Tasman Extension Project
Environmental Impact Statement

APPENDIX I

NOISE AND VIBRATION IMPACT ASSESSMENT

Resource Strategies

DONALDSON COAL
Part of Gloucester Coal

global environmental solutions

Tasman Extension Project

Noise and Vibration Impact Assessment

Report Number 630.01054R1

9 May 2012

Donaldson Coal Pty Ltd
PO Box 2275
Greenhills NSW 2323

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Tasman Extension Project

Noise and Vibration Impact Assessment

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLES

TABLE OF CONTENTS (CONTINUED)

FIGURES

APPENDICES

1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Donaldson Coal Pty Ltd (Donaldson Coal) to conduct a noise and vibration impact assessment for the Tasman Extension Project (the Project). This report presents the results and findings of the noise and vibration impact assessment.

The noise assessment has been prepared with reference to Australian Standards (AS) 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the New South Wales (NSW) Office of Environment and Heritage (OEH) *NSW Industrial Noise Policy* (INP), *Environmental Noise Control Manual* (ENCM), *NSW Interim Construction Noise Guideline* (ICNG) and *NSW Road Noise Policy* (RNP).

2 PROJECT DESCRIPTION

2.1 Project Overview

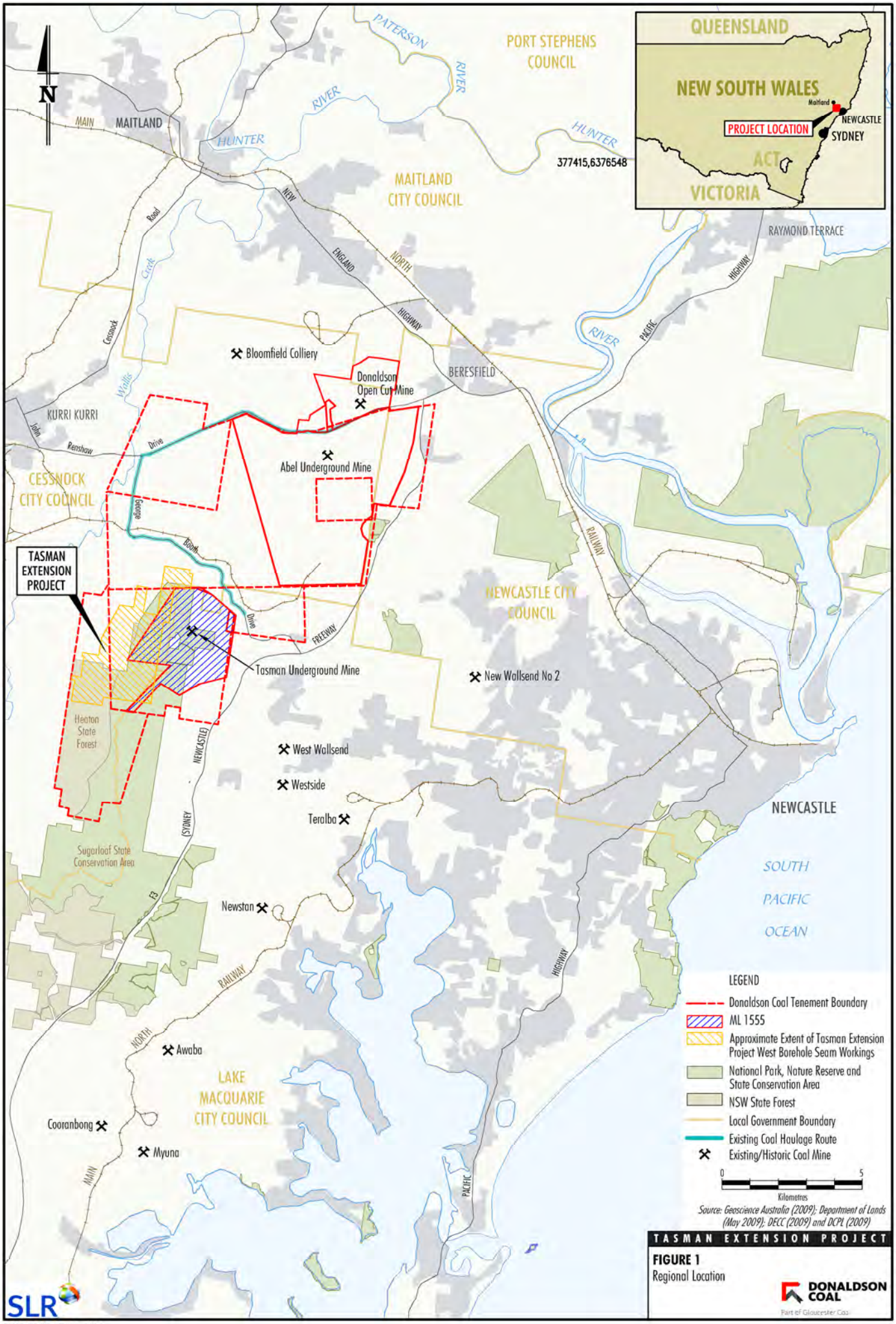
Donaldson Coal currently owns and operates the Tasman Underground Mine located off George Booth Drive approximately 20 kilometres (km) west of the Port of Newcastle, NSW, in the Newcastle Coalfield. The Tasman Underground Mine is approved to operate in accordance with Development Consent (DA 274-9-2002).

The Tasman Underground Mine is approved to produce up to 975,000 tonnes per annum of run-of-mine (ROM) coal. ROM coal produced at the Tasman Underground Mine is transported in road registered haul trucks which travel north-west on George Booth Drive, then east along John Renshaw Drive to the Bloomfield Coal Handling and Preparation Plant (CHPP) and rail loading facility where the coal is processed prior to rail transport to the Port of Newcastle (**Figure 1**) for export or to other customers.

Donaldson Coal is seeking approval for a new development consent under Division 4.1 of Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) to consolidate and replace the existing Development Consent to include a proposed extension of underground mining operations at the Tasman Underground Mine for an additional operational life of approximately 15 years.

The main activities associated with the development of the Project would include:

- Continued underground mining of the Fassifern Seam using a combination of total and partial pillar extraction methods within Mining Lease 1555.
- Underground mining of the West Borehole Seam using a combination of total and partial pillar extraction methods (**Figure 2**).
- Production of ROM coal up to 1.5 million tonnes per annum.
- Development of a new pit top facility, associated ROM coal handling infrastructure and intersection with George Booth Drive (**Figure 2**).
- Development of ventilation surface infrastructure.
- Continued transport of Fassifern Seam ROM coal from the existing Tasman Underground Mine pit top to the Bloomfield CHPP via truck on public and private roads to approximately 2015 (inclusive).
- Transport of West Borehole Seam ROM coal from the new pit top to the Bloomfield CHPP via truck on public and private roads.
- Progressive development of sumps, pumps, pipelines, water storages and other water management equipment and structures.
- Ongoing exploration activities.



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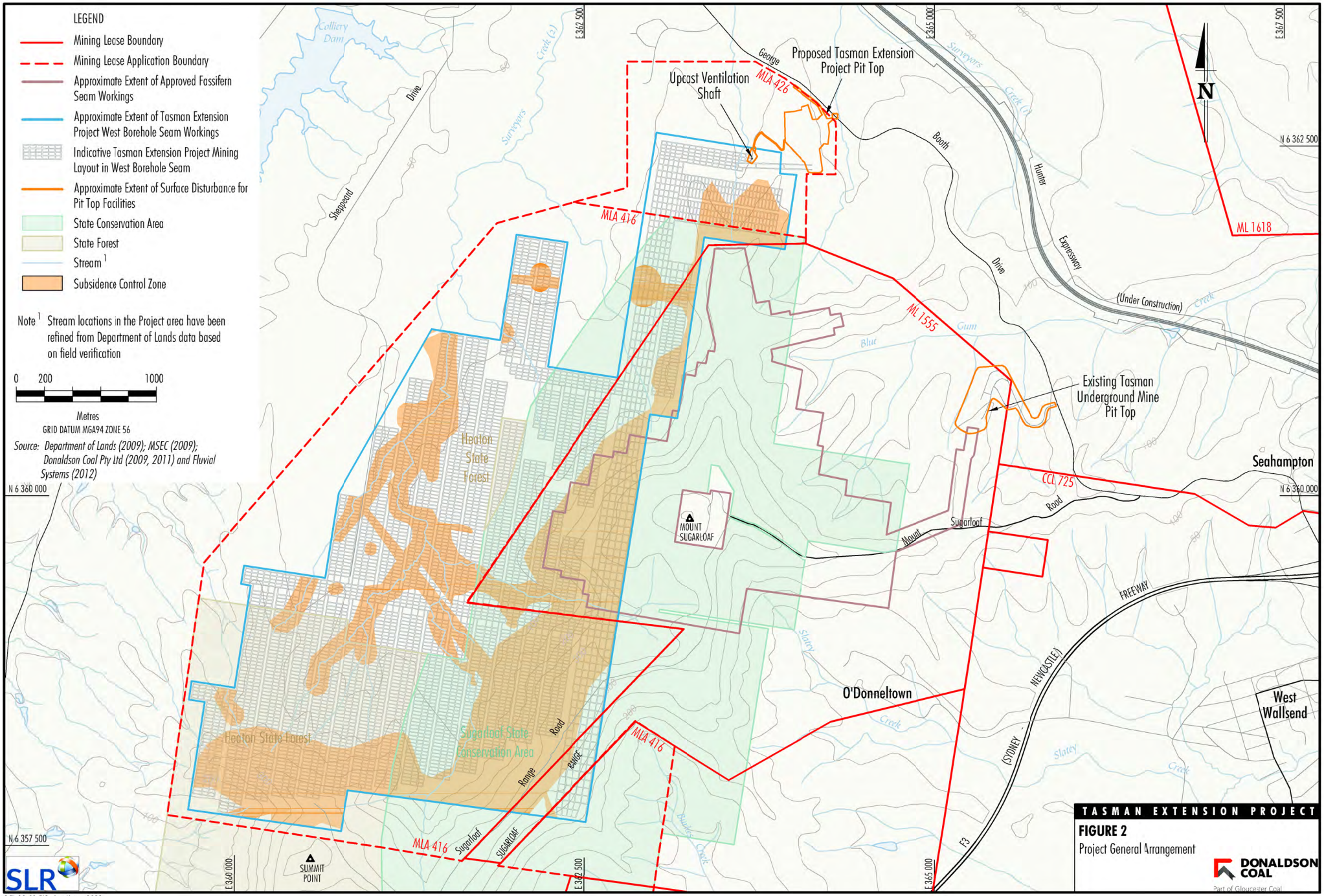

TASMAN EXTENSION PROJECT

FIGURE 2

Project General Arrangement

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- Ongoing surface monitoring, rehabilitation and remediation of subsidence effects.
- Other associated minor infrastructure, plant, equipment and activities.

Figure 1 illustrates the regional location of the Project and Tasman Underground Mine. An indicative Project arrangement is shown in **Figure 2**.

2.2 Hours of Operation

Mining Operations

Mining operations would occur 24 hours per day, seven days per week.

ROM Coal Transport

Movement of coal by road would be restricted to 7.00 am to 10.00 pm Monday to Friday and 7.00 am to 6.00 pm on Saturday. No coal will be transported by road on Sunday or Public Holidays.

Construction

Construction of the new pit top including site structures, internal haul/access roads and box-cut would be conducted within the hours recommended by the ICNG of 7.00 am to 6.00 pm Monday to Friday and 7.00 am to 1.00 pm Saturday. No construction work will be conducted on Sundays or Public Holidays.

Construction of the mine drift following the development of the box-cut would utilise two (2) road headers 24 hours per day, seven days per week.

Construction of the ventilation shaft is scheduled to occur approximately six (6) months after the construction of the new pit top with drilling operations required to develop the ventilation shaft to occur 24 hours per day, seven days per week.

2.3 Plant and Equipment

Tables 1 and **2** show the expected equipment required for the construction of the new pit top and typical operational equipment, respectively. Note that the operational equipment listed for the existing pit top is consistent with the equipment modelled for noise impact assessment for the Tasman Underground Mine (refer Heggies report 30-1054-R1 Noise Impact Assessment Tasman Project dated 2 August 2002).

The sound power levels of acoustically significant plant and equipment to be used during the construction and operation of the Project have been obtained from a SLR Consulting database of similar equipment. Details of these levels are given in **Appendix A**.

2.4 Site Details

The existing pit top is located approximately 2 km west of Seahampton off George Booth Drive. The new pit top is to be located approximately 4 km north-west of Seahampton off George Booth Drive and approximately 3 km by road from the existing pit top (**Figure 2**).

There are numerous residential receivers surrounding the Project including the Village of Seahampton to the east, West Wallsend to the south-east, O'Donneltown to the south as well as rural residences off George Booth Drive to the north-west and Sheppeard Drive to the west.

Relevant receivers surrounding the Project are listed in **Table 3**. **Figure 3** illustrates the locality of the existing and new pit top to the nearest potentially affected residential receivers.

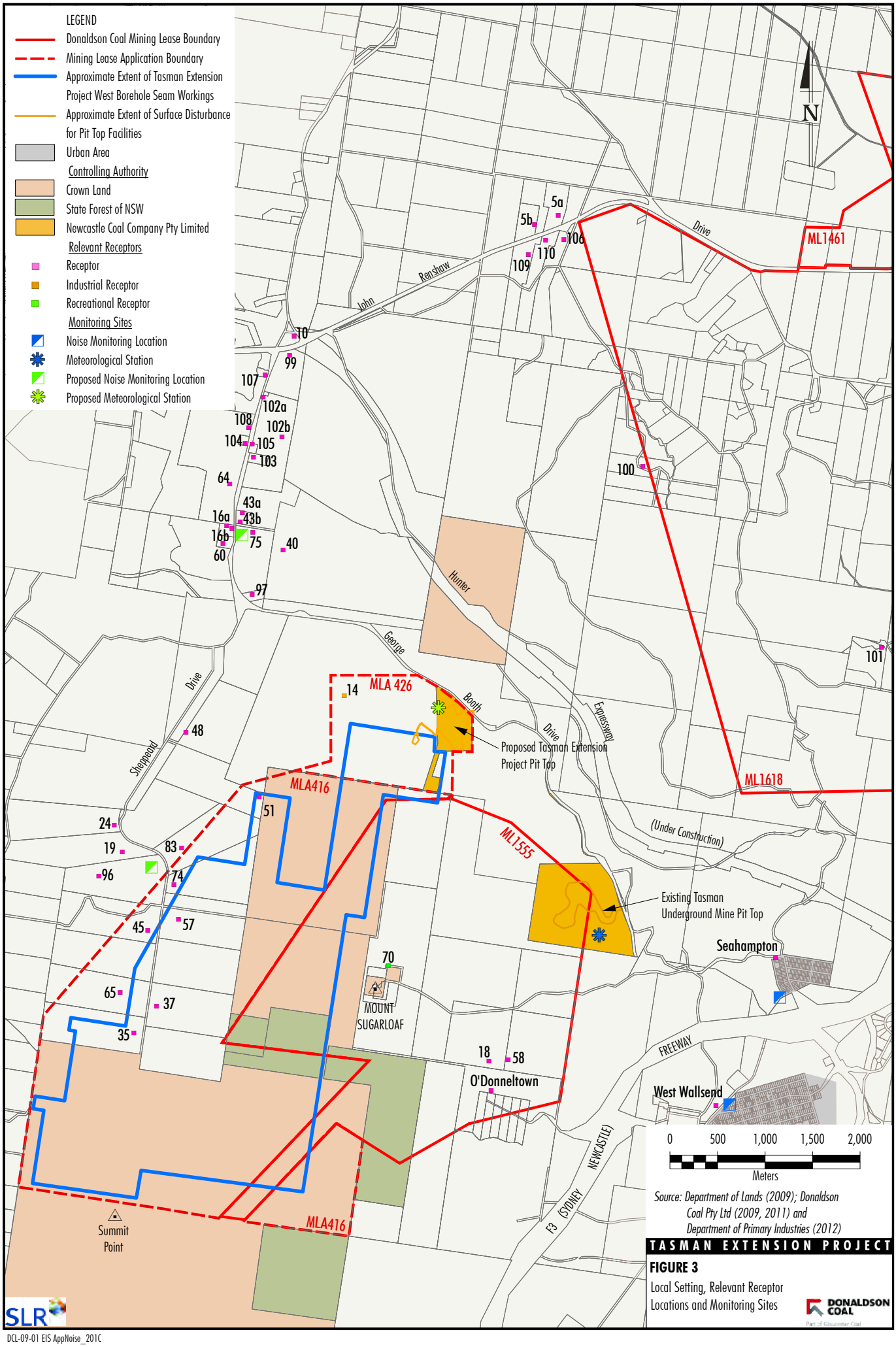

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Table 1 Construction Equipment Sound Power Levels

Equipment	L_{Aeq} Sound Power Level (dBA)
Construction Activities	
Hitachi EX1200	117
Cat 330D Excavator (x2)	116
40 Tonne Articulated Dump Trucks (x6)	110
D10 Dozer	122
40 Tonne Compactor	110
Grader 12G	113
Watercart	105
Genset	98
Grader 12G	113
Smooth Drum Vibrating Roller	110
Backhoe	98
Tandem Trucks	108
70 Tonne Crane	106
Grinder	104
Impact Gun	95
Hand Tools (hammering)	98
Road Headers(x2) - drift construction only	111

L_{Aeq} – equivalent continuous noise level.
dBA – A-weighted decibels.

Table 2 Operational Plant and Equipment

Equipment	L_{Aeq} Sound Power Level (dBA)
Operational Equipment – Existing Pit Top	
Coal Bins and Conveyor	107
Pump	81
Ventilation Fan	102
Underground Vehicle (man transporter)	106
Front End Loader (FEL) 988B	115
Stockpile Truck	108
Workshop Crane	101
Compressor 650 cubic feet per minute (cfm)	108
Operational Equipment – New Pit Top	
Workshop Crane	101
Hammering in Workshop	98
Grinding (workshop)	104
FEL	115
ROM coal haulage truck Loading	108
ROM coal haulage truck Leaving/Entering	108
Ventilation Fan	114
Conveyor	92
Underground vehicle (man transporter)	106
Pump	81
Compressor 650 cfm	108
Stockpile Discharge	95
Watercart	105
Temporary Ventilation Fan 1	120
Temporary Ventilation Fan 2	113

Table 3 Relevant Receivers

ID	Name	Easting (m)	Northing (m)
O'Donneltown	(represents receivers at O'Donneltown)	364493	6358732
Seahampton	(represents receivers at Seahampton)	367488	6360131
West Wallsend	(represents receivers at West Wallsend)	366860	6358574
5a	Four Mile Pty Limited	365200	6367940
5b	Four Mile Pty Limited	364950	6367845
10	Roads and Traffic Authority of New South Wales	362418	6366670
14	Orica Australia Pty Limited	362946	6362886
16a	ARM & C Roach	361705	6364675
16b	ARM & C Roach	361764	6364647
18	AR Sager	364469	6359042
19	AS & KL Green	360610	6361245
24	BG & M Smith	360525	6361530
35	D & JA Hoey	360730	6359340
37	GW & KM Cameron	360970	6359620
40	GT, SD, JR & MA Holmes	362301	6364425
43a	GG & CA Morris	361875	6364817
43b	GG & CA Morris	361850	6364720
45	GK Hooler	360880	6360420
48	H Spruce & JW Rhind	361880	6362634
51	JM Spruce	362051	6361823
57	KH & DM Starr	361200	6360535
58	KM & LJ Spruce	364671	6359057
60	LD & KA Bradbery	361668	6364494
64	ME Hooley	361740	6365116
65	MA Honeysett	360585	6359770
70	The Minister for Lands	363411	6360046
74	PJ Crowhurst	361155	6360900
75	PE Maytom	361982	6364605
83	PW & DL Dryden	361234	6361289
96	Transgrid	360360	6360990
97	WC & LM Gibson	361975	6363954
99	LJ & LM Jones	362370	6366475
100	DR & KL Bishop	366088	6365301
101	GR & RL Watts	368604	6363400
103	DJ & SL Ayre	361989	6365400
104	KP & J Mantle	361901	6365545
105	LJ & C Fairhall	361975	6365534
106	F Valicek	365258	6367688
107	CR & L Parker	362115	6366265
108	AM Williams	361940	6365708
109	CR & ML Parnell	364885	6367530
110	ME & KD Elliott	365065	6367680
102a	IR & MMF Gee	362090	6366033
102b	IR & MMF Gee	362290	6365614

In addition to the residential receivers surrounding the site the proposed Project is adjacent to the Sugarloaf State Conservation Area (**Figure 3**). This is an area that is used for recreational activities such as bushwalking, picnicking as well as four wheel drive touring and trail bike riding. The Orica research facility, an industrial receiver (ID 14), is also located to the west of the Project (**Figure 3**).

3 IMPACT ASSESSMENT PROCEDURES

3.1 General Objectives

Responsibility for the control of noise emission in NSW is vested in Local Government and the OEH. The INP was released in January 2000 and provides a framework and process for deriving noise criteria for consents and licences that will enable the OEH to regulate premises that are scheduled under the *Protection of the Environment Operations Act, 1997* (PoEO Act).

The specific policy objectives of the INP are:

- To establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses.
- To use the criteria as the basis for deriving Project specific noise levels.
- To promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.
- To outline a range of mitigation measures that could be used to minimise noise impacts.
- To provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development.
- To carry out functions relating to the prevention, minimisation and control of noise from the premises scheduled under the PoEO Act.

The INP provides two forms of noise criteria with the aim of achieving environmental noise objectives: one to account for intrusive noise which involves setting a noise goal objective relative to the existing acoustic environment and the other to protect the amenity of particular land uses.

3.2 Assessing Intrusiveness

For assessing intrusiveness, the background noise level must be measured. The intrusiveness criterion essentially means that the L_{Aeq} of the source (e.g. the Project) should not be more than five decibels above the measured background level (L_{A90}).

3.3 Assessing Amenity

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion. For high-traffic areas there is a separate amenity criterion.

Extracts from the INP that relate to the amenity criteria are given in **Table 4** and **Table 5**.

Table 4 Amenity Criteria – Recommended L_{Aeq} Noise levels from industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq(Period)}$ Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial Interface (for existing situations only)	Day	65	70
		Evening	55	60
		Night	50	55
School classrooms - internal	All	Noisiest 1 hour period when in use	35	40
Hospital wards - internal - external	All	Noisiest 1 hour period	35 50	40 55
Place of worship - internal	All	When in use	40	45
Area specifically reserved for passive recreation (e.g. National Park)	All	When in use	50	55
Active recreation area (e.g. school playground, golf course)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Note: Daytime 7.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 7.00 am.
On Sundays and Public Holidays: Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm;
Night-time 10.00 pm - 8.00 am.
The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

Table 5 Modification to Acceptable Noise level (ANL) to Account for Existing Levels of Industrial Noise

Total Existing L_{Aeq} noise level from Industrial Noise Sources	Maximum L_{Aeq} Noise Level for Noise from New Sources Alone, dBA
≥ Acceptable noise level plus 2 dBA	If existing noise level is *likely to decrease* in future acceptable noise level minus 10 dBA If existing noise level is *unlikely to decrease* in future existing noise level minus 10 dBA
Acceptable noise level plus 1 dBA	Acceptable noise level minus 8 dBA
Acceptable noise level	Acceptable noise level minus 8 dBA
Acceptable noise level minus 1 dBA	Acceptable noise level minus 6 dBA
Acceptable noise level minus 2 dBA	Acceptable noise level minus 4 dBA
Acceptable noise level minus 3 dBA	Acceptable noise level minus 3 dBA
Acceptable noise level minus 4 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 5 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 6 dBA	Acceptable noise level minus 1 dBA
< Acceptable noise level minus 6 dBA	Acceptable noise level

ANL = recommended acceptable L_{Aeq} noise level for the specific receiver, area and time of day from **Table 4.**

3.4 INP Project Specific Criteria

The INP Project Specific Noise Criteria are the more stringent of either the amenity or intrusive criteria. The INP states that these criteria have been selected to protect at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

Table 6 provides the methodology for the noise impact assessment for the Project's intrusive and amenity assessment criteria.

Table 6 Noise Impact Assessment Methodology

Assessment Criteria	Project Specific Criteria	Noise Management Zone	Noise Affectation Zone
Intrusive	Rating background level plus 5 dBA	≤ 5 dBA above Project specific criteria	> 5 dBA above Project specific criteria
Amenity	INP based on existing industrial level	≤ 5 dBA above Project specific criteria	> 5 dBA above Project specific criteria

For the purposes of assessing the potential noise impacts the Project specific, management and affectation criteria are further defined as follows.

3.4.1 Project Specific Criteria

Most people in the broader community would generally consider exposure to noise levels corresponding to this zone acceptable.

3.4.2 Noise Management Zone

Depending on the degree of exceedance of the Project specific criteria (1 dBA to 5 dBA) noise impacts could range from negligible to moderate. It is recommended that management procedures be implemented including:

- prompt response to any community issues of concern;
- noise monitoring on site and within the community;
- refinement of on-site noise mitigation measures and plant operating procedures where practical;
- consideration of acoustical mitigation at receivers; and
- consideration of negotiated agreements with property holders.

3.4.3 Noise Affectation Zone

Exposure to noise levels exceeding the Project specific criteria by more than 5 dB(A) may be considered unacceptable by some property holders and the INP recommends that the proponent explore the following:

- discussions with relevant property holders to assess concerns and provide solutions;
- implementation of acoustical mitigation at receivers; and
- negotiated agreements with property holders, where required.

3.5 Assessing Sleep Disturbance

The OEH has acknowledged that the relationship between maximum noise levels and sleep disturbance is not currently well defined. Criteria for assessing sleep disturbance has not been defined under the INP but it is assumed that conformance with the INP would protect against the likelihood of awakening reactions. Notwithstanding the preceding, sleep arousal has been assessed using the guidelines set out in the ENCM Section 19-3.

To avoid the likelihood of sleep disturbance the ENCM recommends that the $L_{A1(1minute)}$ of the noise source under consideration should not exceed the background noise level (L_{A90}) by more than 15 dBA when measured outside the bedroom window of the receiver during the night-time hours (10.00 pm to 7.00 am). This is consistent with Schedule 3, Condition 37 of the existing Development Consent (DA 274-9-2002).

The RNP provides further guidance with regard to sleep disturbance and calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The OEH policy document acknowledges that, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the RNP provides that maximum internal noise levels below 50 to 55 dBA are unlikely to cause awakening reactions and one or two events per night, with maximum internal noise levels of 65 to 70 dBA (inside dwellings) are not likely to significantly affect health and wellbeing.

3.6 Construction Noise

The OEH has prepared an interim guideline covering construction noise. The ICNG sets out noise criteria applicable to construction site noise for the purpose of defining intrusive noise impacts. **Table 7** sets out the noise management levels and how they are to be applied for residential receivers. The approach is intended to provide respite for residents exposed to excessive construction noise outside the recommended standard hours whilst allowing construction during the recommended standard hours without undue constraints.

Table 7 Construction Noise Goals

Time of Day	Management Level	How to apply
Recommended standard hours : Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 6:00 pm No work on Sundays or public holidays	Noise affected RBL* + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly affected noise level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise levels of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL* + 5 dBA	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

* Rating Background Level as described by the NSW Industrial Noise Policy.

Note: $L_{Aeq(15minute)}$ represents the equivalent continuous noise level of a 15 minute period.

3.7 Road Traffic Noise

The RNP presents guidelines for road traffic noise assessment. The policy document provides road traffic noise criteria for "land use development with the potential to generate additional traffic on existing roads".

It should be noted that, consistent with the Road Transport Assessment prepared for the Project (Appendix H of the EIS), George Booth Drive and John Renshaw Drive are considered to be "arterial roads". These roads support major inter-regional traffic movement as well as provide connection between arterial roads and local roads. **Table 8** presents the relevant RNP assessment criteria for road traffic noise on George Booth Drive and John Renshaw Drive.

Two criteria specified in the RNP are relevant to the Project; the road traffic noise assessment criteria and relative increase criteria (**Table 8**). In accordance with the RNP, if exceedances of both the noise assessment criteria and relative increase criteria are predicted, the greater of the exceedances is the controlling criteria.

Table 8 Road Traffic Noise Criteria for Residential Land Uses

Assessment Criteria	Road Category	Type of Project/Land Use	Assessment Criteria/Total Traffic Noise Level Increase	
			Day	Night
Noise Assessment Criteria	Freeway/arterial/ Sub-arterial Roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 dBA (external)	$L_{Aeq(9hour)}$ 55 dBA (external)
Relative Increase	Freeway/arterial/ Sub-arterial Roads	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq(15hour)}$ + 12 dB (external)	Existing traffic $L_{Aeq(9hour)}$ + 12 dB (external)

Note: Day 7:00 am to 10:00 pm; Night 10:00 pm to 7:00 am.

4 EXISTING ACOUSTICAL ENVIRONMENT

Ambient Background Noise Levels

SLR Consulting conducted ambient background noise monitoring at three locations within close proximity to the Project area as part of the noise impact assessment for the Tasman Underground Mine (refer Heggies report 30-1054-R1 Noise Impact Assessment Tasman Project dated 2 August 2002).

A summary of the results of the ambient background noise surveys from this report is provided in **Table 9.**

Table 9 Summary of Ambient Background Noise Levels

Location	Period	Rating Background Level (RBL)	Measured Existing $L_{Aeq(period)}$ Noise Level	Estimated Existing Industrial Contribution L_{Aeq}
1 Ladysmith Drive, West Wallsend	Day	38 dBA	61 dBA	<49 dBA
	Evening	42 dBA	58 dBA	<39 dBA
	Night	36 dBA	54 dBA	<34 dBA
22 George Booth Drive, Seahampton	Day	43 dBA	55 dBA	<44 dBA
	Evening	43 dBA	53 dBA	<39 dBA
	Night	38 dBA	50 dBA	<34 dBA
Lot 2 George Booth Drive, Buchanan	Day	38 dBA	63 dBA	<44 dBA
	Evening	39 dBA	58 dBA	<39 dBA
	Night	32 dBA	56 dBA	<34 dBA

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
On Sundays and Public Holidays: Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am
The L_{A90} represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level
The LAeq represents the equivalent continuous noise level and is defined as the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

As these noise levels were recorded prior to the establishment of the existing Tasman Underground Mine they are considered appropriate for use.

Umwelt Pty Ltd has conducted background noise monitoring at a location on Sheppeard Drive from 30 July 2009 to Tuesday 18 August 2009 inclusive (refer Umwelt report N/R05 Noise Impact Assessment for Proposed Ammonium Nitrate Emulsion Production Facility and Continued Operation of Orica Mining Services Technology Centre, Richmond Vale, NSW dated November 2009). A summary of results from this monitoring is provided in **Table 10**.

Table 10 Summary of Ambient Noise Monitoring – Sheppeard Drive

Location	Period	Rating Background Level (RBL)	Measured Existing $L_{Aeq(period)}$ Noise Level	Estimated Existing Industrial Contribution L_{Aeq}
Sheppeard Drive, Mulbring	Day	32 dBA	45 dBA	<30 dBA
	Evening	31 dBA	41 dBA	<30 dBA
	Night	30 dBA	38 dBA	<30 dBA

Compliance Monitoring Results

Attended operational noise monitoring for the Tasman Underground Mine has been conducted by SLR Consulting Pty Ltd (formerly Heggies Pty Ltd) since 2007, on a quarterly or annual basis, in accordance with the requirements of the Tasman Underground Mine Development Consent (DA-274-9-2002).

As reported in the Annual Environmental Management Reports for the Tasman Underground Mine, the Tasman Underground Mine was inaudible during all attended operational noise monitoring. Noise levels above the Project specific noise criteria have been recorded at the nearest residential receivers in West Wallsend and Seahampton (**Figure 3**) during operational noise monitoring, however the dominant noise sources have been local and freeway traffic.

Complaints

Since operations at the Tasman Underground Mine commenced in 2006, no operational noise complaints have been received.

5 INP ASSESSMENT OF PREVAILING WEATHER CONDITIONS

5.1 Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the noise source. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration. Where wind blows from the source to the receiver at speeds up to 3 metres per second (m/s) for more than 30% of the time in any seasonal assessment period (i.e. day, evening or night), then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

In order to determine the prevailing conditions for the Project, 12 months of weather data was obtained from the OEH automatic weather station located at Beresfield, approximately 13 km north-east of the Project.

The meteorological data from Beresfield was also used by PAEHolmes for the Air Quality and Greenhouse Gas Assessment prepared for the Project (Appendix J of the EIS).

The data was analysed to determine the frequency occurrence of winds of speeds up to 3 m/s in each season during the day, evening and night-time periods. The results of the wind analysis for daytime evening and night time winds for the Beresfield weather data are presented in **Table 11**, to **Table 13** respectively. In each table, the wind directions and percentage occurrence are presented for the dominant winds during each season.

Table 11 Seasonal Frequency of Occurrence of Wind Speed Intervals – Daytime

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	2.4%	SE±45	7.9%	16.9%	24.8%
Autumn	2.5%	SSE±45	10.3%	11.9%	22.2%
Winter	2.1%	WNW±45	10.7%	10.3%	21.0%
Spring	1.6%	ESE±45	7.9%	15.6%	23.4%

Table 12 Seasonal Frequency of Occurrence of Wind Speed Intervals – Evening

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	1.7%	ESE±45	26.9%	19.7%	46.6%
Autumn	10.1%	SSE±45	31.2%	3.7%	34.9%
Winter	15.8%	WSW±45	22.6%	4.4%	27.0%
Spring	7.4%	E±45	24.1%	11.0%	35.1%

Table 13 Seasonal Frequency of Occurrence of Wind Speed Intervals – Night Time

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	9.3%	SSE±45	35.7%	4.2%	39.9%
Autumn	12.9%	WNW±45	29.5%	14.6%	44.1%
Winter	8.5%	WNW±45	25.3%	16.4%	41.6%
Spring	11.8%	SSE±45	24.7%	2.9%	27.6%

Seasonal wind records indicate that significant winds (of up to 3 m/s) are a feature of the area since the 30% threshold is exceeded during the evening and night-time periods. Therefore prevailing winds have been considered as part of this assessment.

Analysis of data for 2010 and 2011 from the Tasman meteorological station was also conducted. The analysis indicated that wind directions were generally consistent with those recorded at Beresfield, however, based on percentage occurrence of wind data, no prevailing winds were present during the night-time period. As such, the more conservative dataset (i.e. Beresfield) was used for the assessment.

5.2 Temperature Inversion

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. The NSW INP states that temperature inversions need only be considered for the night-time noise assessment period (10.00 pm to 7.00 am).

The occurrence of atmospheric stability classes during the winter night-time period at Beresfield are presented in **Table 14**.

In accordance with the INP the frequency of occurrence of F Class temperature inversions is greater than 30% and therefore this weather condition has been included in the assessment.

Table 14 Night Time Stability Frequency of Occurrence – Beresfield

Stability Class	Occurrence Percentage During Winter
A	0.0%
B	0.0%
C	0.0%
D	47.9%
E	13.2%
F	38.7%
G	0.2%

6 PROJECT SPECIFIC NOISE EMISSION CRITERIA

6.1 Operational Noise Criteria

The operational noise criteria for the Project have been established with reference to the INP outlined in **Section 3** of this report.

The amenity criteria have been established using the results of ambient noise monitoring described in **Section 4** of this report.

The resulting operational specific noise criteria for receivers surrounding the Project are contained within **Table 15.**

Table 15 Project Specific Operational Noise Criteria

Location	Period	Intrusiveness Criteria $L_{Aeq(15minute)}$	OEH Acceptable Amenity Criteria $L_{Aeq(Period)}$	Project Specific Noise Criteria
West Wallsend and O'Donneltown Residential Areas	Day	43 dBA	55 dBA	**43 dBA $L_{Aeq(15minute)}$**
	Evening	43 dBA*	45 dBA	**43 dBA $L_{Aeq(15minute)}$**
	Night	41 dBA	40 dBA	**40 dBA $L_{Aeq(Period)}$**
Seahampton Residential Area	Day	48 dBA	55 dBA	**48 dBA $L_{Aeq(15minute)}$**
	Evening	48 dBA	45 dBA	**45 dBA $L_{Aeq(Period)}$**
	Night	43 dBA	40 dBA	**40 dBA $L_{Aeq(Period)}$**
Residences off George Booth Drive	Day	43 dBA	50 dBA	**43 dBA $L_{Aeq(15minute)}$**
	Evening	43 dBA	45 dBA	**43 dBA $L_{Aeq(15minute)}$**
	Night	37 dBA	40 dBA	**37 dBA $L_{Aeq(15minute)}$**
Residences off Sheppeard Drive	Day	37 dBA	50 dBA	**37 dBA $L_{Aeq(15minute)}$**
	Evening	36 dBA	45 dBA	**36 dBA $L_{Aeq(15minute)}$**
	Night	35 dBA	40 dBA	**35 dBA $L_{Aeq(15minute)}$**
Sugarloaf SCA (Lookout)	When in use	N/A	50 dBA	**50 dBA (period)**
Orica Research Facility	When in use	N/A	70 dBA	**70 dBA (period)**

* Daytime criteria adopted with reference to INP Application Notes.

SCA – State Conservation Area.

6.2 Sleep Disturbance Criteria

Sleep disturbance criteria for the Project for the night-time period has been set with reference to the ENCM as outlined in **Section 3.5** of this report and presented in **Table 16**.

Table 16 Sleep Disturbance Criteria

Location	Period	Sleep Disturbance Criteria ($L_{A1[1minute]}$)
West Wallsend and O'Donneltown Residential Areas	Night-time	51 dBA
Seahampton Residential Area		53 dBA
Residences off George Booth Drive		47 dBA
Residences off Sheppeard Drive		45 dBA

6.3 Construction Noise Criteria

The Project specific construction noise goals are presented in **Table 17**.

Table 17 Construction Noise Criteria

Receiver Location	Period	Noise Goal $L_{Aeq(15minute)}$	
		Noise Affected	Highly Noise Affected
West Wallsend and O'Donneltown Residential Areas	Day	48 dBA	75 dBA
	Evening	43 dBA	N/A
	Night	41 dBA	N/A
Seahampton Residential Area	Day	53 dBA	75 dBA
	Evening	48 dBA	N/A
	Night	43 dBA	N/A
Residences off George Booth Drive	Day	48 dBA	75 dBA
	Evening	43 dBA	N/A
	Night	37 dBA	N/A
Residences off Sheppeard Drive	Day	42 dBA	75 dBA
	Evening	36 dBA	N/A
	Night	35 dBA	N/A
Passive recreation areas (Sugarloaf SCA [Lookout])	When in use	60 dBA	

With respect to construction noise impacts at commercial and industrial premises, the ICNG states the following:

> *Due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories. The external noise levels should be assessed at the most-affected occupied point of the premises:*
>
> - *industrial premises: external $L_{Aeq(15min)}$ 75 dB(A)*
> - *offices, retail outlets: external $L_{Aeq(15min)}$ 70 dB(A)*

6.4 Road Traffic Noise

The project will use George Booth Drive and John Renshaw Drive as a haulage route for delivery of coal at the Bloomfield CHPP. In addition, employees and (non-coal) delivery vehicles would travel to/from the Project via these roads. As described in **Section 3.7**, these roads fall into the category of arterial/sub-arterial roads and, therefore the noise criteria outlined in **Table 8** have been adopted.

7 ASSESSMENT OF NOISE IMPACTS

7.1 Noise Modelling

A computer model was used to predict noise emissions from the Project. The Environmental Noise Model noise modelling software package used has been produced in conjunction with the OEH. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

Noise levels were predicted at the residences which represent the nearest, most potentially affected locations. Noise emission levels were modelled for calm, prevailing weather and F class temperature inversion weather conditions.

7.2 Noise Modelling Parameters

The predicted noise emission levels for the operation of the proposed development at potentially affected receivers have been calculated under the meteorological parameters shown in **Table 18**.

Table 18 Noise Modelling Parameters

Assessment Condition	Temperature	Wind Speed/ Direction	Relative Humidity	Temperature Gradient
Day – Calm	20^{o}C	N/A	65%	N/A
Evening – Calm	20^{o}C	N/A	65%	N/A
Evening – Prevailing Wind	20^{o}C	3 m/s ENE, E, ESE, SE, SSE, S	65%	N/A
Night – Calm	10^{o}C	-	85%	-
Night - Inversion	10^{o}C	-	85%	3^{o}C/100 m
Night – Prevailing Wind	10^{o}C	3 m/s SE, SSE, S, W, WNW, NW, NNW	85%	-

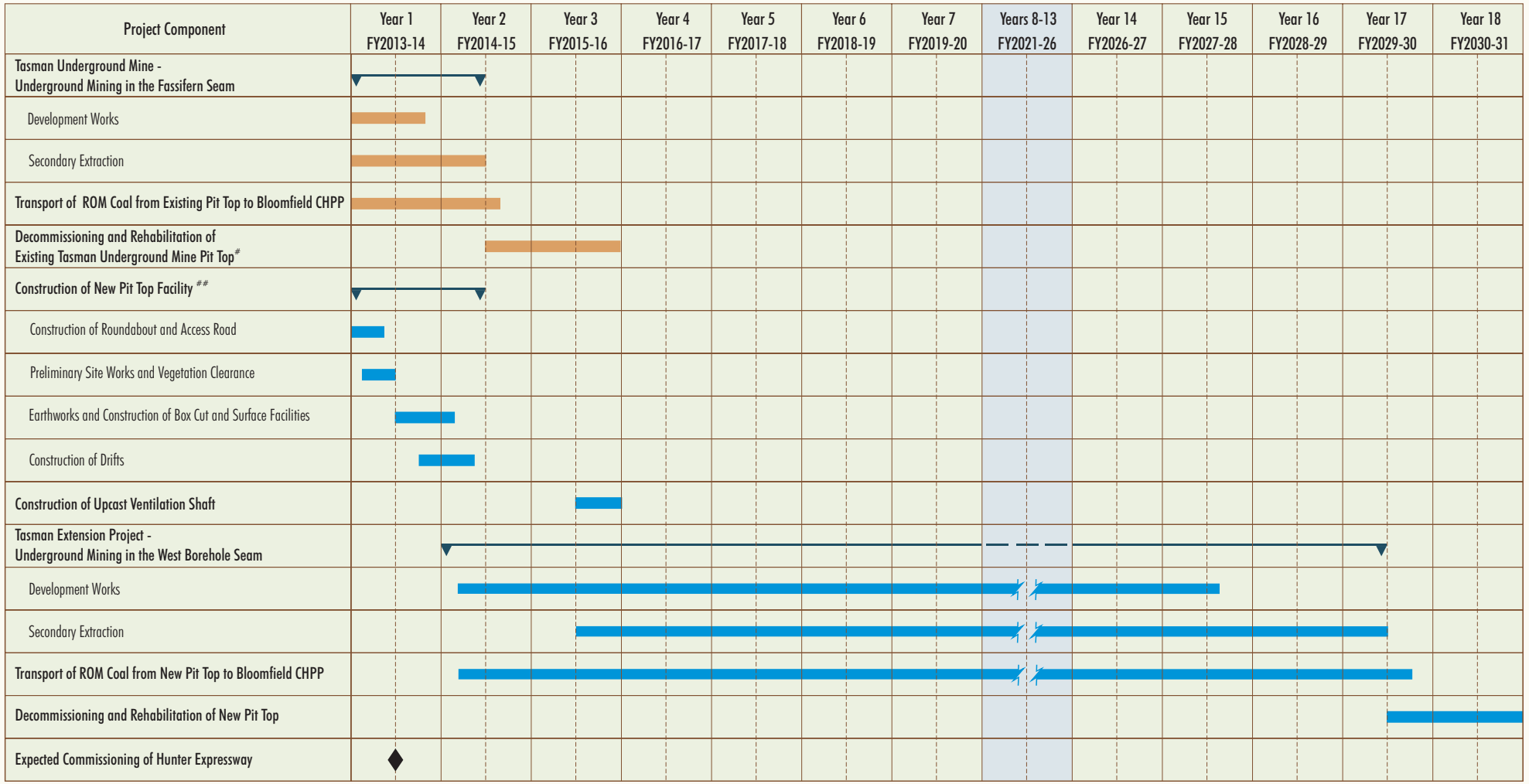
7.3 Operational Noise Modelling Scenarios

The indicative Project schedule is shown in **Figure 4**. From **Figure 4**, two (2) operational scenarios have been modelled for the Project and are provided in **Table 19**.

Table 19 Operational Scenarios

Scenario	Description
Scenario 1	Tasman Extension Project pit top (and ventilation shaft) operational (e.g. Year 4 onwards).
Scenario 2	Tasman Extension Project pit top operational using temporary ventilation fans (prior to construction of ventilation shaft) and existing Tasman pit top operational (e.g. Year 2).

Indicative Project Schedule



Existing/Approved Tasman Underground Mine (DA-274-9-2002)

Tasman Extension Project - Additional Components

\# Decommissioning and rehabilitation of the pit top may be delayed and the pit top placed under care and maintenance subject to necessary approvals under the *Mining Act, 1992*.

\#\# Construction of the new pit top facility would start in early 2013 subject to all necessary approvals being in place.

Source: Donaldson Coal (2012) and Ardill Payne & Partners (2012)

TASMAN EXTENSION PROJECT

FIGURE 4

Indicative Project Schedule

SLR

DONALDSON COAL

DCL-09-01 App Noise_001C

Scenario 1 is representative of Project noise emissions following the closure of the existing Tasman Underground Mine pit top.

Scenario 2 represents Project noise emissions during the early workings of the new pit top (approximately the first six (6) months of operation) where temporary fans will be employed to provide ventilation prior to the construction of the main ventilation shaft. This scenario also includes simultaneous operation of the existing Tasman Underground Mine pit top, before its closure.

Equipment in operation for each scenario is provided in **Table 20**. Equipment considered in operation is marked with a 'tick' (✓) and those not considered to be in operation are marked with a 'cross' (×). Where a 'tick' or 'cross' are separated by a slash indicates whether the selected equipment is operational during the day, evening period and night-time period respectively. For instance ✓/✓/× would indicate that the equipment is operational during the day and evening periods but not during the night-time period.

In particular, it should be noted that noise associated with ROM coal haulage trucks and the loading of coal to ROM coal haulage trucks by front-end loader is not modelled during the night, as these activities are limited to 7.00 am to 10.00 pm operations.

Table 20 Modelled Operational Noise Sources

Equipment	Considered Onsite Activity	
	Scenario 1	**Scenario 2**
Existing Tasman Pit Top		
Coal Bins and Conveyor	×/×/×	✓/✓/✓
Pump	×/×/×	✓/✓/✓
Ventilation Fan	×/×/×	✓/✓/✓
Underground vehicle (man transporter)	×/×/×	✓/✓/✓
Front end loader 988B	×/×/×	✓/✓/×
Stockpile truck	×/×/×	✓/✓/×
Workshop crane	×/×/×	✓/✓/✓
Compressor 650 cfm	×/×/×	✓/✓/✓
New Pit Top		
Workshop Crane	✓/✓/✓	✓/✓/✓
Hammering in Workshop	✓/✓/✓	✓/✓/✓
Grinding (workshop)	✓/✓/✓	✓/✓/✓
FEL	✓/✓/×	✓/✓/×
ROM coal haulage truck Loading	✓/✓/×	✓/✓/×
ROM coal haulage truck Leaving/Entering	✓/✓/×	✓/✓/×
Ventilation Fan	✓/✓/✓	×/×/×
Conveyor	✓/✓/✓	✓/✓/✓
Underground vehicle (man transporter)	✓/✓/✓	✓/✓/✓
Pump	✓/✓/✓	✓/✓/✓
Compressor 650 cfm	✓/✓/✓	✓/✓/✓
Stockpile Discharge	✓/✓/✓	✓/✓/✓
Temporary Ventilation Fan 1	×/×/×	✓/✓/✓
Temporary Ventilation Fan 2	×/×/×	✓/✓/✓

7.4 Predicted Operational Noise Levels

Scenario 1

Predicted noise emission levels from operational Scenario 1 of the Project at the nearest most potentially affected receivers are summarised in **Table 21**.

Table 21 Predicted Operational Noise Levels – Scenario 1

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
West Wallsend Residential Area	Day	<20	N/A	N/A	43 dBA $L_{Aeq(15minute)}$
	Evening	<20	<20	N/A	43 dBA $L_{Aeq(15minute)}$
	Night	<20	<20	<20	40 dBA $L_{Aeq(Period)}$
Seahampton Residential Area	Day	<20	N/A	N/A	48 dBA $L_{Aeq(15minute)}$
	Evening	<20	<20	N/A	45 dBA $L_{Aeq(Period)}$
	Night	<20	<20	<20	40 dBA $L_{Aeq(Period)}$
O'Donneltown Residential Area	Day	<20	N/A	N/A	43 dBA $L_{Aeq(15minute)}$
	Evening	<20	<20	N/A	43 dBA $L_{Aeq(15minute)}$
	Night	<20	<20	<20	40 dBA $L_{Aeq(Period)}$
Residences off George Booth Drive	Day	24	N/A	N/A	43 dBA $L_{Aeq(15minute)}$
	Evening	24	36	N/A	43 dBA $L_{Aeq(15minute)}$
	Night	24	34	30	37 dBA $L_{Aeq(15minute)}$
Residences off Sheppeard Drive	Day	20	N/A	N/A	37 dBA $L_{Aeq(15minute)}$
	Evening	20	34	N/A	36 dBA $L_{Aeq(15minute)}$
	Night	<20	32	26	35 dBA $L_{Aeq(15minute)}$
Sugarloaf SCA (Lookout)	Day	28	N/A	N/A	50 dBA (period)
	Evening	28	35	N/A	
	Night	21	32	27	
Orica Research Facility	Day	33	N/A	N/A	70 dBA (period)
	Evening	33	42	N/A	
	Night	33	43	37	

* Results are for the highest predicted noise level under the relevant prevailing winds provided in **Table 18**.

Project specific noise levels are predicted to be met at all receiver locations at all times under operational Scenario 1. Results for all assessed receiver locations are provided in **Appendix B** and are also presented as noise contour plots for selected meteorological conditions in **Appendix C**.

Scenario 2

Predicted noise emission levels from operational Scenario 2 of the Project at the nearest most potentially affected receivers are provided in **Table 22**.

Table 22 Predicted Operational Noise Levels – Scenario 2

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
West Wallsend Residential Area	Day	<20	N/A	N/A	43 dBA $L_{Aeq(15minute)}$
	Evening	<20	<20	N/A	43 dBA $L_{Aeq(15minute)}$
	Night	<20	27	<20	40 dBA $L_{Aeq(Period)}$
Seahampton Residential Area	Day	<20	N/A	N/A	48 dBA $L_{Aeq(15minute)}$
	Evening	<20	<20	N/A	45 dBA $L_{Aeq(Period)}$
	Night	<20	<20	<20	40 dBA $L_{Aeq(Period)}$
O'Donneltown Residential Area	Day	<20	N/A	N/A	43 dBA $L_{Aeq(15minute)}$
	Evening	<20	<20	N/A	43 dBA $L_{Aeq(15minute)}$
	Night	<20	<20	<20	40 dBA $L_{Aeq(Period)}$
Residences off George Booth Drive	Day	23	N/A	N/A	43 dBA $L_{Aeq(15minute)}$
	Evening	23	36	N/A	43 dBA $L_{Aeq(15minute)}$
	Night	22	31	27	37 dBA $L_{Aeq(15minute)}$
Residences off Sheppeard Drive	Day	20	N/A	N/A	37 dBA $L_{Aeq(15minute)}$
	Evening	20	31	N/A	36 dBA $L_{Aeq(15minute)}$
	Night	<20	27	22	35 dBA $L_{Aeq(15minute)}$
Sugarloaf SCA (Lookout)	Day	32	N/A	N/A	50 dBA (period)
	Evening	32	39	N/A	
	Night	26	31	31	
Orica Research Facility	Day	31	N/A	N/A	70 dBA (period)
	Evening	31	38	N/A	
	Night	30	37	34	

Project specific noise levels are predicted to be met at all receiver locations at all times under operational Scenario 2. Results for all assessed receiver locations are provided in **Appendix B**.

Vacant Land Noise Assessment

A review of potential noise impacts on more than 25% of privately-owned vacant land was conducted, using the noise contours presented in Appendix C. The review indicated that under adverse weather conditions during the evening and night, the relevant project specific noise levels would not be exceeded on more than 25% of any privately-owned vacant land.

On the basis that predicted operational noise levels at receivers during the day are lower, or equal to, noise levels during the evening, the relevant project specific noise levels are not predicted to be exceeded on more than 25% of any privately-owned vacant land during the day.

7.5 Operational Noise Mitigation and Management

Operational Noise Mitigation Measures

Preliminary noise modelling indicated potential noise impacts from operation of the ventilation fan, which is proposed to be located to the west of the new pit top.

To reduce potential for impacts at the nearest residential receivers, the ventilation fan will discharge horizontally, with the direction of discharge orientated to the south (i.e. away from the nearest receivers).

Operational Noise Monitoring

The operational noise monitoring conducted for the Tasman Underground Mine would continue to be conducted for the Project. In addition to the noise monitoring locations at Seahampton and West Wallsend, where monitoring would continue until the exiting pit top is decommissioned, noise monitoring locations would be established at the proposed locations on George Booth Drive and Sheppeard Drive shown on **Figure 3** (note that these locations would be subject to landowner agreement). The *Abel Underground Coal (Integrated with Donaldson Open Cut, Tasman Underground and Bloomfield Open Cut Coal Mines) Integrated Environmental Monitoring Program* would be updated to detail these locations, and the results of operational noise monitoring would continue to be reported in the Annual Environmental Management Report.

Operational noise is not predicted to exceed the Project Specific Noise Criteria at any receiver. On this basis, the appropriateness and suitability of a real-time monitoring system would be investigated following the results of operational noise monitoring (as described above).

7.6 Sleep Disturbance Noise Modelling

In assessing sleep disturbance, typical L_{Amax} noise levels of acoustically significant operations at night have been considered (i.e. the percussive impact noise associated with workshop activities). The use of the L_{Amax} noise level provides a worst-case prediction since the $L_{A1(1minute)}$ noise level of a noise event will be less than the L_{Amax}. Also, to provide a conservative assessment, it has been assumed that the noise source is outside the workshop, with no screening from the workshop or other structures.

The noise events considered are the following:

- Hammering – Sound power level of 123 dBA L_{Amax}.
- Grinding – Sound power level of 120 dBA L_{Amax}.

The highest L_{Amax} predicted at any potentially affected receiver was 45 dBA. This predicted L_{Amax} noise level is compliant with the relevant sleep disturbance goals provided in **Table 16**.

7.7 Cumulative Noise Impact

As discussed in **Section 3.4**, the INP prescribes detailed calculation routines for establishing "Project specific" $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(Period)}$ amenity criteria at potentially affected receivers for a development (in isolation).

Potential cumulative noise impacts from existing and successive developments are embraced by the INP procedures by ensuring that the appropriate noise emission criteria (and consent limits) are established with a view to maintaining acceptable noise amenity levels for residences. A potential source of industrial noise in the subject has been identified to be the Orica Ammonium Nitrate Emulsion Plant which is currently being commissioned.

Umwelt Pty Ltd has predicted noise emission levels for the Orica Ammonium Nitrate Emulsion Plant (refer Umwelt report N/R05 Noise Impact Assessment for Proposed Ammonium Nitrate Emulsion Production Facility and Continued Operation of Orica Mining Services Technology Centre, Richmond Vale, NSW dated November 2009) at nearby residential receivers. Given the location of the Orica Ammonium Nitrate Emulsion Plant and the Project, cumulative noise emission would only impact on residences located off George Booth Drive and Sheppeard Drive.

Predicted cumulative noise levels based on the predicted noise levels from the Project and the Orica Ammonium Nitrate Emulsion Plant is provided in **Table 23**.

Table 23 Predicted Cumulative Noise Levels

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$				Cumulative Noise Level $L_{Aeq(period)}$	
		Project		Orica Ammonium Nitrate Emulsion Plant			
		Calm	Meteorologically Enhanced	Calm	Meteorologically Enhanced	Calm	Meteorologically Enhanced
Residences off George Booth Drive	Day	24	24	<30	33	31	34
	Evening	24	36	<30	33	31	38
	Night	24	34	<30	33	31	37
Residences off Sheppeard Drive	Day	20	20	<30	<30	30	30
	Evening	20	34	<30	<30	30	36
	Night	<20	32	<30	<30	30	34

Note: Where the estimated contribution is < x dBA, the contributed noise level is assumed to be 'x' dBA.

Based on the results presented in **Table 23**, the estimated cumulative $L_{Aeq(period)}$ amenity levels are below the INP acceptable amenity criteria of 50 dBA, 45 dBA and 40 dBA during the daytime, evening and night-time periods respectively, at receivers located off George Booth Drive and Sheppeard Drive.

7.8 Construction

New Pit Top Construction

Noise modelling for the bulk earthworks required for the construction of the new pit top has assumed that all equipment considered during the construction phase provided in **Table 1** are operating simultaneously and continuously for a 15-minute period (with the exception of the road headers).

Results of the construction noise modelling are summarised in **Table 24**.

Table 24 Predicted Construction Noise Levels

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)	Noise Affected Construction Noise Goal $L_{Aeq(15minute)}$
West Wallsend Residential Area	Day	<20	**48 dBA**
Seahampton Residential Area	Day	<20	**53 dBA**
O'Donneltown Residential Area	Day	<20	**48 dBA**
Residences off George Booth Drive	Day	28	**48 dBA**
Residences off Sheppeard Drive	Day	25	**48 dBA**
Sugarloaf SCA - (Lookout)	Day	34	**60 dBA (When in Use)**
Orica Research Facility	Day	36	**75 dBA (When in Use)**

A review of **Table 24** indicates that noise levels from construction activities are predicted to meet the noise affected construction noise goals at all receiver locations. In addition, INP Project specific noise criteria are predicted to be met at all receiver locations at all times during construction.

Drift Construction

Following the completion of the bulk earthworks associated with the box-cut two (2) road headers would commence the development of the drifts. Development of the drifts would occur 24 hours per day, seven days a week. As the development of the drifts progresses the road headers would continue further into the drift beneath the surface and would therefore, only be near the surface for only a few weeks.

The highest $L_{Aeq(15minute)}$ noise level predicted at the nearest residential receivers during surface operations of the road headers under noise enhancing meteorological conditions detailed in **Table 18** is predicted to be 23 dBA. This level is below the construction noise criteria and INP Project specific noise criteria at all locations. It should be noted that as the road headers move further into the drift noise levels at all receivers would continue to reduce.

Ventilation Shaft

Construction activities associated with the ventilation shaft construction would involve the clearing of vegetation, installation of ancillary equipment and drilling of the ventilation shaft.

Drilling is proposed to occur 24 hours a day, seven days a week, with all other construction activities occurring during the daytime hours only.

Given the results of the noise modelling for the bulk earthworks required for the construction of the new pit top **(Table 24)**, daytime construction noise levels for the construction of the ventilation shaft are predicted to be met at all receiver locations.

The ventilation shaft would be constructed using the 'raise bore' method. A pilot hole would be drilled from the surface prior to the remainder of the shaft being excavated from the bottom of the shaft upwards. Using this method, material from the excavation would be removed from the bottom of the shaft via the existing underground system.

Drilling operations for the construction of the ventilation shaft would be partially enclosed in a temporary shed. The drilling equipment and shed would be oriented such that openings to the shed are directed away from the nearest residential receivers.

Previous noise monitoring of similar construction activities associated with the construction of the Abel Underground Mine ventilation shaft conducted by SLR Consulting in 2011 (refer SLR Consulting Report 630.10097 R1 20110314 dated 14 March 2011) indicated that drilling operations were inaudible at receiver locations approximately 1.2 km away. Given that the nearest receiver from the proposed ventilation shaft is approximately 2.4 km away it is likely that Project drilling operations would also be inaudible and below the relevant noise criteria.

Notwithstanding the above, provided the noise emission Sound Power Level of the drilling operations is below 108 dBA, the total noise level from drilling operations and the Project during the night-time period under noise enhancing meteorological conditions at receivers on George Booth Drive and Sheppeard Drive are predicted to be 37 dBA and 35 dBA respectively. This noise level is compliant with the night-time ICNG and INP Project specific criteria.

Drill rigs used in mining projects vary in sound power level due to variations in size, however sound power levels are typically in the range of 110 dBA to 118 dBA. The attenuation afforded by partially enclosing the drill rig within a temporary shed noise levels would be in the order of 10 dBA and therefore noise emissions are likely to be in compliance with the relevant criteria at the nearest residential locations.

Mitigation Measures

The following mitigation measures would be implemented to minimise construction noise:

- Construction of the new pit top would generally adhere to daytime construction hours (with the exception of the construction of the drifts and ventilation fan, as described above).
- Noisy plant operating simultaneously would be avoided wherever possible.
- Maintenance work on all construction plant would be carried out away from noise sensitive areas and confined to standard daytime construction hours.
- Noisy equipment would be situated behind structures that act as barriers, or at the greatest distance from the noise-sensitive areas, or oriented so that noise emissions are directed away from any sensitive areas.
- Equipment would be well maintained.

With regard to potentially offensive noise events associated with construction activities AS 2436-1981 *Guide to noise control on construction, maintenance and demolition sites* provides the following:

> *If noisy operations must be carried out, then a responsible person should maintain liaison between the neighbouring community and the contractor. This person should inform the public at what time to expect noisy operations and also inform the contractor of any special needs of the public.*

As such, community members and the Tasman Underground Mine Community Consultative Council would be informed of the timing of construction activities (i.e. commencement date, duration of construction and operating hours) prior to their commencement.

7.9 Road Traffic Noise Assessment

7.9.1 Existing and Predicted Traffic Movements

The Tasman Extension Project Road Transport Assessment (Appendix H of the EIS) focused on traffic generation along the coal haulage route, as this is where the key Project heavy vehicle related traffic generation would occur. The coal haulage route also represents the greatest potential for road traffic noise impacts due to the trucks hauling coal to the Bloomfield CHPP during the day only (7.00 am to 10:00 pm) (i.e. heavy vehicles have a greater potential for traffic noise generation than light vehicles). As such, **Table 25** presents existing and predicted future traffic movements for George Booth Drive north of the Project and John Renshaw Drive.

In addition, **Table 25** presents existing and predicted traffic movements for George Booth Drive south of the Project, as while this location is not on the coal haulage route, it is the only transport route (i.e. for deliveries and employees) to the Project from the south. It should be noted that the existing and predicted traffic movements for George Booth Drive south of the Project presented in **Table 25** are not based on road traffic counts in Seahampton. However, these traffic movements can be considered to be representative of Seahampton, given that there are no significant gaining roads between the Project and Seahampton along George Booth Drive.

Existing and predicted traffic movements are provided in **Table 25** for the following scenarios:

- 2011/2012 Existing – Representative of existing traffic movements (2011/2012), including the existing traffic associated with the approved existing Tasman Underground Mine (as non-Project related).

- 2013 Construction – Representative of road traffic movements prior to the commissioning of the Hunter Expressway (scheduled to occur at the end of 2013). This scenario considers continued haulage movements at the approved coal haulage rate of 4,000 tonnes per day (during the day only). This traffic is considered as non-Project related, given that the existing approved operations could continue at this rate regardless of the commencement of the Project. Project related traffic in this scenario is representative of the additional traffic required for the construction of the new pit top area, including associated workforce movements and deliveries.
- 2017 Peak – Representative of peak operational traffic movements (2017), with a rate of coal haulage of up to 6,200 tonnes per day (following the commissioning of the Hunter Expressway) during the day only, as per the existing coal haulage hours.

As can be seen from **Table 25,** total road traffic movements on George Booth Drive are predicted to increase in 2013 (as a result of baseline growth and Project construction activities), in comparison with the existing road traffic movements, and then significantly decrease by 2017 due to the commissioning of the Hunter Expressway. Traffic movements on John Renshaw Drive are predicted to increase, even following the commissioning of the Hunter Expressway.

Table 25 Existing and Predicted Traffic Movements

Year	Road	Assessment Period	Non-Project Related Light Vehicles	Non-Project Related Heavy Vehicles	Project Related Light Vehicles	Project Related Heavy Vehicles
2011 / 2012 Existing	George Booth Drive (North of the Project)	Day	6805	759	N/A	N/A
		Night	1383	126	N/A	N/A
	George Booth Drive (South of the Project)	Day	6887	623	N/A	N/A
		Night	1417	124	N/A	N/A
	John Renshaw Drive	Day	7179	1046	N/A	N/A
		Night	1599	188	N/A	N/A
2013 Construction	George Booth Drive (North of the Project)	Day	7625	833	15	92
		Night	1548	141	5	5
	George Booth Drive (South of the Project)	Day	7706	697	37	17
		Night	1586	138	15	6
	John Renshaw Drive	Day	8284	1189	4	87
		Night	1844	217	1	5
2017 Peak	George Booth Drive (North of the Project)	Day	694	63	78	357
		Night	140	12	30	15
	George Booth Drive (South of the Project)	Day	694	63	215	26
		Night	140	12	88	9
	John Renshaw Drive	Day	11267	1428	20	349
		Night	2506	290	8	13

7.9.2 Traffic Noise Complaints

Since operations at the Tasman Underground Mine commenced in 2006, there have been two complaints in regard to traffic noise. These complaints were made by the same person in June and August 2007, and were made in relation to brake noise from coal haulage trucks.

7.9.3 George Booth Drive (North of the Project)

Previous Road Traffic Data and Noise Monitoring

SLR Consulting conducted road traffic noise monitoring at a location approximately 20 m from the roadway on George Booth Drive as part of the noise impact assessment for the Tasman Underground Mine (i.e. prior to the commencement of operations at the Tasman Underground Mine) (refer Heggies report 30-1054-R1 Noise Impact Assessment Tasman Project dated 2 August 2002). Monitoring was conducted at 20 m distance from the roadway as this is the approximate setback of the nearest residence to the haulage route. Results of this monitoring are provided in **Table 26**.

Table 26 Summary of Existing Traffic Noise Levels – 2001

Location	Road Traffic Noise (dBA)			
	$L_{Aeq(15hour)}$ Day	$L_{Aeq(9hour)}$ Night	$L_{Aeq(1hour)}$ Day	$L_{Aeq(1hour)}$ Night
20 m from Roadway	64.6	58.1	66.5	62.3

Note: The $L_{Aeq(1hour)}$ descriptor is the noisiest 1 hour of the relevant period; day (7.00 am to 10.00 pm) or night (10.00 pm to 7.00 am).
As measurements were conducted in the free field a 2.5 dBA façade correction has been added.

Road traffic data from George Booth Drive was obtained from a road traffic survey conducted in 2000. The traffic data included the classification of vehicle type and a summary is provided in **Table 27**.

Table 27 Average Daily George Booth Drive Traffic Movements – 2000

Period	Light Vehicles	Heavy Vehicles	Total Vehicles	Total % Heavy Vehicles
Day	3054	115	3169	3.6%
Night	1035	60	1095	5.5%
Total	4089	175	4264	4.1%

SLR Consulting also measured noise from current haulage operations for the Tasman Underground Mine on 16 March 2011 (refer SLR Consulting Report 630.01054 Tasman Mine Haul Road Noise Monitoring dated 4 April 2011). Noise monitoring consisted of a single operator attended noise survey of 1 hour in duration under typical coal haulage conditions. Nine and three truck movements were recorded northbound and southbound along George Booth Drive, respectively. The speed limit at the monitoring location is 80 kilometres per hour (km/hr). The results are provided in **Table 28**.

Table 28 Existing Tasman Underground Mine Haulage Road Traffic Noise

Location	Tuck movements Northbound $L_{Aeq(1hour)}$	Tuck movements Southbound $L_{Aeq(1hour)}$	Total Haulage Contribution $L_{Aeq(1hour)}$	Total Road Traffic Noise $L_{Aeq(1hour)}$
20 m From Roadway	54.5 dBA	51.3 dBA	56.2 dBA	66.2 dBA

Note: As measurements were conducted in the free field a 2.5 dBA façade correction has been added.

Predicted Road Traffic Noise

Based on previous monitoring of traffic noise, measurements of Tasman Underground Mine coal haulage operations and the predicted future traffic movements, noise levels from traffic on George Booth Drive in 2013 (construction movements) and 2017 (peak operational movements) can be predicted and are provided in **Table 29**.

Table 29 Predicted Road Traffic Noise Levels – George Booth Drive (North of the Project)

Year	Location	Assessment Period	Non-Project Related Traffic	Project Related Traffic	Total Road Traffic Noise
2013 Construction	20 m from Roadway	Day - $L_{Aeq(15hour)}$	**68.9 dBA**	54.8 dBA	**69.0 dBA**
		Night – $L_{Aeq(9hour)}$	**60 dBA**	45.9 dBA	**60.1 dBA**
2017 Peak		Day - $L_{Aeq(15hour)}$	58.4 dBA	59.9 dBA	**62.2 dBA**
		Night – $L_{Aeq(9hour)}$	49.5 dBA	49.1 dBA	52.3 dBA

Note: RNP road traffic noise assessment criteria = $L_{Aeq(15hour)}$ 60 dBA (day) and $L_{Aeq(9hour)}$ 55 dBA (night). Bolded items indicate exceedances of relevant noise assessment criteria.

Prior to the commencement of the Tasman Underground Mine, road traffic noise levels in 2001 (**Table 26**) exceeded the day and night road traffic noise assessment criteria of 60 dBA $L_{Aeq(15hour)}$ and 55 dBA $L_{Aeq(9hour)}$, respectively, north of the Project on George Booth Drive.

Road traffic noise levels associated with vehicles from the Project alone would not exceed the day or night road traffic noise criteria in 2013 or 2017 at a setback distance of 20 m (**Table 29**).

As shown in **Table 29**, road traffic noise associated with non-Project related traffic would continue to exceed the day and night road traffic noise assessment criteria during the Project construction period (2013). Additional Project related traffic (associated with the construction of the new pit top area) is predicted to result in an increase in total road traffic noise levels of 0.1 dBA during the day and night at a setback distance of 20 m (**Table 29**). As detailed in the RNP, an increase of up to 2 dBA represents a minor impact that is considered barely perceptible for the average person, and on this basis, the predicted increase of 0.1 dBA is considered to be imperceptible.

Table 29 indicates that in 2017 (i.e. following the commissioning of the Hunter Expressway), at a setback distance of 20 m, total traffic noise levels on George Booth Drive north of the Project are predicted to decrease by more than 6 dBA for both the day and night periods, in comparison with levels prior to the commissioning of the Hunter Expressway (i.e. 2013). This is due to the significant number of vehicles expected to preferentially use the Hunter Expressway as opposed to George Booth Drive.

However, **Table 29** also indicates that in 2017, total road traffic noise at a setback distance of 20 m from the roadway is predicted to continue to exceed the road traffic noise assessment criteria by up to 2.2 dBA during the day. As described above, the RNP details that an increase of up to 2 dBA represents a minor impact that is considered barely perceptible for the average person. On this basis, the difference between the predicted total road traffic noise in 2017 during the day and compliance with the assessment criteria would be barely perceptible (and it should be noted that a significant reduction in total road traffic noise of more than 6 dBA would be experienced by these receivers, associated with the commissioning of the Hunter Expressway).

It is predicted that compliance with the road traffic noise assessment criteria during the day would occur at a distance of 33 m from the roadway in 2017. Note that on George Booth Drive, north of the Project, six (6) of the receivers identified on **Figure 3** are located within approximately 33 m of the roadway.

While total traffic noise levels on George Booth Drive would reduce following the commissioning of the Hunter Expressway, the relative traffic noise contribution from the Project would increase, primarily due to the proposed continued and increased rates of coal haulage.

During the night-time period, total road traffic noise levels are predicted to be below the road traffic noise assessment criteria of 55 dBA $L_{Aeq(9hour)}$ in 2017 (**Table 29**).

No exceedance of the relative increase criteria is predicted (i.e. no increase in road traffic noise levels associated with the Project of greater than 12 dBA in comparison with existing noise levels) for George Booth Drive north of the Project during the day or night.

7.9.4 George Booth Drive (South of the Project)

An operator-attended road traffic noise survey was conducted adjacent to George Booth Drive (south of the Project) on 13 March 2012. The purpose of the survey was to obtain the typical L_{Amax} noise level of heavy and light vehicles travelling on George Booth Drive (south of the Project) to predict road traffic noise levels from the roadway.

Road traffic noise levels were predicted to a distance of 7 m from the roadway in Seahampton, as this is the approximate setback of the nearest residence to the roadway. The speed limit at the monitoring location is 50 km/hr. The calculated road traffic noise levels are provided in **Table 30.**

Table 30 Predicted Road Traffic Noise Levels – George Booth Drive (South of the Project)

Year	Location	Assessment Period	Non-Project Related Traffic	Project Related Traffic	Total Road Traffic Noise
2011/2012 Existing	7 m from Roadway	Day $L_{Aeq(15hour)}$	**68.0 dBA**	N/A	**68.0 dBA**
		Night $L_{Aeq(9hour)}$	**63.3 dBA**	N/A	**63.3 dBA**
2013 Construction		Day $L_{Aeq(15hour)}$	**68.5 dBA**	50.6 dBA	**68.9 dBA**
		Night $L_{Aeq(9hour)}$	**63.8 dBA**	48.3 dBA	**63.9 dBA**
2017 Peak		Day $L_{Aeq(15hour)}$	58.1 dBA	53.7 dBA	59.5 dBA
		Night $L_{Aeq(9hour)}$	53.2 dBA	51.6 dBA	**55.5 dBA**

Note: RNP road traffic noise assessment criteria = $L_{Aeq(15hour)}$ 60 dBA (day) and $L_{Aeq(9hour)}$ 55 dBA (night). Bolded items indicate exceedances of relevant noise assessment criteria.

As shown in **Table 30,** the existing (2011/2012) road traffic noise levels exceed the day and night road traffic noise assessment criteria.

Road traffic noise levels associated with vehicles from the Project alone would not exceed the day or night road traffic noise criteria in 2013 or 2017 at a setback distance of 7 m (**Table 30**).

As shown in **Table 30**, road traffic noise associated with non-Project related traffic would continue to exceed the day and night road traffic noise assessment criteria during the Project construction period (2013). Additional Project related construction traffic is predicted to result in an increase in road traffic noise of up to 0.4 dBA during the day and 0.1 dBA during the night at a setback distance of 7 m. As described above, the RNP details that an increase of up to 2 dBA represents a minor impact that is considered barely perceptible for the average person.

Table 30 indicates that in 2017 (i.e. following the commissioning of the Hunter Expressway), at a setback distance of 7 m, total traffic noise levels on George Booth Drive south of the Project are predicted to decrease by more than 8 dBA for both the day and night periods, in comparison with levels prior to the commissioning of the Hunter Expressway (i.e. 2013).

However, during the night, total road traffic noise at a setback distance of 7 m is predicted to continue to exceed the road traffic noise assessment criteria by 0.5 dBA. As described above, the RNP details that an increase of up to 2 dBA represents a minor impact that is considered barely perceptible for the average person. On this basis, the difference between the predicted total road traffic noise in 2017 during the night and compliance with the assessment criteria would be barely perceptible (and it should be noted that a significant reduction in total road traffic noise of more than 8 dBA would be experienced by these receivers, associated with the commissioning of the Hunter Expressway).

During the day, total road traffic noise levels at a setback distance of 7 m are predicted to be below the road traffic noise assessment criteria.

No exceedance of the relative increase criteria is predicted (i.e. no increase in road traffic noise levels associated with the Project of greater than 12 dBA in comparison with existing noise levels) for George Booth Drive south of the Project during the day or night.

7.9.5 John Renshaw Drive

An operator-attended road traffic noise survey was conducted adjacent to John Renshaw Drive on 13 March 2012. The purpose of the survey was to obtain the typical L_{Amax} noise level of heavy and light vehicles travelling on John Renshaw Drive to predict road traffic noise levels from the roadway.

Road traffic noise levels were predicted to a distance of 60 m from the roadway as this is the approximate setback of the nearest residence to the roadway. The speed limit at the monitoring location is 100 km/hr. The calculated road traffic noise levels are provided in **Table 31**.

Table 31 Predicted Road Traffic Noise Levels – John Renshaw Drive

Year	Location	Assessment Period	Non-Project Related Traffic	Project Related Traffic	Total Road Traffic Noise
2011/2012 Existing	60 m From Roadway	Day $L_{Aeq(15hour)}$	**63.9 dBA**	-	**63.9 dBA**
		Night $L_{Aeq(9hour)}$	**59.1 dBA**	-	**59.1 dBA**
2013 Construction		Day $L_{Aeq(15hour)}$	**64.4 dBA**	50.4 dBA	**64.6 dBA**
		Night $L_{Aeq(9hour)}$	**59.7 dBA**	40.3 dBA	**59.7 dBA**
2017 Peak		Day $L_{Aeq(15hour)}$	**65.5 dBA**	56.4 dBA	**66.0 dBA**
		Night $L_{Aeq(9hour)}$	**61.0 dBA**	44.7 dBA	**61.1 dBA**

Note: RNP road traffic noise assessment criteria = $L_{Aeq(15hour)}$ 60 dBA (day) and $L_{Aeq(9hour)}$ 55 dBA (night). Bolded items indicate exceedances of relevant noise assessment criteria.

As shown in **Table 31**, the existing (2011/2012) road traffic levels exceed the day and night traffic noise criteria.

Road traffic noise levels associated with vehicles from the Project alone would not exceed the day or night road traffic noise criteria in 2013 or 2017 at a setback distance of 60 m (**Table 31**).

As shown in **Table 31**, road traffic noise associated with non-Project related traffic would continue to exceed the day and night road traffic noise assessment criteria in 2013. Additional Project related traffic is predicted to result in a minor increase in road traffic noise of up to 0.2 dBA during the day, with no increase predicted during the night, at a setback distance of 60 m. As described above, the RNP details that an increase of up to 2 dBA represents a minor impact that is considered barely perceptible for the average person.

Table 31 also shows that road traffic noise associated with non-Project related traffic would continue to exceed the day and night road traffic noise assessment criteria in 2017. Additional Project related traffic is predicted to result in minor increases in road traffic noise of up to 0.5 dBA during the day and 0.1 dBA during the night at a setback distance of 60 m. As described above, the RNP details that an increase of up to 2 dBA represents a minor impact that is considered barely perceptible for the average person.

No exceedance of the relative increase criteria is predicted (i.e. no increase in road traffic noise levels associated with the Project of greater than 12 dBA in comparison with existing noise levels) for John Renshaw Drive.

7.9.6 Road Traffic Noise Mitigation and Monitoring

Mitigation Measures

As described in the RNP, projects that generate additional traffic on existing roads have limited potential for noise control, because these developments are not usually linked to road improvements. In addition, during the Project life, total road traffic noise is predicted to either:

- increase by a barely perceivable level (i.e. less than 2 dBA) due to traffic associated with the Project on George Booth Drive north and south of the Project (i.e. in 2013, prior to the commissioning of the Hunter Expressway) and on John Renshaw Drive; or
- significantly decrease (i.e. for road traffic noise on George Booth Drive following the commissioning of the Hunter Expressway).

The key road traffic noise mitigation measure for the Project is the restriction of coal haulage truck movements to the day (7.00 am to 10:00 pm) only. It should be noted that along the coal haulage route in 2017, no exceedance of the road traffic noise assessment criteria is predicted on George Booth Drive north of the Project during the night, and Project related traffic is predicted to increase road traffic noise on John Renshaw Drive by only 0.1 dBA during the night (comparative to non-Project related traffic) (however, exceedance of the road traffic noise assessment criteria during the day is predicted on George Booth Drive north of the Project and on John Renshaw Drive).

In addition to restricting coal haulage to the day only, the following noise mitigation measures and strategies would be implemented for the Project:

- Staff and drivers would be made aware of the potential for noise impact through site specific inductions and staff education programmes to reinforce quiet driving styles/attitudes.
- The number of vehicle trips to and from the site would be optimised by ensuring that haul trucks are loaded to their operating capacity.
- All loose and rattling truck body parts would be fixed or tightened to minimise noise emissions from ‘body rumble’ (i.e. when loose panels vibrate when the truck hits a bump, causing noise to emanate from the panel).

Monitoring

As described in **Section 7.5**, operational noise monitoring for the Project is proposed at the location on George Booth Drive (north of the Project) shown in **Figure 3**. This location would also be used to monitor road traffic noise on George Booth Drive north of the Project. The *Abel Underground Coal (Integrated with Donaldson Open Cut, Tasman Underground and Bloomfield Open Cut Coal Mines) Integrated Environmental Monitoring Program* would be updated to reflect this monitoring.

8 BLASTING AND VIBRATION ASSESSMENT

8.1 Underground Blasting

Igneous rock dykes have been identified to intersect some underground mining areas and would require removal in order to continue mining. The use of explosives may be required to dislodge and fracture the dykes to enable its extraction and removal. To achieve this, holes would be drilled into the rock in a designed pattern giving strict attention to their angle, depth and spacing. These holes are then filled with an explosive charge and initiated with the aid of primers and detonators. The detonation of holes would be delayed in a pre-designed sequence to ensure that holes are fired in quick succession. A delayed firing technique improves the efficiency of the blast and also reduces its environmental impacts.

The infrastructure and properties potentially affected by the underground blasting, should it be required, includes:

- Transgrid 330 kV suspended transmission lines and fibre optic cable located to the west of the new pit top. A buried AAPT fibre optic cable is also located within this easement.
- Buried Ausgrid 132 kV transmission line and Telstra fibre optic cable to the south west of the proposed new pit top.
- 11kV suspended transmission line on Sheppeard Drive
- Mt Sugarloaf TV towers, communication tower, picnic area and buildings.
- Residences on Sheppeard Drive

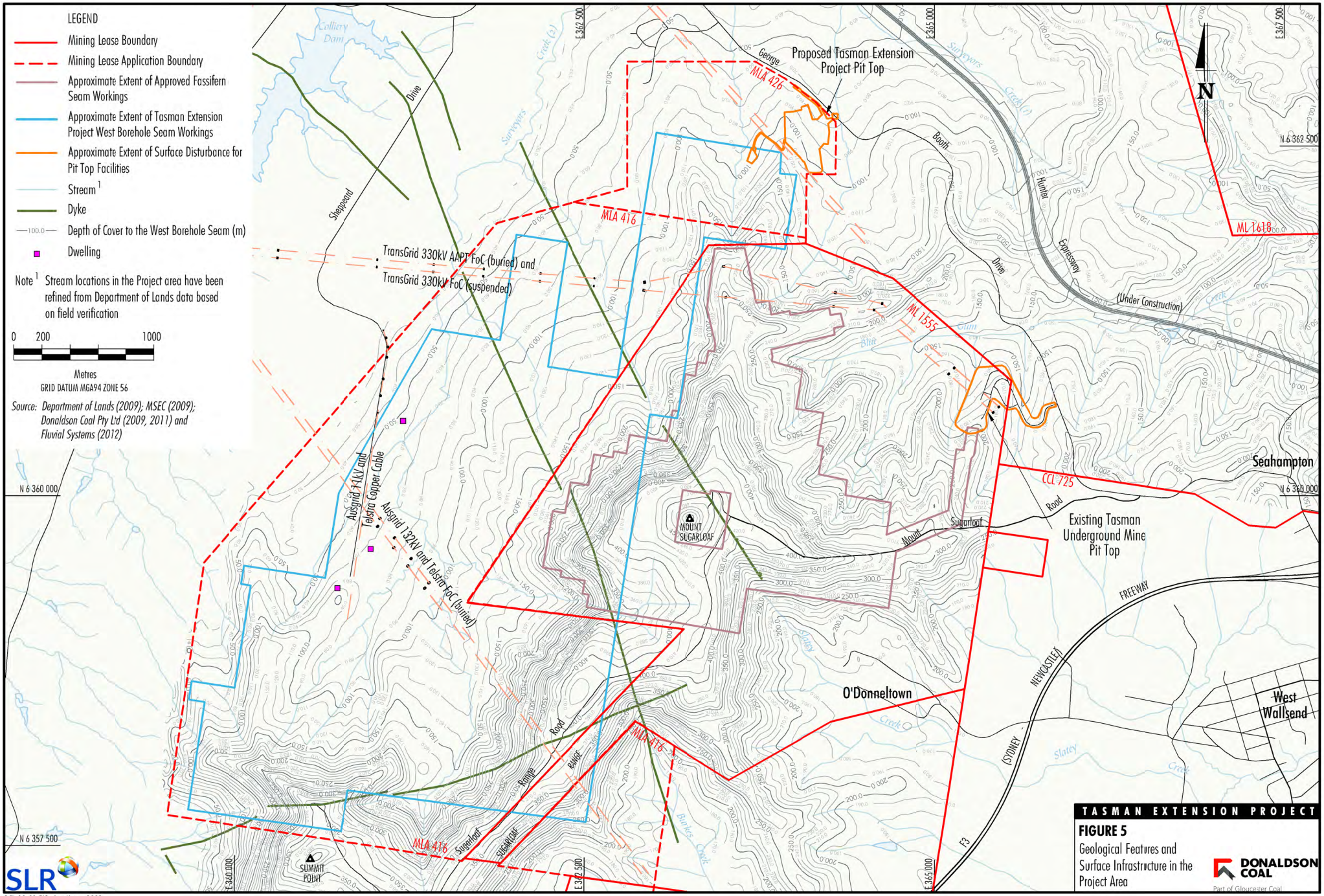
The location of the dykes and relevant surface infrastructure is provided in **Figure 5**.

8.1.1 Blast Emission Criteria

Residential Disturbance

The Australian and New Zealand Environment Conservation Council (ANZECC) guidelines are the most commonly used guideline for assessing potential residential disturbance arising from blast emissions. The ANZECC guidelines provide assessment criteria with the aim of minimising annoyance from noise and vibrations caused by blasting activities and are as follows:

- The recommended maximum level for airblast is 115 dB Linear. This level may be exceeded for up to 5% of the total number of blasts over a 12 month period but should not exceed 120 dB Linear at any time.
- The recommended maximum for ground vibration is a Peak Vector Sum (PVS) vibration velocity of 5 millimetres per second (mm/s). This level may be exceeded for up to 5% of the total number of blasts over a 12 month period but should not exceed 10 mm/s at any time.
- Blasting should generally only be permitted during the hours of 9.00 am to 5.00 pm Monday to Saturday. Blasting should not take place on Sundays and public holidays.
- Blasting should generally take place no more than once per day.
- The ground vibration and airblast levels which cause concern or discomfort to residents are generally lower than the relevant building damage limits.
- As the blasting would be conducted underground, airblast pressure would propagate from the blast location through the underground workings where it would eventually exit through openings to the surface such as ventilation shafts and the portal. The airblast level would attenuate as it travels through the underground workings and is likely to have no measureable impacts at the nearest sensitive receivers. As such the impact of airblast from underground blasting has not been considered as part of this assessment.



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Surface Infrastructure

British Standard 7385: Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2* provides criteria against which the likelihood of building damage from ground vibration can be assessed.

Sources of vibration which are considered in the standard include blasting (carried out during mineral extractions or construction excavation), demolition, piling, ground treatments (compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to commercial and residential buildings are presented numerically in **Table 32**.

Table 32 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage (BS 7385.2)

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced of framed structures - Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures - Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note: Values referred to are at the base of the building being considered.
Hz = hertz.

The standard states that the guide values in **Table 32** relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in **Table 32** may need to be reduced by up to 50%.

German Standard 4150-3 1999 *Structural Vibration Part 3: Effects of Vibration on Structures* also provides guideline criteria for evaluating the short and long-term effects of vibration on structures. The relevant vibration damage criteria are summarised in **Table 33.**

Table 33 Vibration Velocity Damage and Annoyance Risk Criteria (mm/s)

Receiver Area	Damage Risk (mm/s) (DIN4150-3)	
	Horizontal	Vertical
Residential/Dwellings	15	5
Commercial/Offices	40	20
Industrial/Workshops	40	20
Mechanical (On/Off)	20/5	20/5
Electronic/Computers	5	5
Subsurface Infrastructure/Pipework	50-100	50-100

8.1.2 Prediction of Blasting Impacts

Site law formulas provide specific relationships between the level of blast emissions and Scaled Distance. The Scaled Distance is a fundamental relationship between distance and the maximum instantaneous explosive charge mass (MIC). Normally in blast analysis large amounts of recorded blast events are statistically analysed to obtain the site law formulas.

Methodology

In this case no detailed blasting information was available. In the absence of field data it is possible to predict ground vibration using generic site law models developed by the ICI (now Orica) following extensive research into the area of blast transmission. The charge weight scaling law for ground vibration is:

$$PPV = \mathrm{K}\left(\frac{\mathrm{D}}{\sqrt{\mathrm{m}}}\right)^{-1.6}$$

Where:

PPV = Peak Particle Velocity (mm/s)
m = Maximum Instantaneous Charge mass (kilogram [kg] MIC)
D = Distance (m)
K = Site constant

The K value is dependent on the blast interface and the type of rock the blast is being transferred to. For free face blasting of hard or highly structured rock a K value of 500 is typical, for a free face of average rock approximately 1,140 and for nearfield heavily confined blasting values of up to 5,000 are not uncommon.

Previous blasting assessments conducted for Tasman Underground Mine (refer Terrock Consulting Engineers report DCM-0708-270907 Donaldson Coal – Tasman Mine Vibration Effects of Blasting Through Igneous Dykes in an Underground Coal Mine dated 15 October 2007) have used a K factor of 1,900. This is considered an appropriate K factor for the assessment of surface vibration levels from underground blasting from the Project.

The MIC (maximum explosive mass to be detonated in any 8 millisecond interval) proposed for blasting at the Project is 12.2 kg.

Predicted Impacts

The level of ground vibration has been predicted from the nearest potential blasting location to the surface infrastructure. The locations have been identified based on the locations of known dykes, the locations of surface infrastructure, and depth of cover contours from the Project mine plan to the surface. Predicted results are given in **Table 34**.

As can be seen, surface vibration levels from underground blasting at the Project, should it be required, are predicted to be significantly below blast emission criteria for both human comfort and vibration damage.

Table 34 Predicted Vibration Emission Levels

Infrastructure	Predicted Surface Vibration Level PPV (mm/s)	Recommended Vibration Limit PPV (mm/s)
Transgrid 330 kV transmission line and suspended fibre optic cable	0.62	50-100
AAPT fibre optic cable	0.64	50-100
Ausgrid 132 kV and Telstra buried fibre optic cable	1.05	50-100
Sheppeard Drive 11kV suspended transmission line	0.30	50-100
Residences on Sheppeard Drive	0.36	5
Mt Sugarloaf	0.22	20-50

It is possible that blasting may be required at other locations if further dykes and other geological features are discovered during mining. **Table 35** details the minimum safe blasting distance required from infrastructure and buildings to remain within the recommended vibration criteria.

Table 35 Minimum Blast Distance

Predicted Vibration Level (mm/s)	Minimum Blast Distance (m)
100	22
50	34
20	61
5	144

The minimum depth of cover for the Project mine plan is approximately 50 m (**Figure 5**). The depth of cover at Mt Sugarloaf is between 400 to 450 m.

On this basis, no impacts are predicted for any blast beneath, regardless of the blast location, for all infrastructure, with the exception of residences.

The Project mine plan extends underneath three (3) residences on Sheppeard Drive. The depth of cover at these receivers is between 50 to 90 m. No blasting is expected to be required in the vicinity of these residences. However, should additional geological features be encountered during mining in the vicinity of the residences, no blasting would occur within the minimum offset distance to meet the relevant criteria (i.e. blasting would not occur within 144 m, based on the results presented in **Table 35**).

Monitoring

Should blasting be required for the Project, monitoring would be conducted to ensure compliance with relevant criteria, and validate the blasting predictions presented above.

8.2 Blasting during Construction of the New Pit Top Area

Blasting of material may be required during the construction of the box cut at the new pit top area. The requirement for blasting would be dependent on the geotechnical parameters of the material being excavated. Preferentially, no blasting would occur, and the material would be removed through the use of excavators only.

Should blasting be required, the limiting factor for the size (i.e. MIC) of any blast would be compliance with the recommended vibration limit (i.e. 50 mm/s) at the Ausgrid 132 kV and Telstra buried fibre optic cable, which are located adjacent to the new pit top area (**Figure 5)**.

Using the generic site law model for blasting impacts described in **Section 8.1.2** (and using a distance of 14 m and a k value of 1140), an MIC of less than 3.9 kg would be required for the blasting to comply with the recommended vibration limit of 50 mm/s at the Ausgrid 132 kV and Telstra buried fibre optic cable.

Based on this MIC, vibration levels at other surface infrastructure and properties (i.e. dwellings) were predicted, as follows:

- There would be no exceedance of the recommended vibration limit of 5-10 mm at any dwelling (i.e. vibration levels at the closest dwelling to the new pit top area, located approximately 2.5 km away, were predicted to be approximately 0.01 mm/s).
- There would be no exceedance of the recommended vibration limits for the other surface infrastructure listed in **Section 8.1.1** (e.g. Mt Sugarloaf tower), which are located further away from the new pit top area than the Ausgrid 132 kV and Telstra buried fibre optic cable.

8.3 Road Traffic Vibration

Trucks hauling coal from the Project to the Bloomfield CHPP have the potential to generate ground borne traffic vibration.

Previous assessments of truck vibration levels (refer Heggies report 10-5055-R1 Metropolitan Coal Project Noise Impact Assessment dated 31 July 2008) have indicated that haulage trucks travelling at 80 km/hr or less were predicted to generate vibration levels well below the vibration damage criteria of 5 mm/s, and below the more stringent annoyance risk criterion of 0.5 mm/s, at residences a distance of 7.5 m or greater from the road.

The maximum speed limit on George Booth Drive is 80 km/hr, and the closest receivers are located approximately 20 m from the road. As such, vibration criteria are not expected to be exceeded at any receiver due to coal haulage trucks travelling on George Booth Drive.

The speed limit on John Renshaw Drive is 100 km/hr, and the closest receivers are located approximately 60 m from the road. Given that the more stringent annoyance risk criterion of 0.5 mm/s was not predicted to be exceeded at a distance of 7.5 m from the road for trucks travelling at 80 km/hr, it is considered that criteria would not be exceeded at any receiver due to trucks travelling on John Renshaw Drive at 100 km/hr (given the closest receivers are approximately 60 m away from the road).

These conclusions are consistent with the description of the potential impacts from ground borne traffic vibration detailed in the RNP, which states:

> *Vehicles operating on a roadway are unlikely to cause a perceptible level of vibration unless there are significant road irregularities, particularly if the affected receiver is more than 20 metres from the roadway.*

As noted above, receivers along the coal haulage route are 20 m or greater from George Booth Drive or John Renshaw Drive.

9 CONCLUSION

SLR Consulting has conducted a noise and vibration impact assessment for the Project. The purpose of the noise and vibration impact assessment was to identify the potential impacts of noise and vibration from the Project.

Ambient noise monitoring in conjunction with noise modelling and predictions has been used to assess noise emissions from the Project.

Operation

Noise levels at potentially affected receivers were predicted for two (2) operational scenarios under calm and prevailing weather conditions. The operation of the Project is predicted to comply with the Project specific noise levels under calm and prevailing conditions at all receiver locations.

Night-time sleep disturbance noise goals are also predicted to be met at all receiver locations.

Cumulative industrial noise from the Project and the approved Orica Ammonium Nitrate Emulsion Plant under calm and noise enhancing meteorological conditions are predicted to be below the INP acceptable amenity criteria at all relevant receiver locations.

Operational Noise Mitigation and Monitoring Measures

The key source of noise associated with the operation of the Project was identified to be the ventilation fan. To reduce the potential for impacts at the nearest residential receivers, the ventilation fan will discharge horizontally, with the direction of discharge orientated to the south (i.e. away from the nearest receivers).

The operational noise monitoring conducted for the Tasman Underground Mine would continue to be conducted for the Project. In addition to the noise monitoring locations at Seahampton and West Wallsend, noise monitoring locations would be established at proposed locations on George Booth Drive and Sheppeard Drive (subject to landowner agreement).

Construction

Construction activities associated with bulk earthworks required for the development of the new pit top area (e.g. development of the box-cut) would be conducted during day time hours only, and are predicted to meet the noise affected construction noise goals at all receiver locations.

The use of two (2) road headers 24 hours per day, seven days a week, during construction of the drifts following the completion of bulk earthworks is predicted to be significantly below the construction noise criteria at all receiver locations.

The 24 hours per day drilling operations for the construction of the ventilation shaft are predicted to be compliant with the ICNG and INP noise criteria at all receiver locations under calm and noise enhancing meteorological weather conditions.

Road Traffic

No exceedance of the road traffic noise assessment criteria was predicted at any receiver along George Booth Drive or John Renshaw Drive for Project related road traffic noise during the day or night.

Existing road traffic noise exceeds the relevant road traffic noise assessment criteria at the closest receivers along on George Booth Drive and John Renshaw Drive.

In 2013, additional Project related construction traffic was predicted to result in increases to total road traffic noise at the closest receivers along George Booth Drive and John Renshaw of up to 0.4 dBA. The NSW Road Noise Policy details that an increase of up to 2 dBA represents a minor impact that is considered barely perceptible for the average person. As such, the increases to total road traffic noise associated with Project related construction traffic would be barely perceptible.

In 2017, following the commissioning of the Hunter Expressway, there was predicted to be a significant reduction (i.e. greater than 6 dBA) in total road traffic noise experienced by receivers along George Booth Drive.

Notwithstanding, barely perceptible exceedances (i.e. up to 2.2 dBA) of the road traffic noise assessment criteria were predicted for the closest receivers:

- along George Booth Drive north of the Project during the day (2.2 dBA exceedance), with no exceedance predicted during the night; and
- along George Booth Drive south of the Project during the night (0.5 dBA exceedance), with no exceedance predicted during the day.

In 2017, additional Project related traffic was predicted to result in barely perceptible increases to total road traffic noise of up to 0.5 dBA at the closest receivers along John Renshaw Drive.

Road Traffic Noise Mitigation and Monitoring

The key road traffic noise mitigation measure for the Project is the restriction of coal haulage truck movements to the day (7.00 am to 10:00 pm) only.

Road traffic noise monitoring would be conducted on George Booth Drive north of the Project, consistent with the timing and location of the operation noise monitoring at the proposed location on George Booth Drive.

Blasting

Surface vibration levels from any underground blasting of igneous dykes at the Project are predicted to be significantly below blast emission criteria for both human comfort and vibration damage.

It is possible that blasting may be required at other locations if further dykes and other geological features are discovered during mining, therefore, minimum safe blasting distances have been recommended from infrastructure and buildings to remain within the recommended vibration criteria. Should additional geological features be encountered during mining in the vicinity of residences, no blasting would occur within the minimum offset distance required to meet the relevant criteria.

Monitoring of blasts would be conducted in order to derive a site law for the Project to validate predicted vibration levels.

The maximum instantaneous charge of any blasts required during excavation of the box cut at the new pit top area would be designed to achieve the relevant vibration damage criteria for all surface infrastructure (including dwellings), in particular the Ausgrid 132 kV transmission line adjacent to the new pit top facility.

Road Traffic Vibration

Trucks hauling coal from the Project to the Bloomfield CHPP are not expected to exceed the damage or annoyance vibration criteria at receivers located along George Booth Drive or John Renshaw Drive.

10 CLOSURE

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Donaldson Coal Pty Ltd. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Equipment Sound Power Levels

Equipment Description	Octave Band Centre Frequency (Hz) – dB re 1pW										dB	dBA
	31.5	63	125	250	500	1000	2000	4000	8000	16000		
Construction Equipment												
Hitachi EX1200	111	119	118	118	113	113	107	95	88	82	124	117
Cat 330D Excavator	99	104	109	112	111	108	110	108	96	90	118	116
40 Tonne Articulated Dump trucks X1	100	110	113	106	106	105	105	97	92	88	117	110
D10 Dozer	111	112	111	117	117	113	117	117	101	95	124	123
40Tonne Compactor	99	104	109	112	107	105	102	96	90	85	116	110
Grader 12G	97	100	109	104	108	109	106	103	103	103	116	113
Watercart	105	105	102	104	101	99	98	91	86	86	111	105
Genset	112	107	102	97	98	92	88	80	76	66	114	98
Grader 12G	97	100	109	104	108	109	106	103	103	103	116	113
Smooth drum vibrating roller	99	104	109	112	107	105	102	96	90	85	116	110
Backhoe	85	94	93	92	97	94	88	82	80	78	102	98
Cat 330D Excavator	99	104	109	112	111	108	110	108	96	90	118	116
Tandem Trucks	106	115	102	109	104	102	99	100	92	92	117	108
70 T crane	112	110	109	104	106	100	94	86	78	63	116	106
Hitachi EX1200	111	119	118	118	113	113	107	95	88	82	124	117
Cat 330D Excavator	99	104	109	112	111	108	110	108	96	90	118	116
40 Tonne Articulated Dump trucks (6 off)	100	110	113	106	106	105	105	97	92	88	117	110
D10 Dozer	111	112	111	117	117	113	117	117	101	95	124	123
40Tonne Compactor	99	104	109	112	107	105	102	96	90	85	116	110
Grader 12G	97	100	109	104	108	109	106	103	103	103	116	113
Watercart	105	105	102	104	101	99	98	91	86	86	111	105
Genset	112	107	102	97	98	92	88	80	76	66	114	98
Grader 12G	97	100	109	104	108	109	106	103	103	103	116	113
Smooth drum vibrating roller	99	104	109	112	107	105	102	96	90	85	116	110
Backhoe	85	94	93	92	97	94	88	82	80	78	102	98
Cat 330D Excavator	99	104	109	112	111	108	110	108	96	90	118	116
Tandem Trucks	106	115	102	109	104	102	99	100	92	92	117	108
70 T crane	112	110	109	104	106	100	94	86	78	63	116	106
Grinder	63	67	65	67	75	84	95	100	100	95	104	104
Impact gun	69	75	78	84	86	84	86	90	90	85	96	95
Hand Tools (hammering)	108	107	87	93	89	94	93	88	84	79	111	98
Continuous Miners	109	116	115	109	107	106	104	97	92	87	120	111

Equipment Sound Power Levels

Equipment Description	Octave Band Centre Frequency (Hz) – dB re 1pW										dB	dBA
	31.5	63	125	250	500	1000	2000	4000	8000	16000		
Proposed Tasman Extension Pit Top												
Workshop Crane	99	106	96	96	99	97	93	89	87	87	109	101
Hammering in Workshop	108	107	87	93	89	94	93	88	84	79	111	98
Grinding	63	67	65	67	75	84	95	100	100	95	104	104
FEL	111	112	123	111	111	109	106	103	91	75	124	115
Product Truck Loading	106	115	102	109	104	102	99	100	92	92	117	108
Product Truck Leaving/Entering	106	115	102	109	104	102	99	100	92	92	117	108
Watercart	105	105	102	104	101	99	98	91	86	86	111	105
Ventilation Fan	104	115	114	112	113	108	106	104	95	86	120	114
Conveyor	77	80	87	83	92	83	81	80	68	76	95	92
Underground vehicle (man transporter)	92	102	104	108	104	99	96	91	83	83	112	106
Pump	70	72	79	80	81	18	74	67	58	58	86	81
Compressor 650 cfm	92	95	101	108	105	100	103	94	81	81	112	108
Stockpile Discharge	95	87	85	85	87	89	90	87	84	81	99	95
Temp Fan 1	117	117	115	117	117	116	113	108	106	104	125	120
Temp Fan 2	110	110	108	110	110	109	106	101	99	97	118	113
Existing Tasman Mine Pit Top												
Coal Bins and Conveyor	113	112	111	106	105	102	96	89	79	79	118	107
Pump	70	72	79	80	81	18	74	67	58	58	86	81
Ventilation Fan	109	109	106	104	100	96	91	86	76	76	114	102
Stand by generator	103	105	111	110	110	109	106	101	95	84	117	113
Underground vehicle (man transporter)	92	102	104	108	104	99	96	91	83	83	112	106
Front end loader 988B	111	112	123	111	111	109	106	103	91	75	124	115
Stockpile truck	106	115	102	109	104	102	99	100	92	92	117	108
Workshop crane	99	106	96	96	99	97	93	89	87	87	109	101
Compressor 650 cfm	92	95	101	108	105	100	103	94	81	81	112	108

Single Point Receiver Noise Levels - Scenario 1

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
O'Donneltown	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	<20	N/A	43 dBA LAeq(15minute)
	Night	<20	<20	<20	40 dBA LAeq(Period)
Seahampton	Day	<20	N/A	N/A	48 dBA LAeq(15minute)
	Evening	<20	<20	N/A	45 dBA LAeq(Period)
	Night	<20	<20	<20	40 dBA LAeq(Period)
West Wallsend	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	<20	N/A	43 dBA LAeq(15minute)
	Night	<20	<20	<20	40 dBA LAeq(Period)
5a Four Mile Pty Limited	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	26	N/A	43 dBA LAeq(15minute)
	Night	<20	<20	<20	37 dBA LAeq(15minute)
5b Four Mile Pty Limited	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	27	N/A	43 dBA LAeq(15minute)
	Night	<20	20	<20	37 dBA LAeq(15minute)
10 Roads and Traffic Authority of New South Wales	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	28	N/A	43 dBA LAeq(15minute)
	Night	<20	24	21	37 dBA LAeq(15minute)
14 Orica Australia Pty Limited	Day	28	N/A	N/A	70 dBA (period)
	Evening	28	39	N/A	
	Night	26	39	31	
16a ARM & C Roach	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	28	N/A	43 dBA LAeq(15minute)
	Night	<20	30	25	37 dBA LAeq(15minute)
16b ARM & C Roach	Day	23	N/A	N/A	43 dBA LAeq(15minute)
	Evening	23	30	N/A	43 dBA LAeq(15minute)
	Night	21	31	27	37 dBA LAeq(15minute)
18 AR Sager	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	<20	N/A	43 dBA LAeq(15minute)
	Night	<20	<20	<20	40 dBA LAeq(Period)
19 AS & KL Green	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	31	N/A	36 dBA LAeq(15minute)
	Night	<20	21	20	35 dBA LAeq(15minute)
24 BG & M Smith	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	31	N/A	36 dBA LAeq(15minute)
	Night	<20	25	22	35 dBA $L_{Aeq(15minute)}$

Single Point Receiver Noise Levels - Scenario 1

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
35 D & JA Hoey	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	29	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	20	35 dBA LAeq(15minute)
37 GW & KM Cameron	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	31	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
40 GT, SD, JR & MA Holmes	Day	23	N/A	N/A	43 dBA LAeq(15minute)
	Evening	23	33	N/A	43 dBA LAeq(15minute)
	Night	23	33	29	37 dBA LAeq(15minute)
43a GG & CA Morris	Day	22	N/A	N/A	43 dBA LAeq(15minute)
	Evening	22	34	N/A	43 dBA LAeq(15minute)
	Night	21	31	28	37 dBA LAeq(15minute)
43b GG & CA Morris	Day	22	N/A	N/A	43 dBA LAeq(15minute)
	Evening	22	34	N/A	43 dBA LAeq(15minute)
	Night	22	31	28	37 dBA LAeq(15minute)
45 GK Hooler	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	32	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
48 H Spruce & JW Rhind	Day	20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	20	34	N/A	36 dBA LAeq(15minute)
	Night	<20	32	26	35 dBA LAeq(15minute)
51 JM Spruce	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	31	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
57 KH & DM Starr	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	32	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
58 KM & LJ Spruce	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	<20	N/A	43 dBA LAeq(15minute)
	Night	<20	<20	<20	40 dBA LAeq(Period)
60 LD & KA Bradbery	Day	20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	20	28	N/A	43 dBA LAeq(15minute)
	Night	<20	30	22	37 dBA LAeq(15minute)
64 ME Hooley	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	27	N/A	43 dBA LAeq(15minute)
	Night	<20	28	25	37 dBA LAeq(15minute)

Single Point Receiver Noise Levels - Scenario 1

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
65 MA Honeysett	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	30	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
70 The Minister for Lands	Day	28	N/A	N/A	50 dBA (period)
	Evening	28	35	N/A	
	Night	21	32	27	
74 PJ Crowhurst	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	32	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
75 PE Maytom	Day	23	N/A	N/A	43 dBA LAeq(15minute)
	Evening	23	35	N/A	43 dBA LAeq(15minute)
	Night	22	32	28	37 dBA LAeq(15minute)
83 PW & DL Dryden	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	33	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
96 Transgrid	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	<20	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
97 WC & LM Gibson	Day	24	N/A	N/A	43 dBA LAeq(15minute)
	Evening	24	36	N/A	43 dBA LAeq(15minute)
	Night	24	34	30	37 dBA LAeq(15minute)
99 LJ & LM Jones	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	28	N/A	43 dBA LAeq(15minute)
	Night	<20	26	22	37 dBA LAeq(15minute)
100 DR & KL Bishop	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	22	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	5	35 dBA LAeq(15minute)
101 GR & RL Watts	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	<20	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
103 DJ & SL Ayre	Day	20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	20	33	N/A	43 dBA LAeq(15minute)
	Night	<20	30	26	37 dBA LAeq(15minute)
104 KP & J Mantle	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	31	N/A	43 dBA LAeq(15minute)
	Night	<20	29	24	37 dBA LAeq(15minute)

Single Point Receiver Noise Levels - Scenario 1

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
105 LJ & C Fairhall	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	32	N/A	43 dBA LAeq(15minute)
	Night	<20	29	26	37 dBA LAeq(15minute)
106 F Valicek	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	26	N/A	43 dBA LAeq(15minute)
	Night	<20	20	17	37 dBA LAeq(15minute)
107 CR & L Parker	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	26	N/A	43 dBA LAeq(15minute)
	Night	<20	27	23	37 dBA LAeq(15minute)
108 AM Williams	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	31	N/A	43 dBA LAeq(15minute)
	Night	<20	28	24	37 dBA LAeq(15minute)
109 CR & ML Parnell	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	27	N/A	43 dBA LAeq(15minute)
	Night	<20	21	18	37 dBA LAeq(15minute)
110 ME & KD Elliott	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	26	N/A	43 dBA LAeq(15minute)
	Night	<20	20	18	37 dBA LAeq(15minute)
102a IR & MMF Gee	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	30	N/A	43 dBA LAeq(15minute)
	Night	<20	28	24	37 dBA LAeq(15minute)
102b IR & MMF Gee	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	29	N/A	43 dBA LAeq(15minute)
	Night	<20	30	26	37 dBA LAeq(15minute)

Results shown are from the highest predicted noise level under the relevant prevailing winds provided in **Table 18*

Single Point Receiver Noise Levels - Scenario 2

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
O'Donneltown	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	<20	N/A	43 dBA LAeq(15minute)
	Night	<20	<20	<20	40 dBA LAeq(Period)
Seahampton	Day	<20	N/A	N/A	48 dBA LAeq(15minute)
	Evening	<20	<20	N/A	45 dBA LAeq(Period)
	Night	<20	<20	<20	40 dBA LAeq(Period)
West Wallsend	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	<20	N/A	43 dBA LAeq(15minute)
	Night	<20	27	<20	40 dBA LAeq(Period)
5a Four Mile Pty Limited	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	27	N/A	43 dBA LAeq(15minute)
	Night	<20	20	<20	37 dBA LAeq(15minute)
5b Four Mile Pty Limited	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	28	N/A	43 dBA LAeq(15minute)
	Night	<20	21	<20	37 dBA LAeq(15minute)
10 Roads and Traffic Authority of New South Wales	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	31	N/A	43 dBA LAeq(15minute)
	Night	<20	30	21	37 dBA LAeq(15minute)
14 Orica Australia Pty Limited	Day	27	N/A	N/A	70 dBA (period)
	Evening	27	37	N/A	
	Night	25	36	29	
16a ARM & C Roach	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	24	N/A	43 dBA LAeq(15minute)
	Night	<20	23	<20	37 dBA LAeq(15minute)
16b ARM & C Roach	Day	22	N/A	N/A	43 dBA LAeq(15minute)
	Evening	22	29	N/A	43 dBA LAeq(15minute)
	Night	<20	26	23	37 dBA LAeq(15minute)
18 AR Sager	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	<20	N/A	43 dBA LAeq(15minute)
	Night	<20	<20	<20	40 dBA LAeq(Period)
19 AS & KL Green	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	29	N/A	36 dBA LAeq(15minute)
	Night	<20	22	<20	35 dBA LAeq(15minute)
24 BG & M Smith	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	30	N/A	36 dBA LAeq(15minute)
	Night	<20	23	<20	35 dBA $L_{Aeq(15minute)}$

Single Point Receiver Noise Levels - Scenario 2

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
35 D & JA Hoey	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	28	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
37 GW & KM Cameron	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	29	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
40 GT, SD, JR & MA Holmes	Day	22	N/A	N/A	43 dBA LAeq(15minute)
	Evening	22	32	N/A	43 dBA LAeq(15minute)
	Night	21	29	25	37 dBA LAeq(15minute)
43a GG & CA Morris	Day	21	N/A	N/A	43 dBA LAeq(15minute)
	Evening	21	34	N/A	43 dBA LAeq(15minute)
	Night	<20	28	26	37 dBA LAeq(15minute)
43b GG & CA Morris	Day	21	N/A	N/A	43 dBA LAeq(15minute)
	Evening	21	34	N/A	43 dBA LAeq(15minute)
	Night	<20	29	25	37 dBA LAeq(15minute)
45 GK Hooler	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	31	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
48 H Spruce & JW Rhind	Day	20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	20	30	N/A	36 dBA LAeq(15minute)
	Night	<20	27	22	35 dBA LAeq(15minute)
51 JM Spruce	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	29	N/A	36 dBA LAeq(15minute)
	Night	<20	21	<20	35 dBA LAeq(15minute)
57 KH & DM Starr	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	29	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
58 KM & LJ Spruce	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	<20	N/A	43 dBA LAeq(15minute)
	Night	<20	<20	<20	40 dBA LAeq(Period)
60 LD & KA Bradbery	Day	20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	20	25	N/A	43 dBA LAeq(15minute)
	Night	<20	24	<20	37 dBA LAeq(15minute)
64 ME Hooley	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	25	N/A	43 dBA LAeq(15minute)
	Night	<20	24	20	37 dBA LAeq(15minute)

Single Point Receiver Noise Levels - Scenario 2

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
65 MA Honeysett	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	29	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
70 The Minister for Lands	Day	32	N/A	N/A	50 dBA (period)
	Evening	32	39	N/A	
	Night	26	31	31	
74 PJ Crowhurst	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	29	N/A	36 dBA LAeq(15minute)
	Night	<20	23	<20	35 dBA LAeq(15minute)
75 PE Maytom	Day	22	N/A	N/A	43 dBA LAeq(15minute)
	Evening	22	35	N/A	43 dBA LAeq(15minute)
	Night	20	29	26	37 dBA LAeq(15minute)
83 PW & DL Dryden	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	28	N/A	36 dBA LAeq(15minute)
	Night	<20	21	<20	35 dBA LAeq(15minute)
96 Transgrid	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	<20	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
97 WC & LM Gibson	Day	23	N/A	N/A	43 dBA LAeq(15minute)
	Evening	23	36	N/A	43 dBA LAeq(15minute)
	Night	22	31	27	37 dBA LAeq(15minute)
99 LJ & LM Jones	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	30	N/A	43 dBA LAeq(15minute)
	Night	<20	29	21	37 dBA LAeq(15minute)
100 DR & KL Bishop	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	24	N/A	36 dBA LAeq(15minute)
	Night	<20	22	<20	35 dBA LAeq(15minute)
101 GR & RL Watts	Day	<20	N/A	N/A	37 dBA LAeq(15minute)
	Evening	<20	<20	N/A	36 dBA LAeq(15minute)
	Night	<20	<20	<20	35 dBA LAeq(15minute)
103 DJ & SL Ayre	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	33	N/A	43 dBA LAeq(15minute)
	Night	<20	28	25	37 dBA LAeq(15minute)
104 KP & J Mantle	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	31	N/A	43 dBA LAeq(15minute)
	Night	<20	27	24	37 dBA LAeq(15minute)

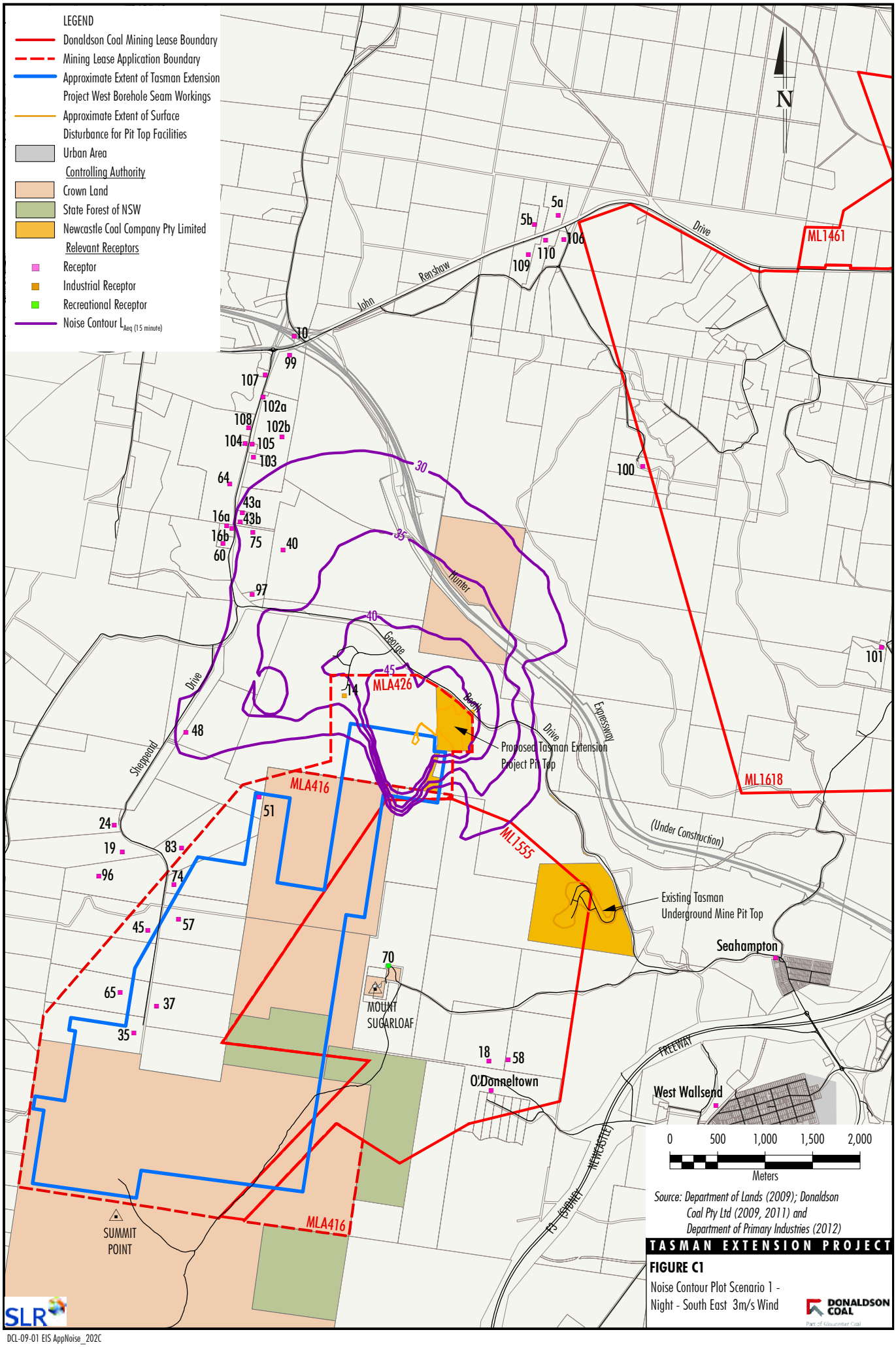
Single Point Receiver Noise Levels - Scenario 2

Receiver Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Project Specific Noise Level
		Calm	Prevailing Wind*	Temperature Inversion	
105 LJ & C Fairhall	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	32	N/A	43 dBA LAeq(15minute)
	Night	<20	28	24	37 dBA LAeq(15minute)
106 F Valicek	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	27	N/A	43 dBA LAeq(15minute)
	Night	<20	21	<20	37 dBA LAeq(15minute)
107 CR & L Parker	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	28	N/A	43 dBA LAeq(15minute)
	Night	<20	26	22	37 dBA LAeq(15minute)
108 AM Williams	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	31	N/A	43 dBA LAeq(15minute)
	Night	<20	27	24	37 dBA LAeq(15minute)
109 CR & ML Parnell	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	28	N/A	43 dBA LAeq(15minute)
	Night	<20	21	<20	37 dBA LAeq(15minute)
110 ME & KD Elliott	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	27	N/A	43 dBA LAeq(15minute)
	Night	<20	21	<20	37 dBA LAeq(15minute)
102a IR & MMF Gee	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	30	N/A	43 dBA LAeq(15minute)
	Night	<20	27	23	37 dBA LAeq(15minute)
102b IR & MMF Gee	Day	<20	N/A	N/A	43 dBA LAeq(15minute)
	Evening	<20	30	N/A	43 dBA LAeq(15minute)
	Night	<20	29	25	37 dBA LAeq(15minute)

Results shown are from the highest predicted noise level under the relevant prevailing winds provided in **Table 18*

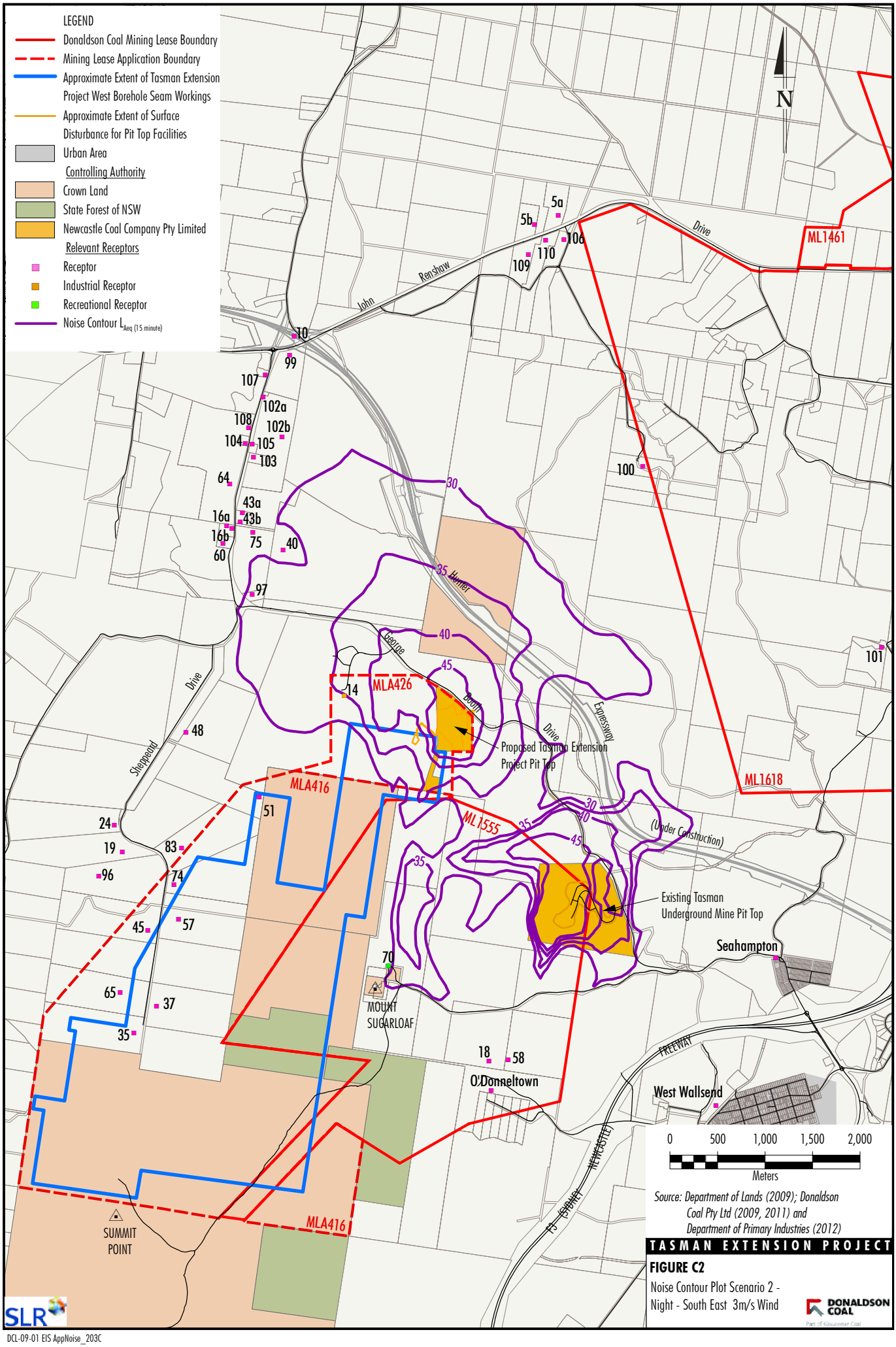
Noise Contour Plot

Scenario 1 – Night – South East 3 m/s Wind


LEGEND
Donaldson Coal Mining Lease Boundary
Mining Lease Application Boundary
Approximate Extent of Tasman Extension Project West Borehole Seam Workings
Approximate Extent of Surface Disturbance for Pit Top Facilities
Urban Area
Controlling Authority
Crown Land
State Forest of NSW
Newcastle Coal Company Pty Limited
Relevant Receptors
Receptor
Industrial Receptor
Recreational Receptor
Noise Contour $L_{Aeq\ (15\ minute)}$
N
ML1461
ML1618
MLA416
MLA426
ML1555
Proposed Tasman Extension Project Pit Top
Existing Tasman Underground Mine Pit Top
Seahampton
West Wallsend
O'Donneltown
MOUNT SUGARLOAF
SUMMIT POINT
Hunter
Expressway
(Under Construction)
FREEWAY
NEWCASTLE
Renshaw
John
Sheppard
George
Beach
Drive
30
35
40
45
0 500 1,000 1,500 2,000
Meters
Source: Department of Lands (2009); Donaldson Coal Pty Ltd (2009, 2011) and Department of Primary Industries (2012)
TASMAN EXTENSION PROJECT
FIGURE C1
Noise Contour Plot Scenario 1 - Night - South East 3m/s Wind
SLR
DONALDSON COAL
DCL-09-01 EIS AppNoise_202C

Noise Contour Plot

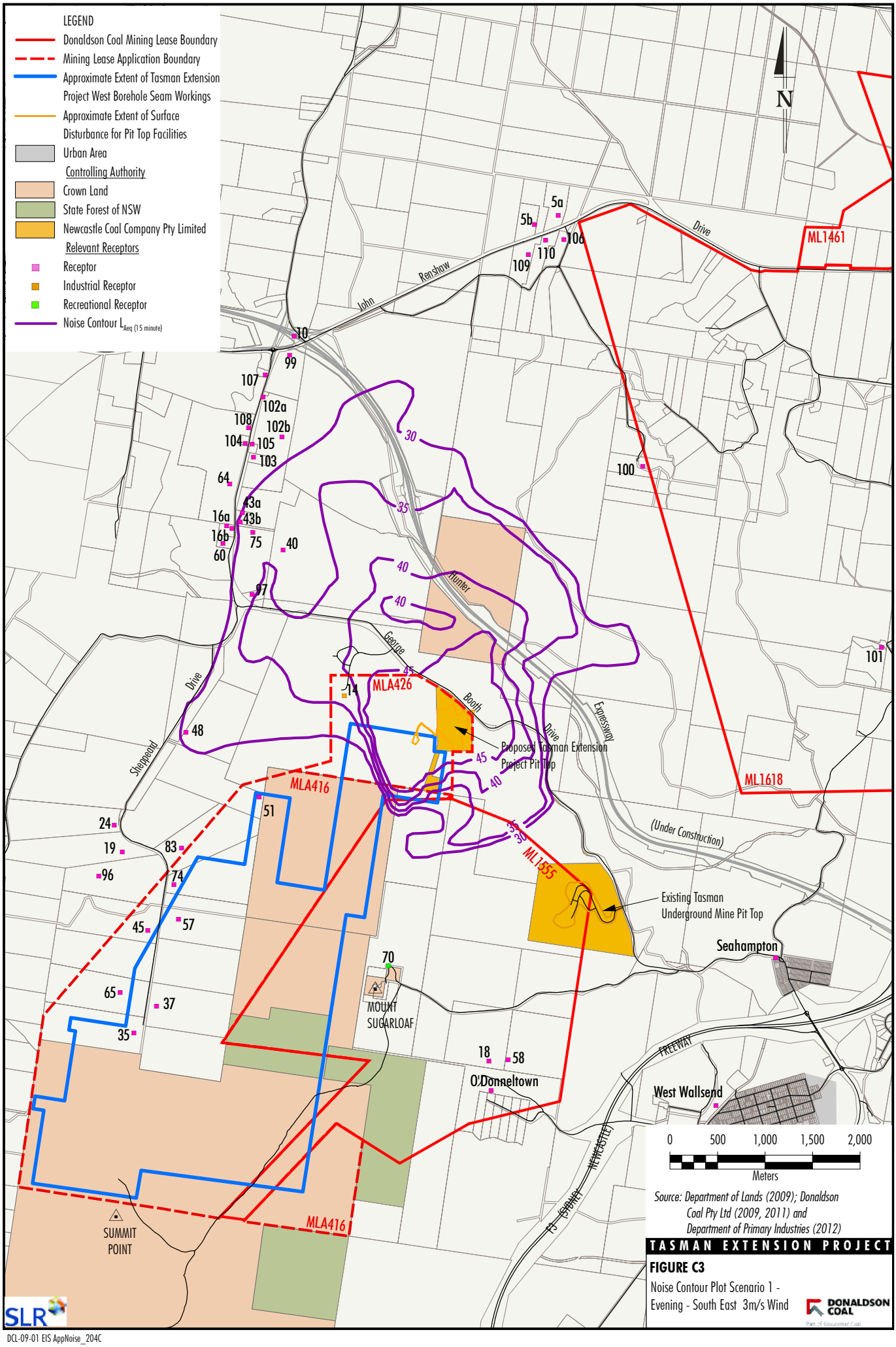
Scenario 2 – Night – South East 3 m/s Wind



DCL-09-01 EIS AppNoise_203C

Noise Contour Plot

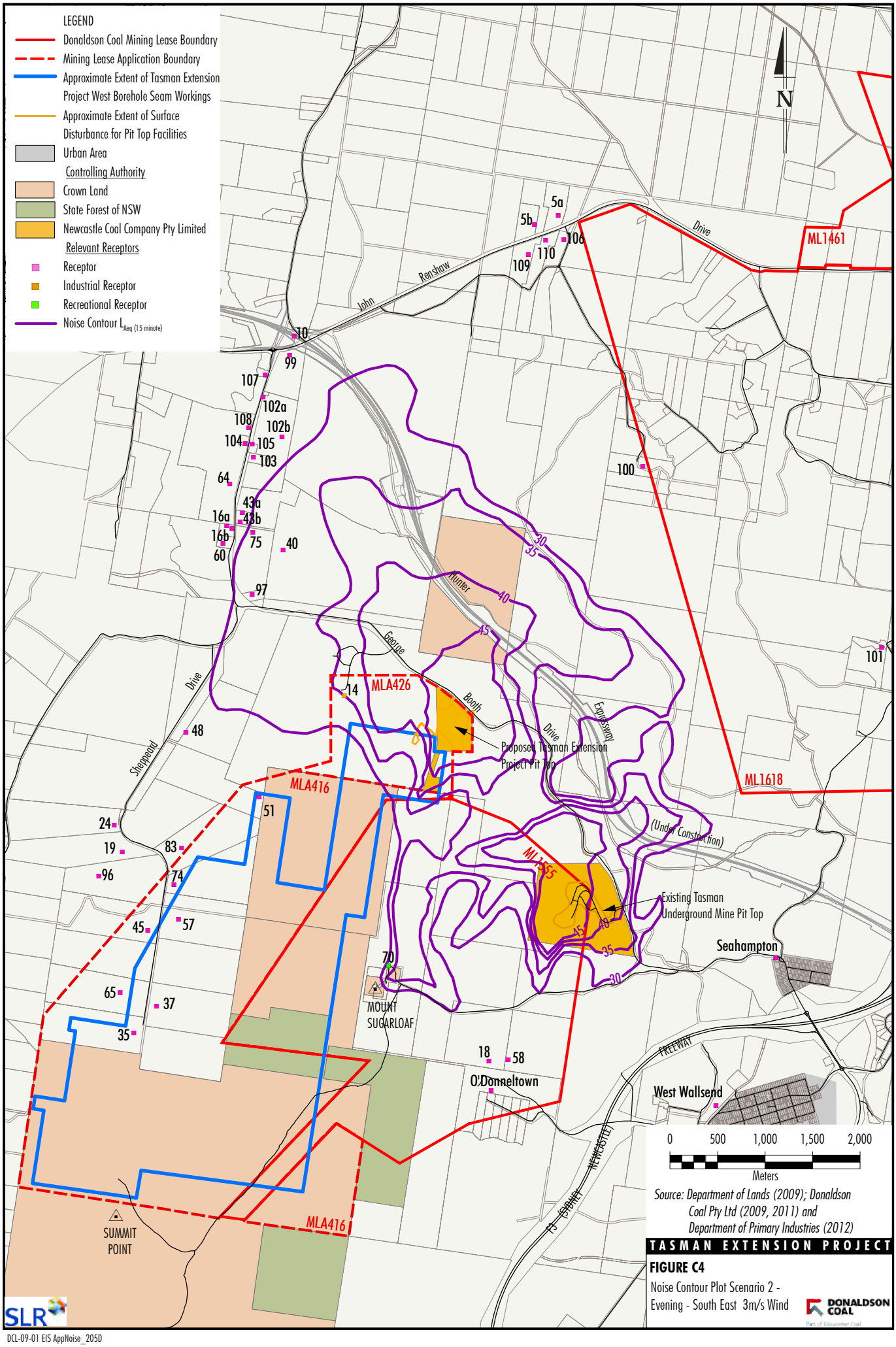
Scenario 1 – Evening – South East 3 m/s Wind



DCL-09-01 EIS AppNoise_204C

Noise Contour Plot

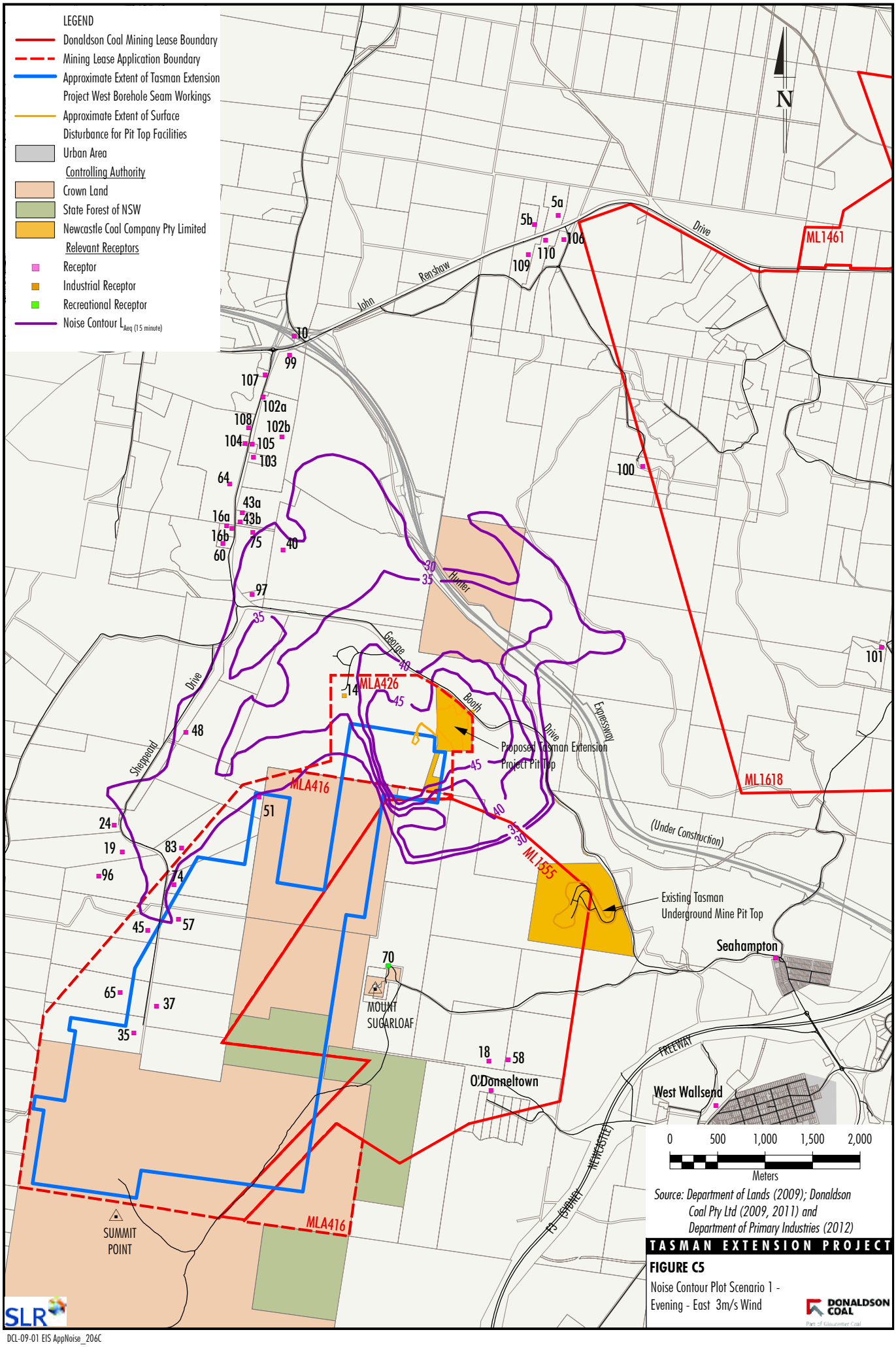
Scenario 2 – Evening – South East 3 m/s Wind



DCL-09-01 EIS AppNoise_205D

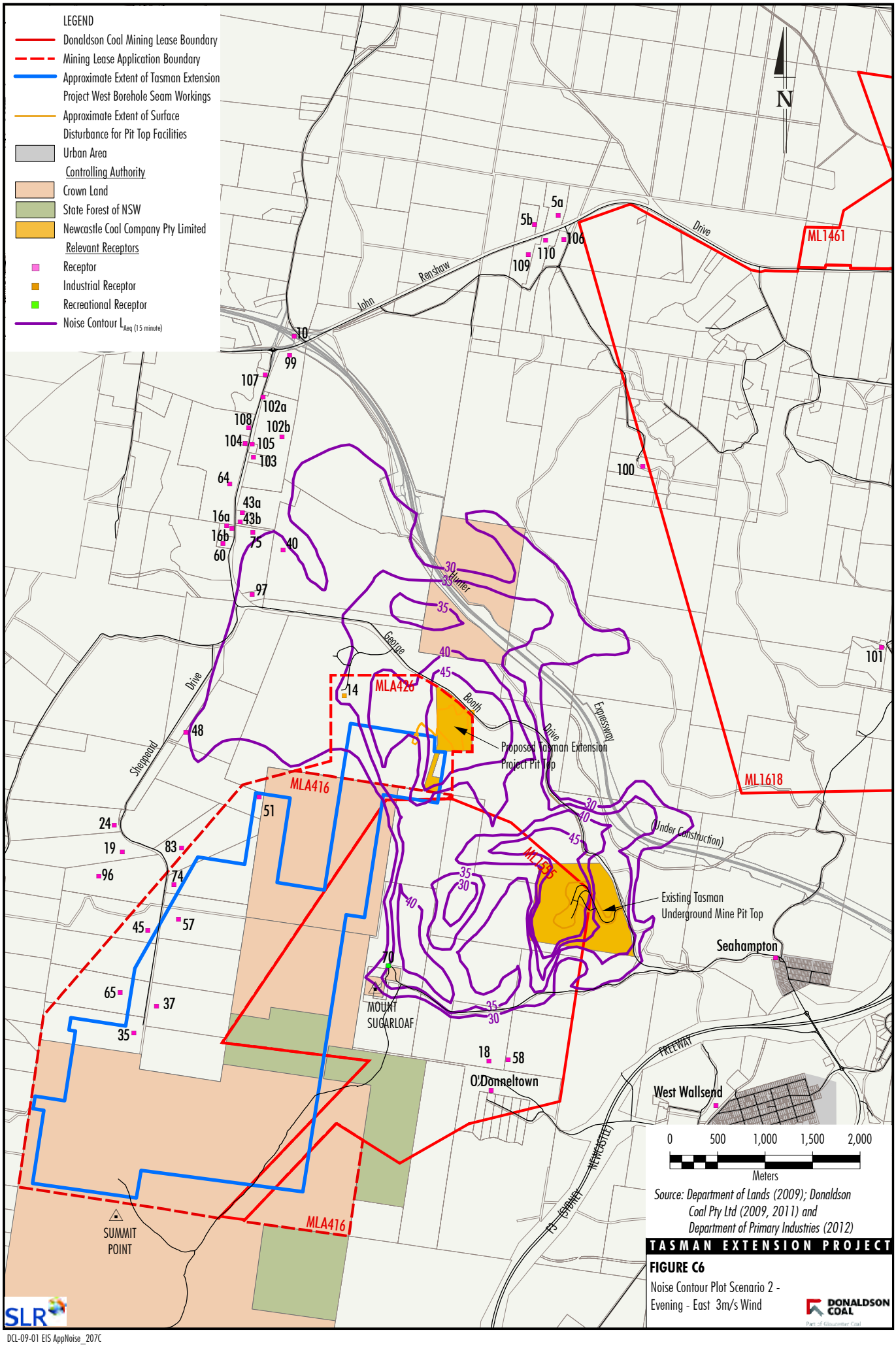
Noise Contour Plot

Scenario 1 – Evening – East 3 m/s Wind


LEGEND
Donaldson Coal Mining Lease Boundary
Mining Lease Application Boundary
Approximate Extent of Tasman Extension Project West Borehole Seam Workings
Approximate Extent of Surface Disturbance for Pit Top Facilities
Urban Area
Controlling Authority
Crown Land
State Forest of NSW
Newcastle Coal Company Pty Limited
Relevant Receptors
Receptor
Industrial Receptor
Recreational Receptor
Noise Contour $L_{Aeq\ (15\ minute)}$
N
ML1461
ML1618
MLA426
MLA416
ML1555
Proposed Tasman Extension Project Pit Top
Existing Tasman Underground Mine Pit Top
(Under Construction)
Seahampton
West Wallsend
O'Donneltown
MOUNT SUGARLOAF
SUMMIT POINT
Hunter
George
Booth
Drive
Expressway
FREEWAY
NEWCASTLE
Sheppard
Renshaw
John
0 500 1,000 1,500 2,000
Meters
Source: Department of Lands (2009); Donaldson Coal Pty Ltd (2009, 2011) and Department of Primary Industries (2012)
TASMAN EXTENSION PROJECT
FIGURE C5
Noise Contour Plot Scenario 1 - Evening - East 3m/s Wind
SLR
DONALDSON COAL
DCL-09-01 EIS AppNoise_206C

Noise Contour Plot

Scenario 2 – Evening – East 3 m/s Wind


LEGEND
Donaldson Coal Mining Lease Boundary
Mining Lease Application Boundary
Approximate Extent of Tasman Extension Project West Borehole Seam Workings
Approximate Extent of Surface Disturbance for Pit Top Facilities
Urban Area
Controlling Authority
Crown Land
State Forest of NSW
Newcastle Coal Company Pty Limited
Relevant Receptors
Receptor
Industrial Receptor
Recreational Receptor
Noise Contour $L_{Aeq\ (15\ minute)}$
N
ML1461
ML1618
MLA416
MLA426
ML1235
Proposed Tasman Extension Project Pit Top
Existing Tasman Underground Mine Pit Top
(Under Construction)
Seahampton
West Wallsend
O'Donneltown
MOUNT SUGARLOAF
SUMMIT POINT
Hunter
George
Booth
Drive
Expressway
Sheppard
Renshaw
John
FREEWAY
NEWCASTLE
0 500 1,000 1,500 2,000
Meters
Source: Department of Lands (2009); Donaldson Coal Pty Ltd (2009, 2011) and Department of Primary Industries (2012)
TASMAN EXTENSION PROJECT
FIGURE C6
Noise Contour Plot Scenario 2 - Evening - East 3m/s Wind
DONALDSON COAL
SLR
DCL-09-01 EIS AppNoise_207C