LANG LANG SAND PIT

Acoustic Report for Work Authority No: WA 007541

For

AURORA CONSTRUCTION MATERIALS

DOC. REF: V299-01-P ACOUSTIC REPORT (R3)
20 JUNE 2022

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Project	Lang Lang Sand Pit
Subject	Acoustic Report for Work Authority No: WA 007541
Client	Aurora Construction Materials
Document Reference	V299-01-P Acoustic Report (r3).docx
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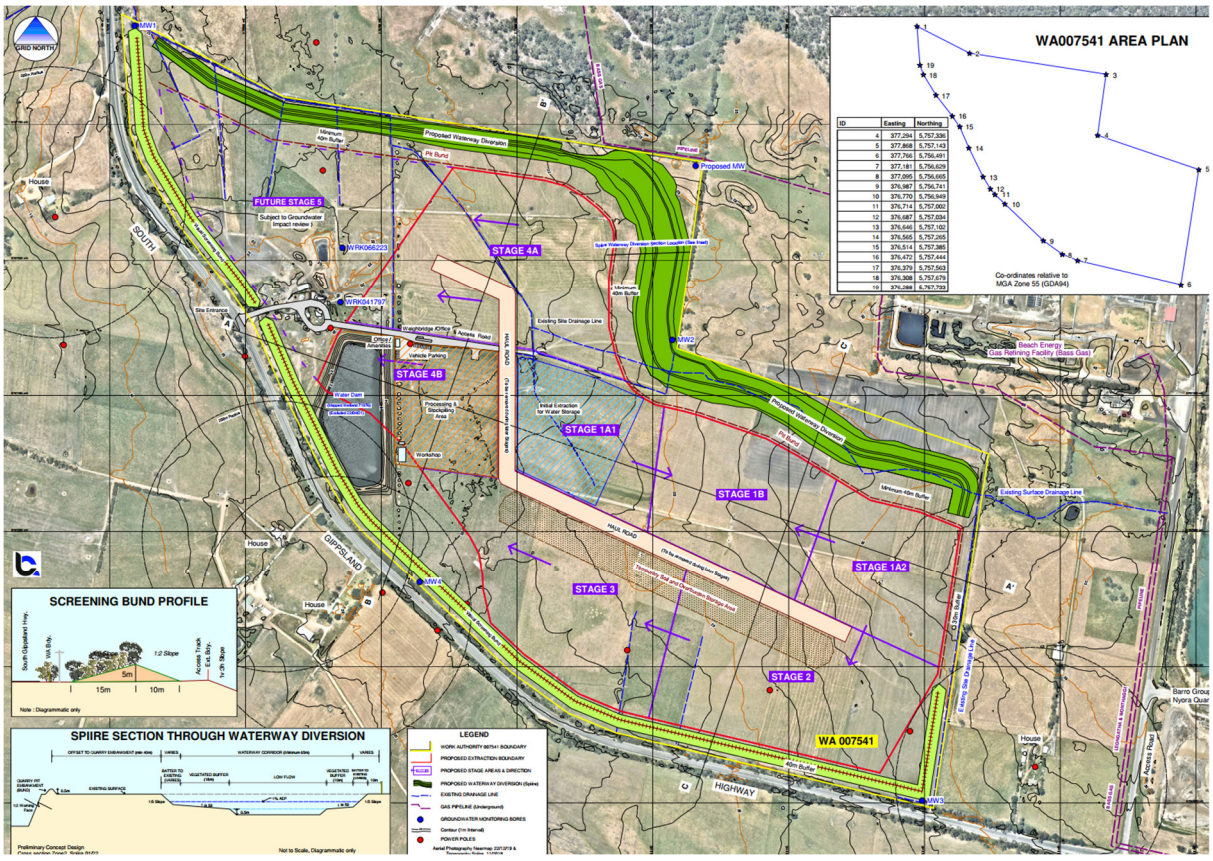
ENFIELD ACOUSTICS NOISE VIBRATION

1 Introduction & Scope

Enfield Acoustics has been engaged by Aurora Construction Materials (ACM) to assess potential noise impacts from the proposed sand quarry operation at 5575 South Gippsland highway, Lang Lang (Subject Land).

This report is written in support of Work Authority No: WA 007541, which proposes extraction, processing sale of sand resource on the Subject Land. Our instruction is that the operational hours proposed on the Subject Land will be 6am to 6pm Monday-Saturday for extraction, processing and sales.

Extraction is proposed over 5 stages across the Subject Land. The WA plan is shown below:



To this end, Enfield Acoustics has:

1. Visited the Subject Land to survey nearby noise sensitive uses;
2. Conducted attended background noise monitoring to establish noise limits in accordance with EPA guidelines and policies;
3. Visited another benchmark sand quarry to obtain empirical noise data;
4. Prepared 3D computational noise modelling to assess potential noise impacts from the Subject Land proposal; and
5. Recommended noise mitigation measures where required so that the Subject Land can comply with the relevant noise limits.

This assessment has been conducted in reference to Site Layout Plan (Plans) prepared by BCA Consulting, dated 17 March 2022.

2 Site Inspection

Enfield Acoustics visited the Subject Land between 6am to 7am on 23 September 2020 to survey nearby sensitive uses and to conduct attended background noise monitoring. We note that relatively high volumes of traffic were observed on the South Gippsland Highway.

Nearby sensitive uses were identified as follows:

1. Residential dwelling at 5755 South Gippsland Highway, located approximately 150m East of the Subject Land boundary;
2. Residential dwelling at 5620 South Gippsland Highway, located approximately 120m Southwest of the Subject Land boundary; and
3. Residential dwelling at 5520 South Gippsland Highway, located approximately 160m West of the Subject Land boundary.

Refer to the site map below for locations of nearby sensitive uses and monitoring survey locations.

The following background noise levels were measured:

Location	Background Noise Level, L_{A90}
Location A – 6am to 6.15am	50dB(A)
Location B – 6.15am to 6.30am	49dB(A)

3 Policy Requirements

Noise from any earth resource use must comply with the EP Regulations 2021 and *Publication 1826: Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (Noise Protocol).

Given that elevated background noise was observed at all identified sensitive uses (due to high volumes of traffic), the Subject Land and surrounding uses are considered to be within a 'background-relevant area' as defined by the Noise Protocol. We note that this is normal where industry proposes to operate between defined 'Night' and 'Day' periods (i.e. 6am-7am).

The Noise Protocol proposes the following noise limits for earth resource uses located within 'background-relevant areas':

- 'Day' period (7am to 6pm) – Background level + 8dB(A)
- 'Night' period (10pm to 7am) – Background level + 5dB(A)

Based on the lowest background noise level measured for the proposed operating hours, the following noise limit applies between 6am-7am:

Location	Noise Protocol Limit
All identified sensitive uses	54dB(A)

It is noted that the noise limit would be higher for the 'Day' period, however this is not deemed to be material for this assessment unless further operational controls are considered for different periods of the day (e.g. extraction only after 7am).

The Noise Protocol considers 30-minute average energy noise emissions, meaning that the relevant assessment metric being considered is $L_{Aeq\text{-}30min}$, dB(A).

4 Assessment

4.1 Noise Protocol Assessment

Key noise sources from the proposal include:

1. Excavator, dump trucks and front-end loader working in the extraction area;
2. Sales trucks with front end loaders working in stockpile areas; and
3. Processing facility.

Enfield Acoustics visited Sand Supplies, located at 1113 Bass Highway (processing and sales) and the Grantville Quarry (extraction), to obtain benchmark noise measurements on 30 March 2021. Our instruction is that the proposal is for equivalent plant operations and that no extraction is to be carried out on the Subject Land using rock breakers.

The following noise levels were recorded:

Description	Measured Noise Level, L_{Aeq}
Processing Facility at a distance of 85m Audible noise sources include: - Processing screens - Sand agitators - Pumps - Sand Washing	58dB(A)
Extraction Area at a distance of 150-200m Noise sources include: - Dump trucks - Excavator - Front end loaders	57dB(A)
Sales and Stockpile Area at a distance of 50m Noise sources include: - Front end loaders	64dB(A)

Processing Facility with Screen

Measurement of Extraction Activities

Measurement of Front-End Loader

Where our office was unable to isolate noise measurements for specific mobile plant (i.e. sales and dump trucks) during the site visit, we have consulted previous measurements captured at other quarry sites, noting that these sources are not unique to sand quarrying.

Sound Power Levels (SWL) were derived for use in our noise model, as follows:

Item	dB(A)	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Processing facility – SWL $L_{Aeq30\text{-}min}$	108	114	101	99	107	101	101	95
Extractive activities – SWL $L_{Aeq30\text{-}min}$	112	122	113	110	109	105	106	97
Front end loader – SWL $L_{Aeq30\text{-}min}$	109	117	118	112	106	102	98	95
Sales trucks – SWL $L_{max\ passby}$	108	112	112	105	104	104	100	93
Dump trucks – SWL $L_{max\ passby}$	113	117	117	110	109	109	105	98

Based on our observations of the benchmark site and instructions from the Applicant, we have assumed the following in our noise model:

- Up to two front end loaders operating within the processing and stockpiling area;
- Up to 15 sales trucks entering and exiting the Subject Land within a 30-minute period during peak periods

- Up to 10 dump truck movements within the designated 'Haul Road' within a 30-minute period
- Extraction generally begins at natural ground level, after topsoil and overburden is stripped

To assess the proposal, a 3D computational noise model has been generated using the software package CadnaA using the input data and assumptions presented in the sections above. All proposed extraction Stages indicated on the WA Plan have been modelled, representative of a worst-case operational condition where mobile plant in the extraction area is sited closest to sensitive receptors.

The model considers acoustic propagation factors including attenuation from screening, noting that the 5m high bunds indicated on the Plans have been included in the model. The model also assumes worst-case meteorological conditions, meaning that downwind noise propagation is assumed in all directions. The modelling has been carried out in accordance with ISO 9613.

The results of the model indicate that noise emissions from the proposal are expected to comply with the Noise Protocol limits for all proposed Stages of extraction, with the following worst-case noise levels modelled:

Location^	Stage	Modelled Noise Level, L_{Aeq}	'Night' Compliance (6am-7am)	'Day' Compliance (7am-6pm)
5755 South Gippsland Highway	Stage 1A1 & 1A2	51 dB(A)	YES	YES
5620 South Gippsland Highway	Stage 3 & 4B	51 dB(A)	YES	YES
5520 South Gippsland Highway	Stage 5	48 dB(A)	YES	YES
Notes:	^Measurement location taken at 10m from the boundary of the dwelling in accordance with the Noise Protocol. Non-habitable spaces (e.g. sheds or garages) are not considered.			

Noise modelling contours for all stages are presented in Appendix A.

Based on our assessment and review of the WA Plans, the proposal is expected to comply with the Noise Protocol over all operation hours proposed. We note that the outcome is assisted by the background noise environment observed during the morning shoulder period (due to proximity to a major highway). This results in higher noise limits than what would occur at quarries located in rural areas having lower background noise environments.

Further, our assessment is considered conservative as the model assumes extraction only occurring during initial Stages, where plant will be closer to natural ground level. As extraction progresses, pit formation will provide increased screening of noise.

On this basis, Enfield Acoustics is satisfied that the risk of adverse noise impacts from the Subject Land use is low and that the Work Authority can be approved.

4.2 Cumulative Impacts

Noise from all commercial and industrial uses are required to cumulatively comply with the Noise Protocol. Based on the context of the site, the worst impacted sensitive use with regards to cumulative impacts is likely to be at 5755 South Gippsland Highway.

The above sensitive use is adjacent to two other industrial uses, as follows:

- BassGas facility to the North
- Nyora Quarry to the East

During our site inspection between 6am to 6.30am, we confirm that no material noise emission was observed from either uses at either Location A or B, noting that the ambient background environment was dominated by traffic noise from the South Gippsland Highway.

To that end, no cumulative noise impacts are expected to occur as a result of the Subject Land use, in particular during the most sensitive hours relevant to the Application.

Regardless, assuming that both BassGas and Nyora Quarry noise emissions are at their permitted limits (being 54dB during the 'Night' and >57dB during the 'Day'), the risk of any cumulative impacts are considered minor, given that:

1. Cumulative impacts are in the order of 2dB(A) when the quarry is operating under the worst-case scenario (Stage 1A2) during the 'Night' period.
2. Cumulative impacts are in the order of 1dB(A) when the quarry is operating under the worst-case scenario (Stage 1A2) during the 'Day' period. However, it is noted that noise limits during the 'Day' hours are expected to be at least 3dB higher than the 'Night' period limits between 6am to 7am, and would likely offset any risk of non-compliance resulting from potential cumulative impacts.
3. Any risk of cumulative impacts is further mitigated as the project progresses down the pit level or as plant and equipment moves away from the boundary.

Further, our attended measurement at Location B indicated that the background level was 49dB(A) L_{90}, which further affirms that any continuous noise emission from both industries is unlikely to be operating at their permissible limits.

Overall, Enfield Acoustics is satisfied that the risk of non-compliance resulting from cumulative noise impacts is considered low.

4.3 General Environmental Duty

Under the Environment Protection Act 2017, any industry is required to fulfill their General Environmental Duty (GED), as follows:

(1) A person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

In effect, the GED requires that environmental impacts are minimised by reasonable and practicable means, however the GED does not set out prescriptive or objective targets.

Further guidance of the GED is provided in EPA Publication 1741, extract as follows:

Working under the general environmental duty

Generally speaking, most businesses would not have to do anything differently. Most businesses already follow good management practices and would find that these aid compliance with the GED. This can be through following responsibilities under OHS laws, meeting industry standards, adopting industry better management practices, and following other relevant legislation related to the environment. In effect, the GED just makes it clear that it is your responsibility to manage your business to reduce risk to the environment.

For businesses that may not be clear on what they should be doing to protect the environment, the GED also helps. By focusing on how you operate, the GED provides a clear framework that EPA and you can follow to understand risks and take steps to address them.

It is difficult to determine what is reasonable and practicable in the context where noise emissions:

- Are expected to reasonably comply with the Noise Protocol
- Measures to mitigate noise have been demonstrated
- The risk of adverse impacts is considered low (by virtue of complying with the objective targets of the Noise Protocol)

The assessment of practicability also requires input by others as it includes assessment of other engineering requirements, costing etc, that extends beyond the scope of an acoustic consultant.

However, guidance on the process of determining what is reasonable and practicable is provided within EPA Publication 1856, as follows:

To show you have thought about what is reasonably practicable, consider these **six factors**:

1. **Eliminate first:** Can you eliminate the risk?
2. **Likelihood:** What's the chance that harm will occur?
3. **Degree (consequence):** How severe could the harm be on human health or the environment?
4. **Your knowledge about the risks:** What do you know, or what can you find out, about the risks your activities pose?
5. **Availability and suitability:** What technology, processes or equipment are available to control the risk? What controls are suitable for use in your circumstances?
6. **Cost:** How much does the control cost to put in place compared to how effective it would be in reducing the risk?

Based on the guidance above, our comments as follows:

Eliminate First

Extractive industries rely on a multitude of plant and equipment to operate and noise emissions cannot be eliminated entirely.

Likelihood

Extractive industries that carry the highest likelihood of noise impacts usually occur when rock breaking or blasting occurs, which is not proposed for the site.

Degree (consequence)

The degree of harm is usually correlated to the existing ambient background environment, which is considered high given the context of the site. To this end, our view is that the degree of harm is considered tempered for sensitive uses nearby the Subject Land and the area is not considered particularly sensitive to noise.

Knowledge about the Risks

Benchmark noise measurements and site observations of a comparable operation have been conducted as part of our assessment. This informs the impacts of the proposed quarry and is considered more reliable than non-benchmarked noise data. This assists in eliminating some risk from inconsistent assumptions used in the noise model.

Availability and Suitability

Generally, new quarries are likely to rely on newer and more current technologies as a general approach to improve the efficiency of the operation. This inherently compliments efforts in reducing noise impacts as newer equipment tend to have lower noise emissions compared to older equipment with older technologies.

Regardless, in complying with the GED, we recommend that the Applicant considers the following:

- Where extraction occurs close to sensitive use boundaries, efforts should be made to limit noisy activities during the 'Night' period (e.g. between 6am to 7am)
- Install broadband reversing alarms on vehicles and machinery in preference to 'beeper' reversing alarms
- Turning off plant and equipment when not in use
- Maintain plant and equipment to ensure that noise emissions do not increase over time

Cost

Extensive earth bunding has already been proposed. Given that compliance with the Noise Protocol is expected with the proposed bunding, we do not consider increasing the extents or heights of the earth bunds to provide improvements proportional to the cost impacts of additional mitigation.

Earth bunding serves to protect sensitive uses primarily during initial extraction. As extraction progresses down to pit level, there are diminishing returns from the bunding in terms of noise mitigation, therefore the effectiveness of increased bunding to further mitigate noise is unlikely to be material over the life of the project.

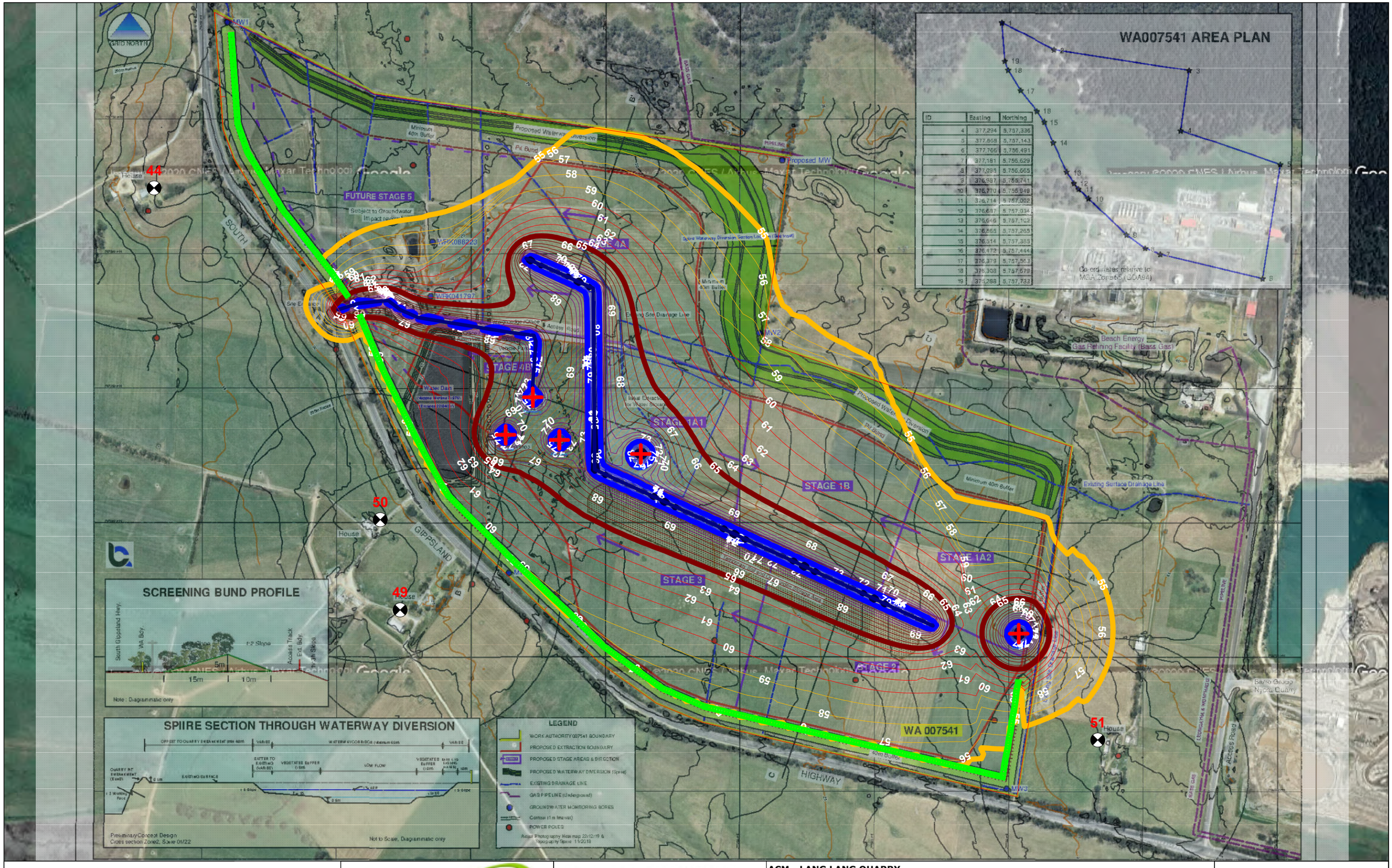
Overall, compliance with the GED would be an on-going requirement for the Applicant to implement during operation, however our view is that no further demonstration is required at this stage with respect to noise impacts.

5 Conclusion and Recommendations

Enfield Acoustics is satisfied that the proposed use of the Subject Land as a sand quarry will not result in adverse noise impacts and the Work Authority can be approved under the following conditions:

1. Earth bunds are to be constructed as shown on the WA Plans.
2. The hours of operation are between 6am-6pm Monday to Saturday

Appendix A: Noise Modelling Contours



Legend:

- Point Source
- Line Source
- Embankment
- Ground Absorption
- Contour Line
- Receiver
- Calculation Area

Noise Level - dB(A)

- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ...

Scale: 1: 6608 @ A3

ACM 'Redefining Green'

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ACM - LANG LANG QUARRY

Noise emission levels for LANG LANG QUARRY

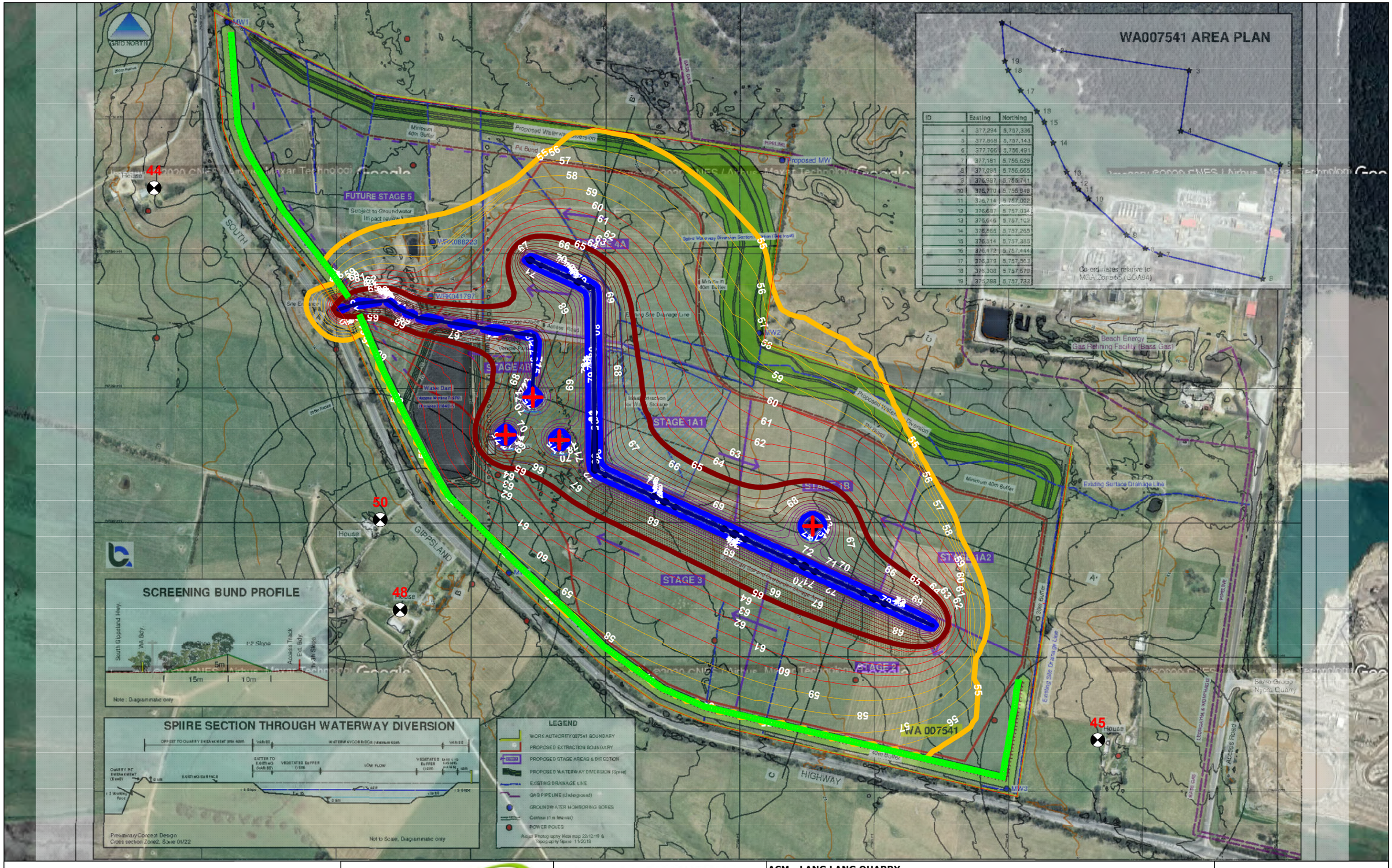
LAeq, 30-min noise levels, Noise Protocol Assessment - Day/Night

STAGE 1A1 & 1A2

Project No: V299-01 Drawing No: MAP-01 Date: 22.03.2022

NOTES:

*Propagation in accordance with ISO9613
*Model includes land topography (10-20m contours)
*Refer to report for SWL



Legend:

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- Contour Line
- Receiver
- Calculation Area

Noise Level - dB(A)

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- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ...

Scale: 1: 6608 @ A3

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ACM - LANG LANG QUARRY

Noise emission levels for LANG LANG QUARRY

LAeq, 30-min noise levels, Noise Protocol Assessment - Day/Night

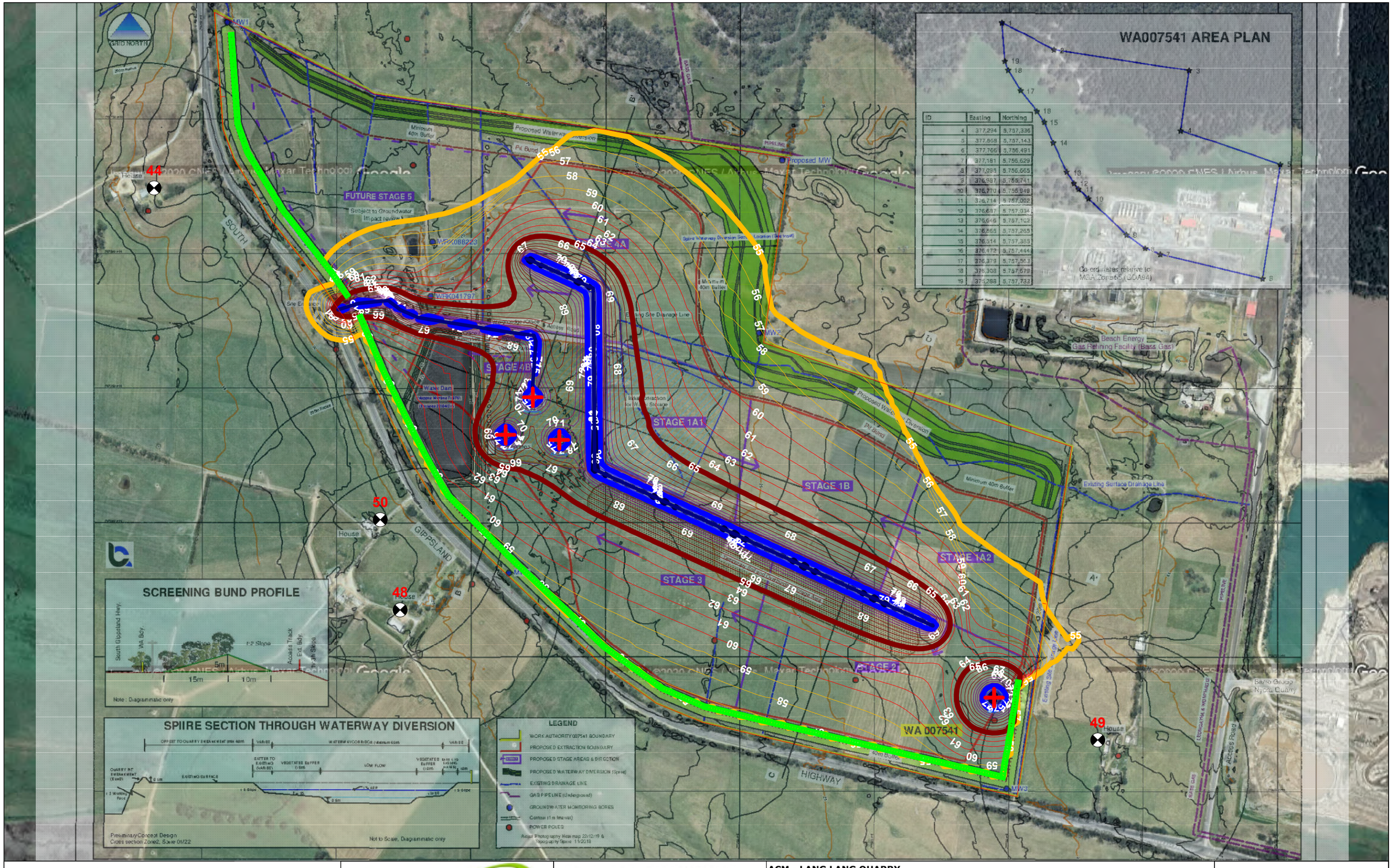
STAGE 1B

Project No: V299-01 Drawing No: MAP-02 Date: 22.03.2022

NOTES:

*Propagation in accordance with ISO9613
*Model includes land topography (10-20m contours)
*Refer to report for SWL

ADVERTISED PLAN



Legend:

- Point Source
- Line Source
- Embankment
- Ground Absorption
- Contour Line
- Receiver
- Calculation Area

Noise Level - dB(A)

- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ...

Scale: 1: 6608 @ A3

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ACM - LANG LANG QUARRY

Noise emission levels for LANG LANG QUARRY

LAeq, 30-min noise levels, Noise Protocol Assessment - Day/Night

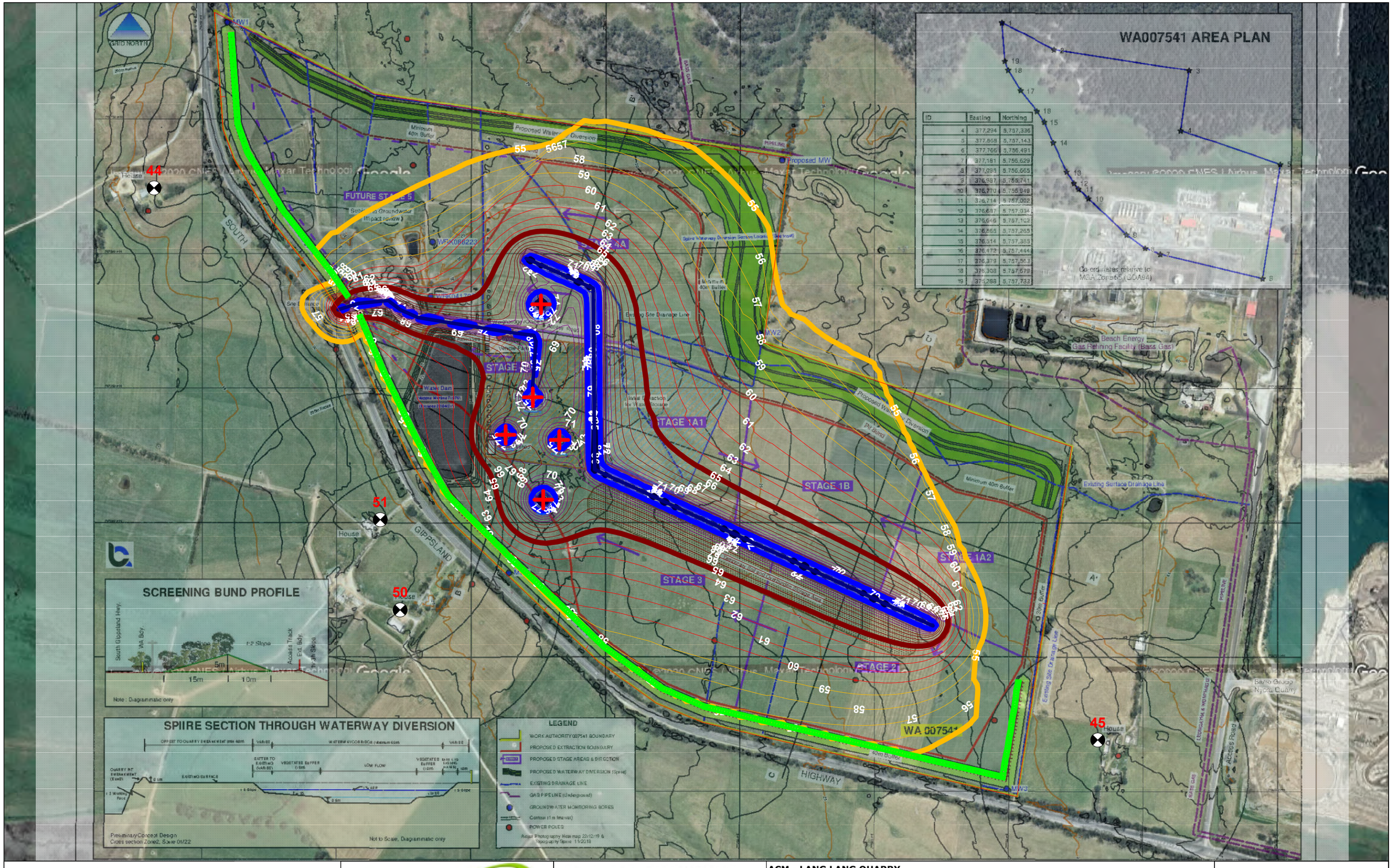
STAGE 2

Project No: V299-01 Drawing No: MAP-03 Date: 22.03.2022

NOTES:

*Propagation in accordance with ISO9613
*Model includes land topography (10-20m contours)
*Refer to report for SWL

ADVERTISED PLAN



Legend:

- Point Source
- Line Source
- Embankment
- Ground Absorption
- Contour Line
- Receiver
- Calculation Area

Noise Level - dB(A)

- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ...

Scale: 1: 6608 @ A3

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ACM - LANG LANG QUARRY

Noise emission levels for LANG LANG QUARRY

LAeq, 30-min noise levels, Noise Protocol Assessment - Day/Night

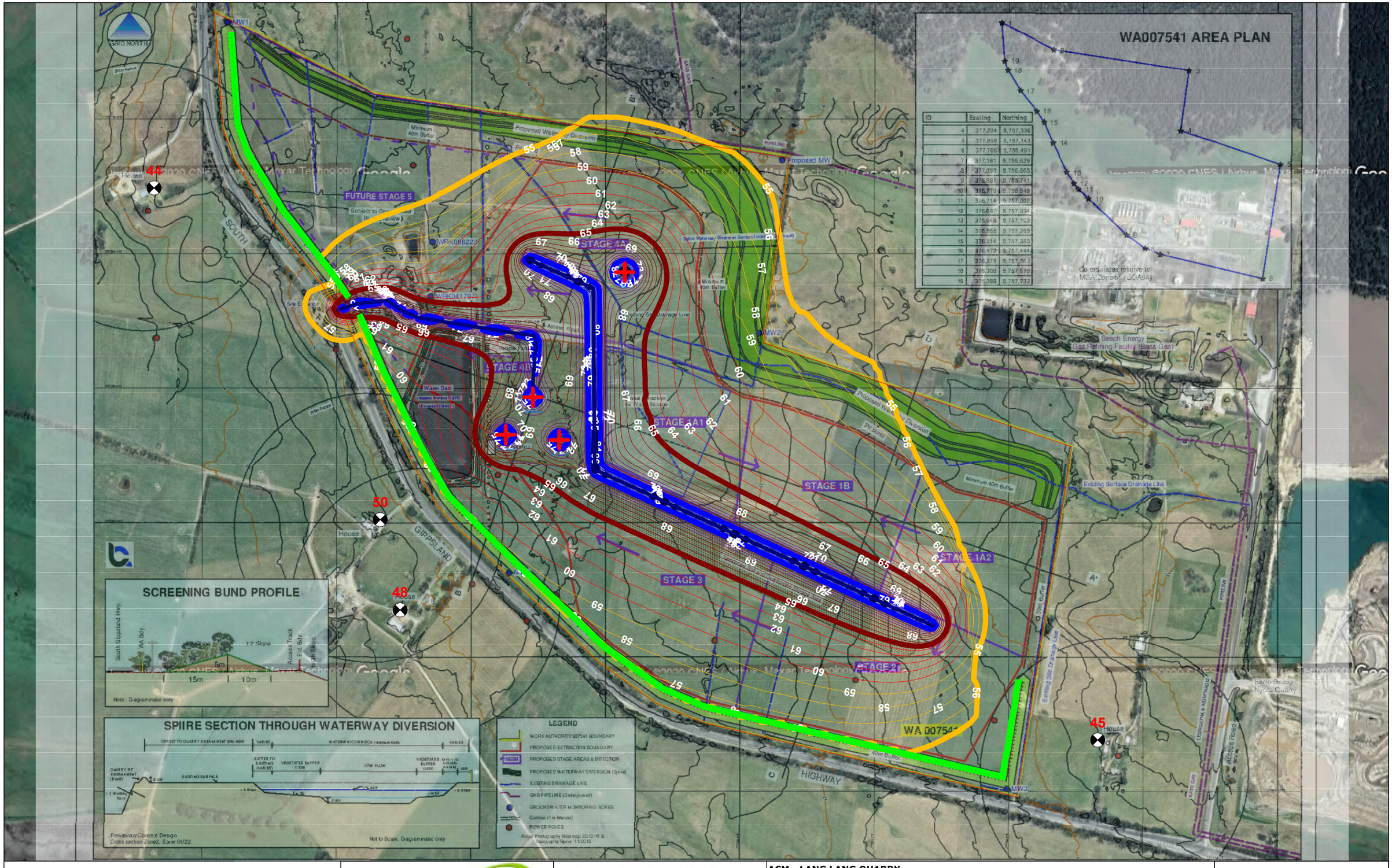
STAGE 3

Project No: V299-01 Drawing No: MAP-04 Date: 22.03.2022

NOTES:

*Propagation in accordance with ISO9613
*Model includes land topography (10-20m contours)
*Refer to report for SWL

ADVERTISED PLAN



Legend:

- Point Source
- Line Source
- Embankment
- Ground Absorption
- Contour Line
- Receiver
- Calculation Area

Noise Level - dB(A)

- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
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Scale: 1: 6608 @ A3

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ACM - LANG LANG QUARRY

Noise emission levels for LANG LANG QUARRY

LAeq, 30-min noise levels, Noise Protocol Assessment - Day/Night

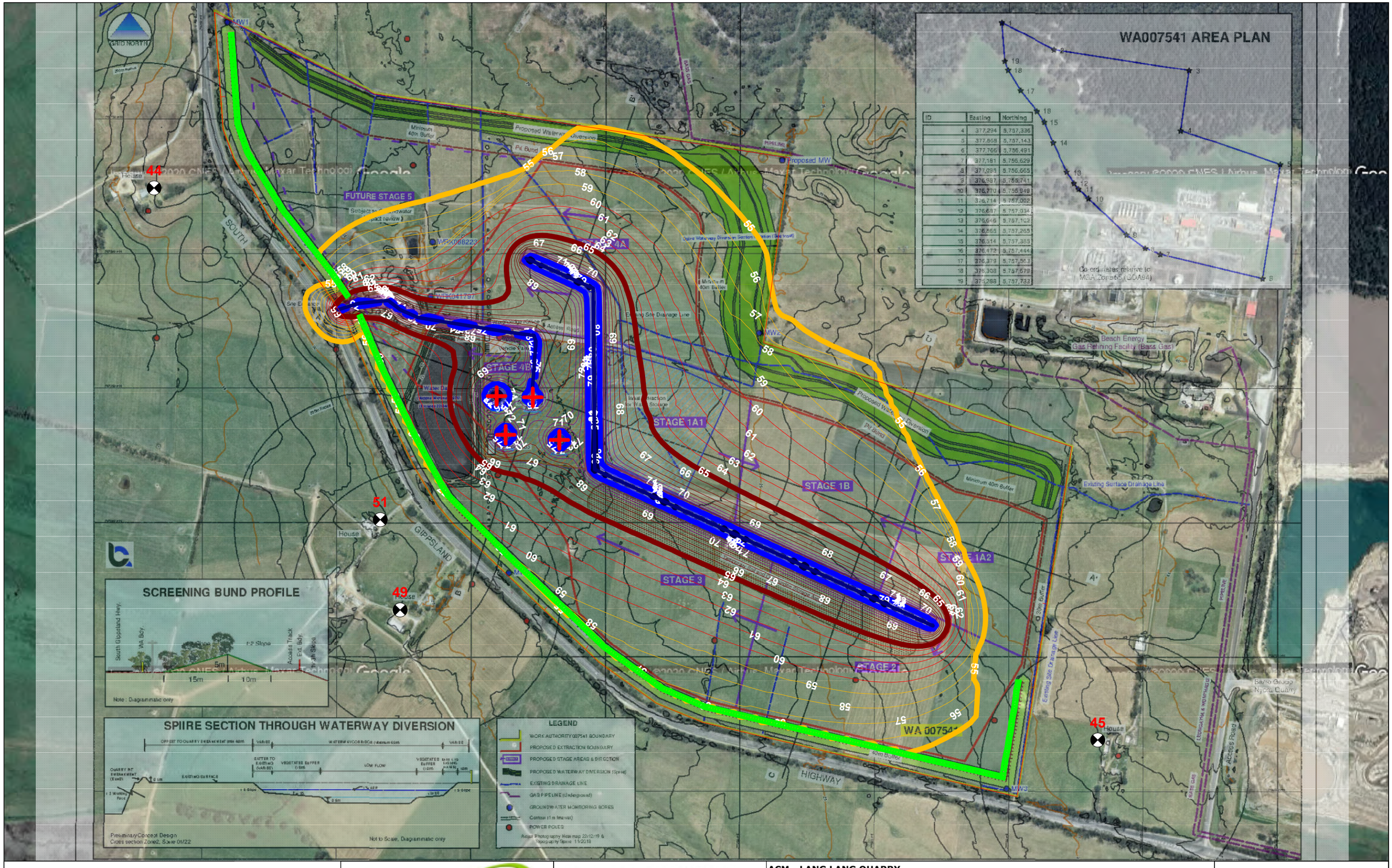
STAGE 4A

Project No: V299-01 Drawing No: MAP-05 Date: 22.03.2022

NOTES:

*Propagation in accordance with ISO9613
*Model includes land topography (10-20m contours)
*Refer to report for SWL

ADVERTISED PLAN



Legend:

- Point Source
- Line Source
- Embankment
- Ground Absorption
- Contour Line
- Receiver
- Calculation Area

Noise Level - dB(A)

- 55.0 <= ... < 60.0
- 60.0 <= ... < 65.0
- 65.0 <= ... < 70.0
- 70.0 <= ... < 75.0
- 75.0 <= ... < 80.0
- 80.0 <= ... < 85.0
- 85.0 <= ...

Scale: 1: 6608 @ A3

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ACM - LANG LANG QUARRY

Noise emission levels for LANG LANG QUARRY

LAeq, 30-min noise levels, Noise Protocol Assessment - Day/Night

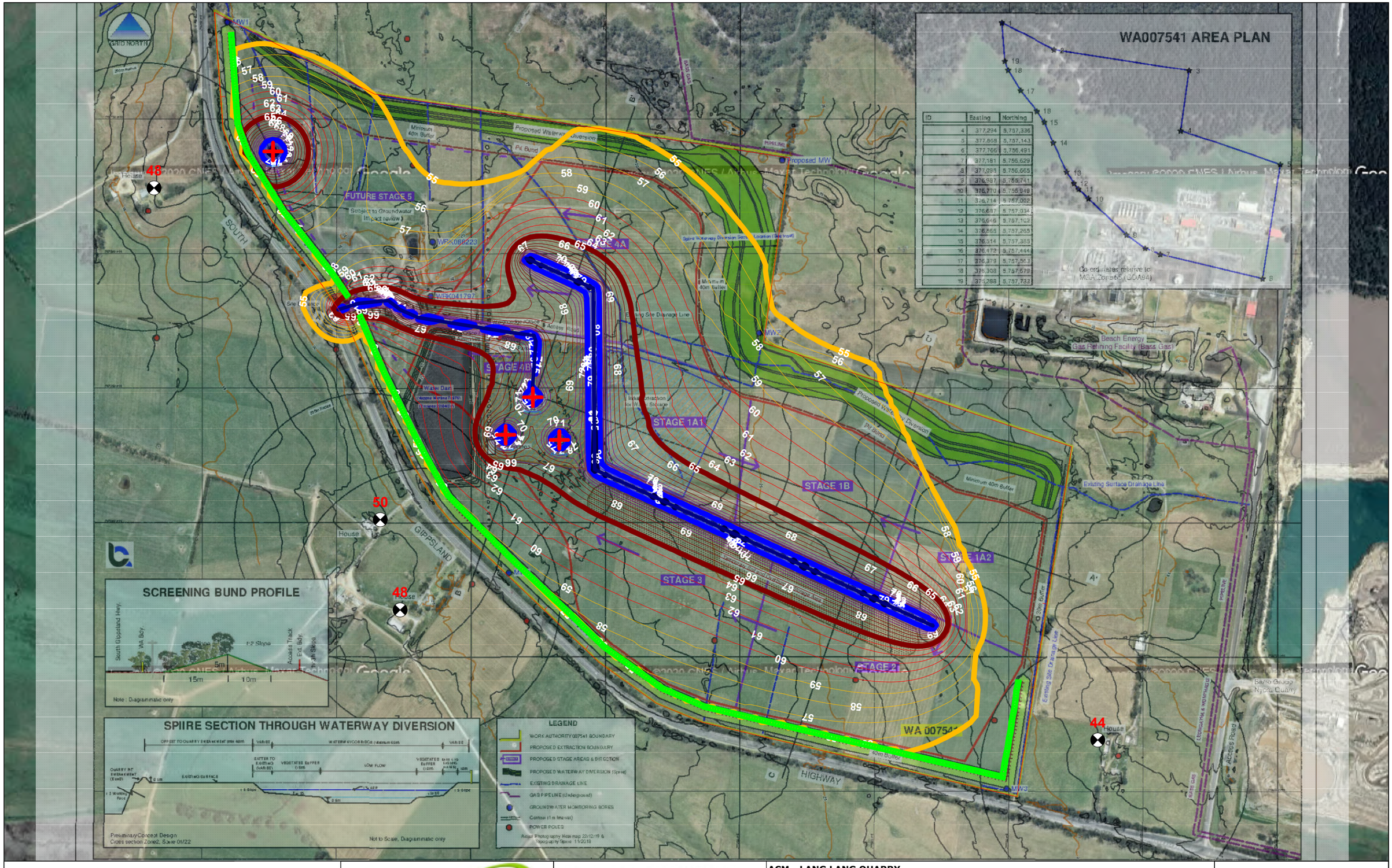
STAGE 4B

Project No: V299-01 Drawing No: MAP-06 Date: 22.03.2022

NOTES:

*Propagation in accordance with ISO9613
*Model includes land topography (10-20m contours)
*Refer to report for SWL

ADVERTISED PLAN



ID	Easting	Northing
4	377,294	5,757,336
5	377,668	5,757,143
6	377,766	5,756,491
7	377,181	5,756,629
8	377,095	5,756,665
9	376,987	5,756,741
10	376,770	5,756,849
11	376,714	5,757,002
12	376,687	5,757,034
13	376,646	5,757,103
14	376,665	5,757,265
15	376,514	5,757,360
16	376,472	5,757,444
17	376,373	5,757,563
18	376,308	5,757,679
19	376,288	5,757,733