APPENDIX G

Acoustic Engineering Services Noise Assessment

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Report Number: AC20312 – 05 – R3

Southern Screenworks Aylesbury Quarry Expansion

Assessment of Environmental Noise Effects

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Document Acceptance

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1.0 BACKGROUND

As requested, we have prepared an Assessment of Environmental Noise Effects for the expansion of a quarry operation at the Southern Screenworks site at 50 Bealey Road, Aylesbury. Our review is based on correspondence to date and the following documentation.

- Site Plan figures titled *Site Plan 2 figures SSW* as prepared by Bligh Architects Limited, received on the 19th of February 2024
- Description of Proposal titled *Description of Proposal*, received on the 19th of February 2024.

Please find our analysis and recommendations below.

2.0 SITE AND PROPOSAL

Southern Screenworks currently operate a gravel quarry and cleanfill at 50 Bealey Road, Aylesbury, near the intersection of Bealey Road and Aylesbury Road. The site is approximately triangular with both the Midland Rail Line and West Coast Road (SH73) passing to the northeast of the site. To the south is Bealey Road and immediately to the west is farmland.

Southern Screenworks are proposing to expand quarrying activity to encompass the entire hatched area shown in figure 2.1 below. Extraction activities are proposed to be undertaken in five stages (with substages within these) and are expected to take more than 30 years to complete. Materials will be extracted, processed and stockpiled prior to being transported off site.

The proposed activity for the quarry expansion is expected to be similar to the quarrying activity that has been undertaken on site for the past decade with no change in the intensity of activity. The extension is a change in the location of active quarrying. The cleanfill activity is not expected to increase in volume or location and is therefore not part of this application as it will remain within the existing quarry area.

We previously gave advice with regard to noise from the existing quarry in our assessment titled *Southern Screenworks Aylesbury Quarry, Assessment of Environmental Noise Effects* (AES file reference: AC20312 – 02 – R2), dated the 11th of May 2021.

Figure 2.1 — Existing Quarry and expansion area

The locations of the nearest dwellings are indicated by blue dots in figure 2.1 above.

3.0 ACOUSTIC CRITERIA

The Resource Management Act requires consideration of the significance of any adverse effects associated with the proposal. Guidance as to the significance of any adverse noise effects may be obtained from several sources.

3.1 Selwyn District Plan

We understand the Partially Operative District Plan (PODP) Appeals Version was made live on the 6th of December 2023 and the latest version of the PODP (Appeals Version) is dated the 13th of March 2024. There are no appeals relating to noise rules for the site and therefore we understand that the provisions of the PODP apply and have not considered the Operative District Plan (ODP) Rules in this assessment.

The quarry expansion area and all existing nearby receivers are located within the General Rural Zone. The noise limits are given in NOISE-TABLE5 of the PODP and apply at the notional boundary of any noise sensitive activity within any General Rural Zone site, and are as follows:

- *Day time* *0700 to 2200 hours* *55 dB $L_{Aeq\ (15\ min)}$*
- *Night time* *2200 to 0700 hours* *45 dB $L_{Aeq\ (15\ min)}$ / 70 dB L_{AFmax}*

Under the PODP, there is also a requirement for future sensitive activities[1] to be set back from any mineral extraction activity. The rule that applies is *GRUZ-REQ11* which has been reproduced as follows:

> *Any sensitive activity established after 19 August 2023 shall be setback from any lawfully established, authorised or operational mine or quarry or any operational mine quarry located on any property listed in GRUZ-SCHED1 at least:*
>
> *a. 200 m to any authorised excavation associated with mining, extracting or winning aggregate.*
>
> *b. 500 m to any authorised processing or aggregate recovery.*

3.2 Ambient noise levels

On the 25th of March 2024, Caleb Tevaga of AES visited the site to observe the existing ambient environment between 1420 to 1530 hours. Measurements were taken 1.5 metres from the property boundaries of 137 and 158 Bealey Road, and were carried out in accordance with NZS 6801:2008 *Acoustics – Measurement of Environmental Sound.*

Sound levels were measured 1.5 metres from the northern property boundary of 137 Bealey Road and these measurements are expected to be representative of the noise level received at the notional boundaries of the dwellings at 137 and 153 Bealey Road. The dominant noise source was vehicles passing by on Bealey Road. During the measurement period, passing vehicles consisted of standard passenger cars, 4WD vehicles with rattling trailers, and one large tractor hauling a fuel storage tank. A total of 28 vehicles passed by during the 15 minute measurement period with 17 of them passing during the last 5 minutes. A sound level of 69 dB $L_{Aeq\ (15\ min)}$ was measured at this location although we note that noise levels will be lower in areas of the site further from the road. The L_{A90} descriptor is the sound level exceeded for 90% of the measurement

[1] *Sensitive activity* means any:

a. residential activity
b. visitor accommodation
c. community facility
d. educational facility

period and is often referred to as the background noise level. A sound level 47 dB L_{A90} was measured at this location.

The sound level measured at 158 Bealey Road was taken 1.5 metres from the eastern property boundary adjacent to the dwelling (12 metres from the dwelling). The dominant noise source was traffic noise from State Highway 73 (SH73) located approximately 750 metres from the measurement point. Similar in proportion was noise from birds in the area. A sound level of 38 dB $L_{Aeq\ (15\ min)}$ was measured at this location.

These measurements indicate that dwellings close to Bealey Road receive elevated noise from passing traffic. Background noise in the area is generally consistent with what is expected in the Rural environment with lower noise levels at locations that are more distant from the roads; however, overall noise in the area is not particularly elevated nor is it a particularly low noise area that would warrant particular protection.

3.3 New Zealand Standard 6802

NZS 6802:2008 *Acoustics – Environmental noise* outlines a guideline daytime limit of 55 dB $L_{Aeq\ (15\ min)}$ and a night-time noise limit of 45 dB $L_{Aeq\ (15\ min)}$ for "the reasonable protection of health and amenity associated with the use of land for residential purposes". Where no time frames are given when noise limits apply, NZS 6802 prescribes the daytime period as between 0700 hours and 2200 hours (15 hours day, 9 hours night). The standard recommends the notional boundary of noise sensitive sites in rural areas as the appropriate assessment location.

The Standard also describes how a -3 dB adjustment may be applied to sound received for less than 50 % of the daytime period, and a -5 dB adjustment may be applied to sound received for less than 30 % of the daytime period.

NZS 6802:2008 also describes the application of a penalty for noise containing Special Audible Characteristics (SAC). In cases where SAC are confirmed to be present, the adjustment is +5 dB.

3.4 World Health Organisation

Guidelines for Community Noise[2], a document produced by the World Health Organisation (WHO) based on extensive international research recommends a guideline limit of 55 dB $L_{Aeq\ (16\ hours)}$ to ensure few people are seriously annoyed in residential situations. A guideline limit of 50 dB $L_{Aeq\ (16\ hours)}$ is recommended to prevent moderate annoyance. A guideline night-time limit of 45 dB $L_{Aeq\ (8\ hours)}$ is recommended to allow occupants to sleep with windows open.

These guidelines are measured at the façade of dwellings and other noise sensitive locations and apply for 16 hours in the daytime, and 8 hours for the night-time.

3.5 Discussion regarding appropriate noise levels

The PODP daytime noise limits are in line with other guidance in terms of level, metrics, and time frames and therefore, we consider the following noise limits (measured and assessed in accordance with NZS 6801:2008 and NZS 6802:2008) when received at the notional boundary of the neighbouring dwellings will be appropriate to ensure noise levels are acceptable at existing and future neighbouring properties.

- Daytime (0700 to 2000 hours) 55 dB L_{Aeq}
- Night-time (2000 to 0700 hours) 45 dB L_{Aeq} / 70 dB L_{Amax}

[2] *Edited by Berglund, B et al. Guidelines for community noise. World Health Organization 1999*

4.0 NOISE GENERATED BY THE ACTIVITY

While the application is for expansion of the quarry, we have included operation of the existing cleanfill site in our noise assessment as the activity will contribute to the overall noise emitted from the site.

4.1 Site operation

Quarrying will occur in five stages (with substages in between) and is expected to take more than 30 years to complete. The site layout and staging diagram are reproduced in figure 4.1 below. We note that there is a bund on the western edge of the existing quarry area and this bund will be removed prior to the Stage 2 quarrying activity commencing.

We understand that Screenworks intends to seek written approvals from the owners and occupiers of 137, 153 and 158 Bealey Road. If these approvals cannot be obtained, no quarrying is to take place within 100 metres of the above dwellings and the mobile crushing and screening plant will be located at least 300 metres from the notional boundary of each dwelling. The resulting exclusion areas are shown in orange in figure 4.1 below. With these measures in place, noise levels at the notional boundaries of all nearby existing noise sensitive receivers are expected to comply with the 55 dB L_{Aeq} noise limit.

The active working quarry across both the expansion area and the main site will take up an area of no more than 8 hectares at one time. Each stage will be quarried in 1 – 2 hectare sections (substages). Before a new substage is quarried, topsoil and overburden will be removed from a 1 to 2 hectare area which is to be quarried over the next twelve months.

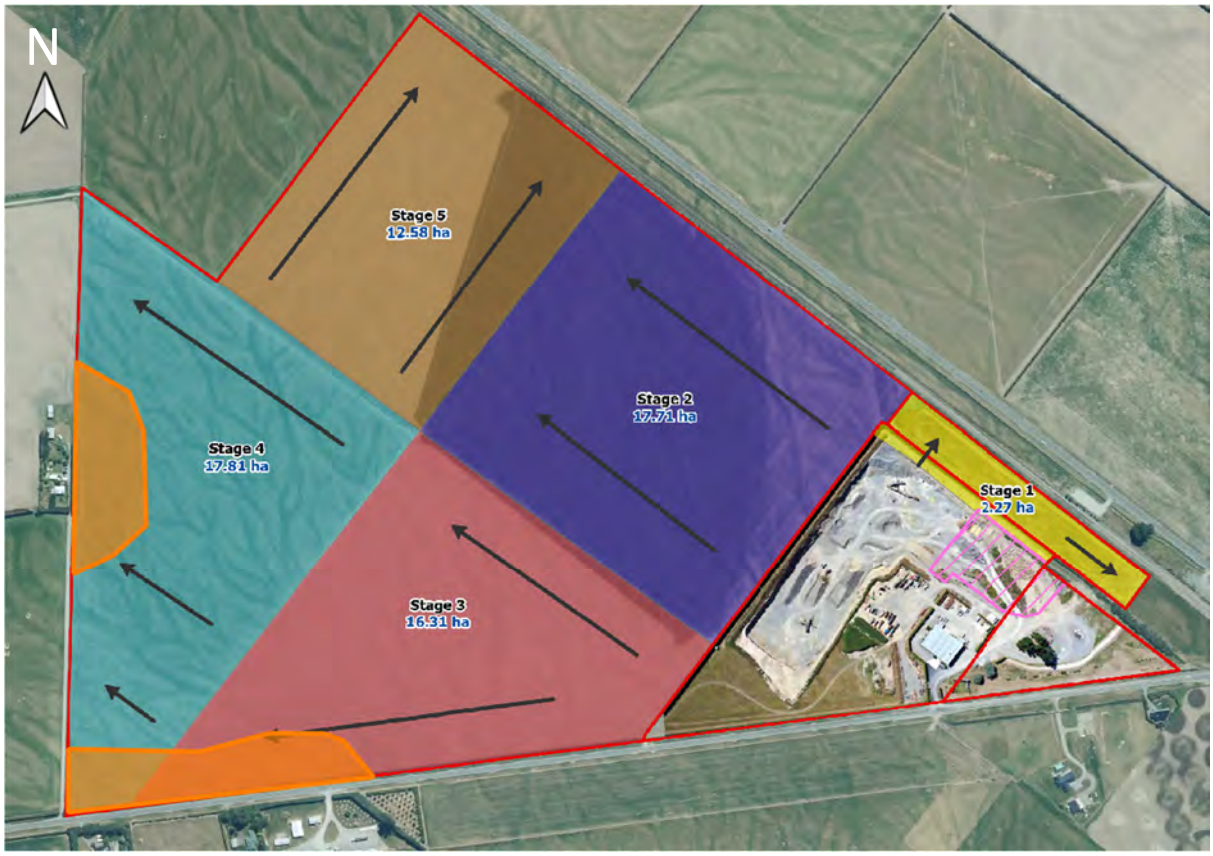

Figure 4.1 — Quarry expansion stages

The extraction of aggregate resource will be a continuation of the processes that have taken place over the past decade within the existing quarry, and these are described below.

Material will be extracted from the pit at a depth of 10 metres with a 20 – 30 tonne digger and a 23 – 25 tonne front end loader. The process will occur in the direction shown in figure 4.1 above and shielding is provided by the pit wall from which gravel is extracted. The extracted material will be carted to the mobile processing plant with the front-end loader. During Stage 1 and the early stages of Stage 2, all processing is expected to occur within the existing quarry site on Lot 1 DP 354364. During extraction from the later stages of Stage 2 and Stages 3 to 5, processing may occur within the expansion area. When this occurs, the mobile processing plant (crushing and screening) will be located on the working pit floor and will be situated at least 250 metres from the boundary of the site. The crushed and screened material will then be placed into stockpiles adjacent to the crushing plant. Loading of aggregate onto outbound vehicles will occur on the pit floor, either beside the pit face or stockpile area.

Truck and trailer units will enter and exit the quarry pit via the existing access point on Bealey Road. Vehicles will enter and exit via a one-way circular road similar to works on the existing quarry site. The intensity of quarrying is not expected to change and therefore we understand there will be between 40 to 60 heavy vehicle movements in and out of the site each day. On peak days there may be up to 120 heavy vehicle movements per day.

Processing machinery, truck and trailer units associated with the quarry, and light vehicle movements will be limited to operating on site between 0700 and 1800 hours, Monday to Friday and 0700 to 1300 hours on Saturdays. We note this is an increase of half an hour in the morning period, however it is consistent with the daytime noise levels of the PODP. No work will occur on Sundays or public holidays.

An activity that will occur outside these hours is movements associated with the two Southern Screenworks owned transporters which may need to leave the site between 0600 and 0700 hours on weekday mornings in order to travel across town within legal requirements.

We expect noise from rehabilitation works to be significantly lower than that generated by extraction works, as these are limited to placing clean topsoil and subsoils from the site, or imported from elsewhere, into the base of the excavation, and we have therefore only assessed noise from extraction.

4.2 Noise sources on site

The following noise sources are likely to contribute most significantly to the noise emitted by the site operation. Listed below are the sound power levels and source heights above the pit floor of the noise generating equipment based on site measurements undertaken by AES, and previous measurements of similar equipment on other sites.

- Existing mobile crushing and screening plant. Based on site measurements undertaken by William Reeve of AES on the 26th of November 2020, we understand this equipment has a sound power of 119 dB L_{WA} and has been modelled at height of the 3 metres above the pit floor.

- Excavator on site working the quarry face (either an excavator or loader will excavate the pit face). We have assumed the excavator has a sound power of 115 dB L_{WA} and has been modelled at a height of 2.0 metres above the ground.

- Loaders – expected a maximum of three on site (with a sound power of 107 L_{WA} each) operating at any one time:

    - Two operating in the quarry pit – excavating the pit face, filling the feeder hopper, relocating material, truck load out.

    - One associated with the fill area.

All front loaders have been modelled at a height of 2.0 metres above the ground.

- Trucks – with a sound power of 111 dB L_{WA} travelling at 20 km / hr.

- Truck wash. Based on manufacturers data, the truck wash will have a sound power of less than 75 dB L_{WA}.

Based on the above noise sources, we have considered the noise likely to be associated with the quarry. SoundPlan computational noise modelling based on ISO 9613 *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation* has been used to calculate the propagation of noise from the site, taking into account screening from buildings and bunds, and sound power levels for each of the noise sources. This modelling assumes light downwind conditions which are favourable to sound propagation in all directions.

We have based our analysis on the following scenario to represent a typical worst-case period for noise from activity during each quarrying stage:

- While quarrying activity is expected to occur at 10 metres below existing ground level, there may be small variations and we have modelled all plant located on a pit floor 8 metres below existing ground level to represent a worst-case scenario.

- Mobile crushing and screening plant, a single excavator and one loader are operating at the same time.

- Peak vehicle movements based on the peak day of 120 movements evenly distributed over the day, with 4 movements in or out of the site in a 15 minute period.

- Truck wash operating continuously.

- The quarry modelled with all previously quarried areas as an open pit. This is expected to be conservative, as there may be screening from stockpiles and previously quarried sections that have been filled and rehabilitated.

- Noise associated with cleanfill works from existing quarry.

4.3 Noise from the quarrying pit

4.3.1 Expected noise levels at the notional boundary of existing dwellings

We have undertaken modelling to determine the noise levels received at all existing dwellings that are in close proximity to the quarrying site and have generated noise contours for the works for each stage of the quarry expansion (refer to Appendix A for the noise contours). The predicted noise level at the notional boundary of each existing dwelling is shown in table 4.1 below. We note that the calculated noise levels for stages 3, 4, and 5 of the quarry expansion have been calculated with a 100 metre exclusion buffer around the existing dwellings at 137, 153 and 158 Bealey Road (as shown in orange in figure 4.1).

Table 4.1 — Noise levels at existing dwellings during each stage of the quarry expansion

Address	Expected noise level dB L_{Aeq}				
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
23 Bealey Road	51	51	50	50	50
35 Bealey Road	54	53	51	51	51
1062 Railway Road	47	46	45	44	45
1056 Railway Road	43	43	41	41	41
1046 Railway Road	44	44	41	41	42
137 Bealey Road	41	44	55	51	46
153 Bealey Road	39	42	51	50	44
158 Bealey Road	38	44	52	55	53
954 Aylesbury Road	41	40	39	38	39
10 Station Road	45	45	44	43	44
62 Station Road	43	43	42	41	42

Noise from all quarrying activities is expected to comply with the 55 dB $L_{Aeq\ (15\ min)}$ noise limit at the notional boundary of all existing dwellings.

4.4 Vehicles on the road

Noise from vehicles on the roading network are exempt from noise limits under the PODP although they are relevant to the overall noise effects from the activity. However, as the number of heavy vehicle movements associated with the expansion of the quarry is not expected to change from the current scenario there will be no additional adverse effects from noise from heavy vehicles driving on Bealey Road or any other road in the wider area.

4.5 Early morning transporter movements

Southern Screenworks owns two transporters which may depart the site during the early morning between 0600 and 0700 hours (within the SDP night time period) in order to travel across town within legal requirements. During this period, sleep disturbance is the primary concern. We understand that these transporters will be loaded the previous day, and noise associated with loading / unloading does not need to be considered during this period. We expect that noise levels associated with a single transporter movement in a 15 minute period will remain below 45 dB L_{Aeq} at the worst affected dwelling (23 Bealey Road). Since this is below the recommended level to protect occupants against sleep disturbance when sleeping with windows open, we consider the noise effects will be minimal.

4.6 Quarrying within the 100 metre exclusion buffer

Where written approval from the occupants of a dwelling is received, quarrying may occur within the 100 metre exclusion buffer. In these cases, noise levels received are expected to exceed the 55 dB L_{Aeq} limit, however, as this activity will only occur with written approval, we expect the noise effects of these exceedances will be acceptable.

5.0 CONSTRUCTION NOISE

Noise generated by construction activities associated with the site preparation for the extended quarry area has the potential to adversely affect nearby sensitive receivers. These short duration works associated with site establishment, creation of access roads, topsoil stripping and the construction, rehabilitation and removal of earthen bunds is typically assessed under construction noise standards.

Alternative limits for construction noise are outlined in Rule NOISE-REQ2 of the PODP as follows:

1. Any activity that generates construction noise and any temporary military training activity where there is a mobile noise source shall meet the construction noise limits in NOISE-TABLE6 - Construction Noise Limits.

Table 5.1 – Noise limits given in in NOISE-TABLE6 (excerpt from NZS 6803:1999)

Time of week	Time period (hours)	Duration of work					
		Typical duration (dB)		Short-term duration (dB)		Long-term duration (dB)	
		L_{Aeq}	L_{max}	L_{Aeq}	L_{max}	L_{Aeq}	L_{max}
Weekdays	0630 – 0730	60	75	65	75	55	75
	0730 – 1800	75	90	80	95	70	85
	1800 – 2000	70	85	75	90	65	80
	2000 – 0630	45	75	45	75	45	75
Saturdays	0730 – 1800	75	90	80	95	70	85
	1800 – 0730	45	75	45	75	45	75
Sundays and public holidays	0730 – 1800	55	85	55	85	55	85
	1800 – 2000	45	75	45	75	45	75

These limits are the same as those given in NZS 6803:1999 *Acoustics – Construction Noise* and provide more lenient limits than the zone limits, recognising that the shorter duration of construction activities will produce less annoyance. These noise limits apply at the façade of any noise sensitive activity.

For the purposes of this consent "construction activities" include the construction, rehabilitation and removal of bunds and topsoil stripping. These works are expected to be completed within a four week window and therefore must comply with the "typical duration" noise limits from table 5.1 above.

The nearest existing bund to any existing dwelling is located more than 100 metres from the dwelling at 23 Bealey Road. Based on an excavator with a sound power of 115 dB L_{WA}, the sound level at a distance of 100 metres is expected to be in the order of 70 dB L_{Aeq}.

As there are no bunds planned to be removed or constructed at any distance closer than 100 metres from any existing dwelling, we expect that these activities will comfortably comply with the relevant noise limits given in table 5.1 above.

6.0 CONCLUSION

We have reviewed the noise emissions associated with the proposed expansion of the Southern Screenworks quarry site at 50 Bealey Road.

Based on a review of the Selwyn PODP noise limits, ambient noise levels in the area and other national / international guidance, we consider the following noise limits (measured and assessed in accordance with NZS 6801:2008 and NZS 6802:2008) will be appropriate to ensure noise levels are acceptable at the notional boundary of nearby dwellings:

- Daytime (0700 to 2000 hours) 55 dB L_{Aeq}
- Night-time (2000 to 0700 hours) 45 dB L_{Aeq} / 70 dB L_{Amax}

Noise levels associated with the peak activity to occur within the quarry expansion area are expected to comply with the 55 dB L_{Aeq} noise limit at all existing dwellings in the vicinity of the site and we expect the overall noise effects of quarrying activity to be acceptable.

We expect that noise levels associated with a single transporter movement before 7 am will remain below 45 dB L_{Aeq} at the worst affected dwelling (23 Bealey Road). Since this is below the recommended level to protect occupants against sleep disturbance when sleeping with windows open, we consider the noise effects will be minimal.

We expect that the "typical duration" works associated with site establishment, topsoil stripping and the construction, rehabilitation and removal of earthen bunds will comfortably comply with the relevant construction noise provisions in NZS 6803:1999.

7.0 APPENDIX A

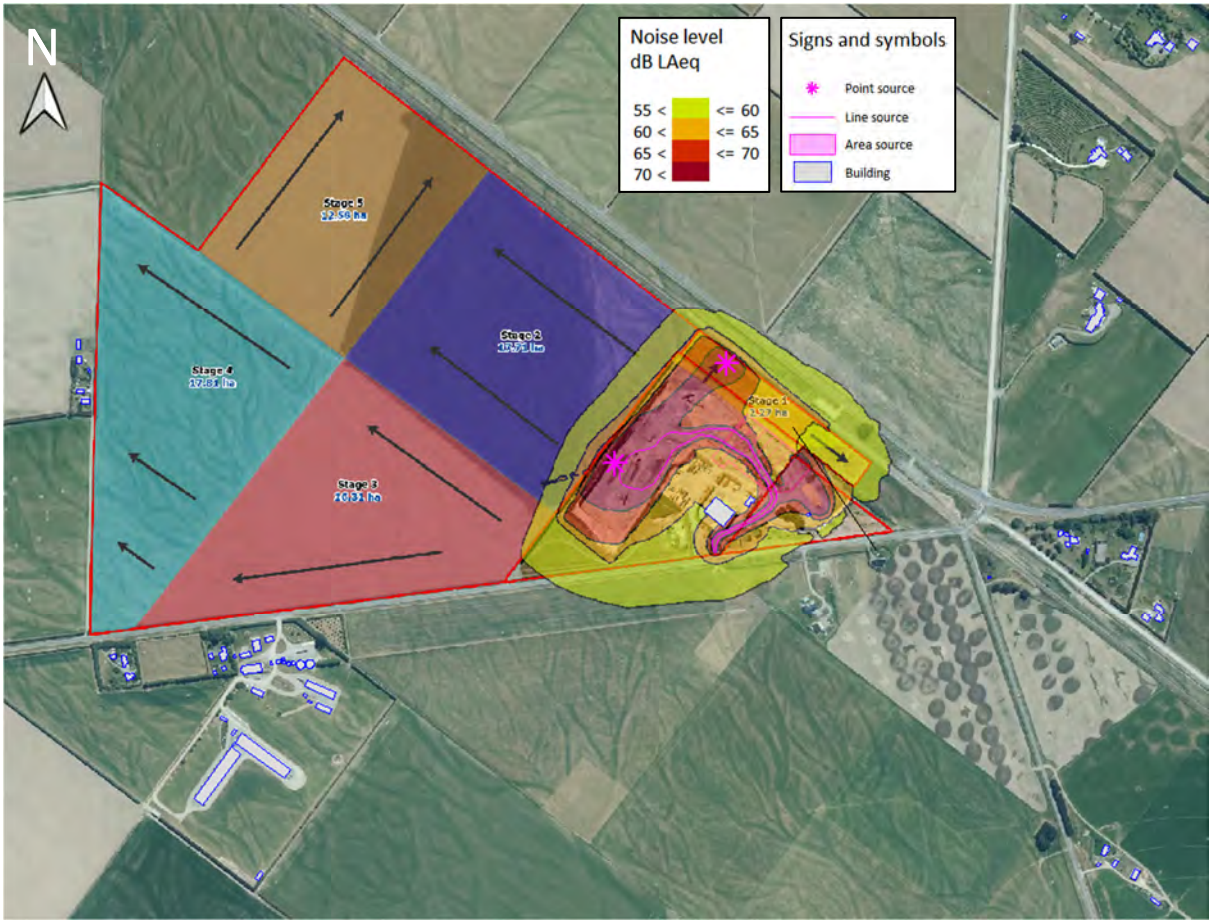

Figure 7.1 — Noise contour for stage 1 of the quarry expansion

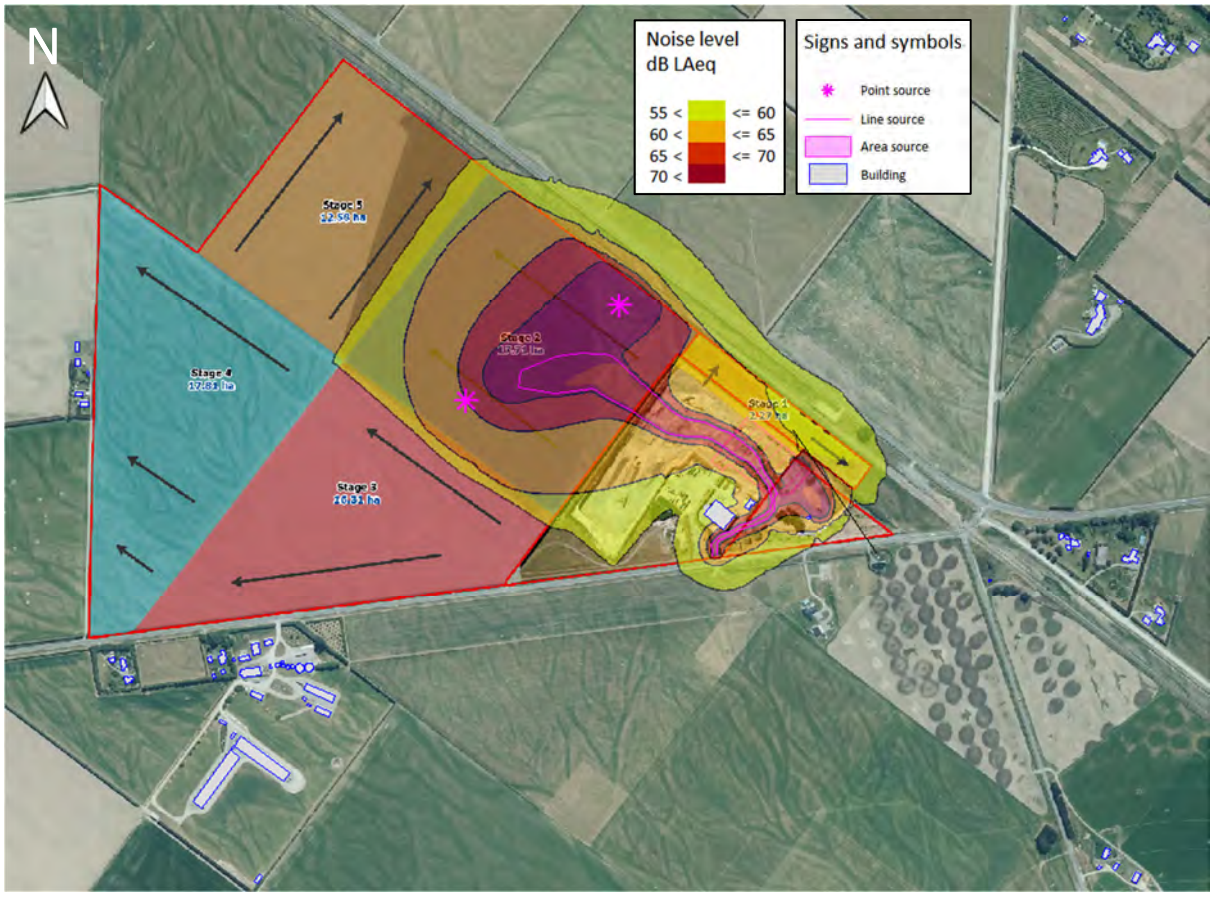

Figure 7.2 — Noise contour for stage 2 of the quarry expansion

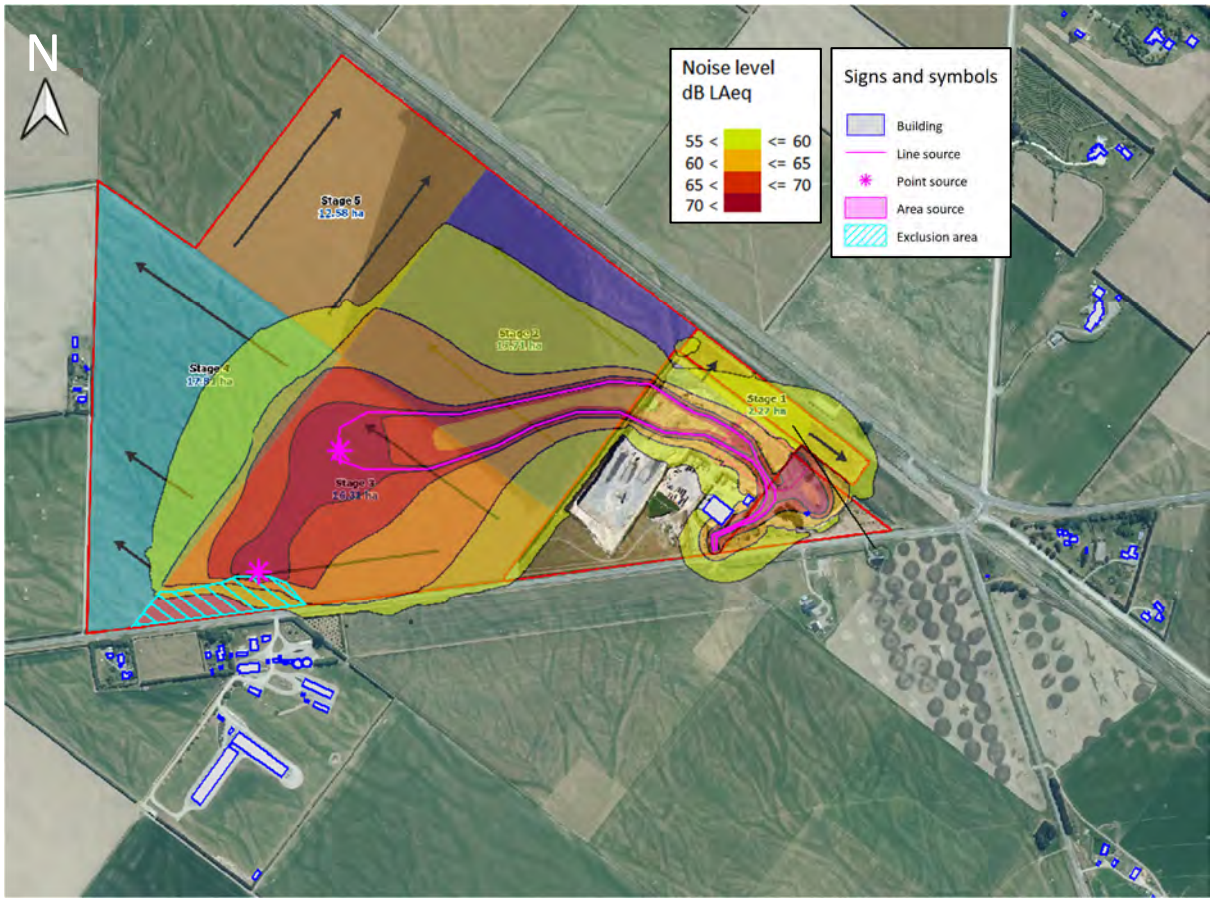

Figure 7.3 — Noise contour for stage 3 of the quarry expansion

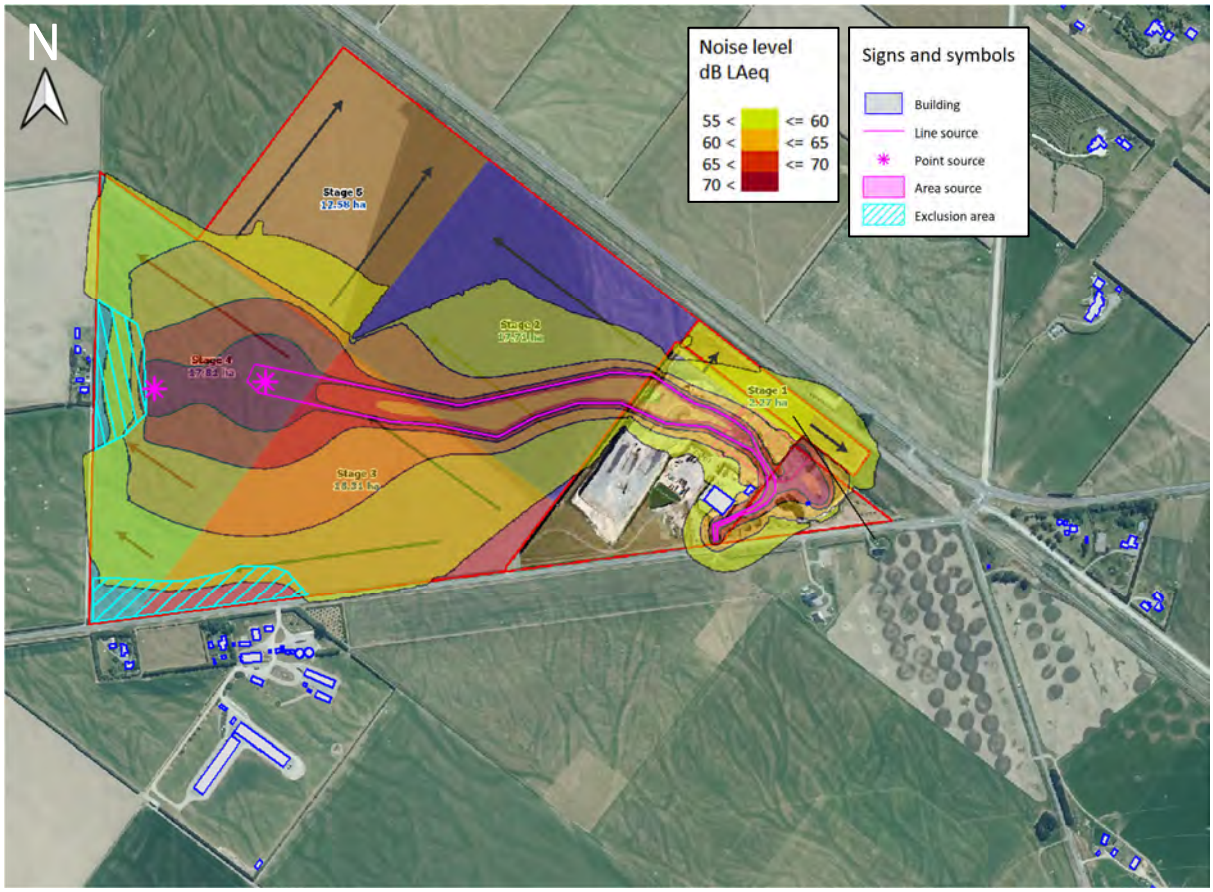

Figure 7.4 — Noise contour for stage 4 of the quarry expansion

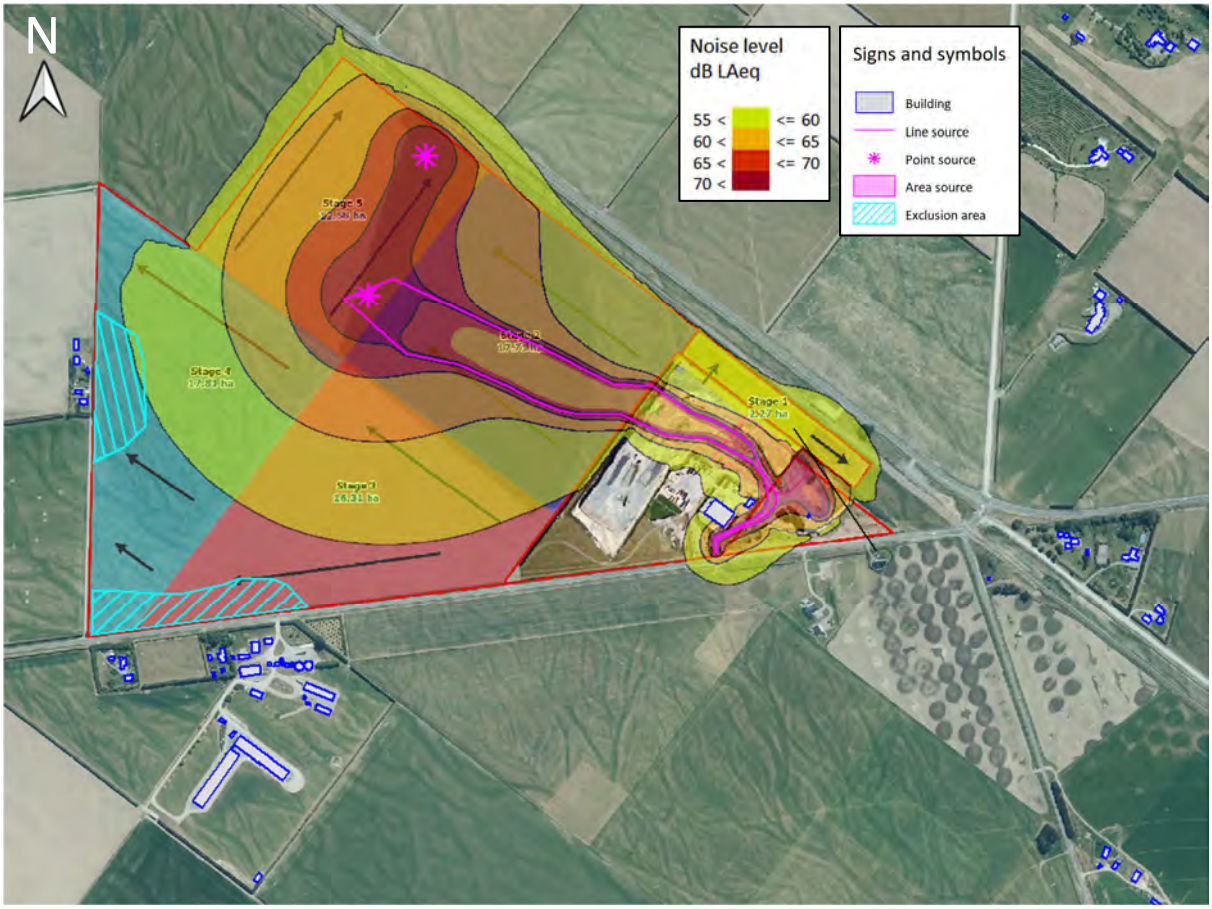

Figure 7.5 — Noise contour for stage 5 of the quarry expansion