MARSHALL DAY Acoustics

BULLER PLATEAUX CONTINUATION PROJECT
ASSESSMENT OF NOISE EFFECTS

Rp 002 R02 20240962| 22 June 2026

[redacted]
[redacted]
Christchurch 8140 New Zealand
T: +[redacted]
www.marshallday.com

Project: **Buller Plateaux Continuation Project**

Prepared for: **Bathurst Resources Limited**
PO Box 5963
Level 12, 1 Willeston Street
Wellington

Attention: **Bathurst Resources Limited**

Report No.: **Rp 002 R02 20240962**

Disclaimer

Reports produced by Marshall Day Acoustics Limited are based on a specific scope, conditions and limitations, as agreed between Marshall Day Acoustics and the Client. Information and/or report(s) prepared by Marshall Day Acoustics may not be suitable for uses other than the specific project.

The advice given herein is for acoustic purposes only. Relevant authorities and experts should be consulted with regard to compliance with regulations or requirements governing areas other than acoustics.

Status:	Rev:	Comments	Date:	Author:	Reviewer:
Complete	-	For issue	22 June 2026	[redacted]	Jon Farren

Certified System ISO 9001

EXECUTIVE SUMMARY

Marshall Day Acoustics has been engaged by Bathurst Resources Limited to assess the potential noise impacts of the Buller Plateaux Continuation Project. This report evaluates noise levels from proposed mining activities and coal handling operations with respect to the relevant noise standards and existing noise environments.

Following our review of the Te Tai o Poutini Plan (TTPP) (Decisions Version), Buller District Plan and World Health Organisation guidance, we propose the following residential noise limits and metrics are adopted for the project in line with current best practice:

- Daytime: 07:00 to 22:00 hrs 55 dB $L_{Aeq(15\ min)}$
- Night-time: 22:00 to 07:00 hrs 45 dB $L_{Aeq(15\ min)}$ and 75 dB L_{AFmax}

Key Findings:

- Noise measurements conducted in November 2024 show that ambient noise levels near Ngakawau are primarily influenced by traffic noise from State Highway 6 and natural sounds (surf, birds, and insects). At the Millerton and Denniston residential areas, local vehicle movements and natural sounds dominated the measurements, with non-related mining noise due to the large distances of the mining equipment and terrain screening effects.
- Daytime coal handling and train loadout operations at Ngakawau comply with the proposed daytime noise limits at all surrounding residential properties. Activities will comply with the TTPP daytime noise limits. However, the Buller District Plan noise limits will be exceeded throughout Sundays (and Saturday evenings) when the more stringent 45 dB L_{A10} noise limit applies.
- Night-time coal processing and maintenance operations at Ngakawau are predicted to comply with the night-time noise limit at all residential receivers. When train loadout operations occur during the early night-time period, noise limits will be exceeded at five dwellings. This train loading activity represents an existing potential adverse noise effect for these residents.
- Operational noise effects from mining and processing will be minimal. Our conservative cumulative noise assessment, which evaluates simultaneous mining, processing, and trucking activities associated with the Buller Plateaux mining activities, predicts comfortable compliance with both daytime and night-time noise limits at nearest residential receivers Millerton and Denniston.
- We propose that the blasting vibration and air overpressure limits from Appendix J of Australian Standard AS 2187-2:2006 *Explosives – Storage and use, Part 2: Use of explosives* are adopted for the project, noting that blasting management is an existing activity at Stockton, with extensive management protocols in place. Blasting is expected to have minimal effects on residential amenity.

Overall, the Buller Plateaux Continuation Project is expected to have minimal noise effects on surrounding residential areas. The Ngakawau Rail Loadout presents the greatest potential for adverse noise effects; however, residents are already familiar with coal handling activities and the associated soundscape.

.

TABLE OF CONTENTS

1.0 INTRODUCTION 6

2.0 PROPOSED ACTIVITY DESCRIPTION 6

2.1 Proposed Project Area 6

2.2 Site activities 8

2.3 Noise generating activities 9

3.0 EXISTING AMBIENT NOISE ENVIRONMENT 10

4.0 NOISE ASSESSMENT CRITERIA 14

4.1 Existing conditions 14

4.2 Te Tai o Poutini Plan (Decisions Version) 14

4.3 Buller District Plan 15

4.4 World Health Organisation Guidelines 16

4.5 NZS 6802:2008 Guideline Upper Noise Limits 16

4.6 Blasting 16

4.7 Discussion of Noise Assessment Criteria 17

5.0 PREDICTED NOISE LEVELS 18

5.1 Prediction Methodology 18

5.2 Input Noise Source Data 18

5.3 Modelling Scenarios & Predicted Noise Levels 19

5.4 Rail Designation Area 21

6.0 PREDICTED NOISE LEVELS 22

6.1 Ngakawau Rail Loadout 22

6.2 Buller Plateaux Coal Mines 25

7.0 EARLY STAGE NOISE EFFECTS ON LOCAL ECOLOGY 26

8.0 ASSESSMENT OF NOISE EFFECTS 28

9.0 BLASTING NOISE AND VIBRATION 29

9.1 Human Comfort 29

9.2 Blasting effects on historic structures 31

10.0 NOISE FROM TRAFFIC ON PUBLIC ROADS 33

11.0 NOISE FROM HELICOPTER ACTIVITY 33

12.0 RECOMMENDED CONSENT CONDITIONS 34

APPENDIX A GLOSSARY OF TERMINOLOGY

APPENDIX B EQUIPMENT BULLER COAL PLATEAUX CONTINUATION PROJECT

APPENDIX C INPUT NOISE DATA EARLY STAGES

APPENDIX D NOISE SURVEY DETAILS

APPENDIX E NOISE CONTOURS

APPENDIX F BULLER PLATEAUX COAL MINES

APPENDIX G NOISE FROM EARLY STAGE WORKS (ESW)

1.0 INTRODUCTION

Marshall Day Acoustics has been engaged by Bathurst Resources Limited to assess the potential noise effects arising from the Buller Plateaux Continuation Project. The proposal includes coal extraction at several locations across the Denniston and Stockton Plateaux, with the existing Ngakawau Rail Loadout being the principal method of coal loadout and transportation.

This report provides:

- An overview of the proposed project and key sources of noise generation;
- Details of the existing noise environment;
- Relevant noise performance standards;
- Predicted noise levels from the proposed activity;
- An assessment of the potential noise effects; and
- Recommended consent conditions relating to noise.

A glossary of the technical terminology used in this report is provided in Appendix A.

2.0 PROPOSED ACTIVITY DESCRIPTION

2.1 Proposed Project Area

The Application documents provide a detailed Project Description. We highlight the relevant aspects of the Project with respect to noise and vibration below.

The Project Area illustrated in Figure 1 covers both the Denniston and Stockton Plateaux, collectively referred to as the Buller Plateaux, situated approximately 15 kilometres northeast of Westport. The land within the Project Area comprises a mix of Crown, private, and Bathurst-owned properties.

Both the existing and proposed mining operations benefit from significant distances between primary noise sources and the closest residential receivers at Millerton and Denniston. This separation distance, combined with the natural terrain providing effective noise screening, generally ensures that mining activity noise will mostly be imperceptible to nearby residents.

The Ngakawau Rail Loadout and its relative proximity to residential areas is the aspect of the proposal with the greatest potential for adverse noise effects.

The Buller Plateaux mining areas and surrounding lands are primarily zoned *Open Space (OSZ)* and *Buller Coalfield Zone (BCZ)* under the Tai o Poutini Plan – Decisions version (TTPP) that was publicly notified on 10 October 2025. Dwellings in Millerton and Denniston are within the *General Rural Zone (GRUZ)*.

The Ngakawau Rail Loadout is zoned Buller Coalfield Zone (BCZ) in the TTPP with *Settlement SETZ)* and *Sport and Active Recreation (SARZ) Zones* located to the west and north across the Ngakawau River.

Figure 1: Buller Plateaux Continuation Project Area

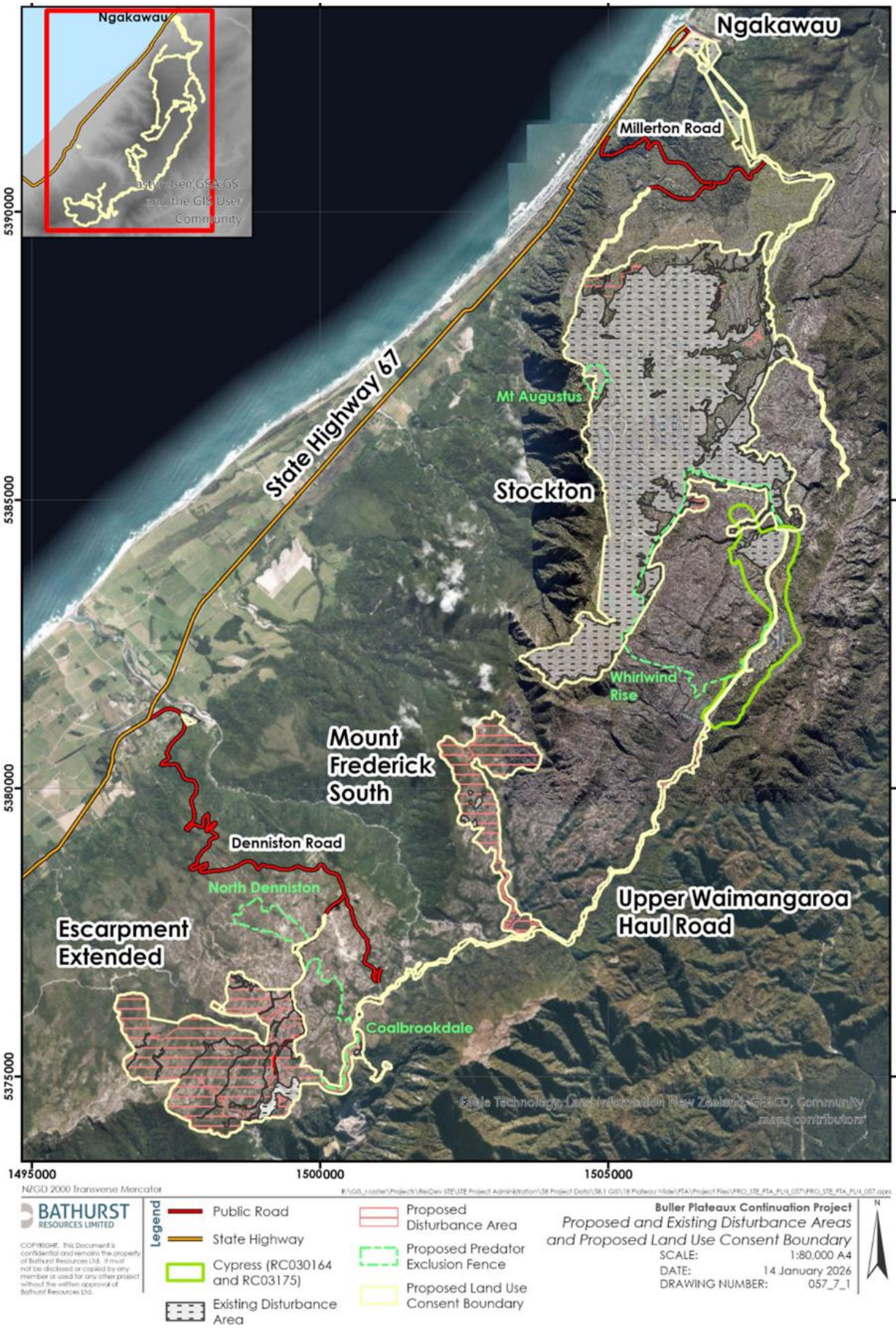
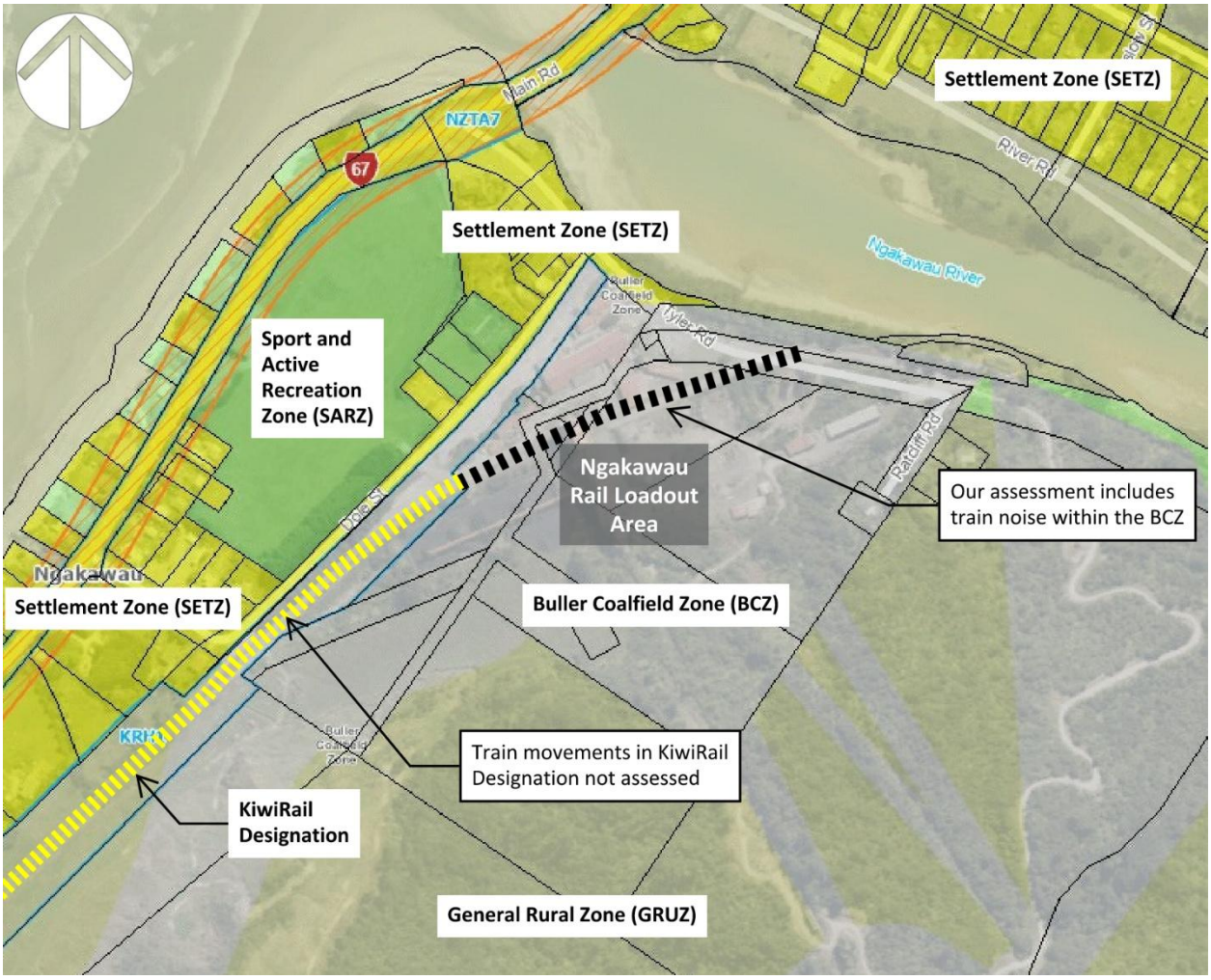


Figure 2: Zoning (TTPP)



2.2 Site activities

Ngakawau Rail Loadout

The Ngakawau Rail Loadout plays a key role as a product stockpile area and rail loading facility. Under normal operating conditions, all coal is taken from Ngakawau via rail to the export facility at Lyttelton Port. Occasionally, Bathurst is required to truck coal from Ngakawau, for example when the rail line is closed for an extended period.

Loadout operations are influenced by KiwiRail's network capacity and no significant change in the existing loading schedule is proposed as part of the current application. During normal operations, the Ngakawau Rail Loadout typically loads 18 trains per week. Loading takes approximately 90 to 120 minutes and occurs primarily during the day. We understand that depending on KiwiRail schedules, loading can extend past midnight which is considered night-time in both the BDP and TTPP.

Stockton

The Stockton Project sub-area covers existing mining operations and coal handling and processing operations including the Coal Handling and Processing Plant (CHPP). Bathurst operates in multiple areas simultaneously to facilitate blending of various coal products to meet market specifications. Each stage is mined individually and subsequently rehabilitated, thereby minimising the total disturbed and exposed land area at any given time. Once mining operations are completed in specific areas, these sites are decommissioned from further use.

Upper Waimangaroa Haul Road

The Upper Waimangaroa Haul Road (UWHR) will connect the Project sub-areas to Stockton, providing access for large trucks to transport coal and for service vehicles.

Mount Frederick South

The Mount Frederick South (MFS) Project sub-area is linked to co-production with the Stockton Mine, accessed via the proposed UWHR with a haul road extending into the MFS mine area.

Escarpment Extended

The Escarpment Extended (ESE) Project sub-area includes the previously consented Escarpment Mine. Coal mined at ESE will be transported to the Stockton sub-area via the UWHR for processing or washing as required at the CHPP or the clean coal sizing and handling system.

The Escarpment borrow pit will provide aggregate for the construction and establishment of ESE, the construction of the UWHR, and for any ongoing aggregate requirements.

Cypress

The activities within the existing Cypress Mine area are already fully consented and no further new consents are sought (with the exception of the proposed sitewide Wildlife Act Authority (WAA) application). Some existing Cypress resource consent conditions relating to pest control operations will also be varied through the application.

2.3 Noise generating activities

Table 1 provides a schedule of noise-generating components for each Project area and their hours of operation. Detailed mining plant for each Project sub-area can be found in Appendix B.

Table 1: Summary of noise generating components

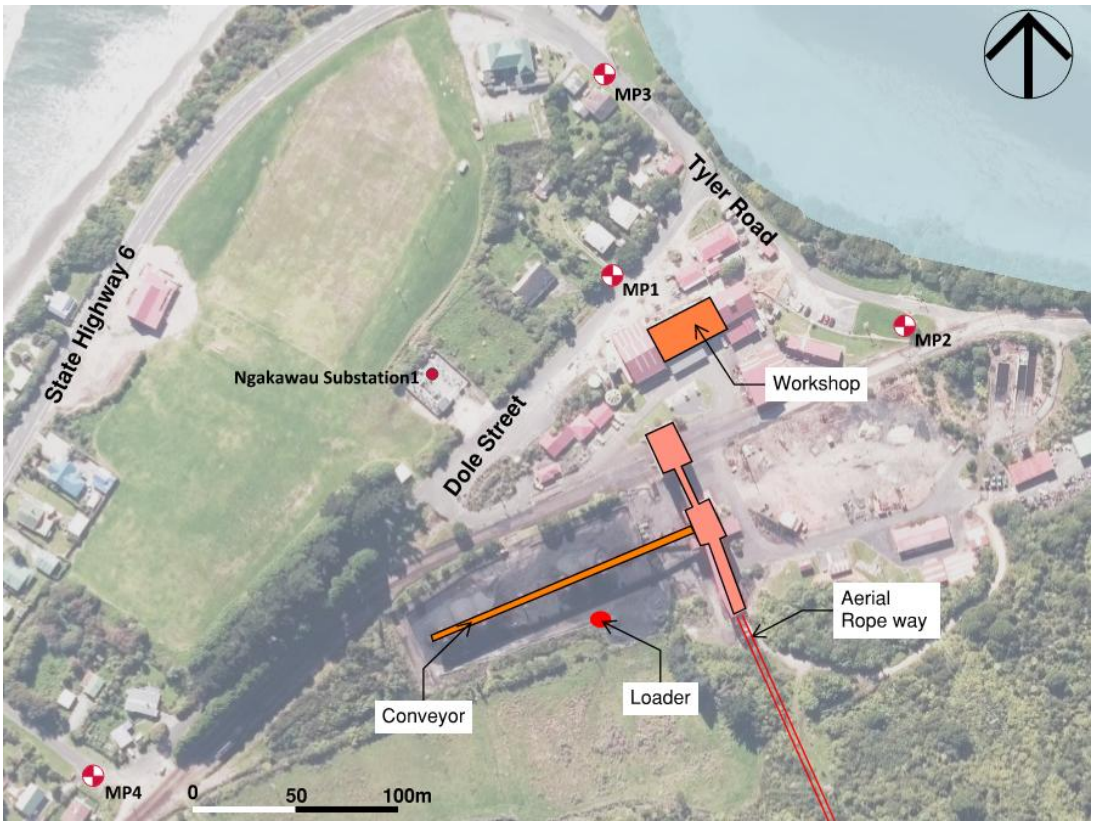
Project Area	Description	Hours of operation
Ngakawau Rail Loadout		
Normal operation +Train loadout	Mining support infrastructure includes a train loadout facility, tracked conveyor system, 25-tonne loader, and workshop with power tools. Train loading normally occurs between 8 am and 9 pm Monday to Friday, but 24/7 operation required on occasion.	Nominally 18 hours per day but 24 hour operation on occasion.
Normal operation	Mining support infrastructure includes a tracked conveyor system, 25-tonne loader, and workshop with power tools.	
Stockton		
Production Fleet, Coal Mining, Processing and Rehabilitation	Mining fleet includes excavators, trucks, loaders, and support vehicles for extraction and rehabilitation.	Various shift rosters in operation. Some activity on site assumed 24 hours/day, 7 days/week
Cypress, Mount Frederick South, Escarpment extended and Upper Waimangaroa Haul Road		
Production Fleet Coal Mining, Rehabilitation , road maintenance and coal transportation	Mining fleet includes excavators, trucks, loaders, and support vehicles for extraction, rehabilitation, road maintenance, and coal transportation.	24-hour operation except for road maintenance day shift only 5 days per week

3.0 EXISTING AMBIENT NOISE ENVIRONMENT

Noise measurements were conducted on 27 to 28 November 2024 near the proposed activity areas at Ngakawau, Denniston and Millerton, during day and night-time hours.

Figure 3 shows measurement positions at Ngakawau. Positions MP1 and MP2 were selected to record operational noise from the coal dispatch facility, while positions MP3 and MP4 measured existing ambient noise levels within residential areas without coal facility operations.

Figure 3: Ambient noise measurement positions at Ngakawau.



For Denniston and Millerton, two monitoring positions were selected as illustrated in Figure 4. Unattended noise monitoring equipment was installed at 415 Calliope Street (position MP5), the closest residential receiver in the Millerton area. Additionally, attended noise measurements were conducted during daytime at 107 Burnetts Face Road (position MP6), the closest residential receiver in the Denniston residential area.

Figure 4: Measurement positions at Millerton and Denniston

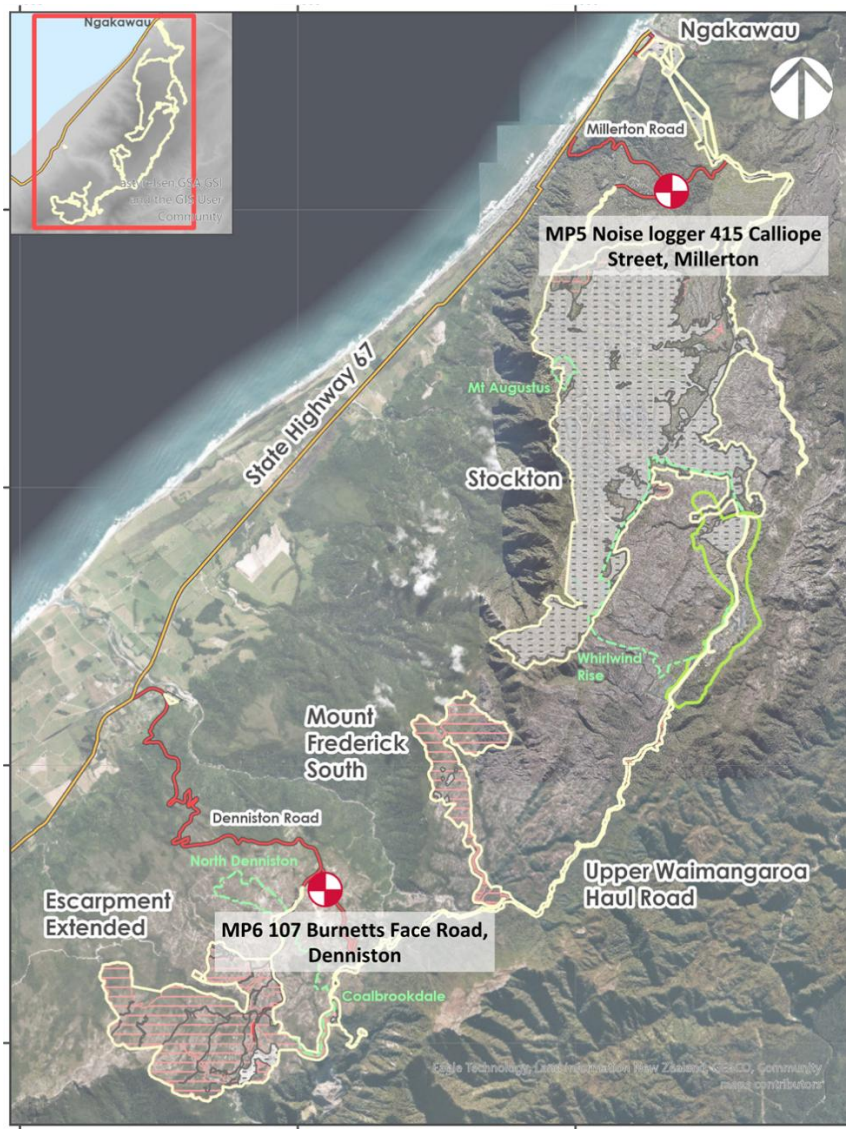


Table 2 summarises the attended noise measurements taken nearby the Ngakawau Rail Loadout.

Table 2: Summary of attended ambient noise survey results at Ngakawau

Position	Time(hh:mm)	Measured noise levels			
		dB L_{Aeq}	dB L_{A10}	dB L_{A90}	dB L_{AFmax}
Daytime					
MP1	15:15	56	58	53	61
MP2	15:31	51	51	46	71
MP3	16:02	44	45	42	55
MP4	16:18	50	52	45	70

Position	Time(hh:mm)	Measured noise levels			
		dB L_{Aeq}	dB L_{A10}	dB L_{A90}	dB L_{AFmax}
Night-time					
MP1	22:26	50	51	42	74
MP2	22:12	51	52	43	77
MP3	22:40	45	45	41	63
MP4	22:56	44	47	42	58

At positions MP1 and MP2, the primary noise sources included loader activity, air pressure release valves, distant aerial ropeway movements and workshop activities. At positions MP3 and MP4, the dominant noise sources were traffic along State Highway 6, surf noise birds and insects.

Table 3 summarises attended and unattended noise measurements taken at Millerton and Denniston.

Table 3: Summary of ambient noise survey results at Millerton and Denniston

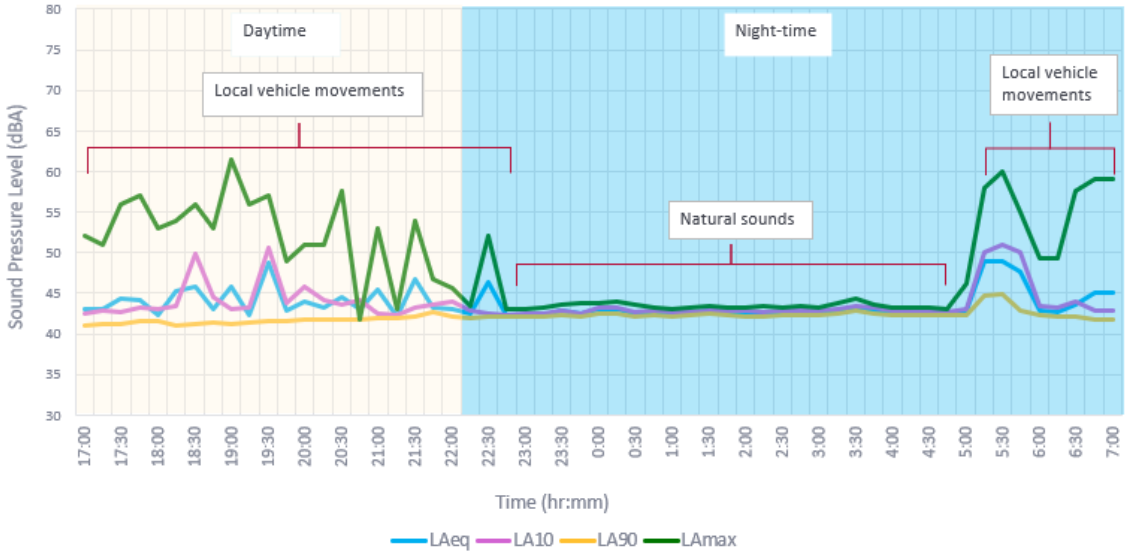
Position	Time(hh:mm)	Measured noise levels			
		dB L_{Aeq}	dB L_{A10}	dB L_{A90}	dB L_{AFmax}
Daytime					
MP5 (Millerton)	Logged average (17:00-22:00)	48	44	41	75
MP6 (Denniston)	17:59	32	33	20	55
Night-time					
MP5(Millerton)	Logged average (22:00-07:00)	44	44	43	52

Our measurements indicate that the noise environment at positions MP5 and MP6 is primarily dominated by ambient natural sounds and local vehicle movements rather than mining-related noise.

Figure 5 shows noise levels recorded at position MP5 in Millerton over a 14-hour period 17:00-07:00 hrs. Between 17:00-21:30 hrs, higher noise levels occurred due to local vehicle traffic. After 21:30 hrs, particularly during night hours 22:30-05:00 hrs, noise levels decreased significantly and stabilised, indicating a predominantly natural sound environment with minimal disruptions. From 05:30-07:00 hrs, noise levels increased again as morning vehicle activity resumed.

Noise survey details can be found in Appendix D.

Figure 5: Measured ambient noise level data at Millerton (Night-time period shaded blue)



4.0 NOISE ASSESSMENT CRITERIA

The Rail Loadout facility at Ngakawau is within the Buller Coalfield Zone (BCZ) under the Tai o Poutini Plan (TTPP) (and *Industrial* under the Operative Buller District Plan (BDP)). The nearest residential dwellings, located to the west and across the Ngakawau River to the north, are within the TTPP *Settlement Zone,* and *Residential* Zone under the BDP.

The nearest residential receivers to the Buller Plateaux mining sites have a rural zoning under both District Plans.

4.1 Existing conditions

There are several existing mining licence and resource consent (RC) conditions that reference noise that provide a useful reference for the Project sub-areas. The noise limits are summarised in Table 4 and typically apply at a dwelling's notional[1] boundary.

Table 4: Existing noise conditions

Ref	Time	Noise limits
CML 37 150 (Stockton)	Monday – Friday (7.00am to 9.00pm) and Saturday (7.00am to 12.00pm)	55 dB L_{A10}
	All other times	45 dB L_{A10}
RC 110043 (No. 2 South Mining Area)	Monday to Friday 8.00am to 11.00pm and Saturday 8.00am to 6.00pm	55 dB L_{A10}
	At all other times including public holiday	45 dB L_{A10}, 75 dB L_{Amax}
RC 03164 (Cypress Mining Area)	Monday-Saturday 7.00am to 9.00pm	50 dB L_{A10}
	All other times	40 dB L_{A10}, 75 dB L_{Amax}

Whilst the times of application vary, the noise limits can be broadly summarised as 55 and 45 dB L_{A10} during the day and night respectively. We note the Cypress mining area, which is further from any dwelling than other mining activities, has 5 dB lower noise limits at 50 and 40 dB L_{A10}.

4.2 Te Tai o Poutini Plan (Decisions Version)

The Te Tai o Poutini Plan Decisions Version (Decision Plan) was publicly notified on 10 October 2025. The noise section is subject to appeal.

The applicable noise limits relevant to the noise-sensitive receiver locations are set out in Table 5. Of relevance to the Project are the TTPP permitted activity standards that apply separately to the Rail Loadout Facility and coal extraction areas:

Ngakawau Rail Loadout Facility

Noise from loadout activities is assessed at the closest *Settlement Zone* boundary which, with reference to Figure 2, is at the road boundary with Dole St. The nearest occupied dwellings in the zone are 17 and 28 Dole Street.

Noise limits also apply at the boundary with the *Sports and Recreation Zone* located on the western side of Dole Street. There are no noise sensitive locations in this zone that are adjacent the Loadout.

[1] Notional boundary is a line 20 metres from any side of a dwelling, or the legal boundary where this is closer to the dwelling. This definition is from NZS 6802:2008.

Mining and Processing Operations

The closest noise sensitive locations to mining and processing operations are at Millerton and Denniston – both are located within the *General Rural Zone* where noise limits apply at the notional boundary of a dwelling which is in line with best practice (NOISE-R5.2).

A significant portion of the coal extraction area is adjacent to *Open Space Zone* boundaries where NOISE-R5.1 limits also apply. There are no noise sensitive dwellings in the Open Space Zone that are affected by the Project.

Table 5: Summary of TTPP noise limits

TTPP Rule	Rule Application	Time Period	Noise Limit
NOISE-R5.1 SETZ Settlement Zone OSZ Open Space Zone	Noise from any activity shall not exceed the following noise limits at any point at or **within the boundary** of any site within any of the following zones:	7:00am-10:00pm Monday–Friday	55 dB L_{Aeq}
		7:00am-10:00pm Saturday, Sundays and Public Holidays	50 dB L_{Aeq}
		10:00pm-7:00am	45 dB L_{Aeq} 70 dB L_{AFmax}
NOISE-R5.2 GRUZ General Rural Zone	Noise from any activity shall not exceed the following noise limits at any point at the **notional boundary** of any site within any of the following zones:	7:00am-7:00pm Monday–Friday	55 dB L_{Aeq}
		7:00pm-10:00pm Monday–Friday	50 dB L_{Aeq}
		7:00am-10:00pm Saturday, Sundays and Public Holidays	
		10:00pm-7:00am	45 dB L_{Aeq} 70 dB L_{AFmax}
NOISE-R5.3 SARZ Sport and Recreation Zone	The maximum noise from any activity shall not exceed the following noise limits at any point at or within the boundary of any site within any of the following zones:	7:00am-10:00pm Monday–Friday	60 dB L_{Aeq}
		7:00am-10:00pm Saturday, Sundays and Public Holidays	55 dB L_{Aeq}
		10:00pm-7:00am	50 dB L_{Aeq} 75 dB L_{AFmax}

The TTPP requires that sound shall be measured in accordance with NZS 6801:2008 *Acoustics* – Measurement *of Environmental Sound* and assessed in accordance with New Zealand Standard NZS 6802:2008 *Acoustics - Environmental Noise.*

4.3 Buller District Plan

The BDP has a district-wide noise rule, Rule 7.8.1, that applies to all the surrounding and nearby zones. This rule states that the noise received at the boundary of any land used for residential activity shall not exceed the following:

- 55 dB L_{A10} from 0800 to 2300 hours, Monday – Friday;
- 55 dB L_{A10} from 0800 to 1800 hours, Saturday;
- 45 dB L_{A10} and 75 dB L_{Amax} at all other times.

The District Plan does not stipulate how these noise levels should be assessed. However, Rule 7.8.3.2 requires that the limits of Rule 7.8.3.1 – which applies to Industrial, Port and Cement Zones – are assessed in accordance with NZS 6801:1991 *"Measurement of Sound"* and NZS 6802:1991 *"Assessment of Environmental Sound".*

4.4 World Health Organisation Guidelines

The World Health Organisation (WHO) *Guidelines for Community Noise* (Berglund, Lindvall and Schwela, 1999) provide guidelines for environmental noise exposure. For community or environmental noise, the critical health effects (those effects which occur at the lowest exposure levels) are sleep disturbance and annoyance.

These guideline values are the exposure levels that represent the onset of the effect for the general population.

Table 6: WHO guideline values for the critical health effects of community or environmental noise

Specific Environment	Critical health effect(s)	dB L_{Aeq}	Time base (hours)	dB L_{AFmax}
Outdoor living area	Serious annoyance, daytime & evening	55	16	-
	Moderate annoyance, daytime & evening	50	16	-
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

4.5 NZS 6802:2008 Guideline Upper Noise Limits

The 2008 version of NZS 6802:2008 *"Acoustics - Environmental Noise"* (note that the District Plan refers to the 1991 version) refers to the following guideline upper limits of sound exposure within a residential zone or within the notional boundary of a rural dwelling:

- Daytime: 55 dB $L_{Aeq(15min)}$
- Night-time: 45 dB $L_{Aeq(15min)}$ and 75 dB L_{AFmax}

4.6 Blasting

Neither the BDP nor TTPP has specific controls for blasting noise or vibration in rural or settlement zones. However, we note blasting controls are provided in the BDP Cement Production Zone.

Blasting limits are referenced in existing resource consents and access agreements as set out in Table 7. In addition to the blast pressure limits that are presented, additional controls such as blasting times and public notification protocols, are also required.

Table 7: Blasting limits

Reference	Airblast pressure limit
RC 110043 (No. 2 South)	*128 dB linear at residence*
DOC Access Arrangement -No. 2 South Mining Area	*120 dB(Lin Peak) at a distance of 100 metres*

In line with current best practice, we propose that blasting activities must be measured and assessed in accordance with Appendix J of Australian Standard AS 2187-2:2006 *Explosives – Storage and use, Part 2: Use of explosives*.

In line with that guidance, blasting must be managed to ensure that in any calendar year, 95% of airblast levels do not exceed 115 dBL, with a maximum of 120 dBL, when applied at any point within the notional boundary of any rural dwelling.

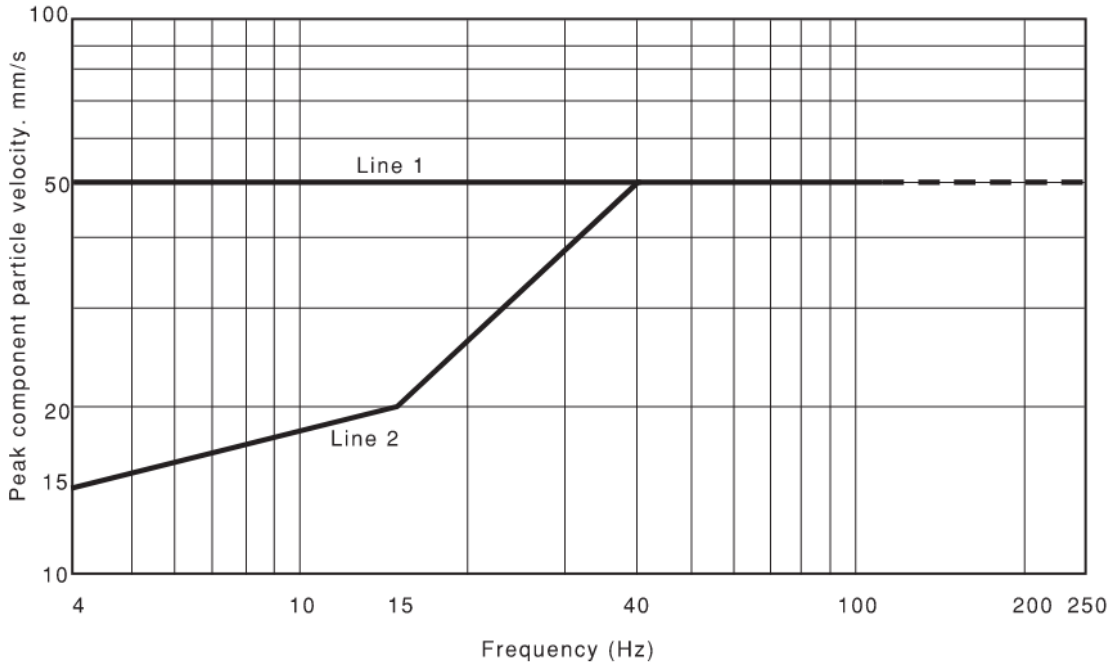
To provide appropriate levels of human comfort, blasting vibration shall not exceed a peak component particle velocity of 5mm/s for 95% in any calendar year, with a maximum of 10 mm/s at the foundation of any dwelling.

Vibration limits to avoid damage to building structures are higher than those specified for human comfort. Table J4.4.2.1 and Figure J4.4.2.1 of AS 2187-2:2006 provide the following (replicated in Table 8 and Figure 6 respectively):

Table 8: J4.4.2.1 Transient vibration guide values for cosmetic damage (BS 7385-2)

Line	Type of Building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structure. 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

Figure 6: J4.4.2.1 Transient vibration guide values for cosmetic damage (BS 7385-2)



AS 2187-2:2006 does not specifically reference superficial vibration damage to historical structures. However, additional guidance can be taken from DIN 4150-3:2016 Vibrations in buildings – Part 3: Effects on structures. We discuss this in Section 9.2.

4.7 Discussion of Noise Assessment Criteria

Both the existing limits in Table 5 and the TTPP/BDP provisions are broadly consistent for protecting residential amenity, except that the noise metric and times of application are different. The BDP and TTPP limits are also consistent with current best practice as described by the guideline values provided in the latest version of NZS 6802 and the World Health Organisation (WHO) recommendations for the protection of residential noise amenity. However, the TTPP noise limits are 5 dB lower during the day on weekends and public holidays.

As the Ngakawau Rail Loadout is an established activity under the existing BDP, we recommend the nominal daytime and night-time noise limits of 55 and 45 dB L_{Aeq} respectively are retained, except that the noise metric is updated from L_{A10} to L_{Aeq} in line with current best practice. The proposed

project criteria will provide an appropriate residential noise amenity that is broadly consistent with noise environment anticipated by both the BDP and TTPP permitted activity standards.

We propose the following noise limits apply within the boundary of any residentially zoned site, or within the notional boundary of any rural dwelling, during the following timeframes :

Daytime	07:00 to 22:00 hrs	55 dB L_{Aeq}
Night-time	22:00 to 07:00 hrs	45 dB L_{Aeq} and 75 dB L_{AFmax}

5.0 PREDICTED NOISE LEVELS

5.1 Prediction Methodology

To accurately predict noise levels, the noise modelling software SoundPLAN has been used. Calculations in SoundPLAN are based on ISO 9613-2:1996 "*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*". This method has the scope to consider a range of factors affecting the sound propagation including:

- The magnitude of the noise source in terms of sound power;
- The distance between source and receiver;
- The presence of obstacles such as screens or barriers in the propagation path;
- The presence of reflecting surfaces;
- The hardness of the ground between the source and receiver;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity.

In ISO 9613, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level. ISO 9613 adopts the conservative approach of assuming that wind is always blowing from the noise sources to the receiver locations. The equations and calculations also hold for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

5.2 Input Noise Source Data

Most of the input noise data is based on measurements from similar coal mining and mineral extraction facilities across New Zealand. However, as the Ngakawau Rail Loadout was identified as the activity most likely to exceed noise limits, we conducted on-site measurements to collect robust noise data to inform our assessment.

The train loadout noise includes relatively elevated noise events such as impacts from empty wagon positioning and squeals from brakes during train repositioning, alongside low-frequency engine noise. Noise levels are highest at the start and end of the loading operation but decrease during the middle section of the loading process that lasts for approximately sixty minutes. For a conservative assessment, we used measurements from the loudest periods.

A detailed schedule of mining equipment is provided in Appendix B with the cumulative sound power levels stated in Table 9.

Table 9: Input noise data of mining plant and equipment used in the noise model

Equipment	Source noise data dB (L_{Aeq} Basis)
Ngakawau Rail Loadout	
Loader (Volvo L180H or similar)	109 dB L_{AW}
Train loadout*	94 dB L_{AW}/metre
Tracked Conveyor	71 dB L_{AW}/metre
Workshop reverberant sound pressure level within all buildings	80 dB L_{Aeq}
Stockton, Cypress, Mount Frederick South, Escarpment extended	
Combined noise emissions for all mobile fleet and processing for Stockton	131dB L_{AW}
Combined noise emissions for all mobile fleet for Cypress	125 dB L_{AW}
Combined noise emissions for all mobile fleet for Mount Frederick South	125 dB L_{AW}
Combined noise emissions for all mobile fleet for Escarpment Extended	125 dB L_{AW}
Upper Waimangaroa Haul Road	
Haul truck 2 movements per 15 min	84 dB L_{AE} at 10 m

**Notes: Measured at Ngakawau Rail Loadout. Noise from the aerial ropeway is negligible and has been excluded from our analysis.*

Haul truck movements along the UWHR have been modelled based on a sound exposure level of 84 dB L_{AE} at 10 metres from a pass-by of a haul truck unit on a gravel road. Our model includes two movements occurring within a 15 minute period.

We understand that there will be other noise sources on site at various stages such as employee vehicle movements. These noise sources are considered negligible in the context of overall noise emission from mining activity and have therefore been excluded from our model.

Our model assumes that no Ngakawau site vehicles will have tonal reversing alarms, and we recommend a consent condition to this effect.

5.3 Modelling Scenarios & Predicted Noise Levels

In our noise model we have assumed several operational scenarios (Scenario 1 to 3) for the Ngakawau Rail Loadout during daytime and night-time activities.

For mining operations, we have calculated cumulative noise levels based on the conservative assumption that all project areas (Stockton, Cypress, Mount Frederick South, Escarpment Extended, and the Upper Waimangaroa Haul Road) will operate simultaneously (Scenario 4).

To assist with the ecological assessment during the early stages of mining, we have conducted additional noise modelling as described in Section 7.0.

Our noise model assumes the conservative situation where mining activities will occur at existing ground level where the mining fleet receives minimum natural sound screening from surrounding terrain. After excavation has commenced, we expect that noise levels will reduce as machinery will operate within the excavated area and the perimeter of the site will serve as a noise barrier.

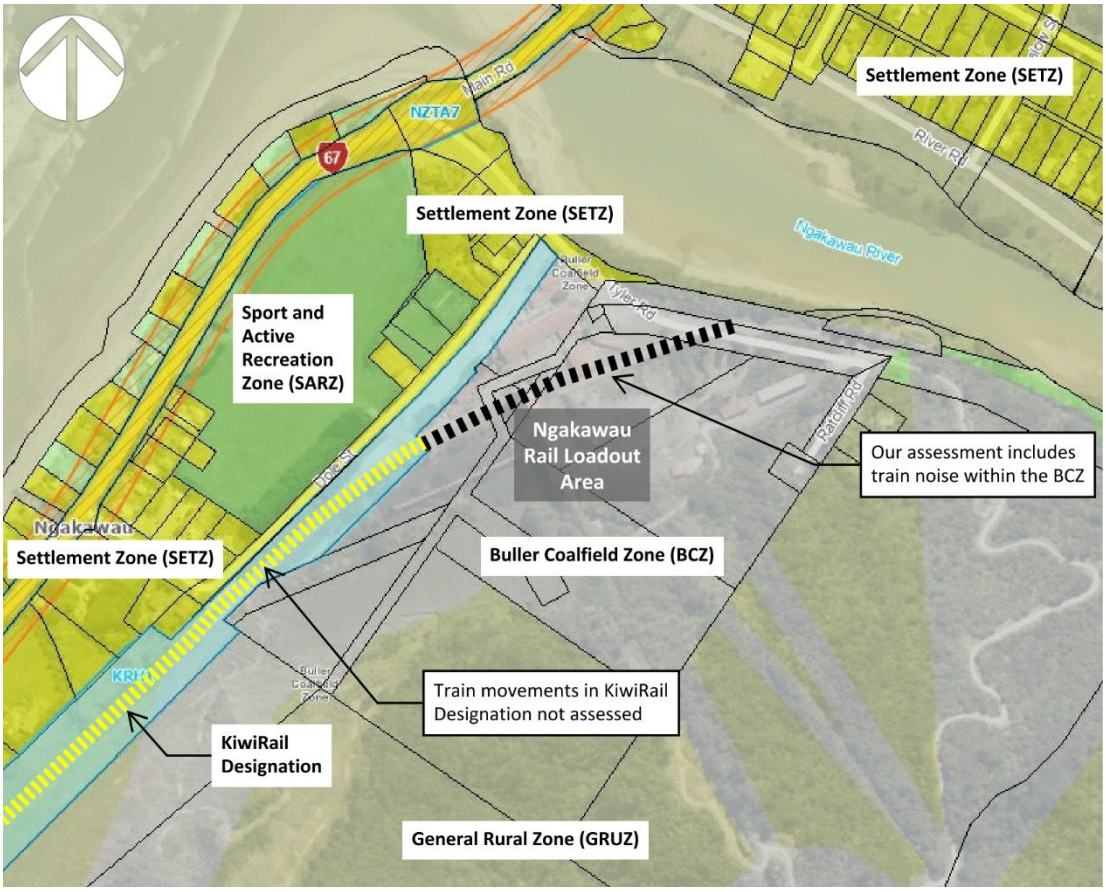
Table 10: Modelled scenarios for Ngakawau and Buller Plateaux

Scenario	Location	Operating noise sources	Operating time
Ngakawau Rail Loadout			
1	Normal operation and train loadout, within industrial zone	Conveyor – Loader – Workshop - Train loadout	Daytime
2	Normal operation and train loadout, within industrial zone	Conveyor — Workshop - Train loadout	Night-time
3	Normal operation	Conveyor- Workshop (doors closed)	Night-time
Buller Plateaux Coal Mines			
4	Typical operation	All mines operating simultaneously including 2 haul truck movements every 15 mins along transport corridor	24/7
5	Typical operational including **dewatering pumps**	Study to evaluate dewatering pump noise at night when operating close to Millerton dwellings	24/7

5.4 Rail Designation Area

Although the total length of the train (30 wagons), is approximately 430 metres, our noise model only considers the train noise for the extent indicated by the dashed black line in Figure 7, when it is operating within the Rail Loadout Area. Noise from train activity in the KiwiRail designation has been excluded from assessment as we understand the current designation is for "railway purposes" and it can be considered an existing permitted activity.

Figure 7: Train length within Industrial Zone and Rail Designated Zone



6.0 PREDICTED NOISE LEVELS

6.1 Ngakawau Rail Loadout

The predicted daytime noise levels in Ngakawau for Scenario 1 are summarised in Table 11, utilising the L_{Aeq} noise metric. The table details the TTPP zoning for each receiver and highlights areas without existing dwellings on site. A noise contour plot of this scenario is provided in Figure 8 with a larger version in Appendix E.

Table 11: Predicted DAYTIME noise levels at nearest properties for Scenario 1

Receiver	Predicted noise level at residential boundary, dB L_{Aeq}	
	Scenario 1 Normal handling operations + Train Loadout	Comply with daytime noise limit 55 dB L_{Aeq}?
[redacted]	52	Yes
[redacted]	44	Yes
[redacted]	54	Yes
[redacted]	55	Yes
[redacted]	45	Yes
[redacted]	45	Yes
[redacted]	46	Yes
[redacted]	46	Yes
[redacted]	45	Yes
[redacted]	45	Yes
[redacted]	46	Yes
[redacted]	47	Yes
[redacted]	43	Yes
[redacted]	43	Yes
[redacted]	40	Yes
[redacted]	43	Yes
[redacted]	49	Yes
[redacted]	42	Yes
[redacted]	47	Yes
[redacted]	41	Yes
[redacted]	40	Yes

**Note: Noise levels calculated at notional boundary*

The results in Table 11 show that predicted noise levels from normal daytime coal handling and train loadout operations (Scenario 1) range between 40 and 55 dB L_{Aeq} and indicate compliance with the proposed project daytime limit of 55 dB L_{Aeq}.

With reference to the BDP, noise limits would be breached at several locations on Dole Street and Tyler Road, all day on Sundays and Saturday evenings when a 45 dB L_{A10} "night-time" limit applies. The TTPP Settlement Zone limit of 50 dB would be breached at weekends and public holidays at two locations that have dwellings: 49 and 51 Dole Street.

The predicted Scenario 2 and 3 night-time noise levels in Ngakawau are presented in Table 12 and noise contour plots are provided in Figure 9 and Figure 10. Larger versions are provided in Appendix E.

Table 12: Predicted NIGHT-TIME noise levels at nearest dwellings for Scenarios 2 and 3

Receiver	Predicted noise level at residential boundary, dB L_{Aeq}			
	Scenario 2 Normal night-time operation + Train loadout	Comply with night-time noise limit 45 dB L_{Aeq} ?	Scenario 3 Normal night-time operation	Comply with night-time noise limit 45 dB L_{Aeq} ?
[redacted]	52	No (+7 dB)	<30	Yes
Z	44	Yes	<30	Yes
	52	No (+7 dB)	<30	Yes
RZ	55	No (+10 dB)	<30	Yes
o	45	Yes	<30	Yes
	45	Yes	<30	Yes
	45	Yes	<30	Yes
	45	Yes	<30	Yes
	45	Yes	<30	Yes
	44	Yes	<30	Yes
BCZ	43	Yes	<30	Yes
Z	47	No (+2 dB)	<30	Yes
	43	Yes	<30	Yes
	43	Yes	<30	Yes
	40	Yes	<30	Yes
	41	Yes	<30	Yes
	48	No (+3 dB)	<30	Yes
	40	Yes	<30	Yes
	45	Yes	<30	Yes
	41	Yes	<30	Yes
[redacted]	40	Yes	<30	Yes

**Note: Noise levels calculated at notional boundary*

The results in Table 12 show that if train loadout activities were to extend into the night-time period (Scenario 2) – nominally between 22:00 and 01:00 hrs – the proposed 45 dB L_{Aeq} noise limit would be

breached at approximately 5 locations on Dole Street and Ratcliff Road. We note that as night-time train loading already occurs, residents will be aware of the potential adverse effects of this breach.

Once night-time train loading has finished, noise levels during most of the night (Scenario 3) will generally be below 30 dB L_{Aeq} and this is comfortably below the applicable limit of 45 dB L_{Aeq}.

Figure 8: Scenario 1 – Normal handling operations + Train Loadout

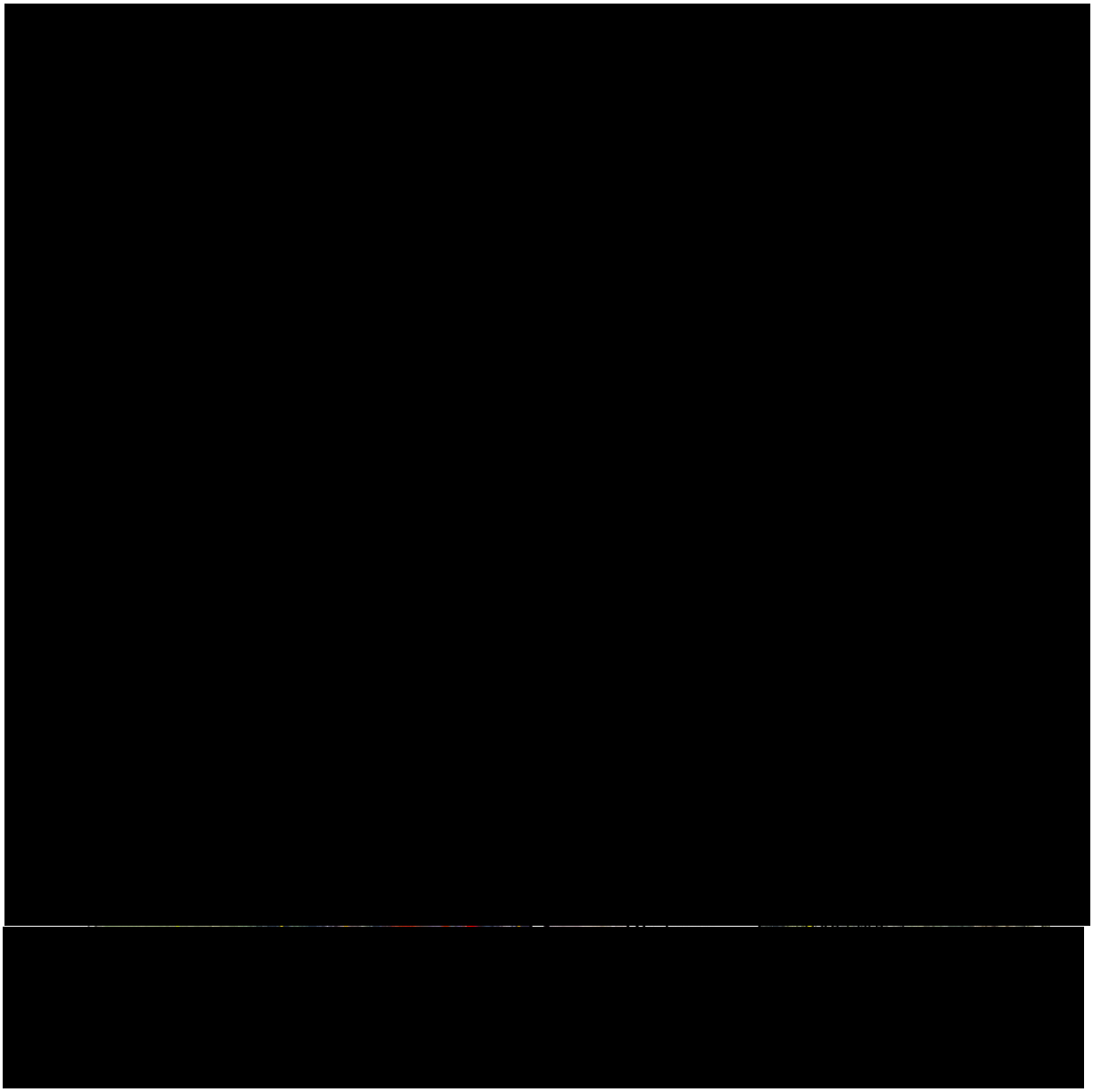


Figure 10: Scenario 3 - Normal night-time operation

6.2 Buller Plateaux Coal Mines

For all mining and processing activities (Scenario 4), Table 13 presents the predicted noise levels at the closest dwellings in Millerton and Denniston.

As de-watering pumps are anticipated to be operational relatively close to Millerton dwellings, approximately between 2033 and 2035, Scenario 4 also includes potential pump noise emissions on a cumulative basis with mining activity. Scenario 5 presents pump noise emissions in isolation noting their location has a noise influence in Millerton only. Noise contour plots for Scenarios 4 and 5 are provided in Appendix F.

Table 13: Predicted cumulative noise levels at nearest dwellings for Scenarios 4 and 5

Receiver	Predicted noise level at notional boundary, dB L_{Aeq}			
	Scenario 4 Mining and processing (plus pumps)	Scenario 5 Dewatering pumps only	Compliance with daytime noise limit 55 dB L_{Aeq} ?	Compliance with night-time noise limit 45 dB L_{Aeq}
[redacted]	43	< 20	Yes	Yes
[redacted]	39	< 20	Yes	Yes
[redacted]	41	---	Yes	Yes

Table 10 indicates that the worst-case cumulative noise from simultaneous operations across all Project mining areas is predicted to be no higher than 43 dB L_{Aeq}. We have assessed noise at the closest dwellings to mining operations and therefore noise levels will be lower at dwellings that are further away. Our assessment confirms that mining, processing and transport operations across the Buller Plateaux will comply with both daytime and night-time noise limits.

Additionally, we confirm that the night-time noise limit of 75 dB L_{Amax} will be met at these residential locations.

7.0 EARLY STAGE NOISE EFFECTS ON LOCAL ECOLOGY

To assist the ecologist with assessing potential noise effects on fauna, we have assessed noise emissions during the project's early construction and operational stages which we understand will potentially cause greatest disturbance.

The primary noise-generating activities we have considered for these early stage works (ESW) are:

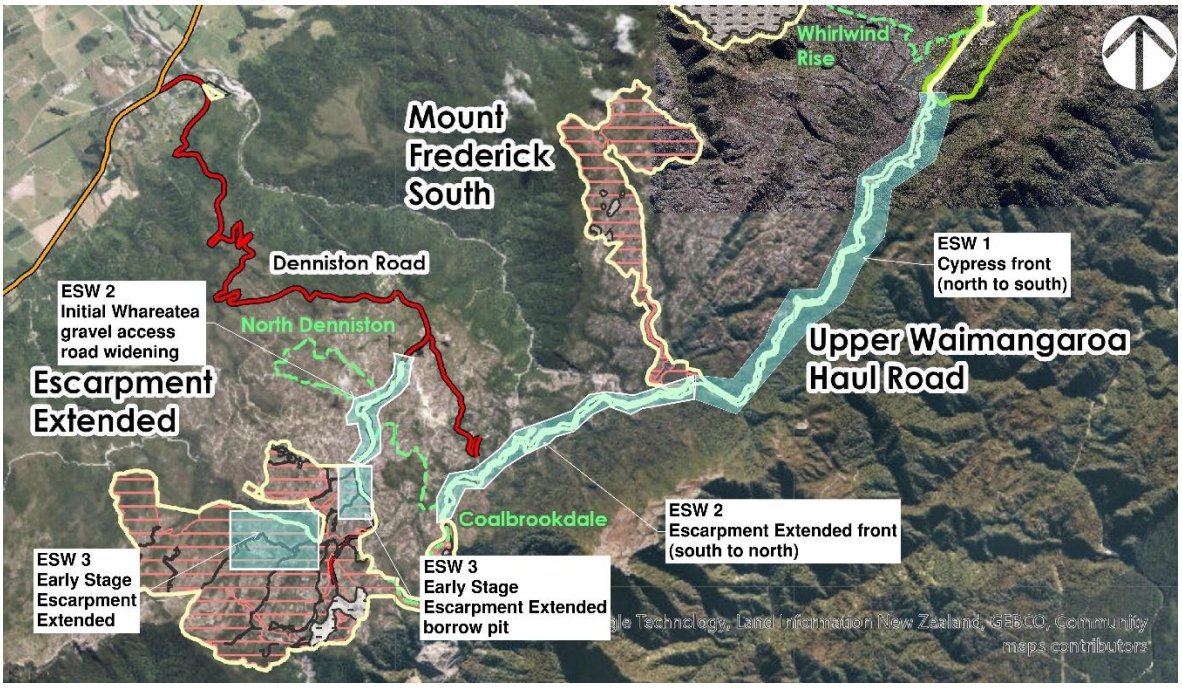
ESW 1 Two construction fronts for the Upper Waimangaroa Haul Road (Escarpment Extended) progressing south to north, and Cypress development advancing north to south, occurring simultaneously.

ESW 2 Initial widening and upgrading of the existing Whareatea gravel access road infrastructure.

ESW 3 Commencement of Escarpment Extended mine and borrow pit extraction operations.

Figure 11 indicates the areas where early-stage operations will be concentrated.

Figure 11: Early stages operational areas



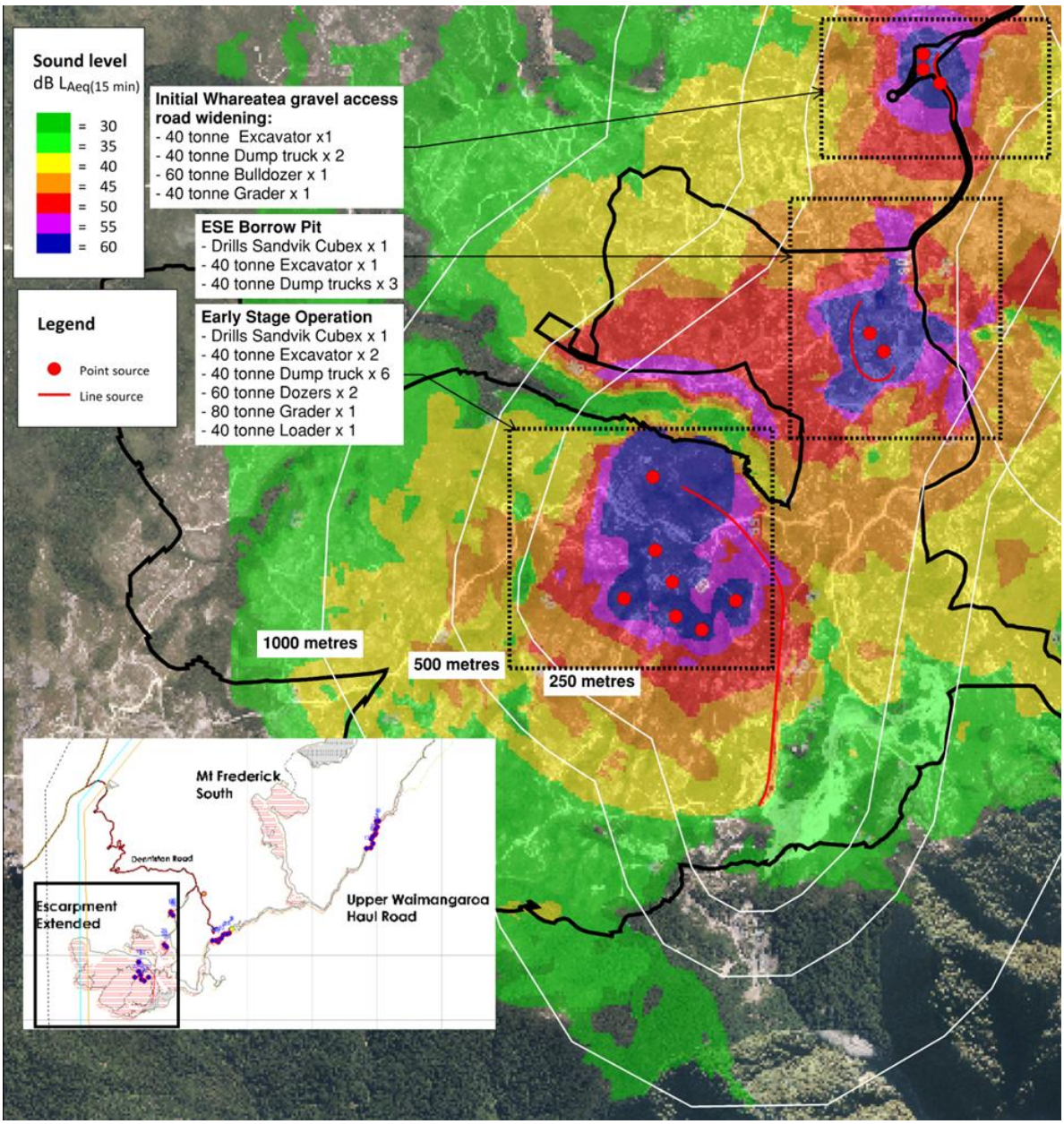
We understand that a variety of equipment will be used during the early stages of the project. To assess the potential impact on wildlife, we have focused our analysis on the dominant noise sources, as summarised in Table 14. The respective sound power levels associated with this equipment that has been used in our calculations, can be found in Appendix C.

Table 14: Dominant noise sources during early stages

Dominant noise sources for early stages				
Initial Whareatea gravel access road widening	**Escarpment Extended mine**	**Escarpment Extended borrow pit**	**Escarpment Extended haul road front**	**Cypress haul road front**
- 90t Excavator x 1 - 40t Trucks x 6 - 40t loader x 2 - 60t Bulldozer x 1 - 18t Grader x 1	- Drills Cubex x 1 - 40t Excavator x 2 - 40t Trucks x 6 - 60t Bulldozer x 2 - 18t Grader x 1 - 40t Loader x 1	- Drills Cubex x 1 - 40t Excavator x 1 - 40t Trucks x 6	- 40t Loader x 1 - 40t Trucks x 6 - 60t Bulldozer x 2 - 19t Roller x 3 - 10t Crane x 2 - 18t Grader x 1	- 40t Loader x 1 - 40t Trucks x 6 - 60t Bulldozer x 2 - 19t Roller x 3 - 10t Crane x 2 - 18t Grader x 1

Noise contour plots for ESW 1 to 3 are provided in Appendix G. However, to illustrate the range of noise levels that can be expected, a snapshot of the Appendix G plots for ESW 2 and 3 is provided in Figure 12.

Figure 12: Early Stage Works noise contours for Whareatea and Escarpment Extended (refer Appendix G)



8.0 ASSESSMENT OF NOISE EFFECTS

The greatest potential for adverse noise effects is for the residential dwellings that are relatively close to the Ngakawau Rail Loadout. However, we expect that future noise emissions will be similar to the existing loadout activity that has occurred at the site over several years and residents will be familiar with the character and nature of the noise that can occur.

The greatest potential for adverse noise effects will occur for approximately five dwellings when rail loadout operations continue into the night-time period, and past midnight on some occasions. For the remainder of the night, noise emissions from the site will be below 45 dB L_{Aeq}. The dwellings are:

- [redacted]
- [redacted]
- [redacted]
- [redacted]*
- [redacted]

We understand night-time train loading currently occurs from time to time as a result of KiwiRail scheduling and, as such, there will be no change in the noise effect currently experienced by these residents. Any modification to residents' behaviour due to the loadout noise, such as sleeping in another room, is likely to have already occurred.

For all other dwellings close to the Ngakawau Rail Loadout, our assessment shows that noise levels are below the 55 and 45 dB L_{Aeq} project noise limits that provide for the protection of residential amenity. These limits are broadly consistent with the BDP and TTPP limits except that the times of application are different.

The proposed coal mining and processing operations are sufficiently distant from residential dwellings in Millerton and Denniston that noise levels will be very low, even in the conservative scenarios we have assessed. There will be minimal noise effects from the proposed activity at these dwellings and there will be negligible impact on residential amenity.

Operational noise effects from mining activities will be minimal in the context of the residential receiving environment. Noise levels will be consistent with the amenity anticipated by the BDP permitted activity noise limits and residents have an existing familiarity with the activity and soundscape.

9.0 BLASTING NOISE AND VIBRATION

We understand that blasting will be required as part of the mining process. Blasting is an established activity at Stockton Mine and Bathurst staff and contractors have specialist expertise in the design and management of blasting programs that address safety, disturbance to residents and recreational users, and protection to heritage structures.

Current processes are described in the following Bathurst standard operating procedure and management plan documents which we have reviewed in preparing our assessment:

- Stockton Mine Drilling and Blasting Design Application and Reporting (STO-TEC-PRO-102 ver 2.0)
- Stockton Mine Firing of Blasts Standard Operating Procedure (STO-TEC-SOP-015 ver 4.1)
- Stockton Mine Explosives - Principal Hazard Management Plan (STO-TEC-PHMP-005 ver 5.0)

9.1 Human Comfort

As noted in Section 4.6, Australian Standard *AS 2187.2-2006 Explosives – Storage and Use, Part 2: Use of Explosives* provides recommended limits for ground vibration and noise (airblast/overpressure) based on maintaining human comfort in dwellings. These are:

1. 95% of airblast levels do not exceed 115 dB L_{Zpeak} in any calendar year, with a maximum of 120 dB L_{Zpeak}, when applied at any point within the notional boundary of any occupied rural dwelling.
2. 95% of vibration levels shall not exceed a peak component particle velocity of 5 mm/s in any calendar year, with a maximum of 10 mm/s at the foundation of any dwelling.

AS 2187.2-2006 recognises that accurately estimating ground vibration and airblast levels is complex because the blasting process is highly non-linear and the variability of most ground types contributes to the difficulty in accurate predictions of the environmental outcomes. However, even with this variability, blasting at Stockton has been successfully conducted over several years and airblast and vibration levels can be designed to comfortably comply with the proposed limits.

By way of example, Figure 13 and Figure 14 show the generic variation in peak sound pressure level and ground vibration with Effective Maximum Instantaneous Charge (MIC) per delay (kg), based on the prediction methodology from AS-2187.2. These graphs indicate that human comfort criteria discussed above are achieved over relatively short distances. For example, for a relatively large MIC of 200 kg, both the vibration and overpressure criteria are achieved at distances of less than approximately 750 metres. The distances between the blasting locations and nearest dwellings are substantially greater than this, and therefore we expect the criteria can be appropriately achieved.

Existing experience from Stockton has established appropriate blast design constraints for the site to ensure the limits can be achieved. Factors such as charge weight, depth and delay intervals can be adjusted to alter vibration and airblast overpressure.

Irrespective of compliance, blasting can be an emotive issue for residents, and effective liaison between the site operator and residents represents good practice. We recommend that effective communication about blasting and review of procedures continues as part of the blasting management for the project.

Figure 13: AS 2187 Blasting Noise Levels (dB L_{Zpeak}) [site exponent (a) of −1.45, and site constant (K_a) is of 10]

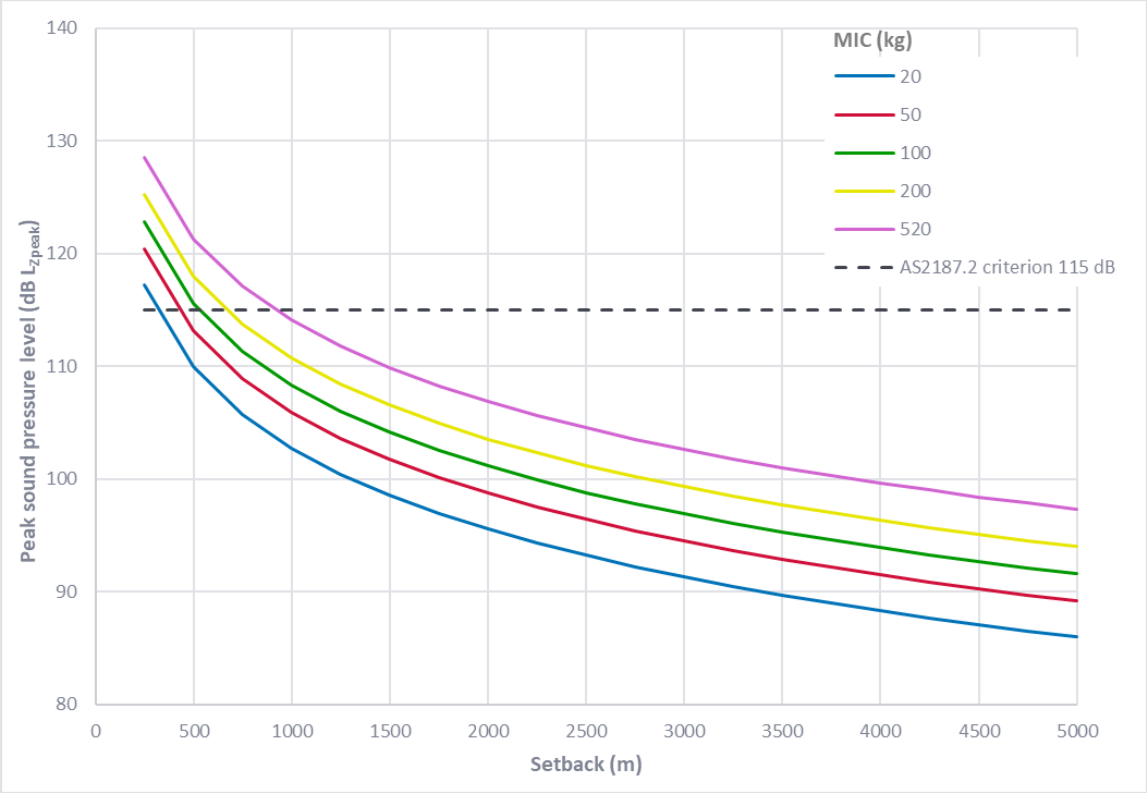
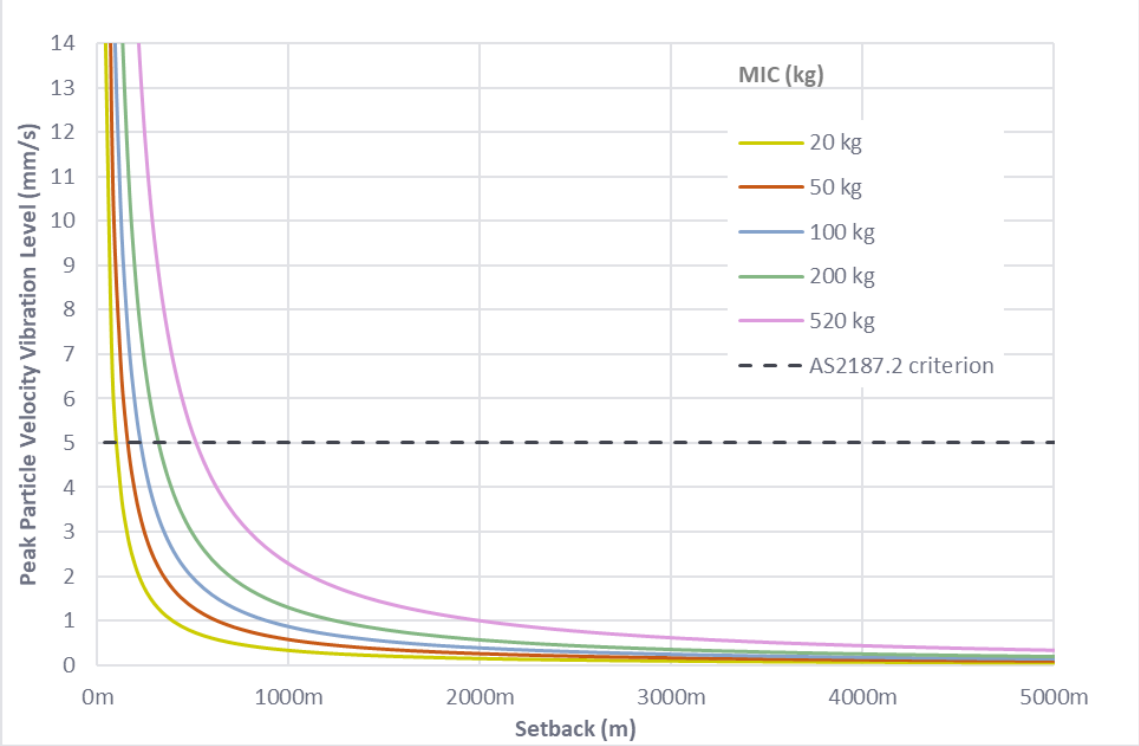


Figure 14: AS 2187 Blasting Vibration Levels (mm/s PPV) [assumed site constants K_g = 1500 and B = -1.5]



9.2 Blasting effects on historic structures

As previously discussed, the air blast and vibration levels for avoiding structural damage to buildings as stated in AS 2187-2:2006 are significantly higher than values for human comfort.

However, AS 2187-2:2006 does not specifically reference superficial vibration damage to historical structures and additional guidance can be taken from DIN 4150-3:2016 *Vibrations in buildings – Part 3: Effects on structures*.

DIN 4150-3 provides vibration limits for "*Structures that, because of their particular sensitivity to vibration, cannot be classified under [Commercial or Residential buildings] and are of great intrinsic value (e.g. listed buildings).*

The guideline vibration limits for structures that align with this classification are set out in Table 15.

Table 15: DIN 4150-3:2016 Guideline values for vibration velocity, for evaluating the effects of short-term vibration on structures

Guideline values for peak particle velocity at foundation, at all directions, at a frequency of		
1 Hz to 10 Hz	**10 Hz to 15 Hz**	**50 to 100 Hz**
3 mm/s	3 to 8 mm/s	8 to 10mm/s

To assist with the evaluation of potential damage to heritage structures from blasting, we have reviewed several historic structures that have been identified by the heritage consultant (Clough and Associates) for the BPCP. Figure 15 shows the historic structures at the Whareatea Mine, which we understand is the closest point to where coal extraction (and blasting) will occur.

Figure 15 also illustrates two examples of the structurally diverse historic structures that are present and are likely to have a range of sensitivity to vibration. However, until their structural integrity is assessed, we have adopted the conservative vibration values in Table 15 as a guide.

The estimated blast vibration levels in Figure 16 indicate that blasting within approximately 150 metres has the potential to exceed the 3mm/s PPV guideline value.

We note that Bathurst already has established procedures that recognises potential damage to historic buildings and monuments from blasting at Stockton. The document, S*tockton Mine Drilling and Blasting Design Application and Reporting (STO-TEC-PRO-102 ver 2.0)* provides vibration criteria and procedures for controlling ground vibration and we recommend this procedure should apply to all project areas. However, we recommend that *STO-TEC-PRO-102 ver 2.0* is updated to reflect the broader Project area and to align with current best practice criteria in Table 8 and Table 15.

Where the applicable criterion could potentially be exceeded, mine blast engineers can employ design steps to implement a "proximity" blast that will typically include the use of smaller charge weights and blast hole diameters. Some structures may benefit from temporary shoring to minimise their vibration sensitivity.

Figure 15: Whareatea Mine, pit extent and example historic features

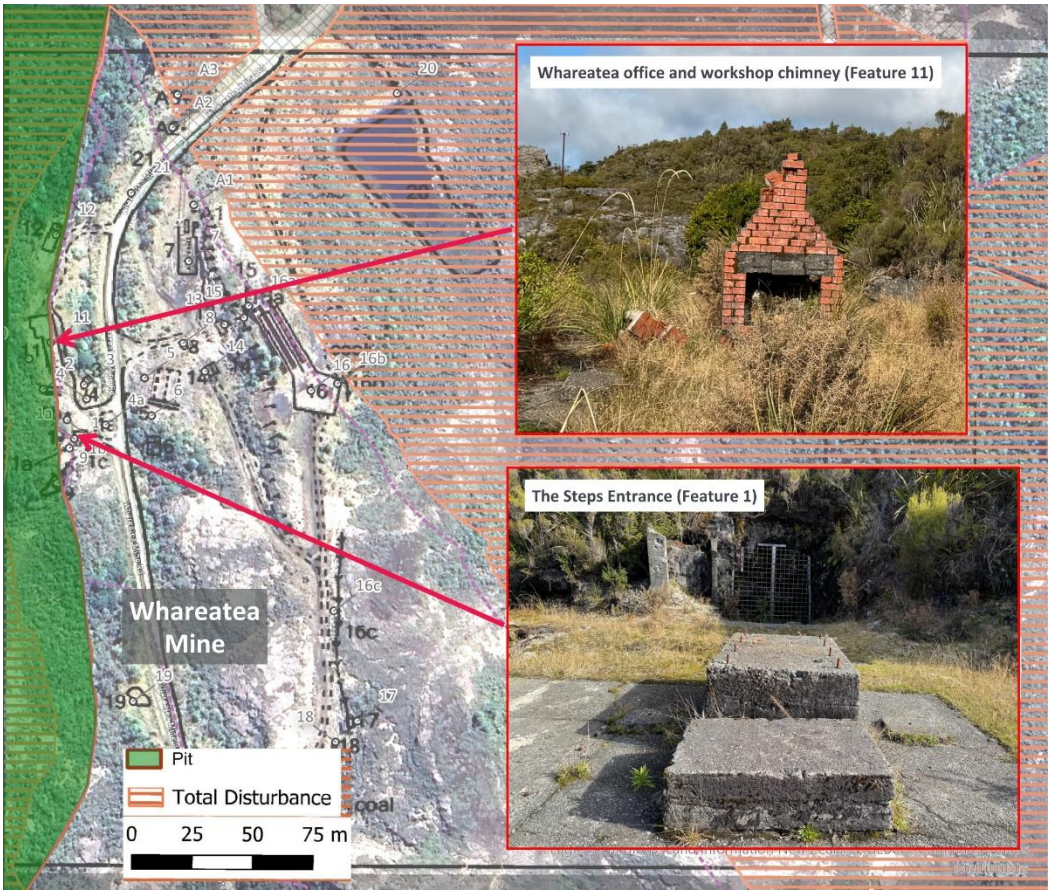
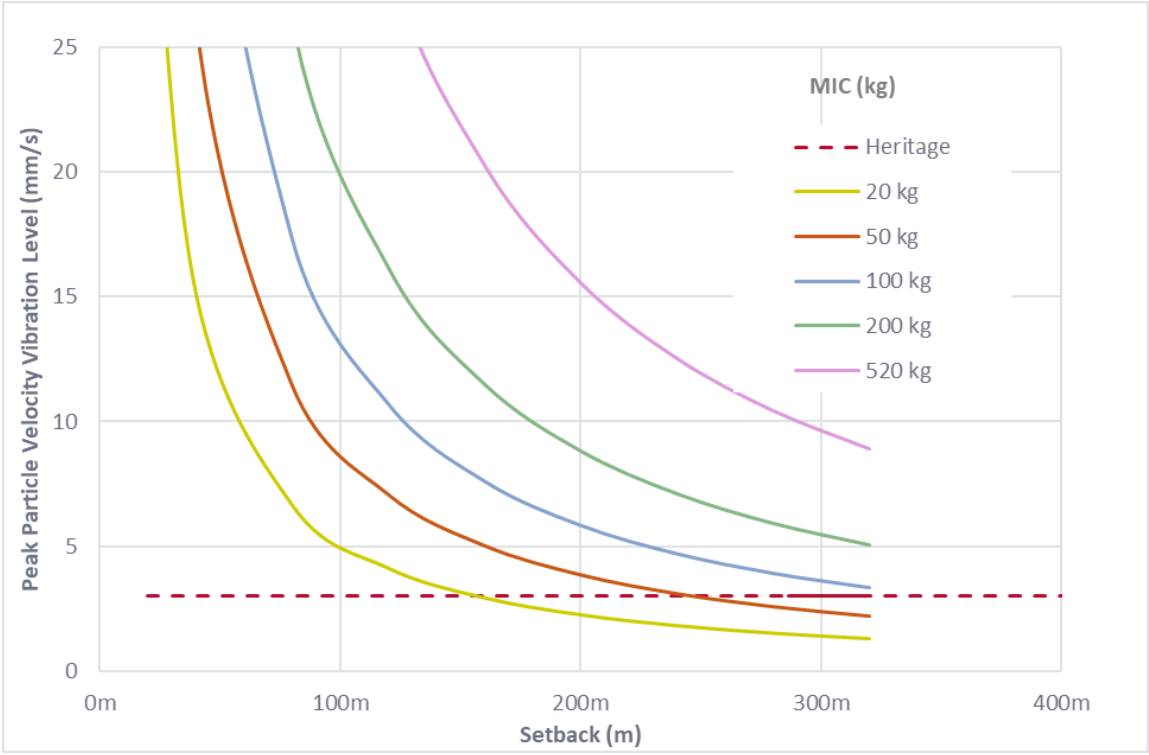


Figure 16: Blasting Vibration Levels (mm/s PPV) [assumed site constants Kg = 1500 and B = -1.5] again DIN4150-3:2016 heritage criteria



10.0 NOISE FROM TRAFFIC ON PUBLIC ROADS

Both the BDP Rule 7.8.2 and TTPP Rule NOISE-R2.7 exempt traffic noise on public roads from compliance with their respective noise limits.

Experience suggests that some mining activities can generate significant additional truck movements on otherwise quiet roads, resulting in adverse amenity effects. However, that is not the case for the current Project, which will use the existing rail load-out to transport coal. As a result, heavy vehicle movements on public roads (and the associated noise) will not be a significant feature.

11.0 NOISE FROM HELICOPTER ACTIVITY

We understand that helicopter activity is proposed but will be irregular. Helicopters will be used for emergency purposes, exploration and transporting field staff into inaccessible locations. Four helicopter landing sites are proposed, as shown in Figure 17. Two of these, H3:Ngakawau Rugby Field and H4:Granity Fire station, will have a potential noise impact for local residents.

Both the BDP Rule 7.8.3.3 and TTPP Rule NOISE-R1.6 require helicopter noise to be assessed for compliance with the limits in New Zealand Standard NZS 6807:1994 *Noise Management and Land Use Planning for Helicopter Landing Areas*, except helicopter use for emergency purposes, which is exempt (TTPP Rule NOISE-R2.4).

NZS 6807 provides useful guidance as to what are generally acceptable noise levels for normal helicopter operations where people are exposed to the noise. The Standard sets out limits of acceptability for helicopter noise for a range of receivers. An acceptable limit for residential and rural receivers is defined as 50 dB L_{dn} (day/night) and 70 dB L_{AFmax}.

We recommend all helicopter activity (excluding emergency use) be required to comply with NZS 6807 as a condition of consent.

Figure 17: Helicopter landing areas

12.0 RECOMMENDED CONSENT CONDITIONS

To ensure that noise from the proposed activities is adequately controlled throughout the life of the consent, we recommend that the following noise-related conditions are included in the consent, should it be granted.

1. The consent holder shall ensure that all operational activities on the site, with the exception of noise generated during train operations, do not exceed the following noise limits at a residentially zoned property boundary or within the notional boundary of any dwelling on any other site:

   - Daytime: 07:00 to 22:00 hrs — 55 dB $L_{Aeq(15\ min)}$
   - Night-time: 22:00 to 07:00 hrs — 45 dB $L_{Aeq(15\ min)}$ and 75 dB L_{AFmax}

   when measured and assessed in accordance with the latest New Zealand noise standards: NZS 6801:2008 "*Acoustics – Measurement of environmental sound*" and NZS 6802:2008 *"Acoustics - Environmental Noise"*.

   'Notional boundary' is defined as a line 20 metres from any side of a dwelling or the legal boundary where this is closer to the dwelling.

2. Mining operations must use the best practicable option to minimise noise at all times. This includes keeping workshop doors closed at night as far as practicable, replacement of worn parts, maintenance of mufflers, lubrication of moving machinery to avoid squeaks and squeals, and appropriate operation of all equipment.

3. Ngakawau site vehicles or equipment must not be fitted with tonal reversing alarms. Where reversing alarms are required, strobe lights or broadband reversing alarms must be used.

4. Noise from helicopter landing areas, except when used for emergency purposes, must be measured and assessed in accordance with NZS 6807:1994 *Noise Management and Land Use Planning for Helicopter Landing Areas,* and comply with the applicable limits in that Standard.

5. Blasting activities must be measured and assessed in accordance with Appendix J of Australian Standard AS 2187-2:2006 *Explosives – Storage and use Part 2: Use of explosives*.

   For human comfort:

   a) Blasting must be managed to ensure that in any calendar year, 95% of airblast levels do not exceed 115 dB L_{Zpeak}, with a maximum of 120 dB L_{Zpeak}, when applied at any point within the notional boundary of any rural dwelling.

   b) Blasting vibration shall not exceed a peak component particle velocity of 5 mm/s for 95% in any calendar year, with a maximum of 10 mm/s at the foundation of any dwelling.

   For the protection of sensitive heritage structures:

   c) Blasting vibration shall not exceed the following peak particle velocities when measured at the foundation of sensitive heritage structure:

Peak particle velocity at foundation, at all directions, at a frequency of		
1 Hz to 10 Hz	**10 Hz to 15 Hz**	**50 to 100 Hz**
3 mm/s	3 to 8 mm/s	8 to 10mm/s

6. The consent holder shall prepare a Noise and Vibration Management Plan (NVMP) to control day-to-day emissions from the site during construction, operational and blasting activities. As a minimum, the NVMP shall include:

   - The person(s) responsible for implementing the NVMP

- Applicable noise conditions relating to noise and vibration
- Specific procedures for informing neighbours of when blasting will occur
- Procedures for noise and vibration monitoring
- Training of staff relating to how to minimise noise and vibration

APPENDIX A GLOSSARY OF TERMINOLOGY

Noise	A sound that is unwanted by, or distracting to, the receiver.
SPL or L_P	Sound Pressure Level A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 µPa RMS) and expressed in decibels.
SWL or L_W	Sound Power Level A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 µPa i.e. dB = 20 x log(P/Pr)
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
$L_{Aeq\ (t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{A10}	The A-weighted noise level equalled or exceeded for 10% of the measurement period. This is commonly referred to as the average maximum noise level.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
SEL or L_{AE}	Sound Exposure Level The sound level of one second duration which has the same amount of energy as the actual noise event measured. Usually used to measure the sound energy of a particular event, such as a train pass-by or an aircraft flyover
NZS 6801:1999	New Zealand Standard NZS 6801:1999 *"Acoustics - Measurement of Environmental Sound"*
NZS 6801:2008	New Zealand Standard NZS 6801:2008 *"Acoustics – Measurement of environmental sound"*
NZS 6802:1991	New Zealand Standard NZS 6802:1991 *"Assessment of Environmental Sound".*
NZS 6802:2008	New Zealand Standard NZS 6802:2008 *"Acoustics – Environmental Noise"*

APPENDIX B EQUIPMENT BULLER COAL PLATEAUX CONTINUATION PROJECT

Facility/mine	Equipment	Hours of operation
Ngakawau		
Normal operation +Train loadout	- Train Loadout - Tracked conveyor - 25 tonne Loader - Workshop/ Power tools	24-hour operation, train loadout during daytime.
Normal operation	- Tracked conveyor -Loader -Workshop / Power tools	24 hours/day, 7 days/week
Stockton		
Production Fleet	- Drill (Sandvik CUBEX) x 3 - 200 tonne Excavator (EX1900) x 2 - 120 tonne Excavator (EX1200) x 2- - 90 tonne trucks (CAT777) x 17 - Dozers (D8,D10,D11,D375) x 4 - Graders (CAT 16M) x 3 - Hi Impact Roller x 1 - Fuel Truck x 3 - Water Cart x 3 - 777 Transporter x 1 - Drill Transporter x 1	Various shift rosters in operation. Some activity on site assumed 24 hours/day, 7 days/week
Coal Mining Fleet	- 90 tonne Excavator (EX890) x 1 - 45 tonne Excavator x 3 - 35 tonne Excavator x 3 - 55 tonne ADT (A60H) x 3 - 75 tonne Trucks (CAT773) x 3 - Loader (CAT988,992,982) x 4	
Civils/Rehab	- 35 tonne Excavator x 2 - 55 tonne ADT x 9 - Dozer (D65) x 1	
Denniston, Escarpment extended, and Transport corridor		
Production Fleet	- Drill (Sandvik CUBEX) x1 - 200t Ex (EX1900) - 90t trucks (CAT777) x 6 -Dozers (KOM D275AX) x 2 -Graders -Vibratory Roller -Fuel Truck -Water Truck x 1	24-hour operation
Mining Fleet 1	-Drill (Sandvik CUBEX) -400 tonne Excavator -180 tonne haul trucks x 6 - Dozers (KOM D375AX) x 2 -Water cart	
Hauling/Transport	- Kenworth C509 prime mover truck and trailer units x 6	

Facility/mine	Equipment	Hours of operation
Coal Haul Road maintenance fleet	- 90 tonne Excavator (ZX890) x 1 -Articulated Haul truck (A60H) x2 -Dozer (KOMD65EX) x1 -Wheel Loader (CAT980) x 1 -Water cart x 1 -Mobile crusher x 1	Day shift only 5 days per week

APPENDIX C INPUT NOISE DATA EARLY STAGES

Item	Equipment	Sound power level dB Law
1	Excavator 40tonne	110
2	Dump trucks 40 tonne	89L_{WA}/m
3	Bulldozer 60 tonne	108
4	Grader 18 tonne	109
5	Drill Sandvik Cubex	122
6	Crane 10 tonne	98
7	Roller 19 tonne	103
8	Loader 40 tonne	106

APPENDIX D NOISE SURVEY DETAILS

The key details of our noise surveys are as follows:

Noise survey 1 - Ambient noise survey

Date: 14 August 11:00 hrs to 15 August 10:00 hrs 2024

Personnel: [redacted] Marshall Day Acoustics

Weather: Average temperature 12-18°C, ~2-3 m/s wind from the west

Instrumentation: Brüel & Kjær Type 2250 analyser, serial 3010261, calibration due 30/05/2025
Brüel & Kjær Type 4231 calibrator, serial 3004051, calibration due 12/09/2025
01dB CUBE Noise Monitoring Terminal, serial 11191, calibration due 22/06/2025

Calibration: Field calibration of the equipment was carried out before measurements, and the calibration checked after measurements. Observed change less than 0.1 dB

Noise survey 2 -Train Loadout

Date: 16:00 hrs to 18:00 hrs, 5 February 2025

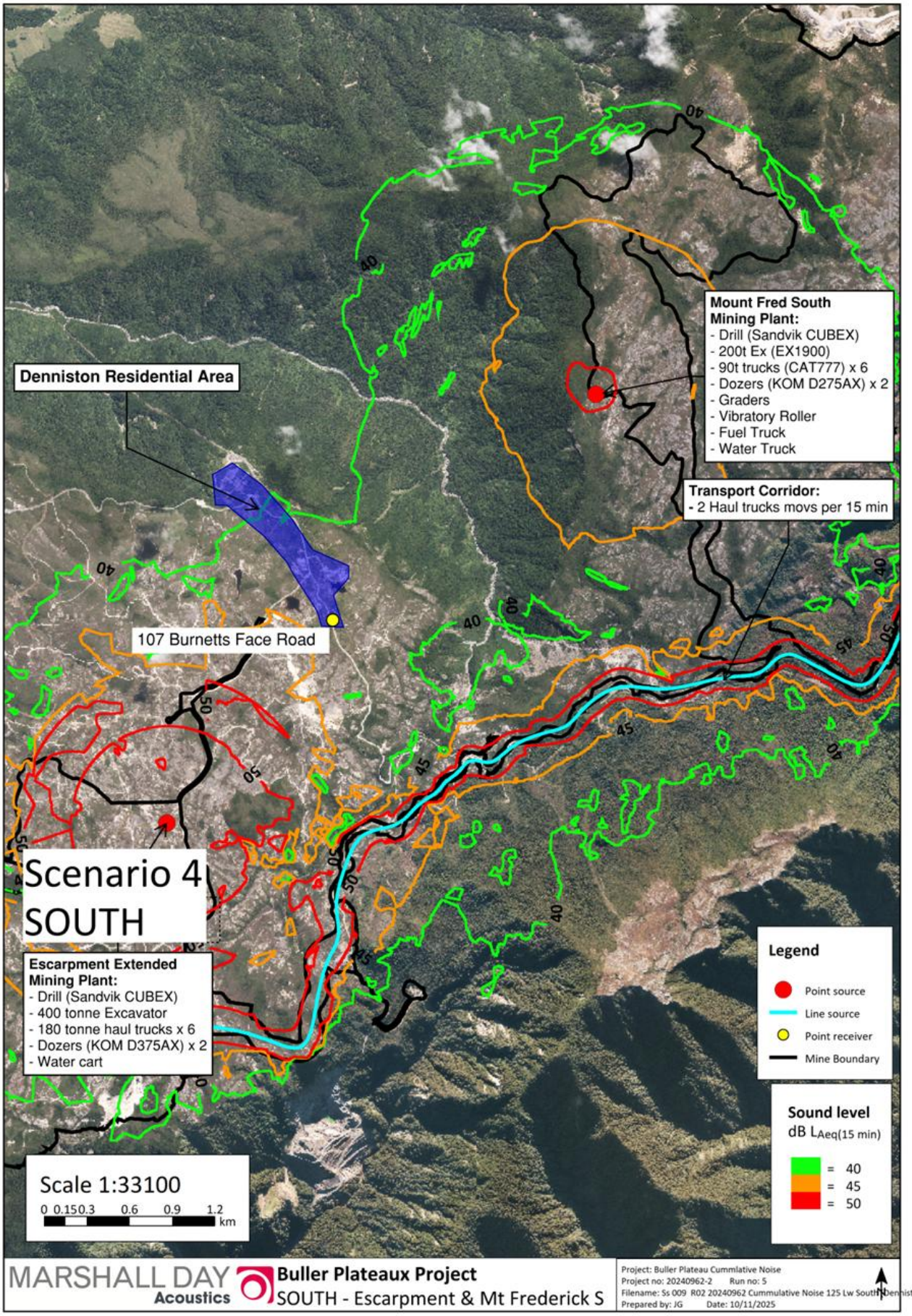
Personnel: [redacted], Marshall Day Acoustics

Weather: Average temperature 12-18°C, ~2-3 m/s wind from the west

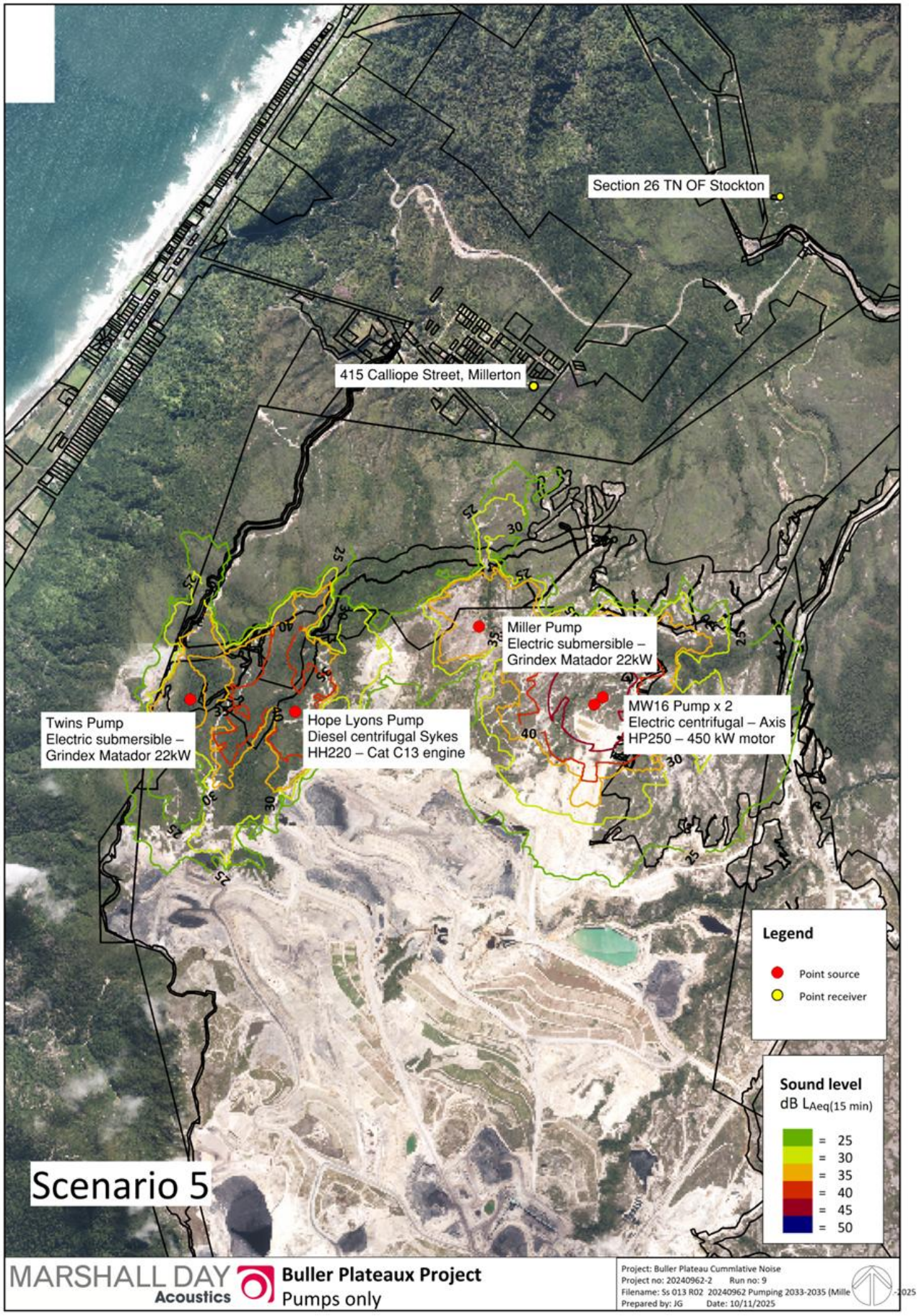
Instrumentation: Brüel & Kjær Type 2250 analyser, serial 2683036, calibration due 20/09/2026
Brüel & Kjær Type 4231 calibrator, serial 2574264, calibration due 20/09/2025

Calibration: Field calibration of the equipment was carried out before measurements, and the calibration checked after measurements. Observed change less than 0.1

F2 Scenario 4-SOUTH Mount Frederick South, Escarpment Extended and UWHR

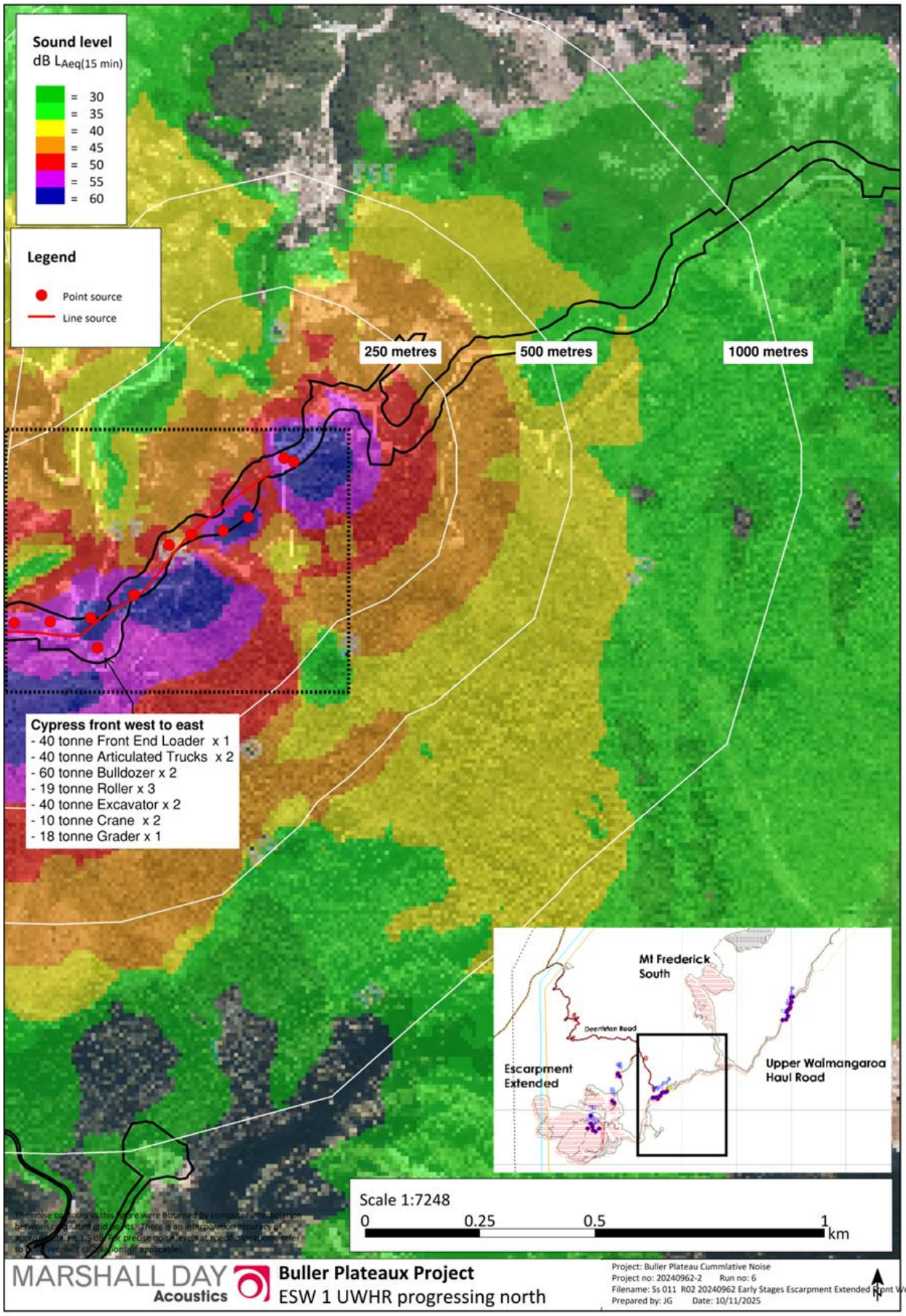


F3 Scenario 3-Dewatering pumps only

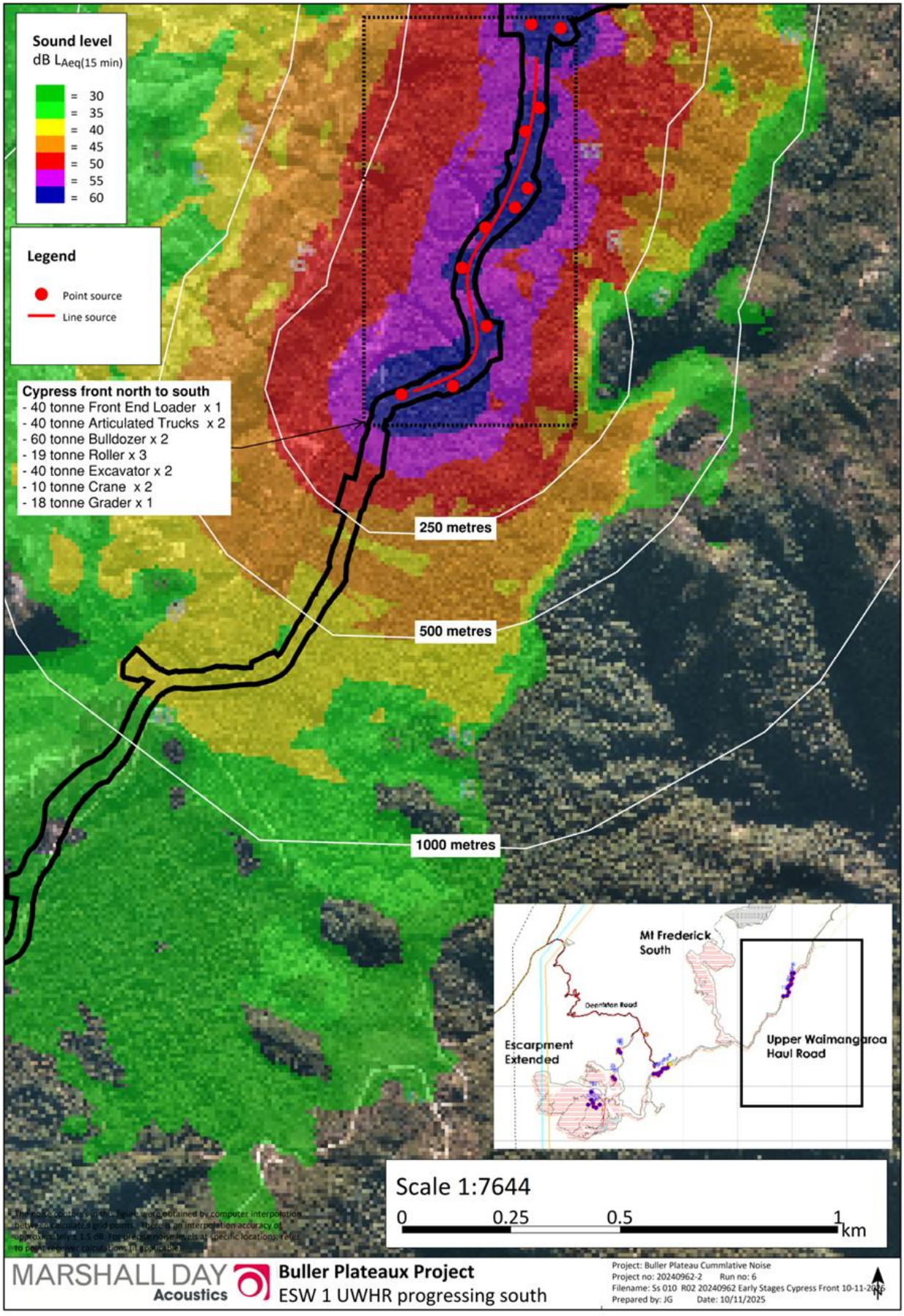
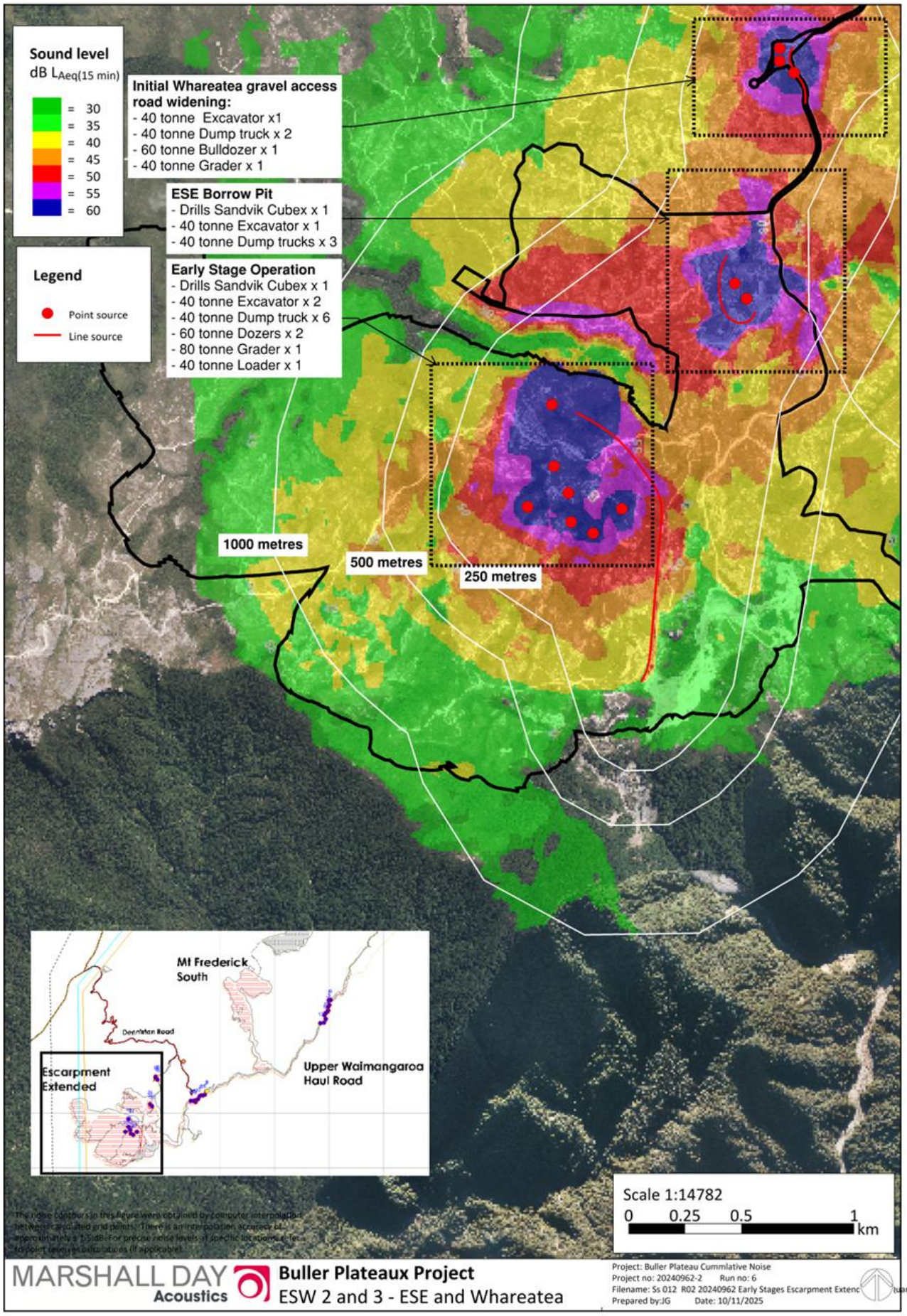


APPENDIX G NOISE FROM EARLY STAGE WORKS (ESW)

G1 ESW 1 UWHR (Escarpment extension progressing south to north,



G2 ESW 1 UWHR and Cypress development advancing north to south)



G3 ESW 2 and 3 - Whareatea infrastructure and Escarpment extended mine and borrow pit