12 W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating the statistical indices.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq Is the A-weighted equivalent continuous noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the "repeatable minimum" LA90 noise level over the daytime and night-time measurement periods, as required by the DECCW. In addition the method produces mean or "average" levels representative of the other descriptors (LAeq, LA10 etc.).

ACOUSTIC TERMINOLOGY

5 Tonality

Tonal noise contains one or more prominent tones (i.e. distinct frequency components), and is normally regarded as more offensive than “broad band" noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

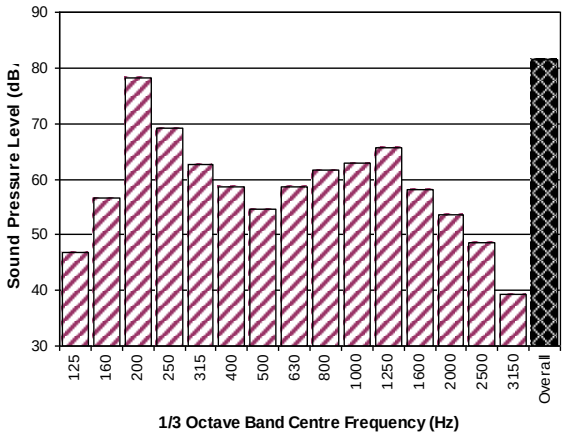
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of “peak” velocity or “rms” velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as “peak particle velocity”, or PPV. The latter incorporate “root mean squared” averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (1E-6 mm/s). Care is required in this regard, as other reference levels are used by some organisations.

9 Human Perception of Vibration

People are able to “feel” vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as “normal” in a car, bus or train is considerably higher than what is perceived as “normal” in a shop, office or dwelling.

10 Overpressure

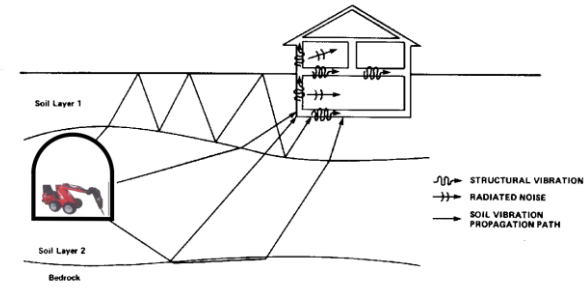
The term “over-pressure” is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (i.e. unweighted), at frequencies both in and below the audible range.

11 Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed “regenerated noise”, “structure borne noise”, or sometimes “ground-borne noise”. Regenerated noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of regenerated noise include tunnelling works, underground railways, excavation plant (e.g. rock breakers), and building services plant (e.g. fans, compressors and generators).

The following figure presents the various paths by which vibration and regenerated noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term “regenerated noise” is also used to describe other types of noise that are emitted from the primary source as a different form of energy. One example would be a fan with a silencer, where the fan is the energy source and primary noise source. The silencer may effectively reduce the fan noise, but some additional noise may be created by the aerodynamic effect of the silencer in the airstream. This “secondary” noise may be referred to as regenerated noise