Noise Impact Assessment to BS4142 for the proposed alterations at the Station Hotel, Hatton, Aberdeenshire.

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1. Introduction

This noise impact assessment (NIA) is designed to follow the previous report for this application produced by E2 Consultants in October 2021. Some of their data will be re-used but the approach is slightly different. Instead of site measurements a SoundPLAN model has been created to predict the sound levels at the neighbouring house. This allows account to be taken of the land levels, the varying distance of the sound source from the receptors, the masking effect of the nearby buildings and the impact of the proposed barrier between the source and receptors. The inputs will be described below, and this assessment will follow the format suggested for reporting results, in section 12 of BS4142 - Methods for rating and assessing industrial and commercial sound.

2. Information to be reported

a. Statement of qualifications, competency, professional memberships and experience

The author is a chartered engineer who has been involved in environmental noise consultancy for around 30 years, assessing a wide range of sources of noise. The work done has mostly been in Aberdeenshire, but the Environmental Health Officers in Highland, Moray and Angus have also accepted the reports produced.

As a full member of the Institute of Acoustics (IOA) he attended 6 meetings regarding the development, production and use of BS4142 (2014) and recently have had further updates via the main IOA publications and in online meetings.

b. Source being assessed as follows:

1) description of the main sound sources and of the specific sound

The source of sound is that of a single forklift truck (FLT) as it unloads pallets of items, for use in the neighbouring factory, from the delivery lorry. The lorry will be parked beside the South side of the Station Hotel. Currently the lorry is parked on the public roadside, and the materials are stored on the verges. The development plans to make the area tidier, but will bring FLT movements closer the neighbouring residence.

A FLT from the factory will also be used to pick up pallets of materials from the storage pad when needed. This is said to be very infrequent as the plan is for long term storage, with access being for only about 2 hrs per week. Whilst it is conceivable that the use could change with more frequent FLT access, the size of the pad limits the amount of storage, so also the number of visits that could be required. In addition, depending on the nature of the

commodities stored, they themselves, may constitute a barrier to the sound of the FLT. However, this benefit is ignored.

It is assumed that the sound level of any reversing alarm is included in the FLT sound power used, see para l, 1a below. A previous measurement by the author, of an electric forklift with reversing bleeper, gave a result of 78 @ 1m, so a sound power level of 86 dB(A), which is less than the power value used in the SoundPLAN model. Disturbance from the sound character will be discussed below.

2) hours of operation

This storage facility will only be accessed during normal working hours.

3) mode of operation (e.g. continuous, twice a day, only in hot weather) statement of operational rates of the main sound sources (e.g. maximum load setting, 50% max rate, low load setting) and description of premises in which the main sound sources are situated (if applicable).

Occasional unloading of a lorry. Infrequent collection of items for use in the factory.

c. Subjective impressions, including:

1) dominance or audibility of the specific sound

During operation of the fork lift truck the sound of the engine, and the reversing warning, may well be audible, with the local traffic noise, but the duration of use is planned to be short.

2) main sources contributing to the residual sound.

The traffic noise is the main contributor to the residual sound at this location.

d. The existing context including an assessment of the sensitivity of the receptor, e.g. school, dwelling, office.

The nearest sensitive receptor is a residence, so it is of high sensitivity.

e. Measurement locations, their distance from the specific sound source, the topography of the intervening ground and any reflecting surface other than the ground, including a photograph, or a dimensioned sketch with a north marker. A justification for the choice of measurement locations should also be included.

See previous NIA and Figure 1.

f. Sound measuring systems, including calibrator or piston phone used:

See previous NIA.

g. operational test:

1) reference level of calibrator

2) meter reading(s) before and after measurements with calibrator

See previous NIA.

h. Weather conditions

See previous NIA.

i. Date(s) and time(s) of measurements.

See previous NIA.

j. Measurement time intervals.

15 minutes

k. Reference time intervals.

1 hour, as daytime.

l. Specific sound level:

1) measured sound level(s)

From the previous NIA: For the 17 minutes that the FLT sound was measured the sound level was reported to be 53 dB(A)[1]. During this period the FLT was driven in and out of the area that will be used for storage. The distance from the FLT to the sound level meter was stated as a minimum of 2 m. If it were consistently 2 m then the sound power level of the FLT would be 64 dB(A), which is unusually low. The vehicle was clearly more distant from the SLM for some of the measurement period, which is understandable. However, the reported result is on the limit of that which can be used in the equation that subtracts the background level from the ambient level, so it may not be accurate – the background level could have increased when the FLT was being measured, which would make an accurate result from this equation impossible. It is therefore possible that even as an activity level the measurement may be unreliable.

To avoid these difficulties, it was decided that a SoundPLAN model would be the best way to predict the sound emissions, and the spread of sound to the nearby residence.

1.a) Description of the SoundPLAN model

SoundPLAN gives the average sound power level of a typical electric FLT in work, as 90 dB(A). The model uses this level, as a line source, going from the lorry to the storage area, and return, at a speed of 5 km/hr. This gives a sound power level of 53 dB(A)/m.

A decision is needed as to how many visits the FLT will make during the reference period of 1 hour. It was previously suggested that 5 per hour would be a reasonable compromise between the maximum that could be made, and the likely infrequent usage. This reduces the

[1] dB refer to Decibel; dB(A) is the decibel with an A-Weighting to adjust the frequency spectrum to sensitivity of the human ear.

need to factor in the reduction of disturbance due to the many hours that no FLT visits will be made.

A computer model was created using the following:

- Digital terrain height data on a 2 m grid
- Key ground heights taken from the submitted plans
- Building located as on the Ordnance Survey Mastermap of the area. This has later been adjusted to match the cross -section provided by the architect
- Ground porosity = 0.5
- Height of source 1 m
- Height of receptor 1.5 m
- A 2 m barrier, an acoustic fence, or similar, was located between the storage pad and the neighbouring garden (height measured from ground level of neighbouring garden).
- The layout used in shown in Figure 1
- A 3D representation is shown in Figure 2.

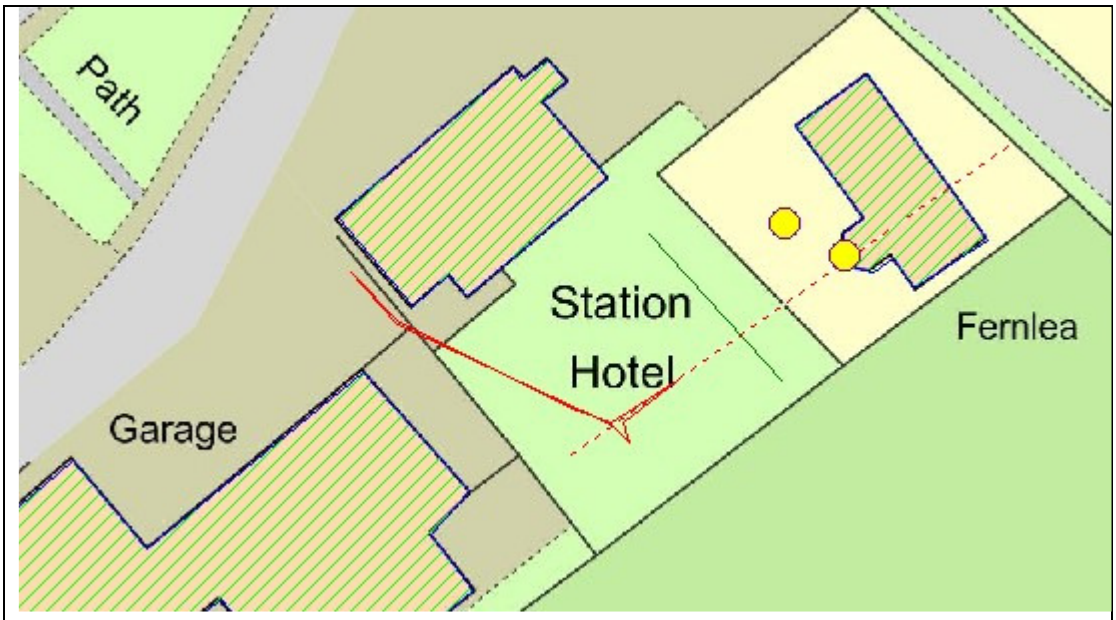


Figure 1: Layout of SoundPLAN model showing outline of proposed pad, FLT route in red and receptors in yellow.

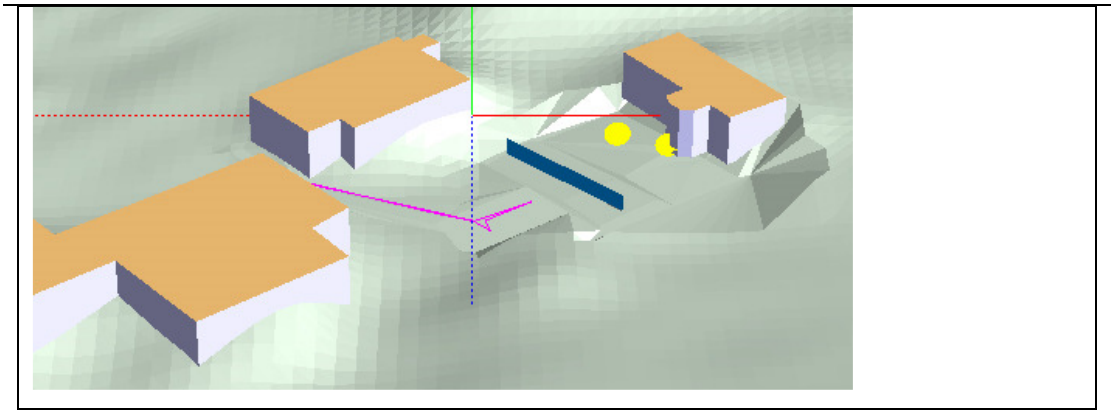


Figure 2: 3D representation of the layout used in the SoundPLAN model (Building heights not considered important, ground heights modified to match recent survey).

2) residual sound levels) and method of determination

See previous NIA – 50 dB(A).

3) ambient sound levels) and method of determination

Not now applicable.

4) specific sound levels) and method of determination

The results provided by SoundPLAN are as shown in Table 1. These are for the two receptors, both at 1.5 m above ground level, the second being 1 m from the house.

Table 1: Results

Receiver	Leq, dB(A)
Garden	35.9
House	36.1

The sound levels provided in Table 1 represent the one hour average during daytime from the predicted use of the forklift truck operations.

5) justification of methods

The use of a modelling package such as SoundPLAN is the best way to include the relevant factors, without confusion with the relatively high background sound level at this site.

6) details of any corrections applied.

Following the first version of this report much thought has been given for the appropriate level of character correction. Additions are made to account for an elevated risk of disturbance from: intermittency, impulsivity, and tonality.

For a sound to have an elevated risk of disturbance from intermittency it needs to be more than an occasional visit from a forklift. If this were not the case then the intermittency of the

road traffic may have a similarly disturbing effect. Neither of these therefore justify an addition for intermittency.

It is true that there may be times when there is a clank when a load is deposited onto the concrete base. However this will not be often, especially if the vehicle is only be used for short durations. The penalty needs to be scaled to account for the proportion of the hour that the elevated disturbance will occur[2].

Similarly, as the reversing warning system will only be heard for a small proportion of the time that the vehicle is operating, and it will only be operating for a small proportion of the hour, the penalty applied should be significantly less than what would be applied if the operation was continuous.

One option would be to set the character correction at:

- +3 dB for impulsivity
- +6 dB for tonality

Giving a total of 9 dB, a very high value, not often applied (it could be argued that the disturbance would not be higher due to the two effects, so 6 dB would normally more than suffice).

9 dB over 60 mins will reduce to about 1 dB over 5 mins.

m. Background sound levels) and measurement time intervals) and, of measurements taken at an equivalent location, the reasons for it to be equivalent.

The background sound level was measured over a period of 3 hrs, as reported by the previous NIA. The result given was L_{A90}[3]= 42 dB(A).

n. Rating level(s):

For the garden

1) specific sound level(s)

As calculated: 35.9 dB(A), from Table 1.

2) any acoustic features of the specific sound

+ 6 dB 0r +9 dB, both reduce to up to 1 dB over 5 minutes operation.

3) rating levels.

36.9 dB(A), which can be rounded to 37 dB(A).

o. Excess of the rating levels) over the measured background sound and the initial estimate of the impacts.

[2] Source: IOA meeting. Logic – a noise that is disturbing for part of an hour is less disturbing than if the same noise was continuous, over the full hour.

[3] L_{A90} is the level exceeded by 90% of the sound levels recorded, after adjustment for the sensitivity of the human ear.

As the background was measured to be 42 dB(A) the excess above background is -5 dB. As zero to +5 dB may indicate an adverse impact it is likely that this proposed activity will be acceptable.

In the house/ sun room

As calculated: 36.1 dB(A), from Table 1.

This level would be expected to drop by at least 10 dB as the sound passes into the house via windows open for ventilation. The sound level in the sun room would not be expected to be more than 27 dB(A). At this level disturbance would not be expected.

p. Conclusions of the assessment after taking context into account.

With the barrier, wall or acoustic fence, at a height of 2 m the impact from activity on the proposed storage area is predicted to be acceptable.

It has been stated that the rating level should not exceed the background sound level however BS4142 requires that context is taken into account when assessing the potential for disturbance.

The relatively high traffic noise in the area, 50 dB(A), and the infrequency that the storage area is to be accessed is context that should be taken into account, as both reduce the risk of possible disturbance.

q. The potential impact of uncertainty

Noise levels do vary but assessments need to be conducted on averages. The likelihood of disturbance will be higher if the pad was in use, in a similar manner every hour of the day, although the rating level would not increase.

Any disturbance is more likely when the neighbouring occupants are in the garden. With infrequent use they may not be, when the pad is used, which reduces the possibility of disturbance.

Whilst extra visits are not expected if the number of FLT visits were to double to 10 in an hour the predicted sound level would increase by 3 dB. Whilst this is not anticipated, and said to be very unlikely to occur, the predicted sound levels at the neighbouring house would still not exceed the background sound level.

3. Conclusions

This report has shown that with the proposed barrier, and in comparison to the relatively high traffic sound levels in the area, the proposed use of the planned storage pad will not normally cause unacceptable disturbance.

The level of character correction has yet to be considered by the Environmental Health Service however this application must now move forward. There are three options:

1. The above analysis, using character correction of 1 dB is accepted and the application is allowed to proceed as being acceptable by a wide margin
2. The time adjusted character correction is rejected and the application is allowed to proceed as the rating level (including 6 dB of character correction) does not exceed the background sound level.
3. The Environmental Health service requires 9 dB of character correction, and this is considered unacceptable even with consideration of context, the application proceeds with a condition that no audible reversing warning system is used on the handling vehicle.

Whilst it would be easiest for the applicant if the first or second of the options above were used, the third is a way forward, if this is the only way that the planned activity will be considered acceptable.

4. Appendix

Cross-sectional drawings of the site.

4802
CL:41.9
IL:40.2

Existing manhole

Existing manhole

LINE OF EXISTING DRAINAGE SYSTEM

To connect to existing sewage system, see Location plan for drainage.

Existing manholes

+CL Datum 42.800

+42.240

+43.140

+43.560

+44.410

44.700+

4803
CL:44.7
IL:43.5

+41.200

4801
CL:42.3
IL:37.5

Hardstanding Ground

+42.780

+43.050

Ramp at 1v in 20

+43.050

Hardstanding Ground

+42.930

+43.190

+42.780

Rail Cl.

Existing drain +40.680

+43.100

+42.430

A

43.180+

+42.770

+43.040

Existing drain

+42.430

Existing drain

+41.630

43.180+

+42.450

+41.130

+40.900

+42.610

Paving

42.180

Existing drain

+40.280

Rear Garden Area - Retained as Existing

Sloping Embankment

Acoustic Barrier

+42.550

+43.500

+42.690

Hardstanding Area

+43.500

+43.500

+42.650

+43.240

Site Access (Forklifts Only)

Turning Area

42.630

B

A

B

Site Layout Plan 1:100

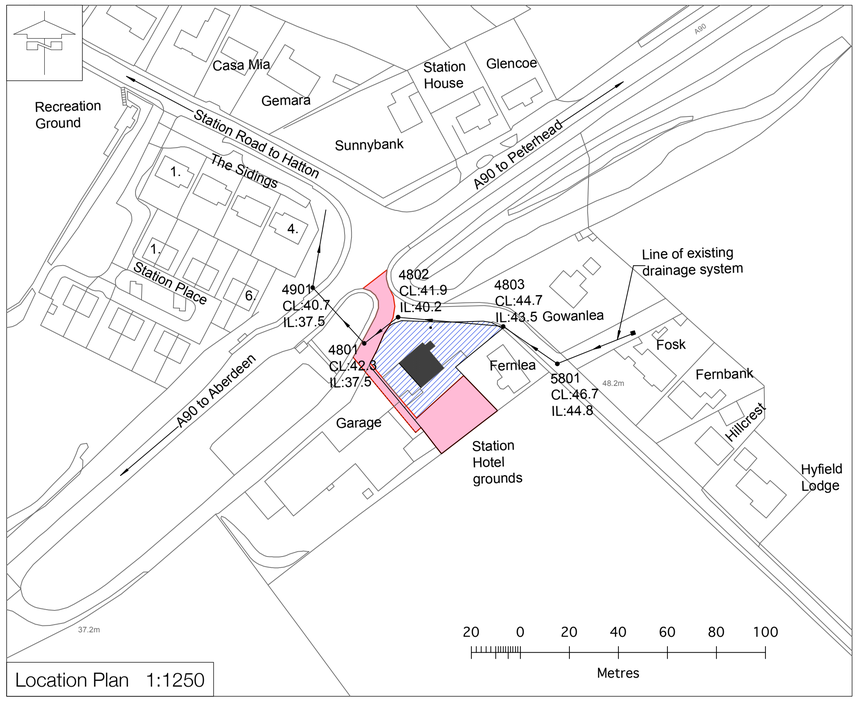
KEY

44.700+ - Existing Ground Levels

44.700+ - Proposed Ground Levels

2 0 2m 4 6 8 10m

Scale 1:100



Location Plan 1:1250

No	Revisions	Date	Initials
F	Additional Site Section	02.03.23	MR
E	Scale Bars Added	10.11.22	MR
D	Levels Related to OS	05.11.22	MR
C	HGV Parking	07.12.21	MR
B	Site Access Added	20.07.21	MR
A	Site Boundary Revised	21.06.21	MR

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project
Ground to Rear of Station Hotel, HATTON.
Proposed Change of Use

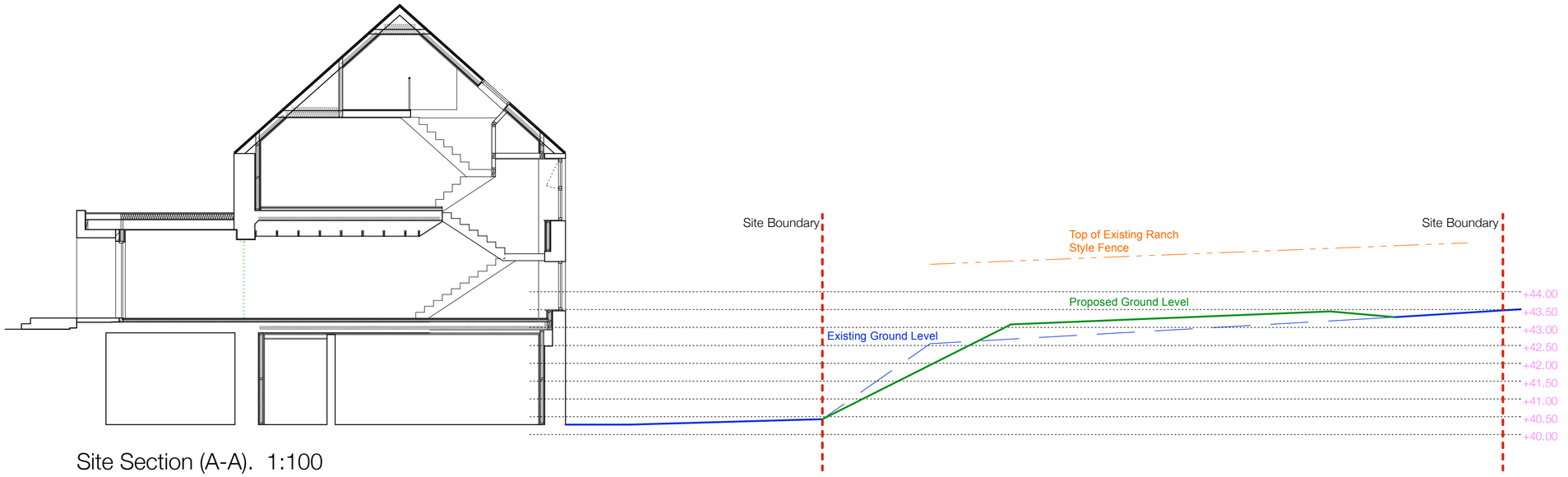
for
Mr S Mahmood

content
Site & Location Plan

scales
1:100, 1:1250

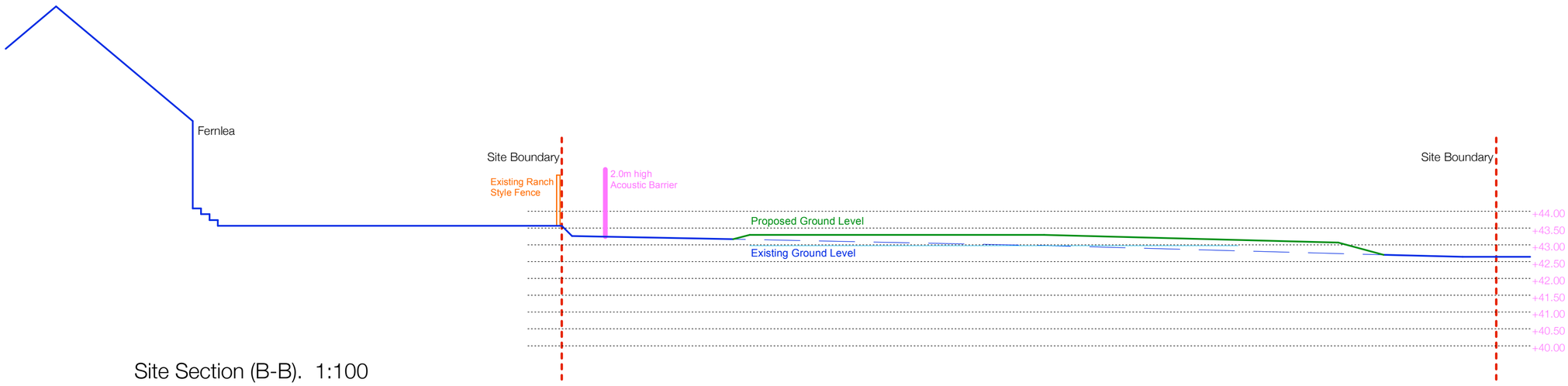
drawn by	size	date
MR	A1	16.06.21

ref **21079** **01F**



Site Section (A-A). 1:100

(NB Datum Point - +42.800 @ MH to North of Station Hotel)



Site Section (B-B). 1:100

No	Revisions	Date	Initials
A	Section B-B Added	02.03.23	MR

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MR	A1	10.11.21

ref 21079 02A