Wressle-2 Oilfield Development Project

Noise Impact Assessment to support Planning and Environmental Permit (Variation) Applications

Report ref.
ARC7235/23150/V3

Issued to
Egdon Resources U.K. Limited

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1. INTRODUCTION

Egdon Resources U.K. Limited is seeking to further develop its existing Wressle Oilfield at Lodge Farm, Clapp Gate, Appleby, North Lincolnshire DN15 0DB.

The works involved are the drilling of two new appraisal wells W2 and W3, installing gas processing facilities, and a 600m gas export pipeline to the existing National Transmission System (NTS).

Spectrum Acoustic Consultants has been instructed by Egdon Resources U.K. Limited to undertake a noise impact assessment (NIA) for these activities to support both the planning application and the application to vary the existing Environmental Permit.

The following document has already been issued to both North Lincolnshire Council (NLC) and the Environment Agency (EA) for their comment as part of the formal pre-application process:

- *Wressle Field Development, Lodge Farm, Clapp Gate, Appleby, North Lincolnshire DN15 0DB: Noise Scoping Report, ARC7230/23150/V2, 3/11/2023*

Comments received from both stakeholders on this document have been noted and have informed the assessment methodologies used in this assessment and the arrangements made for carrying out the baseline noise survey.

2. ABBREVIATIONS

BAT - Best Available Techniques
BS - British Standard
EA - Environment Agency
IEC - Internation Electrotechnical Commission
ISO - International Standards Organisation
LOAEL - Lowest Observable Adverse Effect Level
MPA - Mineral Planning Authority
NIA - Noise Impact Assessment
NLC - North Lincolnshire Council
NML - Noise Monitoring Location
NMP- Noise Management Plan
NNG - Night Noise Guidelines for Europe
NPPF - National Planning Policy Framework
NPSE- Noise Policy Statement for England
NSR - Noise Sensitive Receptor
NTS - National Transmission System (Gas)
NQA - National Quality Assurance Limited
PPG-N - Planning Practice Guidance – Noise
PPG-M - Planning Practice Guidance – Minerals
SOAEL - Significant Observable Adverse Effect Level
UKAS - United Kingdom Accreditation Service
WHO - World Health Organization

3. CURRENT STATUS OF WELLSITE

The Wressle wellsite is currently fully operational producing both oil and gas. The gas is typically used for powering on site generators to provide electricity to power the site.

As a result of a number of planning and permit applications for exploratory drilling and production made over the past 10 years, there is a substantial body of noise related data for the site, including background noise surveys at sensitive receptors and NIA reports predicting and assessing potential noise impacts. A number of noise-related planning conditions were attached to the operative planning permission granted on appeal in January 2020. As a result, there is a Noise Management Plan in place which was approved by NLC in 2020. A Proppant Squeeze report and a Production Noise report were prepared and submitted to NLC in June and July 2021 respectively. All the pre-commencement planning conditions in respect of noise have been fully discharged by NLC. There is therefore substantial evidence of noise design and control at this site. Some of these documents will be referred to in this proposed new phase of development as they provide useful reference points.

There are currently 6 planning conditions in place for current operations. These were set out in the Planning Appeal Decision APP/Y2003/W/19/3221694 of 17th January 2020 :

Planning Condition 4:
Prior to the commencement of development, a Noise Management Plan (NMP) shall be submitted for written approval to the local planning authority. The NMP shall clearly set out all potential sources of noise and techniques to be used to prevent and mitigate noise which shall demonstrate compliance with noise conditions 8 - 11 below. The NMP shall also include methods to deal with noise complaints from the general public. The approved NMP shall be implemented in full for the duration of the development.

Planning Condition 5:
Prior to the commencement of drilling operations or well stimulation on site, the name, make, model and technical noise specification for the drilling rig shall be submitted for approval to the local planning authority. The approved rig shall not be substituted without the prior written approval of the local planning authority and all approved noise mitigation measures shall be implemented in full throughout the duration of drilling.

Planning Condition 8:
Noise from the site shall not exceed 42dB LAeq5min when measured at any noise sensitive dwelling between 19:00 and 07:00 Monday to Sunday inclusive.

Planning Condition 9:
Noise from the site shall not exceed 60dB LAmax when measured at any noise sensitive dwelling between 19:00 and 07:00 Monday to Sunday inclusive.

Planning Condition 10:
Noise from the site shall not exceed 55dB LAeq 1h when measured at any noise sensitive dwelling between 07:00 and 19:00 Monday to Sunday inclusive.

Planning Condition 11:

Noise from the site shall not exceed 70dB LAmax when measured at any noise sensitive dwelling between 07:00 and 19:00 hours Monday to Sunday inclusive.

The current environmental permit conditions in place (EPR/AB3609XX – 17.5.2017) regarding noise are:

Permitting Condition 3.4
Emissions from activities shall be free of noise and vibration at levels likely to cause pollution outside the site.

Permitting Condition 3.4.2
The Operator shall submit a noise and vibration management plan, should noise and vibration become a problem. If a plan is required, once it is assessed as suitable, it will form part of the permit and the Operator must carry out the activity in accordance with the approved techniques.

A site location plan is shown in Figure 1. Along with the location of the nearest existing noise sensitive receptors (NSRs).

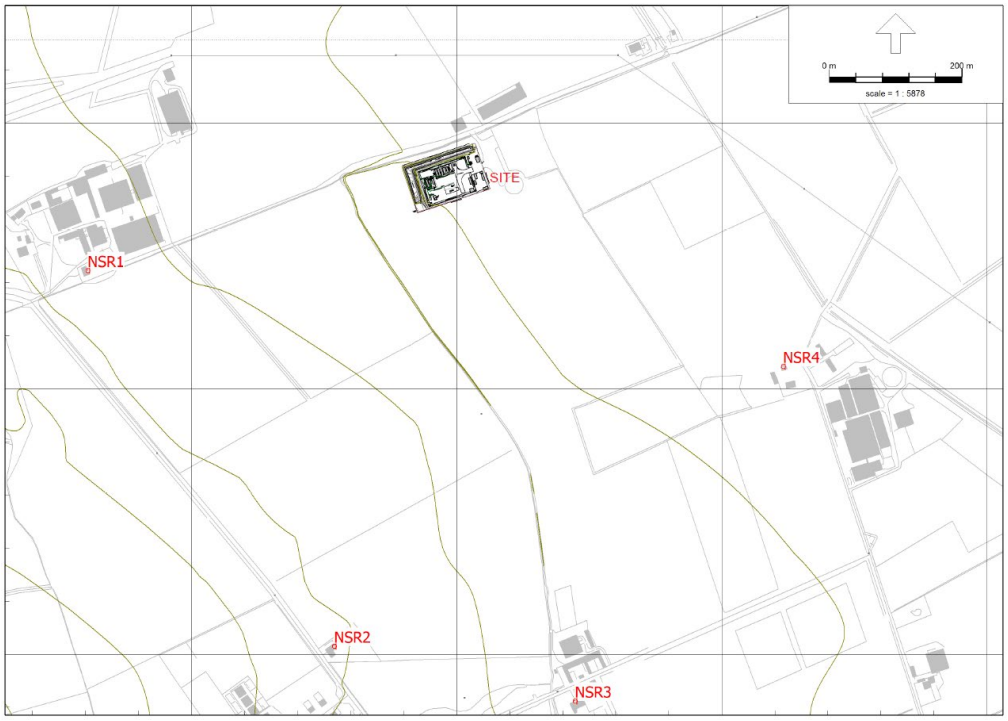


Figure 1: Site Location Plan with Noise Sensitive Receptors (NSRs)

Table 1: shows summarises the locations and set back distances of the nearest NSRs from the wellsite centre.

Noise Sensitive Receptor (NSR)	NSR Name	OS grid reference	Distance (m) and Direction in relation to wellsite centre
NSR1	North/South Cottages	496251E , 410984N	550m W
NSR2	1 Broughton Grange Cottage	496608E , 410415N	715m SW
NSR3	Broughton Grange	496993E , 410348N	800m S
NSR4	Decoy Cottage	497300E , 410814N	590m SE

Table 1: Nearest noise sensitive receptors to site

With setback distances from the centre of the development site being in excess of 500m, which is large, the likely noise impact from this type of development will be reduced.

The proposed development at the wellsite, to increase oil and gas production and export gas through a pipeline connecting to the NTS, is considered against the relevant policy and guidance both in relation to planning and permitting.

4. PROPOSED DEVELOPMENT

Table 2 shows the various phases of the development of the Wressle wellsite and identifies, following consultation with both NLC and the EA, which phases of the development are required to be included in the NIA.

The planning application requires all phases to be included. The permit variation application relates primarily to the testing and production phases.

	Phases required to be included in NIA submitted for Planning or for Permitting	
	Planning	Permit
Phase 0: Existing production from one well	Yes	Yes
Phase 1: Construct extension area and three new well cellars.	Yes	**No**
Phase 2a: Drill new W2 and W3 wells in sequence	Yes	**No**
Phase 2b: Workover for well completions	Yes	**No**
Phase 3a: Production testing of W2 and W3	Yes	Yes
Phase 3b: Proppant squeeze	Yes	**No**
Phase 4a: Construct enhanced production facilities and pipeline to connector	**No** (note 1)	**No**
Phase 4b: Production with gas to grid.	Yes	Yes
Phase 5: Well decommissioning and site restoration.	**No** (note 1)	**No**

Note (1) Not included as similar or less impact than Phase 1.

Table 2: Stages of the development required to be included in the Noise Impact Assessment (NIA)

Whilst not all phases are required by the EA to be included within the NIA, these are, however, included as they will be required by NLC in determining the planning application.

It should be noted that some of the existing oil and gas equipment used currently for production will be decommissioned and removed from site as part of the proposed development.

Appendix A includes site layouts of each of these phases of work, showing the location of temporary and permanent equipment and plant on the wellsite for each stage.

5. CONSULTATION RESPONSES

5.1 NOISE SCOPING REPORT

A Noise Scoping Report[1] was issued to NLC and EA and sought to capture the particular detailed requirements of each Stakeholder in relation to noise matters. This was in addition to more general pre-application advice. The scoping report referenced substantial information in the form of local planning policy and more specific technical guidance.

5.2 PLANNING – NORTH LINCOLNSHIRE COUNCIL

The pre-application planning advice from NLC (PRE/2023/57) made reference to local policy that needed to be considered including emerging policy albeit this currently has only limited weight. In relation to noise at this site NLC confirmed that an NIA would be required. Furthermore, officers commentary included:

Noise

The most relevant extant development plan policies against which to assess the proposed development's effect upon noise are 'saved' policy M1 which requires acceptable proposals to mitigate amenity impacts of mineral extraction proposals; 'saved' policy M3 which seeks to prevent mineral working directly adjacent to housing sites or other land uses where unacceptable impacts may arise; 'saved' policy M23, which requires adequate environmental protection measures to mitigate the impact of oil and gas sites; 'saved' policy RD2, which seeks to prevent development in the open countryside that would be detrimental to residential amenity; 'saved' policy DS1, which requires that new developments do not result in unacceptable loss of amenity to neighbouring land uses; and 'saved' policy DS11, which requires that developments do not create environmental conditions likely to affect nearby developments and adjacent areas.

The 'Wressle Site Development Overview' states that the wells would be drilled sequentially i.e. one after the other, and the total phase duration is expected to be 23 weeks. This includes for:

- *Drilling rig mobilisation and demobilisation: - 4 weeks*
- *Drilling of the two wells: - 15 weeks*
- *Workover rig mobilisation and demobilisation: - 2 weeks*
- *Workover operations:- 2 weeks*
- *Mobilisation and demobilisation: Monday to Saturday 07:00 – 19:00hrs*
- *Drilling: - 24/7 until completion*

[1] *Wressle Field Development , Lodge Farm, Clapp Gate, Appleby, North Lincolnshire, DN15 0DB: Noise Scoping Report - V2, Spectrum Acoustic Consultants, 3/11/2023*

- *Workover operations: - daytime only, seven days per week*

The proposed development is approximately 484m to the Nearest Sensitive Receptor (NSR). Therefore, there is the potential of adverse impact from activities on site to the NSRs. In addition, the proposed 5km pipeline is located in close proximity to several residential properties.

The council's Environmental Protection officer has been consulted and has advised that a noise impact assessment should be undertaken and submitted in support of any forthcoming planning application. The Noise Impact Assessment shall provide details of existing background noise levels, likely noise sources which will impact upon the proposed development, mitigation methods to be employed and the resulting predicted level of noise at sensitive locations.

It should be noted that the option of a 5kM gas export pipeline has been dropped in favour of a 600m underground gas pipeline connection to the NTS.

Following subsequent receipt of the Noise Scoping Report, NLC's EHO acknowledged receipt and raised no concerns with the proposed methodology. Spectrum can confirm that the relevant guidance has been followed within this NIA and all of the nearest noise sensitive receptors have been identified and are considered.

5.3 PERMITTING – ENVIRONMENT AGENCY

The general pre-application advice from the EA of 17 May 2023 was not specific in the matter of noise or vibration but did indicate that an application to vary an existing Environmental Permit (EPR/AB3609XX/.V003) would be required.

Subsequently the EA (AQMAU) responded to the Noise Scoping Report with the following comments:

NIA scoping document reference: Wressle Field Development, NIA Scoping Report, Spectrum Acoustics, ARC7230/23150/V1, 03/11/2023

Section 7 – Potential noise sensitive receivers

Regarding noise monitoring locations, the guiding principles stated in BS 4142 should be followed. It is important that background sound level locations are representative of the soundscape at nearby residential properties, the chosen noise monitoring locations should be justified within the submitted noise impact assessment.

Section 8 – Phases of development

	Propose to be included in NIA submitted for Planning or for Permitting	
	Planning	Permit
Phase 0: Existing production from one well	Yes	Yes
Phase 1: Construct extension area and up to three new well cellars.	Yes	No
Phase 2: Drill and completion of new W2 and W3 wells in sequence	Yes	EA to advise
Phase 3: Testing of W2 and W3 before and after a proppant squeeze	Yes	Yes
Phase 4a: Construct enhanced production facilities and pipeline to connector	Yes	No
Phase 4b: Production with gas to grid.	Yes	Yes
Phase 5: Well decommissioning and site restoration.	No (see 1)	No

Table 2: Stages of the development to be included in the Noise Impact Assessments (NIA)

NIA can exclude the drilling and completion of new wells W2 and W3. It would be useful to confirm the length of the drilling operations.

Section 9 – Matters to be scoped out

it is not clear what is being referred to by "cumulative impacts" and so we cannot agree or disagree that this aspect of the assessment should be screened out.

Section 10 - Baseline noise survey

The consultant queries whether or not the length of the survey (2 week unattended survey with additional attended measurements where possible) is sufficient. A 2 week period, would normally be sufficient for a background sound level survey as long as enough of the measurement period is during acceptable weather as defined in BS 4142 and BS 7445. Note that the EA considers weekend to be a more sensitive time than during the week. Therefore, in line with BS 4142 a separate background sound level and subsequent BS 4142 assessment should be carried out during the weekend if operational hours of the site are over the weekend.

The consultant states "It should however be noted that it is not possible to cease hydrocarbon production operations at this site." In this case the consultant should follow the guidance provided in BS 4142 Section 8.

The consultant states that it will not be practical to use 2 weather stations, one at each measurement location. A single weather station would be sufficient as long as it is clear that the weather will not differ significantly between the weather monitoring location and the background survey locations.

Appendix B

Please note that the EA guidance states "submit all modelling files in both the original software format and, where your modelling software allows, QSI data exchange format."

Regarding the background sound level survey data, please submit the background sound level data measured at each location, including date, time, LAeq, LAmax and LAeq for each measurement. In submit the data from the weather data survey including date, time, wind speed, wind direction and precipitation.

Appendix C

The consultant queries the use of a soundscape assessment, the EA consider that a soundscape analysis using the descriptors and methods stated in ISO 12913 can be used to enhance a BS 4142 assessment. Examples could include:

- *Using the descriptors to state which sound sources dominate and what the character is of an existing soundscape at a residential receptor.*
- *to use a soundscape description and analysis within a context discussion.*

The consultant queries a cost benefit analysis of mitigation methods. In essence inclusion of Best Available Techniques is a cost benefit analysis, where impacts are high from sound emissions off site more stringent and effective mitigation measures would be required. Conversely where impacts from sound emissions off site are low, the need for mitigation measures will be less pertinent.

General comments from the EA:
The consultant has mentioned in several places throughout the document their proposed approach to the assessment as this is an existing site. The following section from the EA guidance is relevant to both variations and sites which are existing and will come into EA regulation:

"When you apply for a variation, do not include noise from the existing site (before changes) as part of the background or the residual sound levels. Your noise impact assessment must consider all the noise resulting from the proposed variation – the existing site and the variation together. Show both components clearly and then add them together to give a new total for site noise at the receptors. The impact assessment will be based on this new value, known as the 'specific level' in BS 4142."

This concludes the EA responses to the Noise Scoping Report.

The following can be confirmed:

- The noise monitoring locations (NMLs) are considered to be representative of the noise sensitive receptors, and their selection is justified within the NIA
- It is noted that the drilling of wells can be excluded from the NIA, although it is included to satisfy the MPA. The 'Wressle Site Development Overview' states that the wells would be drilled sequentially i.e. one after the other, and the total phase duration is expected to be 23 weeks.

- The 'cumulative impacts' proposed to be scoped out would be those associated with other noise generating developments in the area, that have planning consent, but are not yet built/operating. These are not related to the Wressle development nor its permit.

- The baseline noise survey extended over a period of 3 weeks and 2 days, which was longer than the planned 2 weeks. During most of this period the weather (wind speed) conditions were measured as being too high for acceptable noise data to be acquired. However, the extended survey period meant that there is a sufficiently large dataset for acceptable wind and rain conditions to establish the representative background sound levels ($L_{A90,T}$) in the community.

- The EA consider weekends to be a more 'sensitive' period than weekdays and seek separate assessments for weekends as well as weekdays. This is not however reflected within the formal sections of BS 4142 (especially at night) however, the main variable that affects impact from 24-hour operating sites are changes in the background levels. The background levels during the weekend periods are compared to those during the week in the NIA. Where these do not differ significantly, then a weekend assessment is not undertaken, as the BS 4142 impact would be the same.

- As production of hydrocarbons from this site cannot cease to allow a background noise measurement to be undertaken with no activity on site, the procedure outlined in BS 4142 Section 8 has been carried out in this NIA.

- A single weather station was located in open ground clear of trees and buildings (at NSR 4) to ensure weather data was representative of all NML locations.

- Computer model files will be submitted in both the original formats as well as QSI data exchange format.

- Baseline noise survey data recorded and reported within this NIA includes, as requested, date, time, LAmax and LAeq for each noise measurement. And for weather data this includes date, time, wind speed (average and max), wind direction and precipitation (including 1 hour after rains ceases which is considered the period when wet road surface water would have drained away).
- The soundscape is described from observations made at receptors regarding acoustically dominant and contributory sources. This includes reference to any noise from the existing operating hydrocarbon production, that might be audible. On no occasion however during the daytime was the steady site noise audible during the daytime attended measurements, over and above identifiable off-site sources not associated with the development.

- A Best Available Techniques (BAT) assessment is included within the NIA regarding production phase noise, acknowledging this as fulfilling the requirements for a Cost Benefit Analysis of mitigation methods.

- When describing the representative background noise level ($L_{A90,T}$) the NIA excludes any noise from the existing or future site. The existing site noise is shown not to currently contribute to the levels at NMLs. It is however proposed that some of the existing site equipment, will be decommissioned in the new development, and so the Specific Noise Level will not include contributions from such sources. These sources are listed within the NIA.

6. MATTERS SCOPED OUT

- Vibration assessment, as the setback distances are particularly large, and ground borne vibration attenuates quickly with distance, and is rarely detected beyond 50m from a site.
- Assessment of noise from vehicles associated with the proposed development, when travelling on public roads. (Vehicles travelling along the site access road within the red line development boundary are included in the assessment)
- Noise impacts to ecological receptors
- Any matters that would only normally be considered if an Environmental Impact Assessment was required.

A Cumulative Effects/Impacts Noise Assessment is not proposed to be undertaken as, in planning, it is only required where an EIA is being prepared, which is not the case here. For the Environmental Permit, consideration of the cumulative effect of noise from the proposed development, together with any potential consented, but not built, noise generating development in the area, is not required when seeking to vary an existing environmental permit. However, the cumulative effect of noise from existing retained Wressle site equipment together with the proposed new equipment, together, will be assessed within this NIA.

7. POLICY CONTEXT

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The National Planning Policy Framework (NPPF)[2] sets out the Government's planning policies for England and how these should be applied by establishing a framework within which locally prepared plans for development can be produced.

The NPPF requires (174) prevention of new or existing development from contributing to, or being adversely affected by, unacceptable levels of noise pollution.

New development (191) should be appropriate to its location taking into account the likely effects of pollution on health, living conditions and the natural environment. In doing so it is required to:

> *'a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[3];*
>
> *'b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason'*

Planning policies and decisions should also (187) *'ensure that new development can be integrated effectively with existing businesses and community facilities* […]. *Where the operation of an existing*

[2] *National Planning Policy Framework, MHCLG, December 2023*
[3] *See Explanatory Note to the Noise Policy Statement for England, paragraphs 2.23 and 2.24 , Department for Environment, Food & Rural Affairs,15 March 2010).*

business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.'

The NPPF also sets out a framework for the sustainable use of minerals, with a further three paragraphs being relevant to noise:

'*It is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation'.* (209)

'P*lanning policies should* […] *when developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction'*. (210)

'When determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy. In considering proposals for mineral extraction, minerals planning authorities should: […]

b) *'ensure that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety, and take into account the cumulative effect of multiple impacts from individual sites and/or from a number of sites in a locality;*

c) *'ensure that any unavoidable noise* […] *and any blasting vibrations are controlled, mitigated or removed at source, and establish appropriate noise limits for extraction in proximity to noise sensitive properties;* […]*'* (211)

NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

The NPSE was published in March 2010 and sets out the long term vision of Government noise policy as follows:

- *'Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.'*

The NPSE aims to clarify the principles and aims in existing policy documents, legislation and guidance that relate to noise. Its long term vision is supported by the following aims:

'Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *'avoid significant adverse impacts on health and quality of life;*
- *'mitigate and minimise adverse impacts on health and quality of life; and*
- *'where possible, contribute to the improvement of health and quality of life'*

These aims are developed by reference to concepts from toxicology, namely NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level). NPSE also refers to SOAEL (Significant Observed Adverse Effect Level).

It recognises that there is no universally applicable measure for the concepts. Consequently, the SOAEL is likely to be different for different noise sources and receptors and at different times. Even so, significant effects should be avoided, taking account of sustainability aims.

Where noise impact is between LOAEL and SOAEL, the NPSE requires that all reasonable steps should be taken to mitigate adverse effects while taking account sustainable development aims. It notes (Para. 2.7) that *'the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation.'*

DEVELOPMENT PLAN POLICY

North Lincolnshire Local Plan 2003

The following 'saved' policies are relevant to noise associated with new development:

Policy M1:Applications for mineral workings
Proposals for mineral extraction will be permitted provided that (i) adequate proposals are made to minimise visual and other amenity impacts to an acceptable level; …

Policy M3: Residential amenity and Protection Zones
Mineral working and processing will not be allowed directly adjoining existing or proposed housing or other land uses where unacceptable impacts may arise. The width of separation (buffer zone) will depend on the nature of proposed working, the scale of the potential impact and the potential to use other successful mitigatory measures.

Policy M22 – Oil and Gas Appraisal Boreholes
Proposals for the drilling and testing of appraisal boreholes will be permitted, provided that: … (iv) adequate proposals are made for environmental protection during operation and restoration on completion."

Policy M23: Oil and Gas Production
Proposals for oil and gas production facilities will be permitted, provided that the proposal incorporates environmental protection measures that are adequate to mitigate the impacts arising from a long term or permanent site.

Para 15.51 Additional note regarding Policy M23: Oil and gas production wells and associated infrastructure may originate as a result of the development and upgrading of an earlier exploration or appraisal borehole site or they may be developed on a new site following the conclusions of the appraisal stage. Where previous boreholes are developed for production purposes, the Council will wish to review the mitigation proposals submitted previously and where necessary will wish to see these improved, taking into account their effectiveness and the scale of the proposed development. Oil and gas production facilities can result in a requirement for long term or permanent sites. In such cases, it is important that adequate environmental protection measures are taken.

Policy RD2: Development in the Open Countryside
Development in the open countryside will be strictly controlled. Planning permission will only be granted for development which is:…
(ii) employment related development appropriate to the open countryside; …
Provided that: … the development would not be detrimental to residential amenity or highway safety;

Policy DS1: General Requirements
A high standard of design is expected in all developments in both built-up areas and the countryside and proposals for poorly designed development will be refused. All proposals will be considered against the criteria set out below:…
Amenity (iii): No unacceptable loss of amenity to neighbouring land uses should result in terms of noise…

Policy DS11: Polluting Activities
Planning permission for development, including extensions to existing premises and changes of use, will only be permitted where it can be demonstrated that the levels of potentially polluting emissions, including … .noise do not pose a danger by way of creating adverse environmental conditions likely to affect nearby developments and adjacent areas.

These policies generally align with current national guidance in respect of noise emissions. The additional note regarding Policy M23 is of relevance as existing production facilities have noise mitigation measures applied. These measures have been reviewed as part of this assessment.

EMERGING LOCAL POLICY

Proposed Submission North Lincolnshire Local Plan 2020-2038

NLC submitted its new draft Local Plan for North Lincolnshire to the Secretary of State in November 2022 for Examination. Proposed Main Modifications were submitted in October 2023. No date has yet been set for hearings. At this stage, the policies below only carry limited weight.

Policy SS3: Development Principles
Provide high standards of amenity and privacy, by ensuring the impacts of development on adjacent and nearby properties are minimised. These impacts include noise.

Policy CSC1: Health and Wellbeing
Ensure development does not have an adverse impact on the environment or residential amenity through air, noise, vibration and water pollution

Policy MIN3: Mineral Extraction
All types of mineral extraction must ensure that residential amenity and human health is protected from issues including noise

Policy MIN5: Energy Minerals (Oil & Gas/Hydrocarbons)
Proposals for the exploration, appraisal and production of conventional and unconventional hydrocarbons will be supported where they are consistent with the following principles:(b) Support will

only be given to applications for energy minerals that significantly benefit the economy and that any cumulative and adverse impacts on the environment, or residential amenity, such as noise, can be avoided or mitigated to the satisfaction of the Mineral Planning Authority.

Policy MIN6: Mineral Sites
Provision to meet the mineral requirements in North Lincolnshire to 2038 will come from sites with planning permission and the following allocations: MIN6-14a Wressle (Oil and Gas). All relevant constraints and issues have been identified and mitigation put in place through existing planning permissions. It is expected all sites will conform to the planning permission, associated conditions, and agreed restoration and aftercare plans.

Policy DM1:General Requirements
Planning permission for development will only be permitted where it can be demonstrated that the levels of potentially polluting emissions, including noise do not create adverse environmental conditions likely to affect nearby developments and adjacent areas.

Policy DM3:Environmental Protection
Development proposals as appropriate to their nature and scale, should demonstrate that environmental impacts on receptors have been evaluated and appropriate measures have been taken to minimise the risks of adverse impacts to air and land , whilst assessing vibration, and noise pollution. Development generating noise which is likely to create significant adverse impacts on health and quality of life and cannot be mitigated and controlled through the use of conditions will not be permitted.

There is a wide range of draft policies in the emerging new Local Plan where noise is referenced. The policies generally align with National Policy and Guidance in that significant or unacceptable noise impacts have to be avoided if planning permission is to be granted. National guidance and policy does, however, allow adverse impacts and effects which are lesser in terms of impact, provided that they have been mitigated with appropriate and reasonably practical measures. Spectrum has assessed relevant noise mitigation measures to minimise adverse noise impacts to the community. Provided reasonable and effective noise mitigation has been implemented, residual impacts are allowed to be as low as practicable even if they might still remain just in the marginally adverse category.

A number of emerging policies (for example, CSC1 and DM1) state that planning consent will not be granted in the event of impacts being within the adverse impact category. It is noted that this might not fully align with National Guidance, which indicates adverse impacts of noise are acceptable but only provided all reasonable mitigation measures have been put in place. It is significant adverse impacts that are unacceptable.

It remains however a design objective to avoid significant adverse impacts and endeavour to avoid if possible, or minimise if not, those impacts which once mitigated remain marginally adverse.

8. GUIDANCE AND STANDARDS

PLANNING PRACTICE GUIDANCE – NOISE (PPG-N)

Planning Practice Guidance on Noise[4] (PPG-N) sets out government guidance on '*how planning can manage potential noise impacts in new development'*.

Whilst it does advise that noise can override other planning concerns, *'where justified'*, it states that *'it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern.' (002)*

It also details the hierarchy of noise exposure, including the thresholds LOAEL and SOAEL, based on the likely average response, referred to within NPSE[5]. The noise exposure categories are summarised below.

- No Observed Adverse Effect: Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response.
- Observed Adverse Effect: Noise can be heard and causes small changes in behaviour, attitude or other physiological response.
- Significant Observed Adverse Effect: The noise causes a material change in behaviour, attitude or other physiological response.
- Unacceptable Adverse Effect: Extensive and regular changes in behaviour, attitude or other physiological response, and/or an inability to mitigate effect of noise leading to psychological stress.

The guidance advises, in accordance with the first and second aims of the NPSE, that where there is no observed effect or no observed adverse effect, no specific measures are required to manage the acoustic environment; where there is an observed adverse effect, consideration needs to be given to mitigating and minimising those effects; where there is significant adverse effects, the planning process should be used to avoid these effects occurring; where there are unacceptable adverse effects, the situation should be prevented.

In establishing values for LOAELs and SOAELs, which represent the onset levels of adverse effects and significant adverse effects, respectively, the guidance advises because of the subjective nature of noise, there is no simple relationship between noise level and its impact. It will instead depend on a number of factors in a particular situation. These will include:

- The source, its absolute level and the time of day.
- For intermittent sources, the number and duration of events;
- The spectral frequency content of the noise

Other factors will need to be considered in many cases, which are more fully described and detailed in paragraph 6 of the Noise PPG but include matters such as:

[4] *PPG - Noise, MHCLG, 22 July 2019*
[5] *Explanatory Note to the Noise Policy Statement for England, paragraphs 2.19 and 2.20, DEFRA,15 March 2010)*

- The cumulative impacts with other sources
- Whether internal effects can be completely removed for example by closing windows (relevant with new residential development subject to ventilation being developed)
- Whether existing noise sensitive locations already experience high noise levels,
- Where Noise Action Plans, and, in particular Important Areas are identified nearby.
- The effect on wildlife especially on nationally designated sites.
- The use of external amenity spaces intrinsic to an overall design and including private gardens.
- The potential effect of a new residential or other sensitive development being located close to an existing noisy business or site, and for noise mitigation to be considered.
- Whether there are nearby areas of tranquility relatively undisturbed by noise from human caused sources that undermine the intrinsic character of the area and likely already valued for their tranquillity.

The Noise PPG does not provide any detail on the how such assessment, including these factors, should be carried out. However, reference is made to documents published by other organisations, such as:

- *BS 8233:2014– Guidance on sound insulation and noise reduction for buildings (British Standards Institute 2014);*
- *Guidelines for Environmental Noise Impact Assessment (Institute of Environmental Management and Assessment, 2014);*
- *ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise- New Residential Development (Association of Noise Consultants, Institute of Acoustics and Chartered Institute of Environmental Health, May 2017).*

This should not be considered an exhaustive list, however, as reference may also be made to other existing British Standards, where relevant, and to scientific exposure-response studies or reviews relating to noise and its effects on human and, where appropriate, animal populations.

PLANNING PRACTICE GUIDANCE – MINERALS (PPG-M)

PPG-M (17 October 2014) provides further detail for noise assessment of developments specifically related to minerals extraction.

Paragraph 20 states that, '*in line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure would be above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.'*

Paragraph 21 states that '*mineral planning authorities should aim to establish a noise limit, through a planning condition, at the noise-sensitive property*.' During the daytime (07:00-19:00) and evening (19:00-22:00) periods the noise level from the proposed activities should not exceed the background sound level, $L_{A90,1hr}$, by more than 10dB. (Taking account of the acoustic character of the sound, this is at least equivalent to, and potentially greater than, the threshold of significant adverse impact as defined in BS 4142). It recognises, however, that this is often not achievable without imposing unreasonable burdens

on the mineral operator and suggests that where this is the case, noise levels from operations should be as near that level as possible and should not exceed $L_{Aeq,1hr}$ 55dB.

Paragraph 21 also states, '*care should be taken, however, to avoid any of these suggested values being implemented as fixed thresholds as specific circumstances may justify some small variation being allowed.'*

During the night time period (22:00-07:00) it is advised that noise from operations should not exceed $L_{Aeq,1hr}$ 42dB (free field). No reference is made to any comparison with the background sound level for this period, suggesting that a BS 4142 style assessment is not considered to be an appropriate assessment methodology for the night time period.

Paragraph 22 suggests that it may be appropriate to set higher noise limits for some particularly noisy but short term activities, identifying '*activities such as soil-stripping, the construction and removal of baffle mounds, soil storage mounds and spoil heaps, construction of new permanent landforms and aspects of site road construction and maintenance*.'

It states, '*increased temporary daytime noise limits of up to 70dB(A) LAeq 1h (free field) for periods of up to 8 weeks in a year at specified noise-sensitive properties should be considered to facilitate essential site preparation and restoration work and construction of baffle mounds where it is clear that this will bring longer-term environmental benefits to the site or its environs*.'

It further recommends that '*where work is likely to take longer than 8 weeks, a lower limit over a longer period should be considered*, and that, *in some wholly exceptional cases, where there is no viable alternative, a higher limit for a very limited period may be appropriate in order to attain the environmental benefits*.'

The suggested noise limits for minerals extraction sites, as set out in the PPG Minerals guidance, are higher than those that would typically apply to other permanent industrial/commercial developments. This reflects the position of the NPPF by recognising the economic and social benefits being derived from minerals extraction and that the range of potential site locations is limited by the location of the natural resource.

The guidance does not specifically define what noise level would be considered to represent a SOAEL. What is clear, however, is that the SOAEL varies with duration of impact and that any assessment must consider both the level and duration when establishing thresholds.

For site preparation works during the day, guideline levels are typically L_{Aeq} 70dB, reducing to L_{Aeq} 60dB for the first and final hour or so of daytime activity. During the night time period, a guideline noise level of L_{Aeq} 45dB is indicated.

For operation of temporary sources such as a drilling rig, daytime guideline levels are up to L_{A90} + 10dB (in reference to the background sound level), reducing to L_{A90} + 5dB during the evening period. At night, the guideline level is L_{Aeq} 42dB.

For operation of permanent plant installations, Paragraph 112 advises '– *whilst planning conditions may be imposed to prevent run-off of any liquid from the pad, and to control any impact on local amenity (such*

as noise), the actual operation of the site's equipment should not be of concern to mineral planning authorities as these are controlled by the Environment Agency and the Health and Safety Executive'

BS 5228-1:2009+A1:2014 CODE OF PRACTICE FOR NOISE AND VIBRATION CONTROL ON CONSTRUCTION AND OPEN SITES – PART 1:NOISE

Construction site noise is assessed differently to noise from permanent installations as it is recognised that some degree of noise is an inevitable by-product of required works and that the construction works are a transient activity.

Annex E of BS 5228-1 provides guidance on assessing the significance of noise effects resulting from construction activities. It sets out two general methodologies for assessment. The first is based on absolute noise limits, which was principally developed for the determination of eligibility for noise insulation. The second (ABC Method) is based on noise level change and is used to indicate a '*potential significant effect'*.

The ABC Method takes account of the existing baseline noise condition by defining three baseline categories (A, B, and C) for which different criteria apply. Noise from construction activities is then assessed against this criteria. Where a potential significant effect is indicated, further consideration of other factors (number of affected receptors, duration, acoustic character, etc.) should be taken into account to establish whether or not there is a significant effect.

GUIDELINES FOR COMMUNITY NOISE (GCN) – WORLD HEALTH ORGANISATION (WHO), 1999

New guidance from WHO titled Environmental Noise Guidelines for the European Region (ENG) was published in 2018. The document takes a very different approach to guidance set out in the previous Guidelines for Community Noise (GCN) document by identifying separate thresholds for specific sources rather than for community noise as a whole. Consequently, much of the earlier guidance set out in GCN is now absent from ENG. While ENG was intended to supersede GCN, it recognises this absence and states that *'indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid.'*

GCN gives guidance on suitable noise levels for sleeping and resting conditions in dwellings. It recommends internal noise levels of 30dB(A) at night for bedrooms, and 35dB(A) during the day for living-rooms. The guideline levels are based on annual average data.

To avoid sleep disturbance in bedrooms during the nighttime period, it also recommends that noise levels from single sound events should not regularly exceed L_{Amax} 45dB. WHO defines 'regular' as not more than 10-15 events per night.

WHO also gives guidance on suitable noise levels for outdoor living areas such as gardens. The WHO guidelines state that '*to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB Laeq for a steady continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB Laeq'.*

The preface to GCN states that community noise includes road, rail and air traffic, industries, construction and public work, and the neighbourhood.

NIGHT NOISE GUIDELINES FOR EUROPE, WHO, 2009

Night Noise Guidelines for Europe (NNG) was published in 2009 as an extension to Guidelines for Community Noise (WHO) 1999. It provides additional guidance in relation to the observed adverse effects of noise on sleep and proposes two external noise level criteria for the purposes of limiting these effects. The lowest noise criterion is based on the LOAEL. However, it recognises that achieving LOAEL will not be feasible in many circumstances and suggests that a higher Interim Target (IT) may be used instead as a guideline. However, the IT is not related to health based observations and should not, therefore, be interpreted as a threshold for SOAEL, which may be higher.

The document states that '*all Member States are encouraged to gradually reduce the proportion of the population exposed to levels over the IT within the context of meeting wider sustainable development objectives.'* While the guidelines provide useful information relating to the effects of noise on sleep, they have not been adopted into UK legislation, standards or guidance. The suggested guideline night time noise levels presented should not therefore be applied as a standardised criteria for assessment but may be useful when interpreting the significance of the impact of noise within the wider context of the development. Based on empirical evidence, it suggests that the LOAEL is $L_{night,outside}$ 40dB. Below this level there would be no observable adverse effects. Therefore, there would be little value in setting limits below this level.

BS 4142:2014 METHOD FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

The scope of BS 4142 states that it is aimed at the assessment of sound from fixed installations and mobile plant that form an intrinsic part of the overall sound emanating from an industrial/commercial premises or process. It is not intended to be used for the assessment of temporary activities such as construction and demolition, which are outside the scope of the Standard.

The principle of BS 4142 is to determine an initial estimate of impact of industrial/commercial sound on nearby residents by comparing the Rating Level (sound level from the industrial/commercial source, with a correction applied for any acoustic features that characterise the sound) with the Background Sound Level (L_{A90} as measured in absence of the industrial/commercial source).

Generally, the greater the difference by which the Rating Level exceeds the Background Sound Level, the greater the magnitude of impact. BS 4142 states that *'a difference of around +10 dB or more is likely to be an indication of a significant adverse impact […]. A difference of around +5 dB is likely to be an indication of an adverse impact […]. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.'*

However, BS 4142 also advises that, in each case, the context in which the sound is placed must be considered and the initial estimate of impact should be modified accordingly. For example it advises '*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.'*

It also indicates that impacts estimated during '*the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes.'*

Drilling, workover, and testing and appraisal are also all short term, temporary activities carried out to test the potential for and/or prepare the wellsite for production. The equipment used cannot be considered a fixed installation nor a mobile plant that forms an intrinsic part of the overall sound emanating from premises or processes at the site over the long term.

Therefore, it is not supported in guidance to use BS 4142 to assess these activities. Other more relevant Standards and guidance are available for this purpose and these are well established. In them, it is recognised that sound levels that might be considered to cause a potential significant adverse effect over the long-term period, may be acceptable over the short term. A balance must be made between potential temporary adverse effects over the short term with the economic and social benefits afforded to the wider community over the long term.

Once short-term construction, drilling and testing are complete, and oil and gas production is underway, then BS 4142 may also be considered as an assessment methodology to be used for the site. This would cover both the day and night periods, although the night period is more critical.

9. ASSESSMENT METHODOLOGY

The objective of any proposed noise mitigation is to achieve levels better (lower) than the SOAEL and approach the LOAEL, as far as is reasonably practicable, in line with NPSE and PPG guidance. The following sections set out the thresholds used in the assessment to determine the potential for significant adverse effects to arise and scope for mitigation as required to minimise these potential effects.

9.1 CONSTRUCTION NOISE

The assessment thresholds for construction noise are based on the values given in BS 5228-1:2009+A1:2014 Table E.1 (ABC Method) for the identification of potential significant effects. The table presented in the Standard is copied below in Table 3.

Assessment category and threshold value period	Threshold value, in decibels (dB) ($L_{Aeq,T}$)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23.00−07.00)	45	50	55
Evenings and weekends [D]	55	60	65
Daytime (07.00−19.00) and Saturdays (07.00−13.00)	65	70	75
NOTE 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. *NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.* *NOTE 3 Applied to residential receptors only.*			
[A] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. [B] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. [C] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. [D] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.			

Table 3: Construction noise assessment thresholds (table copied from BS 5228-1)

Construction activities would be carried out during the daytime period only. Where existing daytime ambient noise levels are less than $L_{Aeq,T}$ 63dB, the Category A threshold would apply. Under these conditions the SOAEL would be $L_{Aeq,T}$ 65dB. Where existing ambient noise levels are higher, a higher threshold for SOAEL would apply.

BS 5228 does not provide any indication of what might be considered a LOAEL for construction noise. WHO GCN, however, states that community noise includes construction and suggests that where noise levels do not exceed L_{Aeq} 50dB in external amenity areas, moderate annoyance would be avoided. This is, therefore, considered to be a reasonable threshold for LOAEL during the daytime period. If there is any construction activity at night WHO GCN suggests the value of the LOAEL is $L_{night,outside}$ 40dB. It suggests at night-time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedroom windows open. This value may be considered the SOAEL at night.

Assessment period	LOAEL $L_{Aeq,1hr}$ (dB)	SOAEL $L_{Aeq,1hr}$ (dB)
Daytime period (07:00-23:00)	50	65
Night time period (23:00-07:00)	40	45

Table 4: Construction activity assessment (SOAEL and LOAEL) thresholds

9.2 NOISE FROM DRILLING, COMPLETION AND PRODUCTION TESTING

Drilling, completion and production testing are all temporary activities of different durations. Once completed, the site moves into its production or normal operating long-term phase. This may however still involve some temporary maintenance activity from time to time. Once the site is into normal production, then its noise impact is assessed in accordance with BS4142.

During the short term drilling, completion and production testing activity, the various recommended criteria in the described policies, guidance, and Standards, reveals a fairly consistent appraisal of what is considered to constitute a significant adverse effect in relation to noise from the temporary activities such as those proposed at this site.

Drilling, completion and production testing would be carried out over a 24 hour period. The night time period will, therefore, be critical to the assessment of noise from these activities.

Although the proposed activities are short term and temporary and would, therefore, not be assessed under BS 4142, it may still be useful to consider some of the guidance provided within this Standard, as it does relate to noise from industrial sources, albeit aimed at permanent, long term installations. BS 4142 states that *'where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.'* The Standard, therefore, recognises the importance of consideration of absolute noise levels and points to other Standards and guidance such as BS 8233 and WHO guidance. This is particularly relevant to rural areas.

Empirical evidence referenced by WHO NNG indicates that the night time LOAEL is L_{night} 40dB, for all sources. WHO suggests this level as a target designed to protect the public, including the most vulnerable groups such as children, chronically ill and elderly people. Below this level there would be no observable adverse effects and little benefit in carrying out an assessment under BS 4142.

Likewise, an absolute threshold for SOAEL may also be considered, below which there would be no significant adverse effects. For industrial sound, BS 4142 indicates a difference between the onset of adverse impact and significant adverse impact of 5dB (i.e. SOAEL = LOAEL + 5dB). The SOAEL for industrial sound at night could, therefore, be considered to be L_{night} 45dB. Also WHO CGN aligns with this by suggesting at night-time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedroom windows open. This value may be considered the SOAEL at night. Above this value, the significance of industrial sound may then be considered in context with the existing acoustic environment, as per the methodology in BS 4142.

The NPPF requires that planning policies and decisions should ensure that new development is designed so as to mitigate and reduce to a minimum any potential adverse impacts. In other words, the aim of

mitigation is to avoid exceeding the SOAEL and to approach the LOAEL as far as is reasonably practicable, within design constraints.

Additionally, PPG-M guidance states that local authorities should establish a planning noise level limit for minerals extraction sites, and suggests a value of $L_{Aeq,1hr}$ 42dB at night. Noise levels from minerals extraction activities, as referred to in the PPG-M, would typically be variable. The suggested night time limit of $L_{Aeq,1hr}$ 42dB would, therefore, be a maximum allowable limit for any given one-hour period during the night. Accounting for some variation in operational noise levels, this might be equivalent to a long term annual average value of L_{night} 40dB, suggested to be the LOAEL by WHO.

The PPG-M (Para. 21) also states that *'care should be taken, however, to avoid any of these suggested values being implemented as fixed thresholds as specific circumstances may justify some small variation being allowed.'* This reflects the position of the NPPF (Para. 240g), which states that *'planning policies should […] when developing noise limits, recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction.'*

Table 5 summarises the assessment thresholds for drilling, completion and production testing both for the day and night time periods. The daytime LOAEL and SOAEL is based on WHO GCN guidance for external amenity spaces. A cautious approach has been taken by setting the thresholds over one-hour periods, rather than the full day or night time periods from which the values are derived.

Assessment period	LOAEL $L_{Aeq,1hr}$ (dB)	SOAEL $L_{Aeq,1hr}$ (dB)
Daytime period (07:00-23:00)	50	55
Night time period (23:00-07:00)	40	45

Table 5: Drilling, workover, and testing and appraisal assessment thresholds

9.3 OIL AND GAS PRODUCTION NOISE

The various recommended criteria in the described policies, guidance, and Standards, reveals a fairly consistent appraisal of what is considered to constitute both a significant adverse effect, and also just an adverse effect, in relation to noise from activities such as those proposed at this site.

Noise impact from normally operating industrial sites is typically assessed following the methodology set out in BS 4142. The Standard, however, states that *'where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.'* The Standard, therefore, recognises the importance of consideration of absolute noise levels and points to other Standards and guidance such as BS 8233 and WHO guidance.

Empirical evidence referenced by WHO NNG indicates that the night time LOAEL is L_{night} 40dB, for all sources. WHO suggests this level as a target designed to protect the public, including the most vulnerable groups such as children, chronically ill and elderly people. Below this level there would be no observable adverse effects and little benefit in carrying out an assessment under BS 4142.

Likewise, an absolute threshold for SOAEL may also be considered, below which there would be no significant adverse effects. For industrial sound, BS 4142 indicates a difference between the onset of adverse impact and significant adverse impact of 5dB (i.e. SOAEL = LOAEL + 5dB). The SOAEL for industrial sound at night could, therefore, be considered to be L_{night} 45dB. Above this value, the significance of industrial sound may then be considered in context with the existing acoustic environment, as per the methodology in BS 4142.

The NPPF requires that planning policies and decisions should ensure that new development is designed so as to mitigate and reduce to a minimum any potential adverse impacts. In other words, the aim of mitigation is to avoid exceeding the SOAEL and to approach the LOAEL as far as is reasonably practicable, within design constraints. PPG-M guidance states that local authorities should establish a planning noise level limit for minerals extraction sites, and suggests a value of $L_{Aeq,1hr}$ 42dB at night.

Noise levels from minerals extraction activities, as referred to in the PPG-M, would typically be variable. The suggested nighttime limit of $L_{Aeq,1hr}$ 42dB would, therefore, be a maximum allowable limit for any given one-hour period during the night. Accounting for some variation in operational noise levels, this might be equivalent to a long term annual average value of L_{night} 40dB, suggested to be the LOAEL by WHO.

Table 6 summarises the assessment thresholds for operational activities both for the day and nighttime periods. The daytime LOAEL and SOAEL is based on WHO GCN guidance for external amenity spaces. A cautious approach has been taken by setting the thresholds over one-hour periods, rather than the full day or nighttime periods from which the values are derived.

Assessment period	LOAEL LAeq,1hr (dB)	SOAEL LAeq,1hr (dB)
Daytime period (07:00-23:00)	50	55
Night time period (23:00-07:00)	40	45

Table 6: Nighttime period (23:00-07:00) production phase noise assessment thresholds

The EA in considering the impact of long-term operating or production noise require assessments according to BS 4142, however BS 4142 is clear in stating that where rating and background levels are low, absolute noise levels may be more relevant in assessing the impact.

Whilst acknowledging the weight that the EA give to BS 4142, consideration of absolute levels is fully part of a BS 4142 assessment and cannot be disassociated from the Standard. BS 4142 cannot be interpreted in one way for planning and a different way for permitting. Consistency is key.

However, for completeness, but essentially for mainly context, a full baseline noise survey has been undertaken so that comparisons can be made between Rating Levels and Background Sound Levels, to establish an initial indication of noise impact. The methodology for the survey, complies with the high demands set down by the EA, and incorporates the suggestions made by the EA when they responded to the Noise Scoping Report.

10. ENVIRONMENTAL NOISE BASELINE

10.1 REQUIREMENTS IN BS 4142

An initial indication of the noise impact of activity during the long-term production phase can be established using the procedure as outlined within BS 4142, although where Rating Levels and Background Sound Levels are low, the Standard accepts that absolute levels may be a more relevant indication of noise impact.

A cautious approach is adopted here that even though the noise impacts and background noise levels are expected to be low, a full baseline noise monitoring survey was undertaken to provide a fuller picture of the existing noise environment.

The survey has been carried out in accordance with both the requirements stated within BS 4142 but more importantly with the detailed requirements of the EA. In particular the approach to the survey was fully described within the Noise Scoping Report[1], and EA detailed comments on the approach have been fully taken on board in its execution. This has resulted in a high-quality baseline noise data set, fully evaluated for 4 different wind directions. Other aspects studied are weekday/weekend differences. Data excluded is that when the local weather station recorded high wind conditions (>3.5m/s mean, to ensure most data is acquired < 5m/s gusting). Furthermore, data acquired when rain is falling and for 1 hour after this time, is also excluded. All this is done using Spectrum's suite of post-processing programs developed to establish high quality baseline noise datasets.

10.2 MEASUREMENT SURVEY METHODOLOGY

A noise measurement survey has been carried out at the site to establish the background (L_{A90}), residual (L_{Aeq}) sound levels, and L_{AFmax} sound levels, at the nearest noise sensitive receptors (NSR).

Long term unattended measurements were made at NML1 (near NSR1) and NML2 (near NSR3) as shown in figure 2. These represent the closest and the furthest of the four nearest NSRs to the wellsite. Measurement data was obtained for a continuous period of 23 days/nights (18.12.23 – 10.1.24). Measurements at these locations are post processed in detail to establish the baseline and more particularly the $L_{A90,15min}$ background sound level in the area. During this period a temporary weather station was installed near NSR 4.

Photos of the instrumentation in use at the receptors are included in Appendix B.

Short term attended measurements were made close to all four NSRs with the purpose of obtaining a small sample of data to establish instantaneous differences between each receptor and to calibrate against the long-term monitor values.

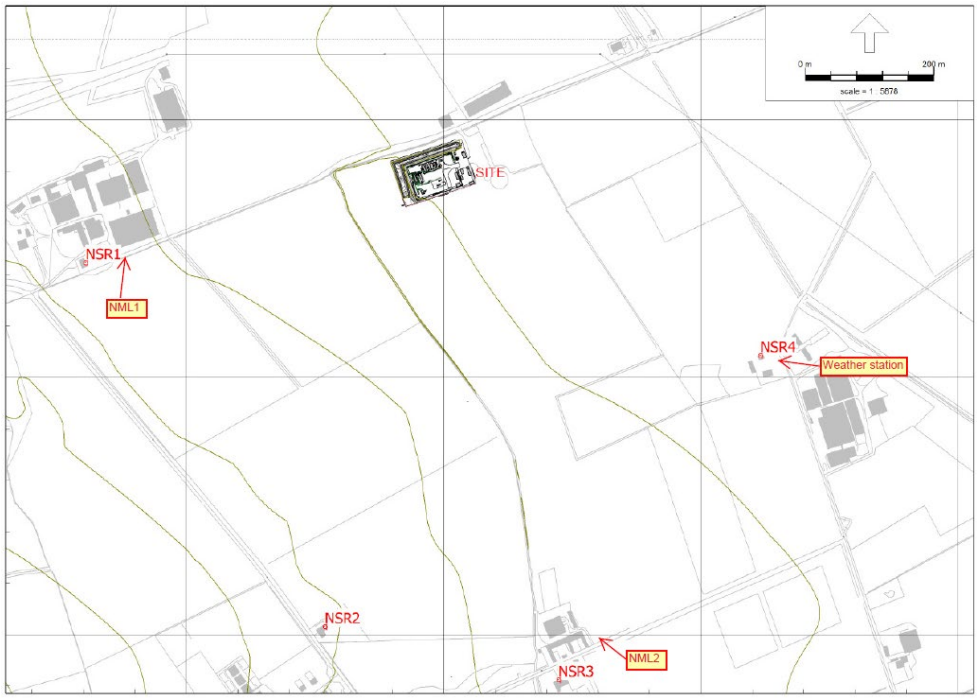


Figure 2: Noise sensitive receptors (NSR) and (unattended) noise and weather monitoring locations

The following equipment was used:

For unattended monitoring:

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 2739650
- Bruel & Kjaer Type 4189 Microphone s/n 2983518
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 3030452

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 2726905
- Bruel & Kjaer Type 4189 Microphone s/n 2710995
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 2730220

- Davis Vantage Pro 2 Weather Station

- Weatherproof cases, carbon fibre microphone poles, all weather microphone protection.

For attended measurements on 18.12.23 and 10.1.24

- Bruel & Kjaer Type 2250 Sound Level Meter s/n 3000713
- Bruel & Kjaer Type 4189 Microphone s/n 2780512
- Bruel & Kjaer Type 4231 Acoustic Calibrator s/n 3001598

Before and after the survey, the sound level meters field-calibrated in accordance with the manufacturer's guidelines; the calibration values, along with the date of instrument external calibration, are included

within appendix B as required by the EA. Calibration certificates are available on request. However, the results show no significant drift duration the survey periods. The meters, microphones and field calibrators are laboratory calibrated biennially in accordance with UKAS procedures or to traceable National Standards.

10.3 MEASUREMENT RESULTS

Soundscape description

During the two attended measurement surveys near all 4 NSRs, observations were made about the ambient noise environment. These are now summarised.

Attended measurements were made only during the day, however the soundscape during the night is quieter as local farms become less active and nearby roads less busy.

The nearest NSRs are either to the west of the site or broadly south of it. Set back distances are large at typically over 500m. The levels of noise generated by existing production on the site are low and propagation modelling show them all to be below the existing nighttime background sound levels, so are not contributing to ambient noise measurements.

The land around the receptors is generally either woodland or arable farmland. Farm activity strongly influences ambient noise levels at:

NSR1 (Farm buildings, yard machinery, grain stores and grain dryers)
NSR3 (Farm and administrative buildings, ventilation fans)
NSR4 (Pig farming units, fans and machinery)

NSR 2 is not affected by farm noise but it is located on the B1208 and experiences significant road traffic noise.

All NSR were influenced by major noise sources further afield, notably the British Steel Scunthorpe Steelworks 4kM to the west, and the M180 motorway about 3.5km to the south, running east-west. Prevailing SW and W winds will mean noise from these distant sources are likely to be noticeable. Occasional highly audible noise events associated with the steelworks were observed.

Table 7 shows the results of listening to short samples of sound recordings made at 01:00 on nights where average wind speeds were low (< 3.5m/s).

Date	Wind direction	Sound description at NML1 near NSR 1 (sound level La90)	Sound description at NML2 near NSR 3 (sound level La90)
24/12	WNW	Mid frequency grain dryer (37 dB)	No discernible sources. Some wind in trees (34 dB)
27/12	SSW	Mid frequency grain dryer (34 dB)	Some distant traffic (27 dB)
30/12	NW	Strong tonal grain dryer (36 dB)	Some distant traffic (31dB)
4/1	NW	Grain dryer (34 dB)	Some distant traffic (29 dB)
5/1	NNE	Low frequency rumble grain dryer (32 dB)	Some distant traffic (30dB)
7/1	E	Low frequency rumble grain dryer (32 dB)	No discernible sources (29dB)
8/1	ESE	Low frequency rumble grain dryer (32 dB)	No discernible sources (28dB)
10/1	SE	Louder low frequency rumble dryer (37 dB)	No discernible sources (31dB)

Table 7: Sound recordings analysis (Soundscape) at 01:00 on different nights

At neither location was steady noise from the existing producing site perceived. In both cases, in spite of different wind directions, the range of $L_{A90,T}$ background levels at this single time of night was narrow. Ignoring the highest and lowest values, the range was $L_{A90,T}$ 32-37dB at NML1 and $L_{A90,T}$ 28-31dB at NML2.

All the values measured at 01:00 at NML1 included substantial contributions from nearby grain and other drying systems in the farm buildings. Dryers switch on and off regularly and may have been off for some periods later in the night. Discussion with the farm/estate owners suggested that there were 4-5 separate dryers, and they operated anytime over the 24-hour period. However, these are seasonal noise sources and are absent during the summer months. At night, during the summer, grain dryers would not be operating, and the farm buildings will be quiet. The only sources of noise present are likely to be those that contributed to the levels at NML2 which is predominantly distant traffic. The levels recorded at NML2 are highly likely to prevail on many occasions over the whole study area.

Attended Daytime Noise Measurements

Attended daytime measurements were made at NSR1-4. The purpose of these was to compare values of $L_{A90,T}$ background attended measurements with results being recorded in the unattended continuous noise monitors. The full comparisons are included within Appendix B, however the mean difference between attended and unattended La90 background levels at the two unattended monitoring positions was 1.0 dB only so very good correlation is demonstrated.

The attended daytime measurements are also shown for each of the four NSRs. Although only a small sample of data, the results, especially the important $L_{A90,T}$ values were higher at NSR1 and NSR2 than at NSR3 and NSR4. The reason for this at NSR1 is the presence of grain and other drying systems associated with the farm buildings. At NSR 2 the main reason is the proximity of the nearby B1208 road.

Unattended Continuous Noise Monitoring – Weather monitoring

The important baseline noise levels recorded were those at the two noise monitors NML1 and NML2 located close to NSR1 and NSR3 respectively.

The large dataset from 23 days of continual noise monitoring at each location, along with simultaneous weather data recorded in the area, means that data obtained under adverse wind and weather conditions can be filtered out, and also results can be analysed for different wind directions.

Figure 3 shows the wind rose for the duration of the noise monitoring. Even for winter conditions there were long periods of high wind speeds (WNW and NW), which meant that noise data for these periods (typically 60% of the survey period) couldn't be used to establish representative baseline levels. Broadly speaking, the black, orange and yellow categories are all discarded. However, there is a reasonable range of wind directions left with low wind speeds, and sufficient for a robust dataset.

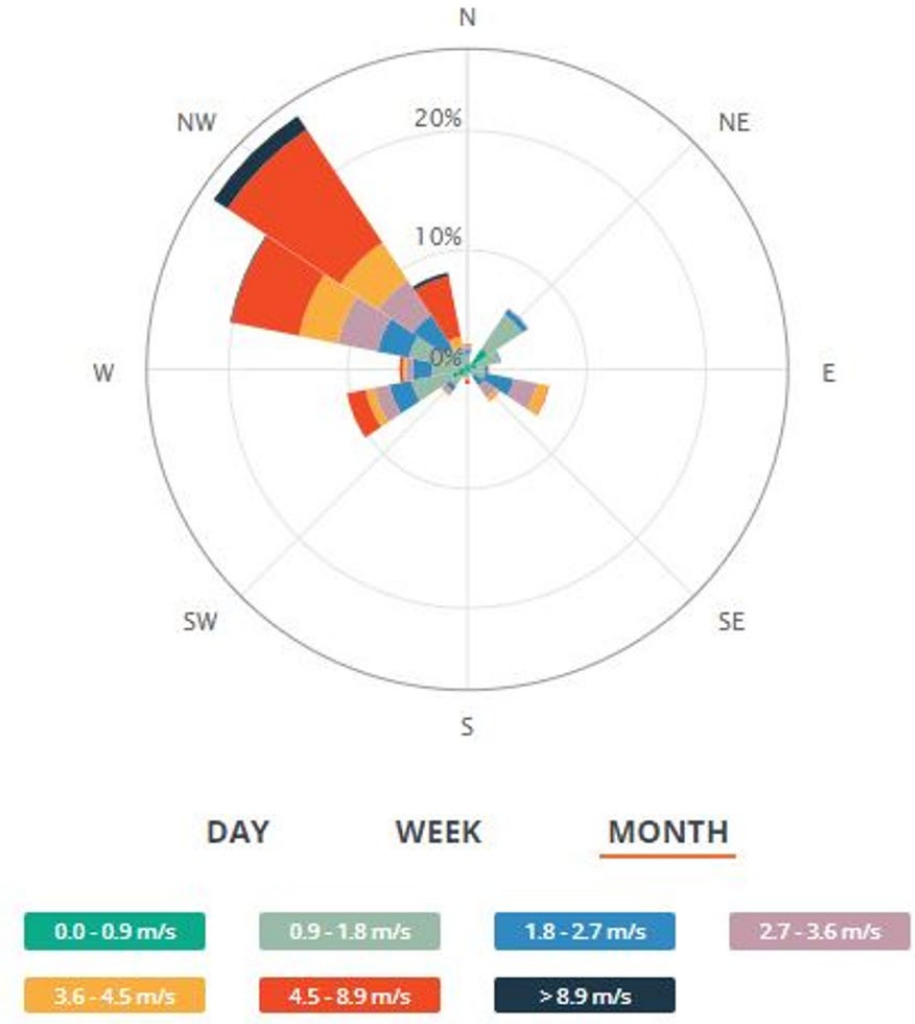


Figure 3: Wind Rose (mean speed) for the duration of the 23 days unattended noise monitoring.

Similarly, the rainfall was monitored over 15 minute intervals throughout the survey period, and times when rain was falling and for a further 1 hour period after each occasion (to allow road surfaces to drain) were excluded from the dataset (this is done by assigning a high wind speed value of 9m/s to all wet periods in the dataset, which automatically ensures it is excluded)

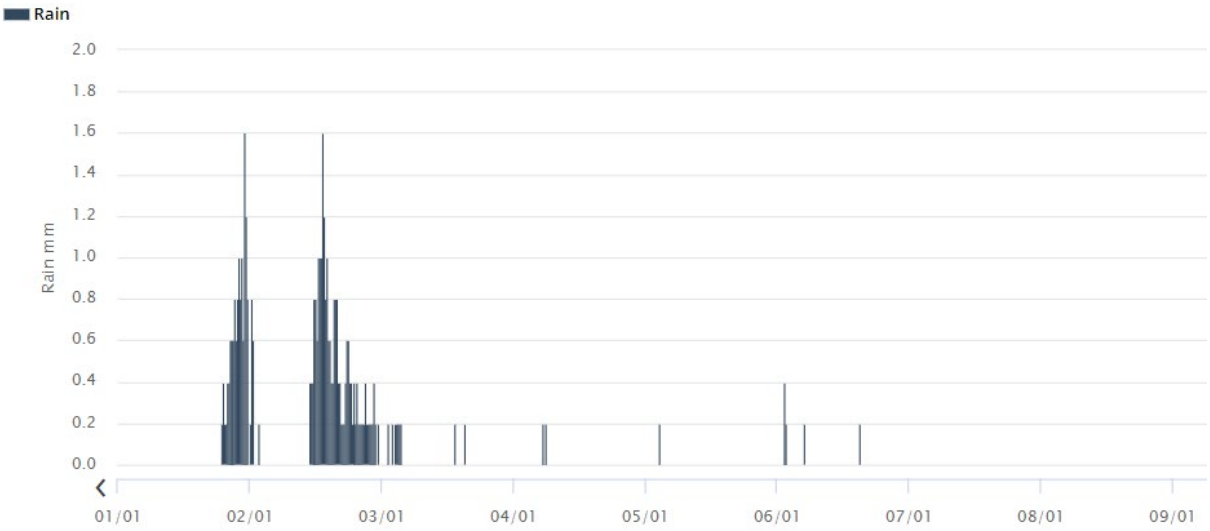


Figure 4: Rain measurement chart for part of the monitoring period.

Rain, sometimes heavy, was a characteristic of the dataset, with a result that further data was excluded from the post-processed dataset. This rain was associated with the storms in the early and mid part of the period. The conditions from January 3rd to 10th were dryer with much lighter winds.

Unattended Continuous Noise Monitoring – Noise Data

Graphical representation of the noise monitor at NML1 and NML2 are included within appendix B but are also shown in Figures 5a and 5b. This provides a helpful visual understanding of the change in noise levels each day and the reduction in noise when high wind speeds abated.

However, the large dataset needs to be statistically analysed through post-processing in order to establish representative values for noise that can be used as part of an assessment.

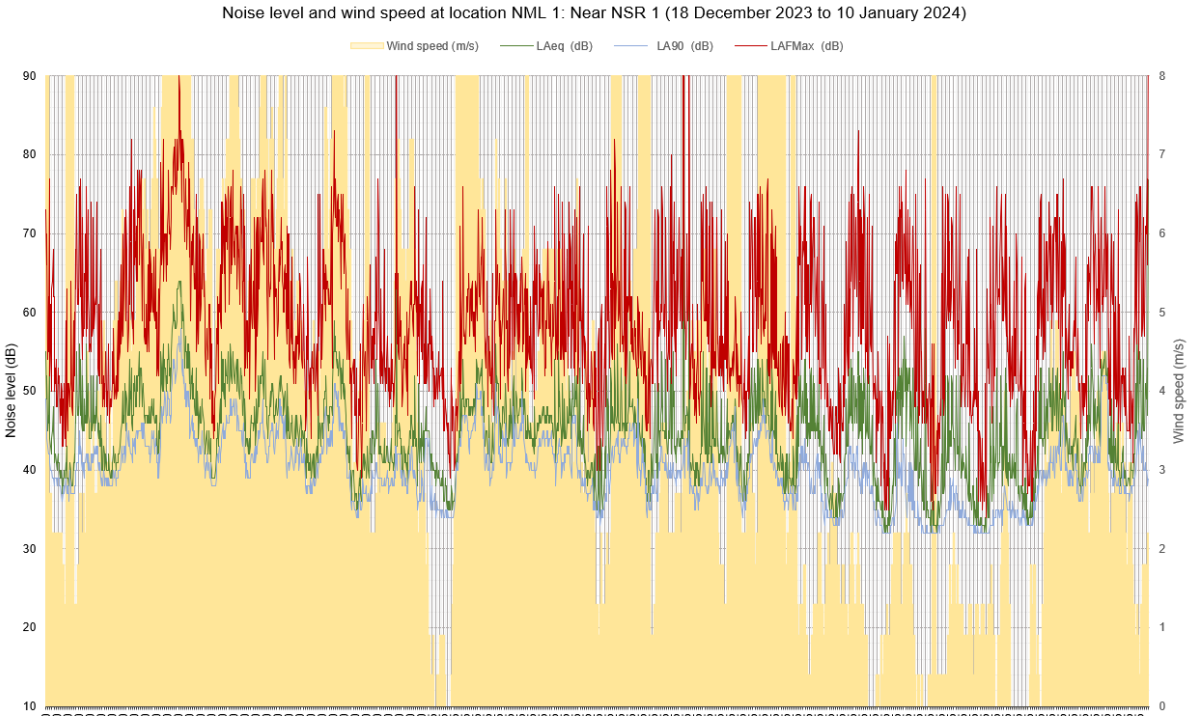


Figure 5a: Graphical noise profiles over full monitoring period at NML1 near NSR1

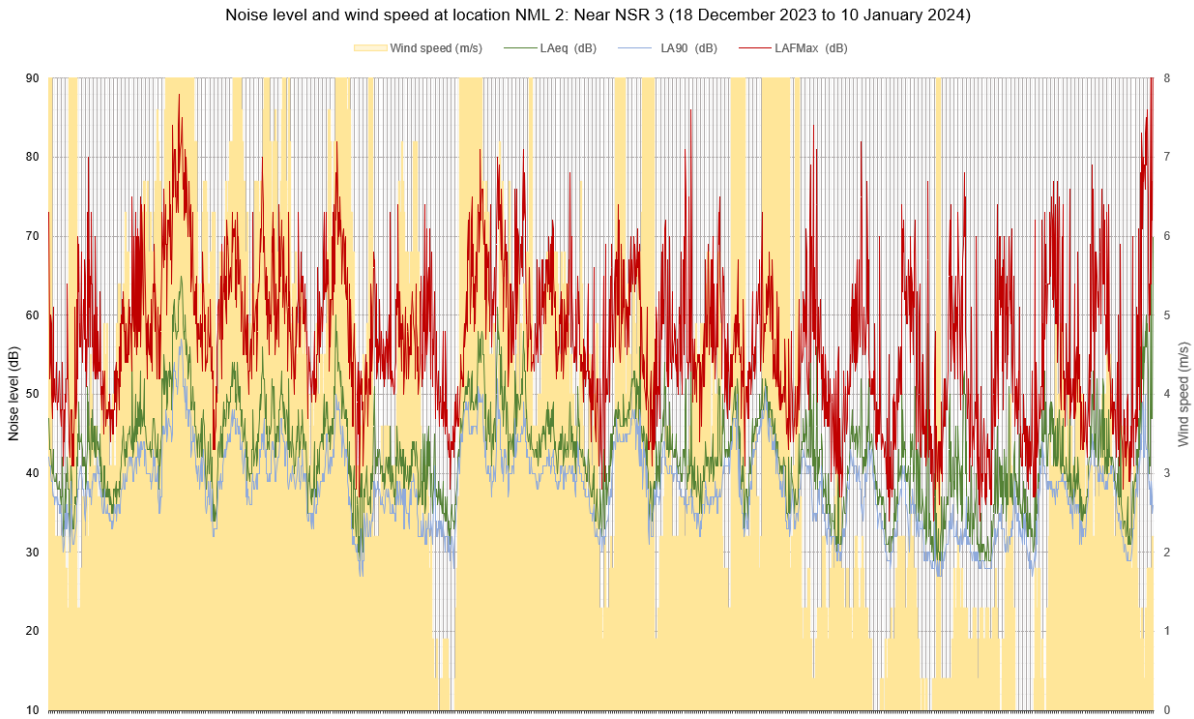


Figure 5b: Graphical noise profiles over full monitoring period at NML2 near NSR3

With data being captured every 15 minutes the raw noise dataset comprises 2200 items from each noise monitor. This is too large to report here , even within an appendix.

However, appendix B includes the first page of printout of data, preceded by a table of statistical data values. The examples included in the appendix are night values with no filtering of wind direction. Figure 6 shows the top part of this first data page. Statistical summary data heads the table.

Raw data and central tendencies for location NML 1: Near NSR 1

Measure of central tendency	L_{Aeq} (dB)	L_{A90} (dB)	L_{AFMax} (dB)
Modes	39	32	51
Mean	38	35	50
Mean - 1 s.d.	34	33	-
Log Average	41	-	-

Table 4: Night-time period (23:00 to 07:00)

Date	Time	L_{Aeq} (dB)	L_{A90} (dB)	L_{AFMax} (dB)	Wind direction (°)	Wind speed (m/s)
18/12/2023	23:00	39	37	47	247.5	1.80
18/12/2023	23:15	40	37	51	247.5	2.20
18/12/2023	23:30	38	36	50	292.5	1.80
18/12/2023	23:45	37	36	43	292.5	1.80
19/12/2023	00:00	39	37	49	292.5	1.80
19/12/2023	00:15	38	37	43	247.5	0.90
19/12/2023	00:30	40	38	49	270	1.30
19/12/2023	00:45	40	37	51	270	0.90
19/12/2023	01:00	39	38	44	270	0.90
19/12/2023	01:15	41	39	59	270	0.90

Figure 6: Top of a post processed data page of a noise monitor output

The statistical values determined for the complete valid datasets are mean for L_{AFmax} and background level $L_{A90,T}$, and log average for $L_{Aeq,T}$. These values extracted from this data set are included in tables 8a and 8b, which apply to NML1/NSR1 and NML2/NSR3 respectively. The first line of data is the total with all wind directions and the following 4 lines break these down for each wind direction, N, E, S and W.

Wind direction	***Mean maximum sound levels* L_{AFmax} (day/night)**	***Log average residual sound levels* $L_{Aeq,T}$ (day/night)**	***Mean background sound levels* $L_{A90,T}$ (day/night)**
Total	60/50	51/41	38/35
N	59/49	47/40	38/34
E	61/49	54/41	38/35
S	57/47	46/39	39/36
W	59/51	47/42	39/36

Table 8a: Post processed noise results for all days (day/night) at NML1/NSR1

The most important metric is the $L_{A90,T}$ during the night, which represents the background sound level. At NML1/NSR1 this ranges between 34-36dB depending upon wind direction. This range is so narrow that it can be concluded that the background noise level here at night is not dependent on wind direction in any significant way. This aligns with the dominant noise sources being associated with activity and in particular grain dryers, located close by. The representative background sound level at NSR1 can be taken to be the value for the whole valid dataset at $L_{A90,T}$ 35 dB.

At the most distant receptor from the wellsite (NSR3/NML2) levels measured are shown in Table 8b

Wind direction	*Mean maximum sound levels* L_{AFmax} (day/night)	*Log average residual sound levels* $L_{Aeq,T}$ (day/night)	*Mean background sound levels* $L_{A90,T}$ (day/night)
Total	57/49	48/41	36/34
N	58/48	50/39	35/32
E	58/48	51/41	35/33
S	54/47	43/38	38/34
W	56/51	44/41	38/35

Table 8b: Post processed noise results for all days (day/night) at NML2/NSR3

At NML2/NSR3 the $L_{A90,T}$ at night for all the valid data is 34dB, which ranges between 32dB with a N wind to 35dB with a prevailing W wind. This is not a large variation, but does reflect the presence, to a slight degree, of both the Scunthorpe Steelworks 4km west of the site long with the nearby B120x and the M180 3.5km to the south. However, the influence of the main sources are some distance away. As the effect of wind direction is so small, the representative background sound level at NSR3 can be taken to be the value for the whole valid dataset at $L_{A90,T}$ 34 dB, not least because this is the value under prevailing SW wind conditions.

Finally, consideration is given to the potential higher noise impact at weekends. Guidance does not necessarily automatically consider the weekend to be a more sensitive period of time to weekdays, although some stakeholders consider they are. From a technical viewpoint, there is an assumption that weekend noise impacts can be greater because ambient and background sound levels are lower, often due to less road traffic noise. However, this is not always the case. So, this aspect is considered solely here by considering the ambient noise levels at weekends and comparing these with those during the weekdays. Ignoring the effects of wind direction, table 9 shows the post processed baseline values for the whole valid dataset, then the values for weekdays and then for weekends. NML2/NSR3 is considered here to demonstrate any potential differences.

Location	Day type	*Mean maximum sound levels* L_{AFmax} (day/night)	*Log average residual sound levels* $L_{Aeq,T}$ (day/night)	*Mean background sound levels* $L_{A90,T}$ (day/night)
NML2/NSR3	All days	57/49	48/41	36/34
NML2/NSR3	Weekdays only	57/49	49/41	37/34
NML2/NSR3	Weekends only	57/48	43/39	35/33

Table 9: Post processed noise results for weekdays and weekends (day/night) at NML2/NSR3

The results in this table show that the levels of background $L_{A90,T}$ noise levels at night are 1dB lower during weekends than during weekdays. 1dB however is not significant nor sufficient to undertake a separate formal assessment of noise impact for weekend periods. However, in the assessment, reference can be made within discussions about night background levels at weekends being 1dB lower than during the week.

11. NOISE IMPACT ASSESSMENT

11.1 GENERAL AND NOISE MODELLING

The potential significant effects have been assessed during construction, drilling, testing/appraisal and finally for current production and then production following upgrading and application of noise mitigation measures.

All noise predictions have been carried out using the highest available quality of calculation package. The particular prediction software used for this analysis is Softnoise Predictor. This acoustic model implements the procedures set out in ISO 9613-2:1996 “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation to determine noise levels”, and is Quality Assured to all parts of ISO 17534:2015 “Acoustics – Software for the calculation of sound outdoors”. The Predictor model takes account of the following features in its calculation procedure:

- Source sound power level (for point, line and area sources)
- Reflection from nearby structures and source directivity
- Distance from noise source (geometric spreading)
- Atmospheric absorption
- Acoustic screening of intervening structures and topography
- Ground absorption
- Ground effects (which includes the height of ground relative to the noise source)

Full details of the equipment modelled including existing equipment including their respective sound power outputs are presented in Appendix C. This model input data also includes information in relation to where this information was obtained (eg for construction activity, mainly BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise).* Data for drilling rigs is cited as being either directly measured, with full information provided on where these were made. For normal oil and gas production, measurements have been made on site on existing production noise sources which are being retained or upgraded. Associated with this is a plan, developed to ensure Best

Available Techniques are implemented as part of the Environmental Permit requirements of the EA, to implement noise mitigation measures where dominant sources have been able to be identified and where noise mitigation has not yet been installed to abate these.

Noise has been assessed for each of these phases, at the nearest sensitive receptors to the site NSR 1, 2, 3 and 4, as shown in the site location plan of Figure 1. There are two noise results at each NSR. The first is at ground floor level and should be used for daytime noise assessment; the second is at first floor level and should be used for assessment at night.

11.2 CONSTRUCTION (PHASES 1 AND 4A)

This section assesses the potential noise impact of the construction of well cellars and site extension, grid connection and extended production facilities.

The approach to be adopted in this is to consider a worst-case scenario covering activity during construction on the wellsite itself, both in relation to the proposed site extension and later the construction of enhanced production equipment.

The full results of the noise simulation for the construction phases is shown within Appendix D. The noise contour map is also shown in Figure 7.

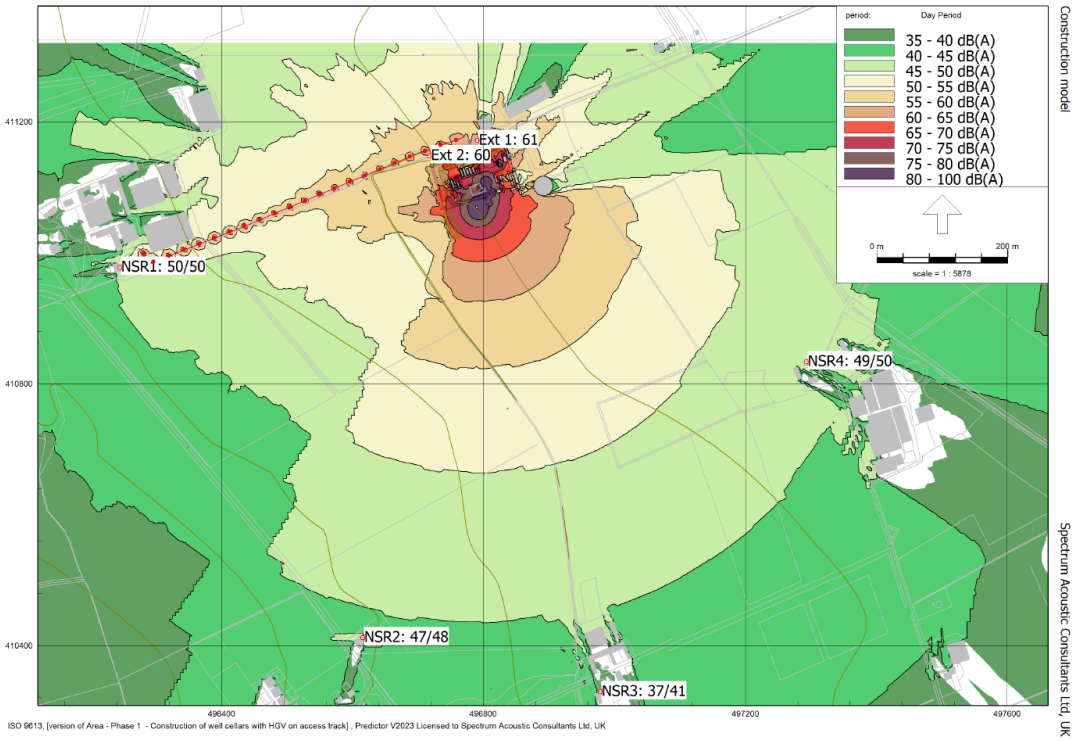


Figure 7: Predicted noise contours during daytime construction activity

Receptor	Noise level, $L_{Aeq,1hr}$ (dB)	Level of effect	Significant? (Yes/No)
NSR1 North/South Cottages	50	≤ LOAEL	No
NSR2 1 Broughton Grange Cottage	47	≤ LOAEL	No
NSR3 Broughton Grange	37	≤ LOAEL	No
NSR4 Decoy Cottage	49	≤ LOAEL	No

Table 10: Daytime predicted noise levels during construction phases

With the highest levels of noise predicted being $L_{Aeq,T}$ 50dB, all values are less than or equal to the LOAEL for daytime construction noise which is 50dB. With the threshold of significance being much higher still at 65dB, the levels provided avoid significant impacts by a very large margin.

There would be no construction activity in these phases at night.

During the short period of trenching activity relating to the connection to the NTS grid, construction equipment will be operating along the route of the connection, but as it moves, its impact will vary. For a short period of the overall construction programme, this activity will increase the general level of noise.

The route of the connection to the NTS is shown in Figure 8.

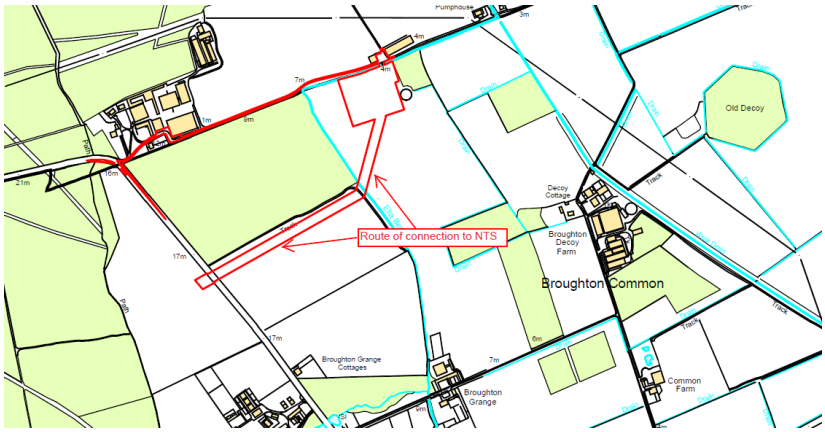


Figure 8: Route of the connection to the NTS

The noisiest elements in the trenching work for the connection will be the use of an excavator and vibratory compactor roller, with full details in appendix D.

The effect of including the short-term trenching work is shown in Figure 9.

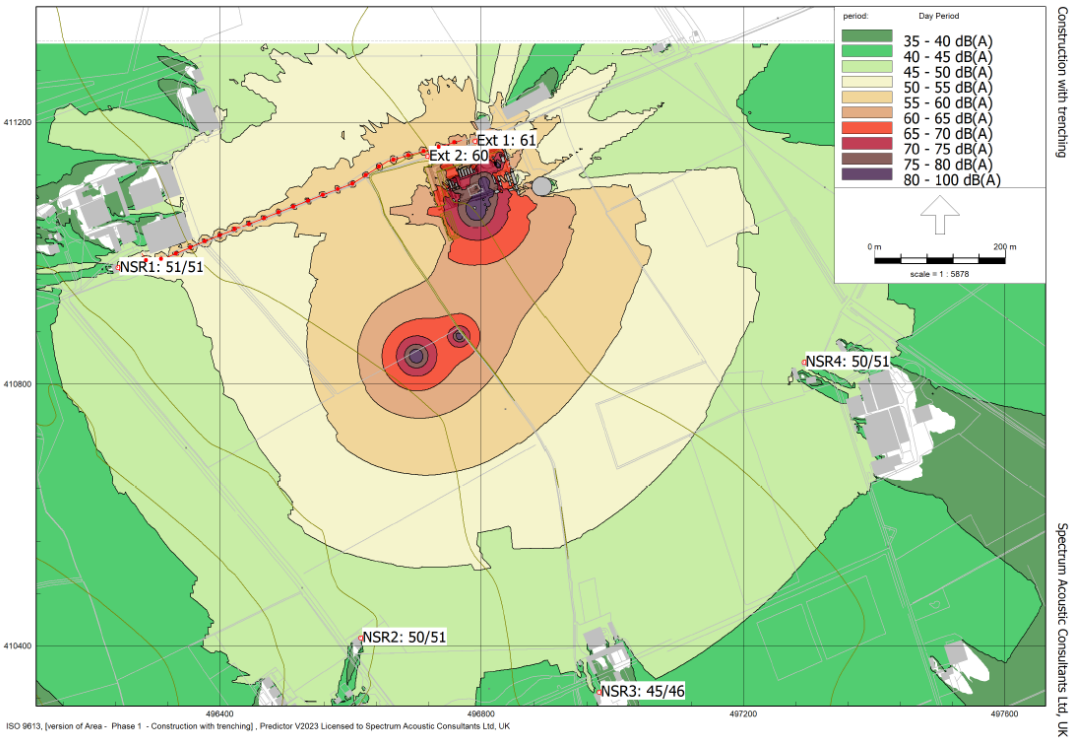


Figure 9: Predicted noise contours during daytime construction activity with trenching for the connection to the NTS

For a short period of time the daytime levels at NSR 1 rise to $L_{Aeq,T}$ 51dB and to 50dB at NSR 2 and NSR 4, which is a small increase in noise. However, the noise remains 14- 15dB less than the significant noise impact threshold (SOAEL) of 60 dB. In practice, the overall level of noise impact during the construction phases of the project are considered to be generally low.

11.3 DRILLING (PHASE 2A AND 3B)

New production wells W2 and W3 are proposed to be drilled. These have to continue once started for well integrity reasons so unavoidably have to operate 24 hours/day until the target depth has been achieved.

It is proposed that one of a number of candidate drilling rigs will be used.

- Consortium Rig 4 (with recently installed noise mitigation upgrades)
- Cuadrilla Drillmec HH-220
- BDF Rig 28 Ideco BIR5625
- Edeco Rig 407
- Marriott Rig 18

Appendix E includes full details of some of these candidate rigs along with the sources of the noise data for each. Sound power levels LwA information in Appendix C, of these rigs are established as being LwA 105 dB +/- 1dB. Final rig selection will be made at a later date when timings and rig availabilities can be established.

During this period of activity, it will be the night period where the potential noise impact is greatest. The full results of the noise predictions during drilling are included in appendix F, with Figure 10 showing the noise contours at night and table 11 showing the levels at each NSR against the appropriate LOAEL criterion. It should be noted that noise from existing production is included within this noise prediction. The LOAEL for night drilling is $L_{Aeq,T}$ 40 dB and the SOAEL 45 dB.

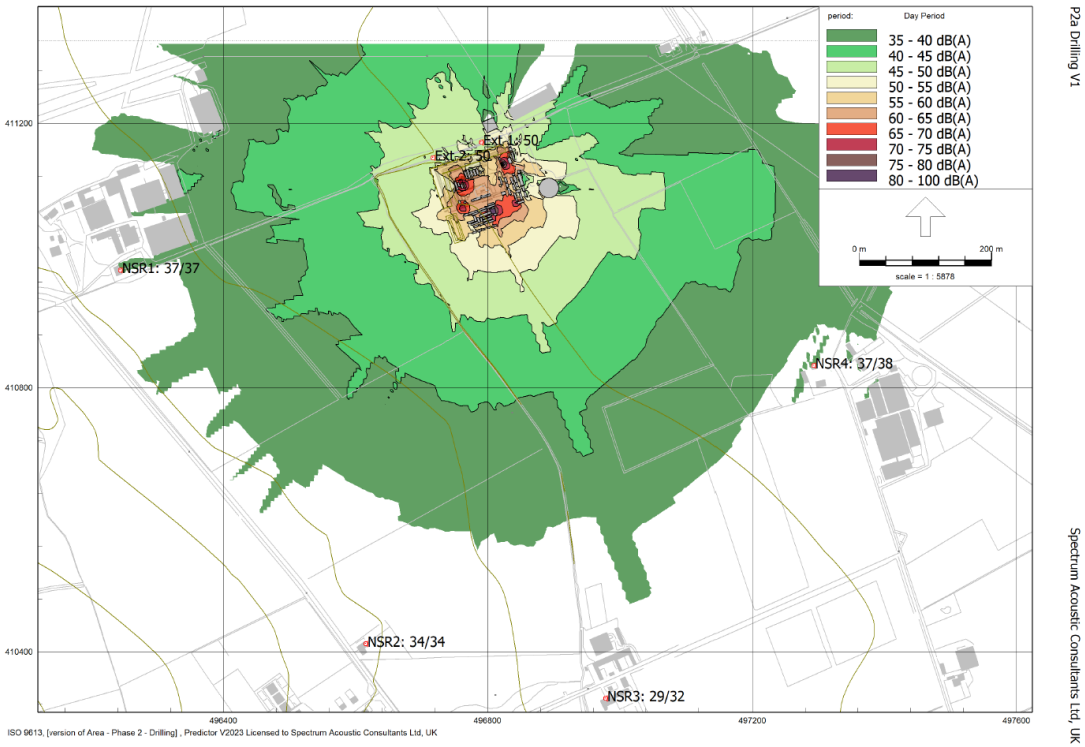


Figure 10: Predicted noise contours during nighttime drilling

Receptor	Noise level, $L_{Aeq,1hr}$ (dB)	Level of effect	Significant? (Yes/No)
NSR1 North/South Cottages	37	≤ LOAEL	No
NSR2 1 Broughton Grange Cottage	34	≤ LOAEL	No
NSR3 Broughton Grange	32	≤ LOAEL	No
NSR4 Decoy Cottage	38	≤ LOAEL	No

Table 11: Nighttime predicted noise levels during drilling phases

The results indicate that at all receptors, drilling noise levels would be below the LOAEL. Therefore, no adverse or significant adverse effects would arise at any residential receptors near to the wellsite.

Additionally, drilling noise levels would be below $L_{Aeq,1hr}$ 42dB, suggested as a potential nighttime noise level limit by PPG-M, for minerals extraction operational activities over the long term. Therefore, the noise impact resulting from the proposed shorter-term activities would be acceptably low.

11.4 WELL COMPLETIONS

Completion of these newly drilled wells is proposed using a workover rig. Workover activities once commenced are normally carried out uninterrupted and so as with drilling, need to continue 24 hours/day. Workover rigs and ancillary equipment have fewer noise sources than drilling rigs. Noise information used in this prediction is included within appendix G.

Figure 11 and table 12 show the noise contours and noise level values at each noise sensitive receptor at night during workover rig well completion activity.

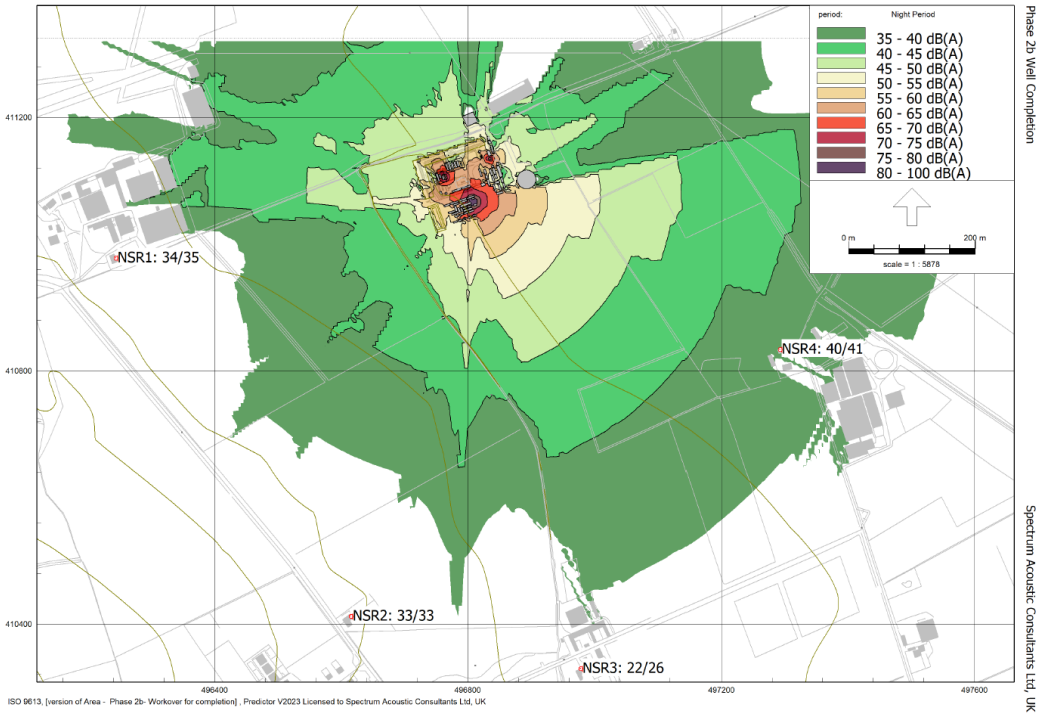


Figure 11: Predicted night noise contours during well completion activity

At night the LOAEL is $L_{Aeq,T}$ 40dB and the SOAEL is $L_{Aeq,T}$ 45dB

Receptor	Noise level, $L_{Aeq,1hr}$ (dB)	Level of effect	Significant? (Yes/No)
NSR1 North/South Cottages	35	≤ LOAEL	No
NSR2 1 Broughton Grange Cottage	33	≤ LOAEL	No
NSR3 Broughton Grange	26	≤ LOAEL	No
NSR4 Decoy Cottage	41	Between LOAEL and SOAEL	No

Table 12 Nighttime predicted noise levels during well completion activity

The noise impact of $L_{Aeq,T}$ 41dB during well completion activity nominally exceeds the LOAEL at night (1 dB which is not in practice material) but is well within the SOAEL of Laeq 45 dB. There is a need to ensure noise from the activity is minimised with appropriate noise mitigation. In addition to standard noise mitigation measures, the following additional noise mitigation measures have been incorporated into the workover rig:

- Acoustic enclosure for main rig diesel engine drive and drive train
- Acoustic barrier material, such as Echobarrier, https://echobarrier.com/noise-reduction-barriers#section1-view-products is utilised from the rig trailer level to the ground, to reduce engine noise from under the trailer

These mitigation measures are assumed will remain in place during completion activities. It may be that completion is limited to daytime periods in which case there will be no exceedance of the LOAEL

11.5 PRODUCTION TESTING (PHASE 3A)

Following new well completions, production flows will be tested. This will be repeated following the well stimulation (proppant squeeze). It is likely that the flows and associated noise generated will likely be higher after well stimulation, so this is the condition which has been noise modelled and will be assessed.

Flow test and pumping equipment will also be installed and any associated gas will be burnt off by flaring during this temporary period. Flow rates are anticipated to be up to 2,400 M^3/hr up from a current rate of 500M^3/hr. Noise from the enclosed ground flare will increase from the current levels. Noise data for the flare has been measure and also provided by the manufacturer and is included within appendix H.

Flare noise can vary significantly depending on a number of factors, including gas flow rate, flare tip diameter, pressure drop at tip, and rate of steam/air injection, among other factors.

The detailed results of the model simulation are presented in Appendix H. The noise contour plot is shown in Figure 12 and the values at each receptor included in table 13.

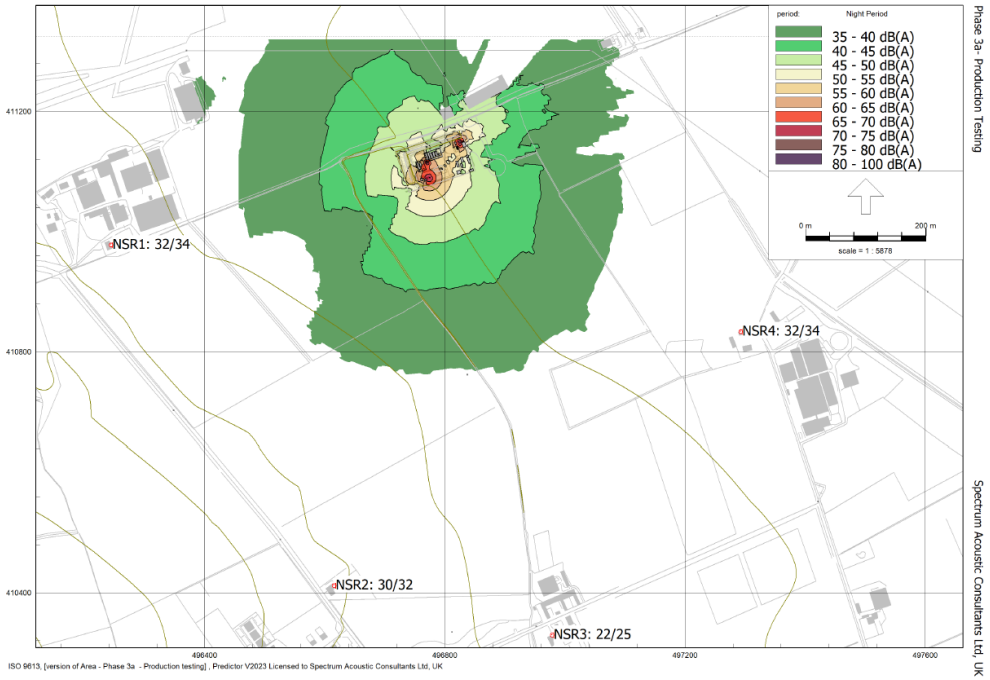


Figure 12: Predicted night noise contours during production testing

At night the LOAEL is $L_{Aeq,T}$ 40dB and the SOAEL is $L_{Aeq,T}$ 45dB

Receptor	Noise level, $L_{Aeq,1hr}$ (dB)	Level of effect	Significant? (Yes/No)
NSR1 North/South Cottages	34	≤ LOAEL	No
NSR2 1 Broughton Grange Cottage	32	≤ LOAEL	No
NSR3 Broughton Grange	25	≤ LOAEL	No
NSR4 Decoy Cottage	34	≤ LOAEL	No

Table 13: Nighttime predicted noise levels during production testing

The results indicate that noise levels during production testing are in the range $L_{Aeq,T}$ 25-34 dB depending upon location. This is substantially below the LOAEL and no significant effects would arise and the noise impact would be low.

11.6 WELL STIMULATION (PROPPANT SQUEEZE)

The well stimulation (proppant squeeze) will take a short period of time (typically 3 hours and during the day) for this activity to be completed. During that time, noise levels will rise, primarily due to trailer mounted pumps running.

The type of pumping equipment proposed to be used for the short proppant squeeze activity has already been used for proppant squeeze at this site in 2021 and was noise tested[6]. The key noise data from this report has been identified and is included within Appendix J along with the resulting sound power level established for the Proppant Squeeze activity.

The predicted levels of noise are shown in full in appendix J with the noise contour map and the numeric values at receptors shown in Table 14.

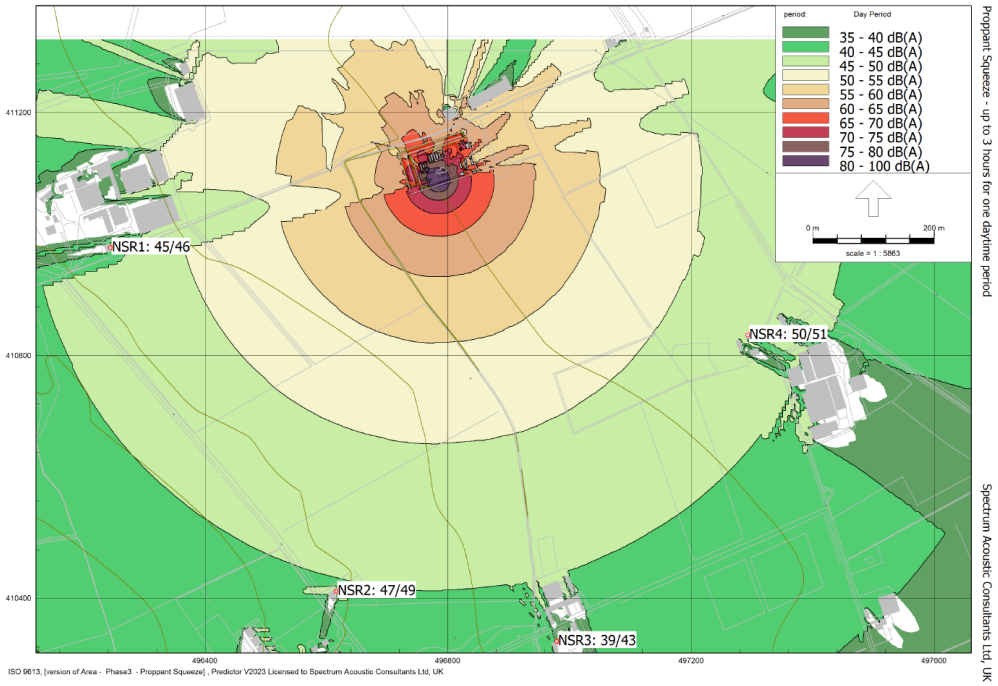


Figure 13: Daytime predicted noise contours during 3-hour stimulation (proppant squeeze)

Although this activity is a single event over a period of 3 hours, it is carried out during the drilling and production testing phase, and therefore a cautious approach would have the criteria for these phases apply. During the daytime the LOAEL is $L_{Aeq,T}$ 50dB and the SOAEL is $L_{Aeq,T}$ 55dB. It might however be noted that if characterised as a construction activity, the SOAEL is 10dB higher at $L_{Aeq,T}$ 65dB.

Receptor	Noise level, $L_{Aeq,1hr}$ (dB)	Level of effect	Significant? (Yes/No)
NSR1 North/South Cottages	45	≤ LOAEL	No
NSR2 1 Broughton Grange Cottage	47	≤ LOAEL	No
NSR3 Broughton Grange	39	≤ LOAEL	No
NSR4 Decoy Cottage	50	≤ LOAEL	No

Table 14: Daytime predicted noise levels during 3-hour stimulation (proppant squeeze)

[6] *Proppant Squeeze Noise Level Measurement 25 July 2021 , Lodge Farm, Clapp Gate, Appleby, Scunthorpe, ACIA*

During the brief period of well stimulation, the predicted noise levels do not exceed the LOAEL values. Even during this event the noise impact assessed would be low.

11.7 OIL AND GAS PRODUCTION

11.7.1 Assessment criteria for production phase

Empirical evidence referenced by WHO NNG indicates that the nighttime LOAEL is L_{night} 40dB, for all sources. WHO suggests this level as a target designed to protect the public, including the most vulnerable groups such as children, chronically ill and elderly people. Below this level there would be no observable adverse effects and little benefit in carrying out an assessment under BS 4142.

Likewise, an absolute threshold for SOAEL may also be considered, below which there would be no significant adverse effects. For industrial sound, BS 4142 indicates a difference between the onset of adverse impact and significant adverse impact of 5dB (i.e. SOAEL = LOAEL + 5dB). The SOAEL for industrial sound at night could, therefore, be considered to be L_{night} 45dB.

However, for context reasons and to provide further reassurance to stakeholders a formal assessment will also be carried out in accordance with BS 4142,

11.7.2 Noise from existing production

Before considering the noise impact of the proposed expanding of facilities at this wellsite, consideration should be given to the impact from existing operations. Appendix C includes full details of Equipment Sound Power Levels the existing noise sources operating. Appendix B includes measurements made on site to capture the noise output from existing item of equipment. The main identifiable sources currently include:

- Flow noise, especially within the separation plant
- Diesel generator (400kvA)
- Flare operating at 500^3/hr

Extrapolated sound pressure levels from existing operation are included within appendix K with the noise contour map included as Figure 14. Table 15 shows the values at NSRs during the more critical night period.

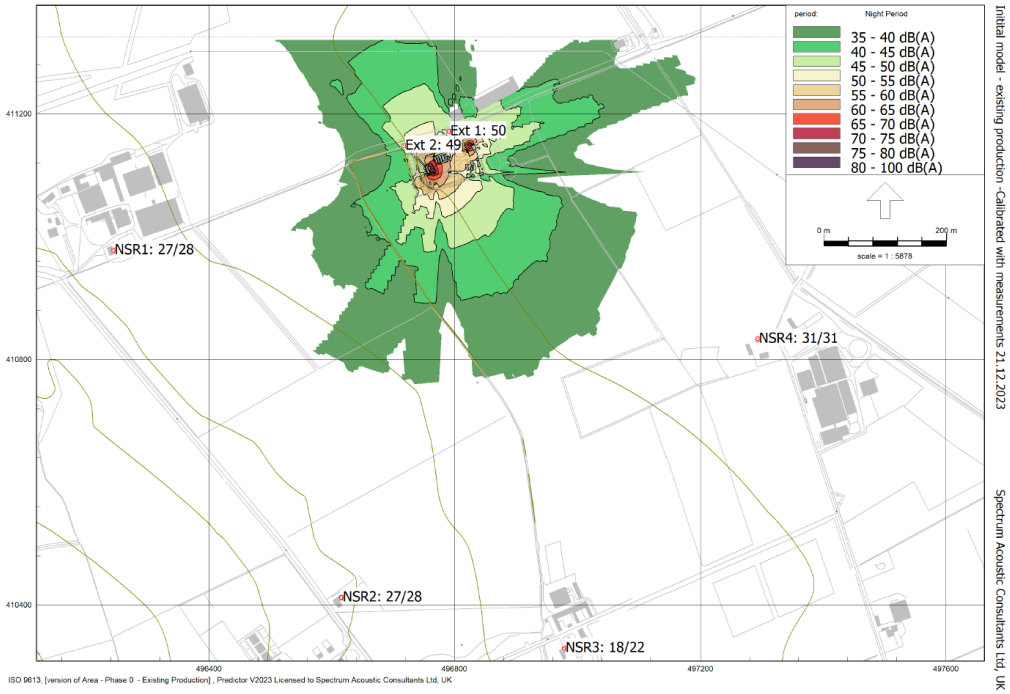


Figure 14: Extrapolated nighttime extrapolated current production noise level contours

Receptor	Noise level, $L_{Aeq,1hr}$ (dB)
NSR1 North/South Cottages	28
NSR2 1 Broughton Grange Cottage	28
NSR3 Broughton Grange	22
NSR4 Decoy Cottage	31

Table 15 Extrapolated nighttime extrapolated current production noise levels

The levels of existing noise from production on the wellsite ranges, under downwind propagation conditions, are between $L_{Aeq,T}$ 22dB and 31dB depending upon location. Under prevailing SW/W wind conditions, the levels at NSR4 would be $L_{Aeq,T}$ 31dB but at other locations would likely be less than 23dB because of crosswind and upwind propagation conditions.

All the determined current production noise levels are below the statistically established representative background sound levels established in the baseline noise survey. And importantly below the background levels established in each of the 4 wind directions. This means that the noise from existing production operations is not a significant element of the values put forward as representative background levels. And that the values put forward can be considered true and representative of the background noise environment. Stakeholders have already agreed in consultation that it was not practical to cease production at the site, and certainly not for the period of 3 weeks necessary to obtain a high quality baseline noise dataset.

11.7.3 Noise from upgraded production

On completion of the development programme, the production flows may be significantly greater than they currently are. Full details of the additional noise sources during future production, along with predictions are included in appendix L. Figure 15 shows the noise contour map and Table 16, the numerical values at NSRs, during future expanded production. It should be noted that the prediction includes contributions from existing retained equipment, including effects of increased flow rates. Both retained and new equipment has additional noise mitigation in place as part of the need to apply Best Available Techniques for noise control to the installation.

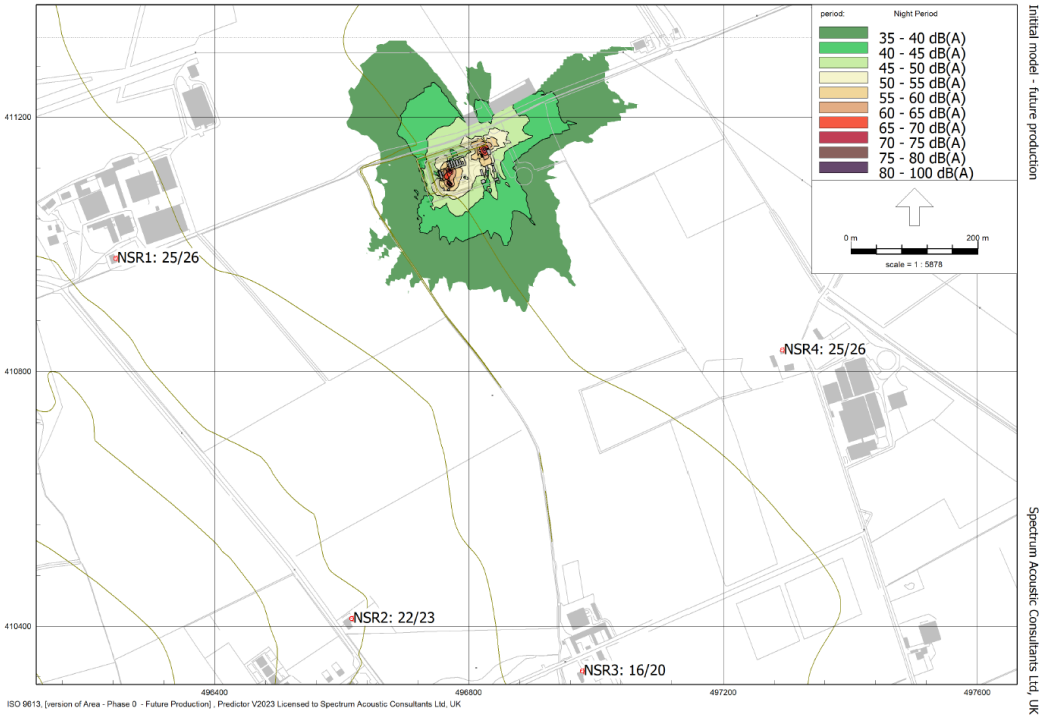


Figure 15: Predicted nighttime noise contours for future production

Receptor	Current noise level, $L_{Aeq,1hr}$ (dB)	Future noise level, $L_{Aeq,1hr}$ (dB)	Expected change in noise level $L_{Aeq,1hr}$ (dB)
NSR1 North/South Cottages	28	26	-2
NSR2 1 Broughton Grange Cottage	28	23	-5
NSR3 Broughton Grange	22	20	-2
NSR4 Decoy Cottage	31	26	-5

Table 16: Current and future predicted production nighttime noise levels

11.7.4 Assessment of future production noise versus LOAEL and SOAEL thresholds

Assessment of just the future levels of production noise, against LOAEL and SOAEL criteria are included in Table 17. Nighttime LOAEL and SOAEL values $L_{Aeq,T}$ 40 dB and 45 dB respectively.

Receptor	Future noise level, $L_{Aeq,1hr}$ (dB)	Level of effect	Significant? (Yes/No)
NSR1 North/South Cottages	26	≤ LOAEL	No
NSR2 1 Broughton Grange Cottage	23	≤ LOAEL	No
NSR3 Broughton Grange	20	≤ LOAEL	No
NSR4 Decoy Cottage	26	≤ LOAEL	No

Table 17: Assessment of future night production noise against SOAEL and LOAEL criteria

Predicted future levels of production noise at $L_{Aeq,T}$ 20 - 26 dB are below SOAEL and LOAEL thresholds. Future noise impact would therefore be low.

11.7.5 Assessment of future production noise using BS 4142

Assessment of the future predicted levels of noise during production, in accordance with BS 4142 procedures is summarised in table 18. A precautionary character correction of +3dB is included, as a worst-case basis, although levels are unlikely to be audible. This is reflected by the same increase in the Rating level. The mean background noise levels representing all wind directions at the two noise monitoring locations NML1 and NML2 were very slightly different at $L_{A90,15min}$ 38/35 dB (day/night) at NML1 and 36/34 dB (day/night) at NML2. The values obtained at NML1, near NSR1, have been described as being potentially affected by seasonal grain drying plant at the nearby farm, and with NML2 near NSR3 being the furthest receptor from the wellsite, and not noticeably affected by local noise sources, a cautious approach to consideration of background noise levels in the whole area would be to consider the lower background noise values obtained at NML2 might apply to all receptors. This very precautionary approach will be used in the BS 4142 assessment.

Noise Sensitive Receptor	Specific sound level, Ls (dB)	Rating level, LAr,Tr (dB)	Background sound level LA90 (dB)	Difference or Rating minus Background levels(dB)	Initial Impact defined within BS 4142
Daytime					
NSR1	26	29	36	(-7)	Low
NSR2	23	26	36	(-10)	Low
NSR3	20	23	36	(-13)	Low
NSR4	26	29	36	(-7)	Low
Nightime					
NSR1	26	29	34	(-5)	Low
NSR2	23	26	34	(-8)	Low
NSR3	20	23	34	(-11)	Low
NSR4	26	29	34	(-5)	Low

Table 18: BS 4142 assessment of initial noise impact of the future production before considering context .

The initial indication of impact from this BS 4142 assessment is that it would be low. Any negative value would be a low impact. An adverse impact would arise where the difference between the Rating Level and the Background Level were to be +5dB and a significant adverse impact would arise where the difference was +10dB.

In the analysis of background noise level differences at weekends, the typically 1dB lower value recorded during the weekends is very small, and in the context of the BS4142 difference being 5dB or more within the low noise impact category, the impacts during the weekend of production noise would be unchanged from weekdays.

Context

BS 4142 describes a methodology for assessing noise impact, however it states clearly this is only an 'initial indication' of noise impact. Other factors need also to be considered before a final assessment can be concluded. This is the consideration of context. The EA provide additional notes regarding context.

It is assumed that the receptors all have a high sensitivity. In practice those nearby properties associated with the farm estate on which the wellsite is located may be more tolerant of noise.

The proposed development is an expansion of an existing oil and gas development and therefore local attitudes might be more favourable than if it were a new development.

Most of the development stages are short term. The long term noise from the expanded site is expected to be no greater than it currently is, with the noise mitigation measures implemented.

The residual noise environment can be noisy both during the day as well as the night because of the presence of farming activity nearby. Seasonally operating grain dryers contribute to the ambient noise.

There is activity development continuing through the weekends, and also at night, however once operating in production again, the noise is steady in level and continuous in nature. The sound quality does currently not include strong character elements such as tones, and this is expected to remain the case after plant expansion.

The number of sensitive properties near the development is small.

Taking note of the above context points the final assessment according to BS 4142 concludes that both during the day and the night periods, initial indication of a low impact, will be unchanged in the final assessment.

Uncertainty

A noise impact assessment, carried out in accordance with BS 4142, must consider and report the level of the effect that uncertainty in measurements and calculations, has on the assessment's overall conclusions. This will typically be expressed in qualitative rather than quantitative terms. The amount of effort put into minimising such uncertainties should be proportionate to the noise impact risk that the site presents,

With this project, uncertainty both in measurement data and also calculations, has been considered and minimised in the following way:

Reductions in uncertainty of measurement data

Measurements made have been post processed to ensure all data then used in the assessment has been obtained in appropriate weather conditions. That is in wind speeds less than 5m/s and other adverse weather conditions not significantly affecting data.

- All single measurements used to quantify particular noise sources have, where possible, been made in the acoustic far-field to avoid nearfield effects arising.

- A very large dataset has been generated for baseline noise, and sophisticated post processing of data on a large scale means increased confidence in the measurement summary.

- Where measurements have been made at particular locations, distances have either been directly measured on site, or identified precisely from maps or site plans, rather than being estimated.

- The noise sources arising and the potential time variations of noise level have been specifically investigated and accounted for in planning the times and durations of measurements made, and to ensure particular events and operating conditions are measured and assessed.

- Consistency in sound field description is achieved through all measurements being made under free-field conditions, unless specifically expressed as façade measurements.

- The instrumentation used to measure sound levels on this project is all classified class 1 (Precision Grade) to IEC 61672-1:2002/ BS EN 61672-1:2003. This offers lower uncertainty in measurement than class 2 (survey grade) instrumentation.

- All instrumentation is fully calibrated, and independently verified by external auditors and global certification body, NQA, to ISO 90001:2015 as part of Spectrum's Quality System. Records are kept of dates of calibration. Results of field calibration tests are reported where drift over the duration of the survey is found to have exceeded 0.5dB at 1kHz.

Reductions in uncertainty of calculations and assessment

- Where sound level predictions are extrapolated out to sensitive receptors, this has been done using appropriate algorithms having uncertainty reflecting the degree of risk the site presents[7].

- Substantial effort in the assessment has been put into minimising uncertainty, and this in spite of the predicted impacts of the upgraded production plant showing impacts comfortably within the low impact category.

[7] For this critical site extrapolation calculations are undertaken using computer modelling adopting ISO 1996-2:2007 *Acoustics – Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.*

Assessor Competency

- The uncertainty in the assessment conclusions is also minimised as it has been carried out by a competent person as defined within BS 4142. This is someone who is a qualified acoustician and can demonstrate competency in environmental noise work. The assessment has been carried out by Andrew Corkill, Principal Consultant level with an MSc in Acoustics, Noise and Vibration from Imperial College and over 35 years of acoustic consultancy experience. Assistance to the assessor was provided on site by Luke Lloyd, Acoustic Technician

The measures taken to reduce uncertainty on this project along with the numerical difference between the Rating Level and Background Sound Level indicate a level of uncertainty will not change the outcome of the assessment.

12. BAT ASSESSMENT

The EA require a BAT Assessment or 'appropriate measures justification' to be carried out as part of a permit application or permit variation application, as in this case.

The EA guidance[8] sets out what information is required as part of a BAT assessment. The conclusion must be a justification that the applicant will be using BAT to prevent or minimise polluting noise emissions. The key elements in justifying noise mitigation measures stated in the guidance are:

- Concentrate on the dominant noise sources (and where necessary consider the influence of individual sub-components within a system)
- Detail all existing noise attenuation measures (enclosures, silencers, location of kit, operating time restrictions and maintenance regimes)
- For dominant noise sources, consider all noise reduction techniques an come to a reason determination of what is achievable.
- Where upgrades are identified – state the predicted impact of the works and commit to time completion timescales
- Develop a noise management plan (if there will be a noise impact beyond the site boundary)

The current levels of noise at receptors is already low and is expected to be lower once the development is complete. Table 19 shows the current and future production noise levels.

Receptor	Current noise level, $L_{Aeq,1hr}$ (dB)	Future noise level, $L_{Aeq,1hr}$ (dB)	Expected change in noise level $L_{Aeq,1hr}$ (dB)
NSR1 North/South Cottages	28	26	-2
NSR2 1 Broughton Grange Cottage	28	23	-5
NSR3 Broughton Grange	22	20	-2
NSR4 Decoy Cottage	31	26	-5

Table 19 Current and future predicted production nighttime noise levels

[8] *Noise and vibration management: environmental permits, Environment Agency, updated 31 January 2022*

The highest levels of noise arise at two of the locations, however the values at NSR 4 (Decoy Cottage) is further broken down to show the contributions from individual sources.

Contributing Noise Source	$L_{Aeq,T}$ sound pressure level	Noise mitigation measures
Diesel generator	22	Diesel Generator installed in a high-performance acoustic enclosure with silenced cooling air apertures and silenced exhaust system. LwA badge showing rating
Surface lift pump	21	Low noise equipment
Existing separator and KO drum	19	Acoustic insulation of 50-75mm thickness applied to piping and part of vessels, to mitigate existing noise
New process equipment	19	Acoustic insulation of 50-75mm thickness applied to piping and part of vessels, to mitigate new process flow noise
TOTAL	**26**	

Table 20 : Contributing sources predicted during future production

There is no single noise source that is dominant. The noise mitigation outlined has the effect of bringing all main noise sources to similar levels of noise impact. Any additional noise mitigation to one single source would not therefore further reduce the total noise impact.

The EA does require noise impact to be reduced when levels are low, however will take the level into account when considering whether additional noise mitigation measures are required. With the level of impact being at least 5-10dB below the LOAEL or the threshold off an adverse impact, the margin is considered large enough for additional noise mitigation not to be required.

13. NOISE MANAGEMENT PLAN

An outline Noise Management Plan including noise monitoring when required, is included within appendix M. This is based on the NMP already in force for the existing operations of the site. If this was approved by the MPA, it could be implemented in order to protect the amenity of residents. However, it should be noted that with such large set back distances, the impacts to residents would not be so great as to be of concern to residents. The NMP therefore represents a protocol that is set out to cover and be responsive to, potential noise issues from the development.

Whilst it would be consistent with normal planning policy for a NMP to be submitted for approval by the MPA, a separate NMP would not be required automatically in the case of an Environmental Permit. Once normal production is underway, the operating noise levels will be low and unlikely to give rise to any noticeable impact to residents. The wording of the current Permit Condition 4 states:

Permitting Condition 3.4.2
The Operator shall submit a noise and vibration management plan should noise and vibration become a problem. If a plan is required, once it is assessed as suitable, it will form part of the permit and the Operator must carry out the activity in accordance with the approved techniques

It is anticipated that a NMP would not therefore need to be submitted to the EA for their consideration and approval. However, knowing that an NMP related to the planning application is currently in place, potentially subject to a revision, is expected to be sufficient to satisfy the EA.

14. PLANNING CONDITIONS

Paragraph 21 of PPG-M advises that mineral planning authorities (MPA) should aim to establish a noise limit for normal mineral operations, to be set as a planning condition. Normal operations are considered to be those which would be typical operational activities that persist over the long term. While some phases within this application do not fall under this category, it would be reasonable to advise noise limits, to be set by the MPA as a Planning Condition.

For construction during the daytime, noise limits should be set in accordance with the ABC Method described in Section 9.1. These give a SOAEL during the daytime of $L_{Aeq,1hr}$ 65dB, and $L_{Aeq,1hr}$ 55dB during evenings and weekends.

For drilling and production testing activities, the condition should be set so that the SOAEL values in Table 5 of $L_{Aeq,1hr}$ 55dB $L_{Aeq,1hr}$ during the day and $L_{Aeq,T}$ 45dB during the night, are not exceeded at receptor locations.

During normal production the levels should be set so that the SOAEL values in Table 6 of $L_{Aeq,1hr}$ 55dB $L_{Aeq,1hr}$ during the day and $L_{Aeq,T}$ 45dB during the night, are not exceeded at receptor locations.

The existing conditions covering noise at Wressle wellsite are judged to provide a good level of protection to residents. Conditions 4 and 5 are prior commencement conditions which have been discharged by NLC. Conditions 8-11 are operational noise conditions.

Planning Condition 4:
Prior to the commencement of development, a Noise Management Plan (NMP) shall be submitted for written approval to the local planning authority. The NMP shall clearly set out all potential sources of noise and techniques to be used to prevent and mitigate noise which shall demonstrate compliance with noise conditions 8 - 11 below. The NMP shall also include methods to deal with noise complaints from the general public. The approved NMP shall be implemented in full for the duration of the development.

Planning Condition 5:
Prior to the commencement of drilling operations or well stimulation on site, the name, make, model and technical noise specification for the drilling rig shall be submitted for approval to the local planning authority. The approved rig shall not be substituted without the prior written approval of the local planning authority and all approved noise mitigation measures shall be implemented in full throughout the duration of drilling.

Planning Condition 8:
Noise from the site shall not exceed 42dB LAeq5min when measured at any noise sensitive dwelling between 19:00 and 07:00 Monday to Sunday inclusive.

Planning Condition 9:
Noise from the site shall not exceed 60dB LAmax when measured at any noise sensitive dwelling between 19:00 and 07:00 Monday to Sunday inclusive.

Planning Condition 10:
Noise from the site shall not exceed 55dB LAeq 1h when measured at any noise sensitive dwelling between 07:00 and 19:00 Monday to Sunday inclusive.

Planning Condition 11:
Noise from the site shall not exceed 70dB LAmax when measured at any noise sensitive dwelling between 07:00 and 19:00 hours Monday to Sunday inclusive.

To avoid the need for the MPA to attach a condition requiring the submission of a new NMP for the wellsite, Appendix M includes an updated NMP which may be now considered for adoption. Otherwise, the same conditions above can be attached to any future planning permission for the proposed development at Wressle-2 to limit noise to an acceptable level in the interests of residential amenity.

15. CONCLUSIONS

The most relevant extant development plan policies against which to assess the proposed development's effect upon noise are 'saved' policy M1 which requires acceptable proposals to mitigate amenity impacts of mineral extraction proposals; 'saved' policy M3 which seeks to prevent mineral working directly adjacent to housing sites or other land uses where unacceptable impacts may arise; 'saved' policy M23, which requires adequate environmental protection measures to mitigate the impact of oil and gas sites; 'saved' policy RD2, which seeks to prevent development in the open countryside that would be detrimental to residential amenity; 'saved' policy DS1, which requires that new developments do not result in unacceptable loss of amenity to neighbouring land uses; and 'saved' policy DS11, which requires that developments do not create environmental conditions likely to affect nearby developments and adjacent areas.

A noise impact assessment (NIA) has been carried out for the proposed expansion of operations at Wressle wellsite.

This NIA report seeks to address the requirements of both NLC and the EA as regards supporting the planning application and the application for a variation to an existing Environmental Permit.

A Noise Scoping Report detailing the approach to the assessment, and the methodology has previously been issued[1]. Full responses were received by NLC and the EA, and these are included within this report, along with a statement confirming that all additional points raised have been adopted in the assessment.

The set back distances between the well site and the nearest sensitive receptors is large at 550m – 800m and this has a major effect in ensuring lower levels of noise impact than might arise at many other sites.

All phases of the development have been considered and assessed. Some of the shorter phases will not be required by the EA, however they are considered helpful context in demonstrating the applicant's approach to assessment of noise and mitigation.

A worst-case scenario with downwind noise propagation conditions has been assumed throughout.

The conclusion of the assessments is that for all phases of the proposed development, the impacts will be low, even during the well stimulation (proppant squeeze).

Noise mitigation of both the existing plant retained, and also new equipment is outlined within this NIA.

It may also be concluded that the predicted levels during all phases will comply with the existing planning conditions currently in place for this wellsite.

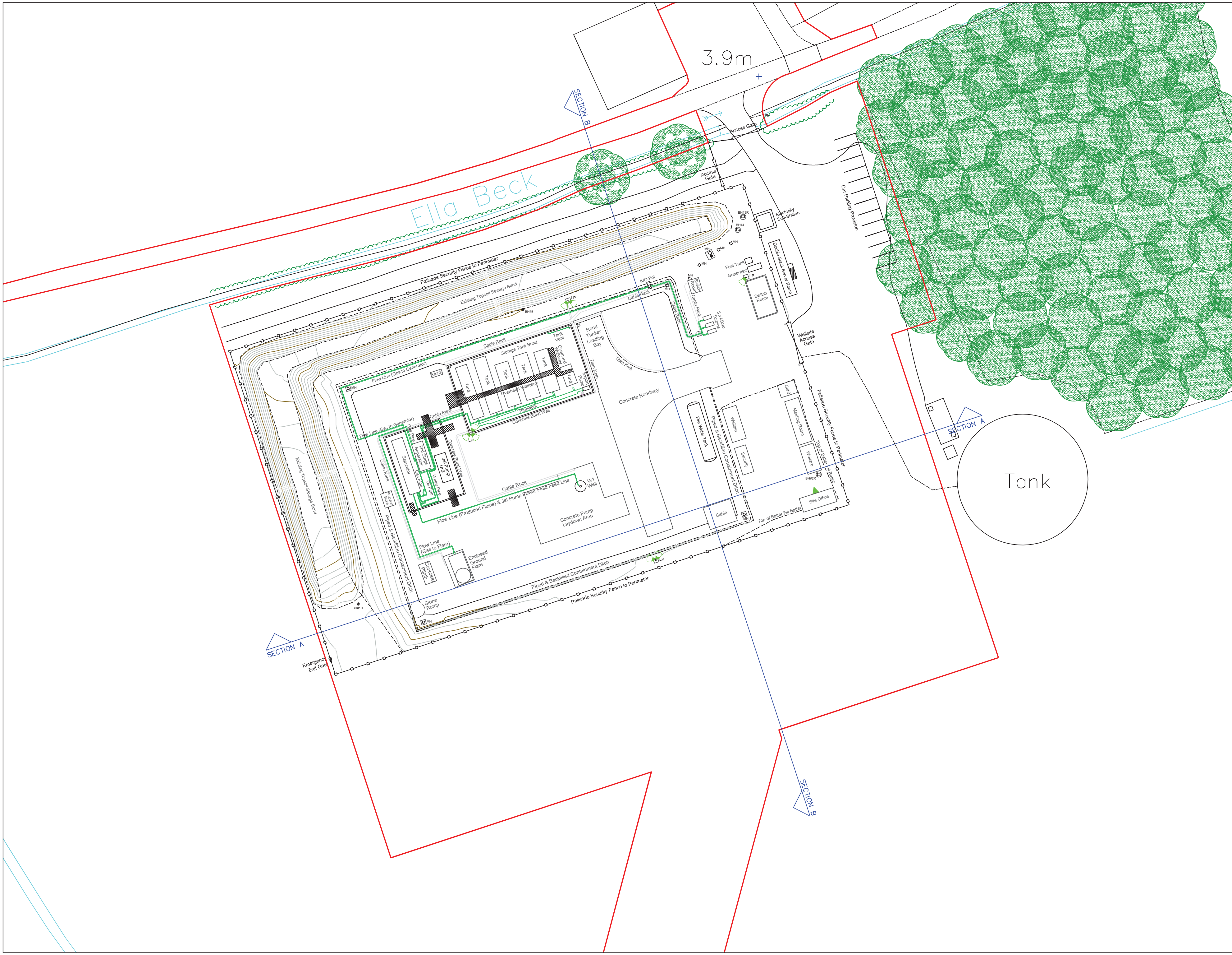
It is considered that the mitigation, via the use of the same planning conditions that are in place at present, of the potential adverse noise effects, are appropriate and proportionate and will adequately protect the amenity of neighbouring residential properties. Subject to the same noise conditions as they apply to the existing wellsite, the proposed development accords with policies M1, M3, M23, DS1, DS11 and RD2 of the NLLP with regard to protecting the amenity of surrounding land uses.

In relation to the existing Environmental Permit, the absence of historic noise complaints from the construction, drilling, stimulation and most importantly, production associated with the existing wellsite activities and the updated assessment of existing production noise impacts from the wellsite is strong evidence that EA permitting condition 3.4, requiring activities to be free of noise pollution, has, and continues to be met.

Similarly, whilst the EA has no reason to require an NMP under the existing permitting condition 3.4.2, it is hoped that the proposal for a revised NMP to support the new planning application provides them with some reassurance that the necessary controls will be in place should they be needed.

APPENDIX A

Site layouts of further development phases



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N

KEY:

- PLANNING APPLICATION BOUNDARY
- WATER FEATURES (PONDS, DRAINS)
- EXISTING TREES
- GROUNDWATER QUALITY MONITORING BOREHOLES (#3R & 4)
- GROUNDWATER QUALITY MONITORING BOREHOLE (#1R & 5)
- SURFACE FLOW LINES
- ELEVATED WALKWAYS & STEPS

LIGHTING DETAILS:

- FIXED 400W METAL HALIDE FLOODLIGHT
- 250W OR 400W TUNGSTEN HALOGEN LAMP

ABBREVIATIONS:

BH#: GROUNDWATER MONITORING BOREHOLE
GP: GATE POST
K/O: KNOCK OUT
LP: LAMP POST
MH: MANHOLE
W: WRESSLE

NOTES:

CROSS-SECTION VIEW DETAILS INDICATED BY THE DIRECTION THE TRIANGLES ARE FACING, AS SHOWN BELOW

SECTION A SECTION A

FOR SECTION DETAILS, REFER TO PLAN NO: ZG-ER-W1-W2-PA-04

REVISION HISTORY

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0	OCT23	JF	FIRST ISSUE	JF

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Registered in England No. 05964499. Registered office: The Innovation Centre, Kirkleatham Business Park, Redcar, TS10 5SH

SITE: WRESSLE WELLSITE, NORTH LINCOLNSHIRE

PROJECT: WRESSLE-2 & 3 DRILLING, TESTING & PRODUCTION

TITLE: SITE LAYOUT PLAN - EXISTING SITE

CLIENT: EGDON RESOURCES U.K. LIMITED

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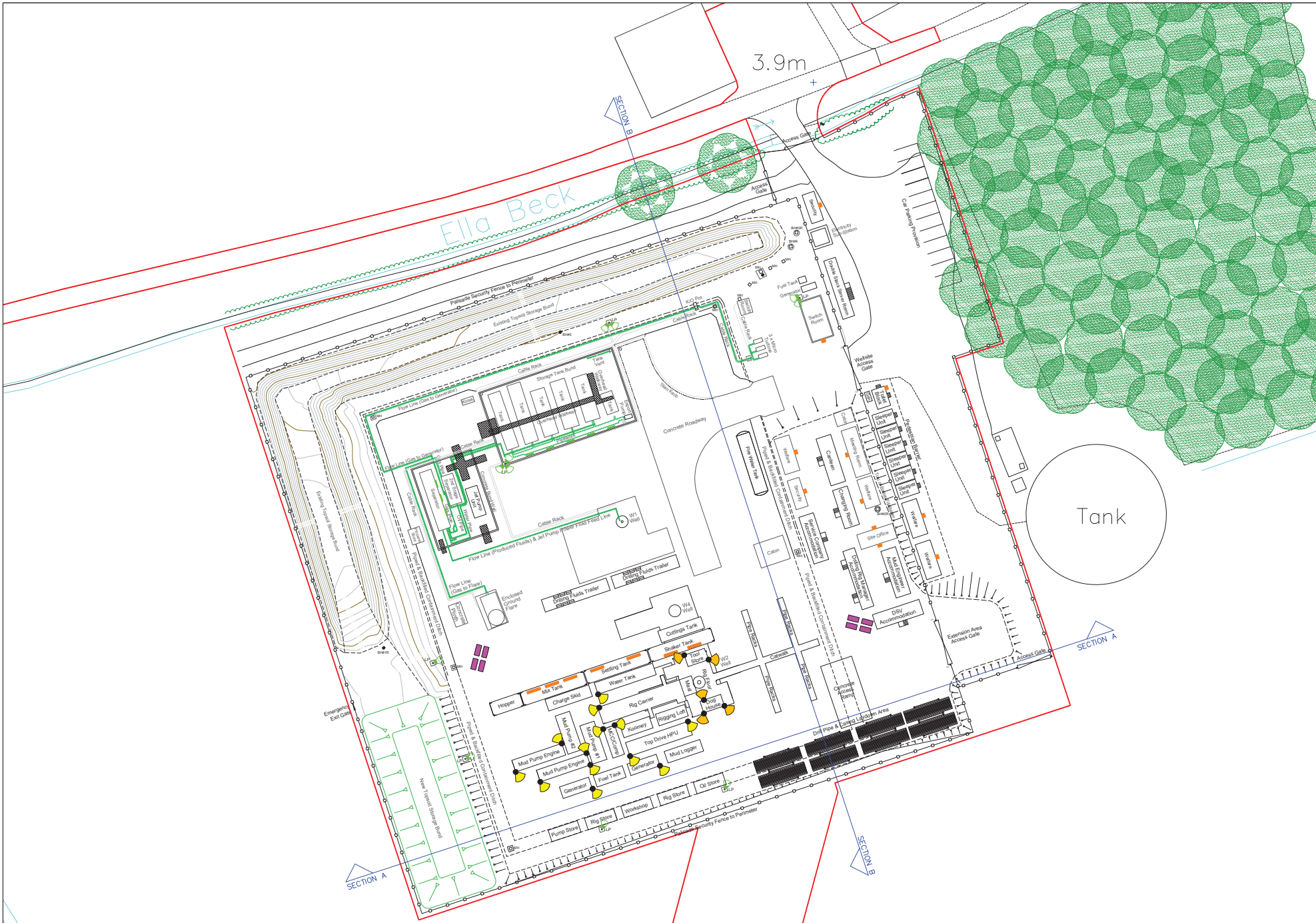
DWG. No:	ZG-ER-W1-W2-PA-03



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- EXISTING TREES
- GROUNDWATER QUALITY MONITORING BOREHOLES (#3R & 4)
- GROUNDWATER QUALITY MONITORING BOREHOLE (#1R & 5)
- SURFACE FLOW LINES
- ELEVATED WALKWAYS & STEPS
- NEW TOPSOIL STORAGE BUND

LIGHTING DETAILS:

- QFLOOD-300CW/AS (1 X LED 300W / 3900 lm)
- LXFL20WBV2 (1 X 20W / 1613 ml)
- 14840 (1 X 37W / 5010 ml)
- DRILLING RIG 300W LED FLOODLIGHT
- DRILLING RIG 212W HIGH BAY FLOODLIGHT
- DRILLING RIG 75W LINEAR LED
- LIGHTING TOWER 4 X 1000W METAL HALIDE

ABBREVIATIONS:

BH#:	GROUNDWATER MONITORING BOREHOLE
DSV:	DRILLING SUPERVISOR
GP:	GATE POST
K/O:	KNOCK OUT
LP:	LAMP POST
MH:	MANHOLE
W:	WRESSLE

NOTES:

CROSS-SECTION VIEW DETAILS INDICATED BY THE DIRECTION THE TRIANGLES ARE FACING, AS SHOWN BELOW

SECTION A SECTION A

FOR SECTION DETAILS, REFER TO PLAN NO: ZG-ER-W1-W2-PA-08

REVISION HISTORY

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SITE: WRESSLE WELLSITE, NORTH LINCOLNSHIRE

PROJECT: WRESSLE-2 & 3 DRILLING, TESTING & PRODUCTION

TITLE: INDICATIVE SITE LAYOUT PLAN - DRILLING PHASE

CLIENT: EGDON RESOURCES U.K. LIMITED

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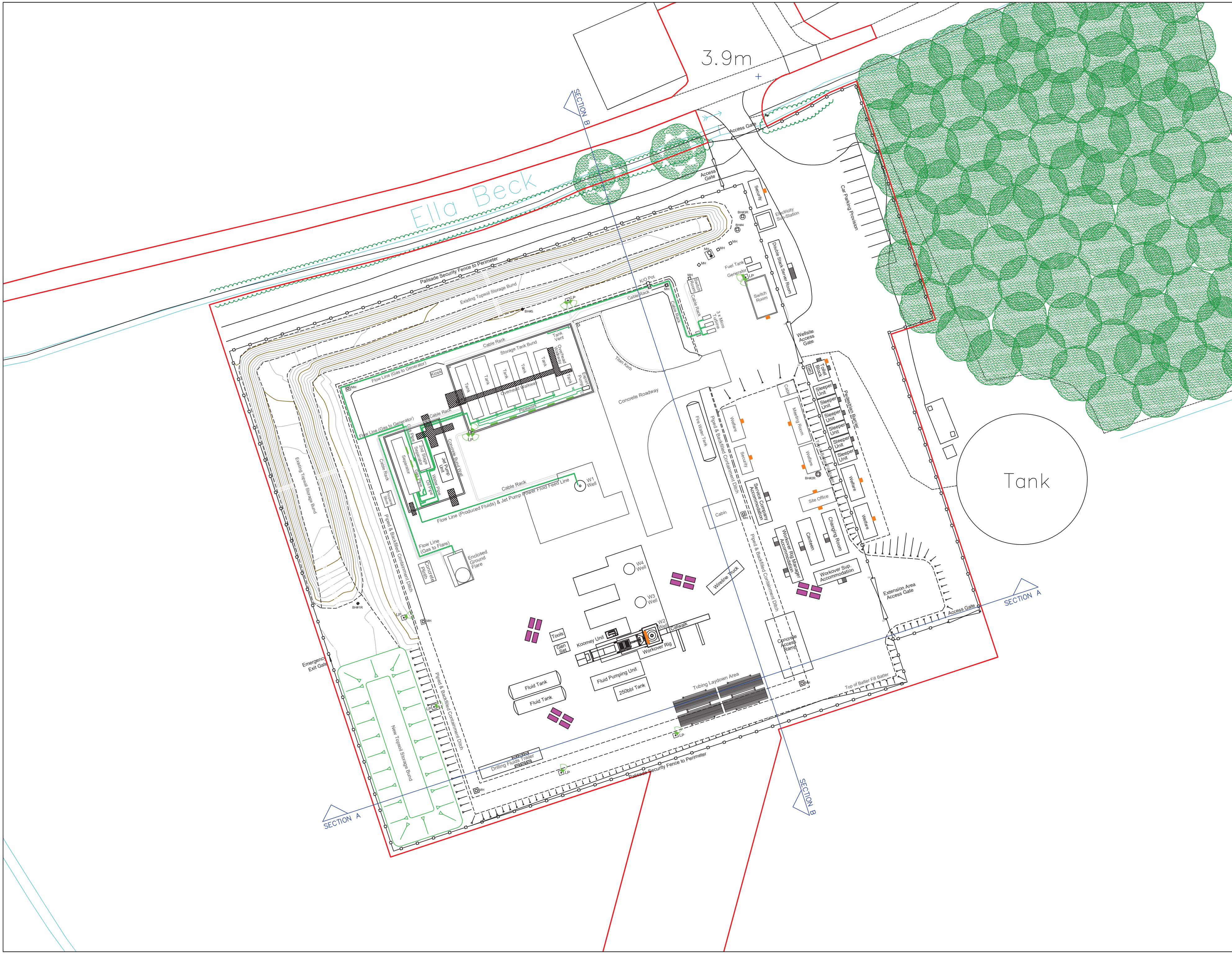

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KEY:

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- WATER FEATURES (PONDS, DRAINS)
- EXISTING TREES
- GROUNDWATER QUALITY MONITORING BOREHOLES (#3R & 4)
- GROUNDWATER QUALITY MONITORING BOREHOLE (#1R & 5)
- SURFACE FLOW LINES
- ELEVATED WALKWAYS & STEPS
- NEW TOPSOIL STORAGE BUND

LIGHTING DETAILS:

- QFLOOD-300CW/AS (1 X LED 300W / 39000 lm)
- LXFL20WBV2 (1 X 20W / 1613 lm)
- 14840 (1 X LED 37W / 5010 lm)
- EXTERNAL LINEAR FLUORESCENT (2X36W)
- LIGHTING TOWER 4 X 1000W METAL HALIDE

ABBREVIATIONS:

BH#:	GROUNDWATER MONITORING BOREHOLE
GP:	GATE POST
K/O:	KNOCK OUT
LP:	LAMP POST
MH:	MANHOLE
W:	WRESSLE

NOTES:

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SITE: WRESSLE WELLSITE, NORTH LINCOLNSHIRE

PROJECT: WRESSLE-2 & 3 DRILLING, TESTING & PRODUCTION

TITLE: INDICATIVE SITE LAYOUT PLAN - WORKOVER PHASE

CLIENT: EGDON RESOURCES U.K. LIMITED

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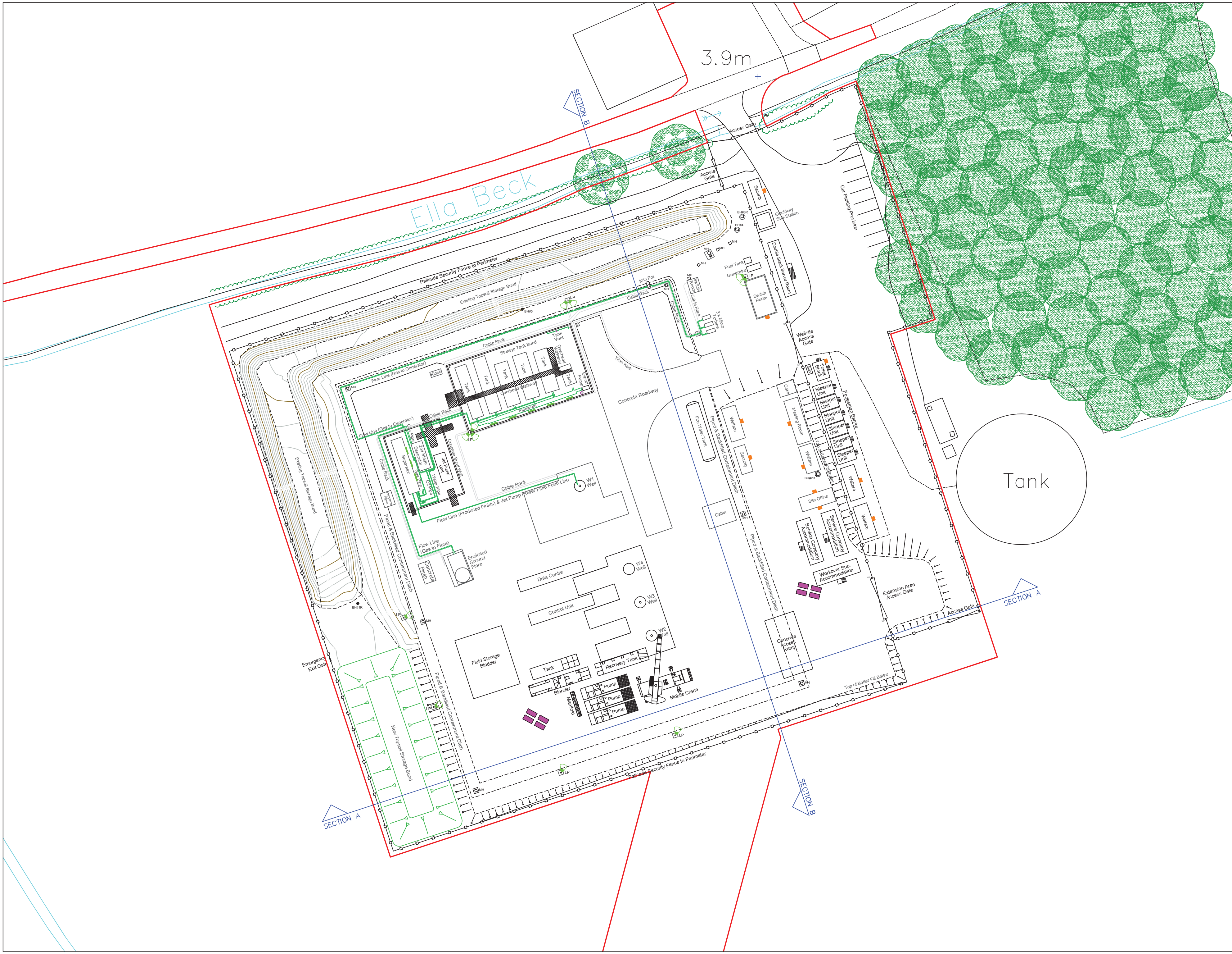

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KEY:

- PLANNING APPLICATION BOUNDARY
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- GROUNDWATER QUALITY MONITORING BOREHOLES (#3R & 4)
- GROUNDWATER QUALITY MONITORING BOREHOLE (#1R & 5)
- SURFACE FLOW LINES
- ELEVATED WALKWAYS & STEPS
- NEW TOPSOIL STORAGE BUND

LIGHTING DETAILS:

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- LXFL20WBV2 (1 X 20W / 1613 lm)
- 14840 (1 X LED 37W / 5010 lm)
- LIGHTING TOWER 4 X 1000W METAL HALIDE

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SECTION A SECTION A

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SITE: WRESSLE WELLSITE, NORTH LINCOLNSHIRE

PROJECT: WRESSLE-2 & 3 DRILLING, TESTING & PRODUCTION

TITLE: INDICATIVE SITE LAYOUT PLAN - PROPPANT SQUEEZE PHASE

CLIENT: EGDON RESOURCES U.K. LIMITED

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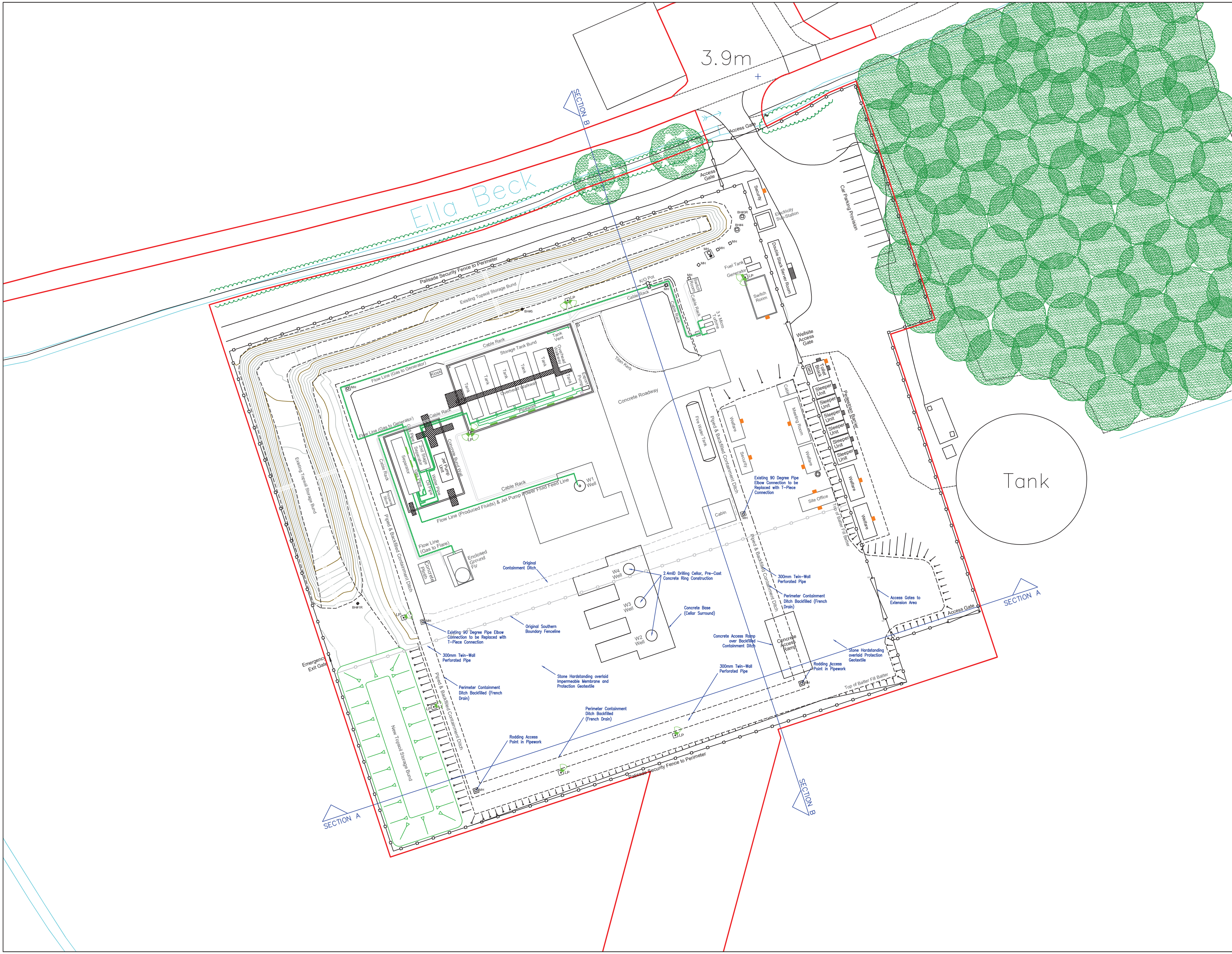

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KEY:

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- GROUNDWATER QUALITY MONITORING BOREHOLE (#1R & 5)
- SURFACE FLOW LINES
- ELEVATED WALKWAYS & STEPS
- NEW TOPSOIL STORAGE BUND

LIGHTING DETAILS:

- QFLOOD-300CW/AS (1 X LED 300W / 39000 lm)
- LXFL20WBV2 (1 X 20W / 1613 lm)
- 14840 (1 X LED 37W / 5010 lm)

ABBREVIATIONS:

BH#:	GROUNDWATER MONITORING BOREHOLE
GP:	GATE POST
K/O:	KNOCK OUT
LP:	LAMP POST
MH:	MANHOLE
W:	WRESSLE

NOTES:

CROSS-SECTION VIEW DETAILS INDICATED BY THE DIRECTION THE TRIANGLES ARE FACING, AS SHOWN BELOW

SECTION A SECTION A

FOR SECTION DETAILS, REFER TO PLAN NO: ZG-ER-W1-W2-PA-06

REVISION HISTORY

REV	DATE	BY	DETAILS	APR
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
0	OCT23	JF	FIRST ISSUE	JF

ZETLAND GROUP
FROM CONCEPTION TO COMPLETION
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Registered in England No. 05964499. Registered office: The Innovation Centre, Kirkleatham Business Park, Redcar, TS10 5SH

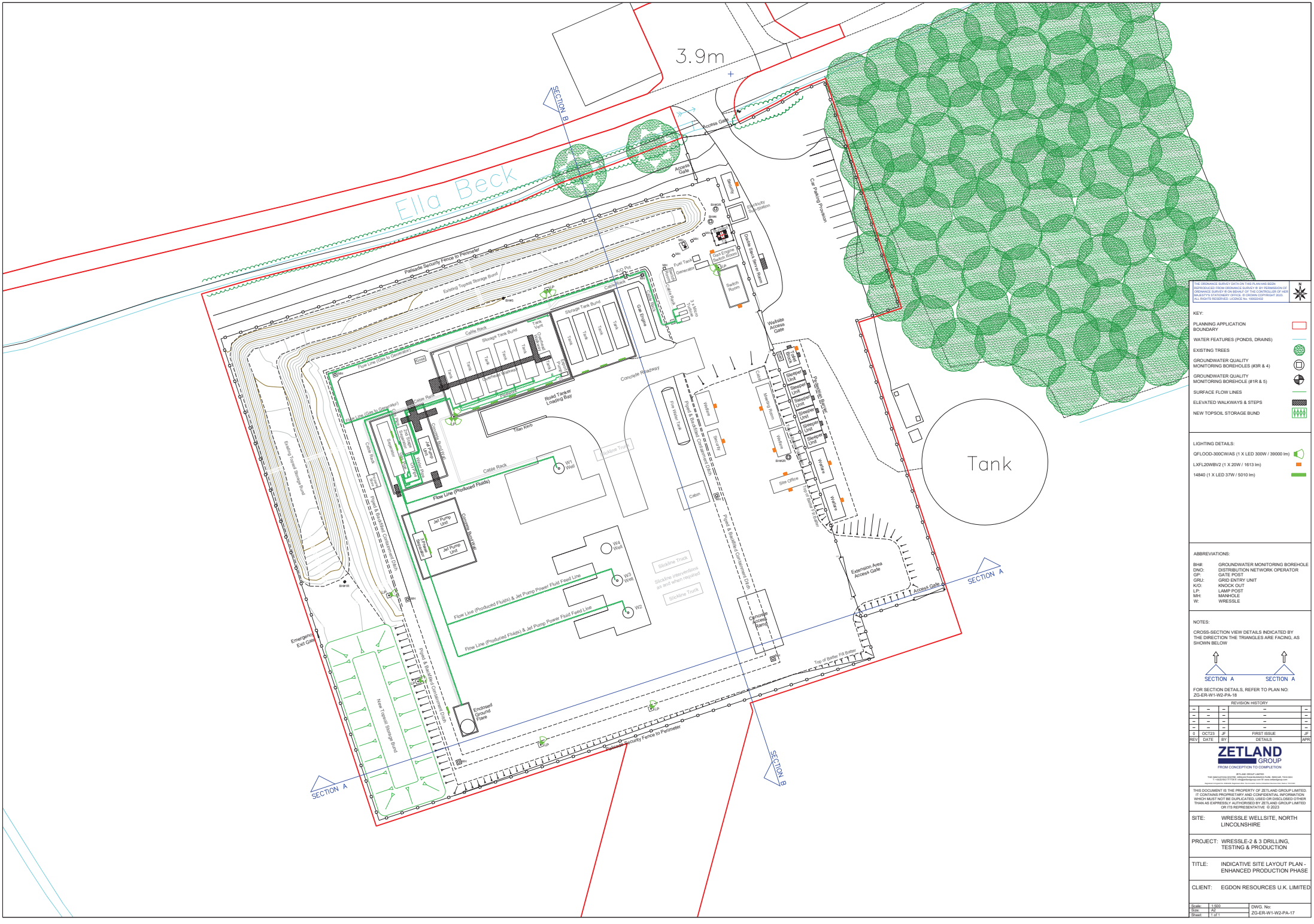
SITE: WRESSLE WELLSITE, NORTH LINCOLNSHIRE

PROJECT: WRESSLE-2 & 3 DRILLING, TESTING & PRODUCTION

TITLE: INDICATIVE SITE LAYOUT PLAN - CONSTRUCTION PHASE

CLIENT: EGDON RESOURCES U.K. LIMITED

Scale:	1:500	DWG. No: ZG-ER-W1-W2-PA-05
Size:	A2	
Sheet:	1 of 1	



KEY:

- PLANNING APPLICATION BOUNDARY
- WATER FEATURES (PONDS, DRAINS)
- EXISTING TREES
- GROUNDWATER QUALITY MONITORING BOREHOLES (#3R & 4)
- GROUNDWATER QUALITY MONITORING BOREHOLE (#1R & 5)
- SURFACE FLOW LINES
- ELEVATED WALKWAYS & STEPS
- NEW TOPSOIL STORAGE BUND

LIGHTING DETAILS:

- QFLOOD-300CW/AS (1 X LED 300W / 39000 lm)
- LXFL20WBV2 (1 X 20W / 1613 lm)
- 14840 (1 X LED 37W / 5010 lm)

ABBREVIATIONS:

BH#:	GROUNDWATER MONITORING BOREHOLE
DNO:	DISTRIBUTION NETWORK OPERATOR
GP:	GATE POST
GRU:	GRID ENTRY UNIT
K/O:	KNOCK OUT
LP:	LAMP POST
MH:	MANHOLE
W:	WRESSLE

NOTES:

CROSS-SECTION VIEW DETAILS INDICATED BY THE DIRECTION THE TRIANGLES ARE FACING, AS SHOWN BELOW

SECTION A SECTION A

FOR SECTION DETAILS, REFER TO PLAN NO: ZG-ER-W1-W2-PA-18

REVISION HISTORY

REV	DATE	BY	DETAILS	APR
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
0	OCT23	JF	FIRST ISSUE	JF

ZETLAND GROUP
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SITE: WRESSLE WELLSITE, NORTH LINCOLNSHIRE

PROJECT: WRESSLE-2 & 3 DRILLING, TESTING & PRODUCTION

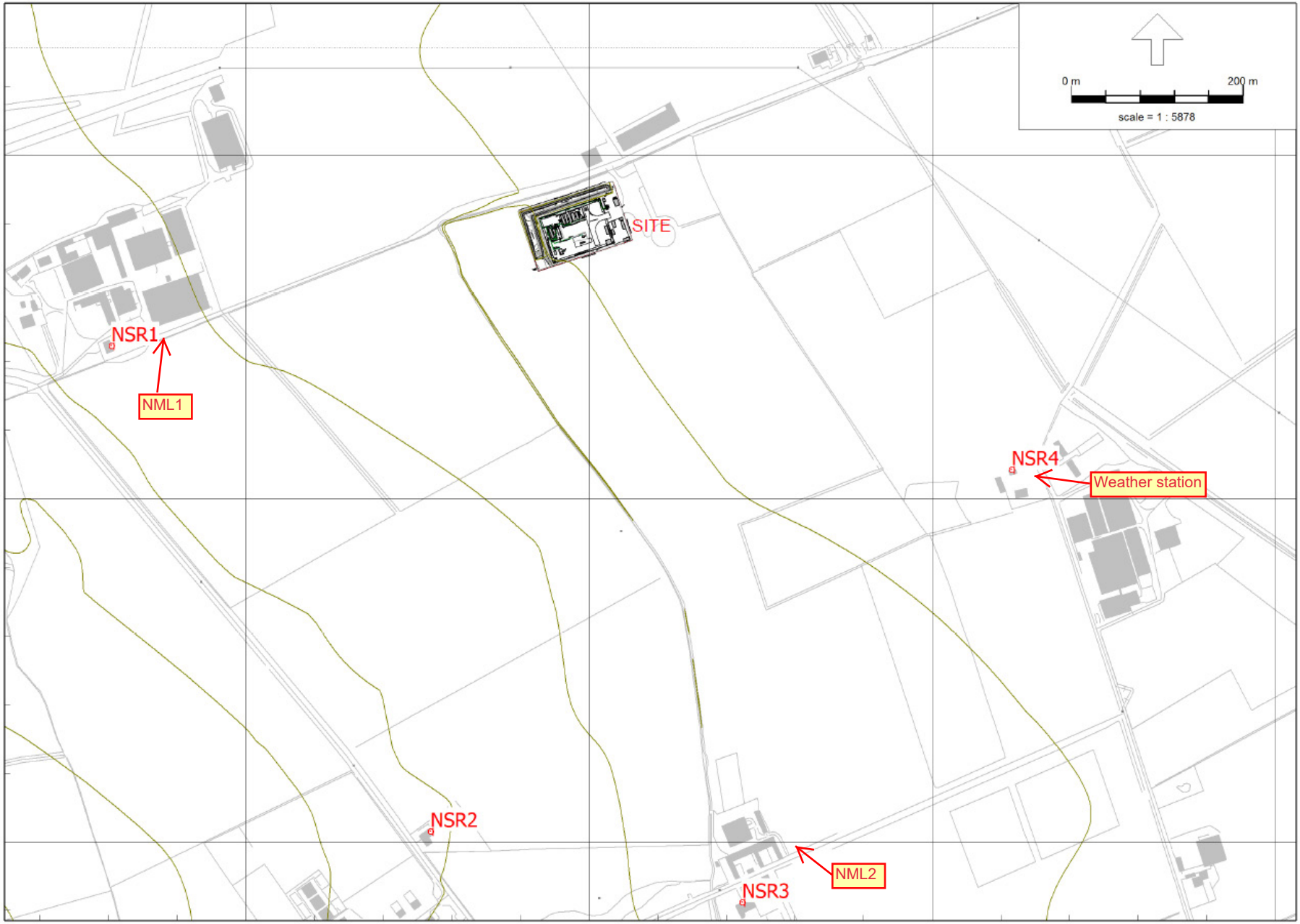
TITLE: INDICATIVE SITE LAYOUT PLAN - ENHANCED PRODUCTION PHASE

CLIENT: EGDON RESOURCES U.K. LIMITED

Scale:	1:500	DWG. No:	
Size:	A2		ZG-ER-W1-W2-PA-17
Sheet:	1 of 1		

APPENDIX B

Baseline noise measurement survey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200 m
scale = 1 : 5878
SITE
NSR1
NML1
NSR4
Weather station
NSR2
NML2
NSR3

NML1 near NSR1 with microphone on pole above shrubs

NML1 monitor adjoining farm sheds with grain dryers

NML2 near NSR3

Attended monitoring near NSR4

Temporary weather station near NSR4

Enclosed ground flare on wellsite

Piping connected to 2nd stage separator on wellsite

Close to an inlet aperture (90%closed) of Enclosed Ground Flare on wellsite

Liquid storage tanks on wellsite

Acoustically enclosed packaged generator labelled LwA 97dB on wellsite

ATTENDED BASELINE NOISE MEASUREMENT SAMPLE
for correlation with unattended noise monitor output

Measurement Position	Start Time	Elapsed Time	LAFmax	Laeq	LAF90.0	Comment	Calibration Details: Attended meter Start/End/Drift dB	Calibration Details: Unattended logger Start/End/Drift dB	Calibration Details: Calibration Certificate date
NSR 1/NML1	18/12/2023 15:38	00:10:00	63	52	**49**	Farm vehicles moving around in nearby yard. Audible dryers from farm storage sheds. Occasional traffic on B1028. Distant noise from M180. Wind 2m/s SW so upwind of site. Cloud cover 100%. Site inaudible.	93.9/93.9/0.04		21/08/2023
NSR 1/NML1	10/01/2024 12:46	00:10:00	66	49	**43**	Audible dryers from farm storage sheds, wellsite vehicles reversing and clanging in distance, infrequent military jets flyover, distant road traffic, vehicles moving around farm. Cloud cover 10%, 1-2m/s East wind so downwind from site.	93.8/93.9/0.07	93.8/93.9/0.07	18/05/2022
NSR 2	18/12/2023 13:13	00:10:00	75	59	**41**	Distant road traffic, M180, Occasional vehicles on B1028, distant whooshing and occasional banging likely from steelworks. Wind 2-3m/s SW so upwnd of the site. Cloud cover 90%. Site inaudible	93.9/93.9/0.04		21/08/2023
NSR 2	10/01/2024 13:55	00:10:00	77	57	**37**	Adjacent road traffic on B1028, distant M180 traffic noise, infrequent jet aircraft passing by. 30% cloud coverage, 4-5m/s East wind so crosswind from site. Site inaudible.	93.8/93.9/0.07		21/08/2023
NSR 3/NML2	18/12/2023 13:33	00:10:00	55	44	**41**	Distant M180 traffic and some wind in trees. Occasional vehicles on B1028. Wind 3-4m/s SW so upwind of the site. Cloud cover 70%. Site inaudible	93.9/93.9/0.04		21/08/2023
NSR 3/NML2	10/01/2024 13:31	00:10:00	53	37	**34**	Distant road traffic noise from M180, infrequent jet aircraft passing by, distant construction and grinding noise. 30% cloud coverage, 3-4m/s East wind so crosswind from site. Site inaudible.	93.8/93.9/0.07	93.9/93.9/0.03	11/08/2023
NSR 4	18/12/2023 13:50	00:10:00	64	52	**45**	Noise from HGV at farm, mechanical plant noise from farm. Distant barking dogs from kennels. Wind 3m/s SW so crosswind from the site. Cloud cover 100%. Site inaudible.	93.9/93.9/0.04		21/08/2023
NSR 4	10/01/2024 13:08	00:10:00	74	51	**34**	Farm vehicles moving around area next to pig farm, banging and loading noise from wellsite, distant grain dryer from farm, distant freight and passenger trains passing by. Cloud cover 10%, 3-4m/s East wind so upwind from site.	93.8/93.9/0.07		21/08/2023

The key measurement data is La90 Background Sound Level
The levels of daytime noise were significantly lower on the second survey when the wind was easterly. La90 levels at NSR 3 and 4 showed much lower contributions from daytime noise sources
Levels of daytime background noise appear significantly lower at NSR3 and NSR4 than at NSR1 (Farm building noise) and NSR2 (B1028 traffic noise)

Attended measurements 18/12/2023 including on-site during production

Project Name		Start Time	Elapsed Time	LAFmax	LAeq	LAF90.0	Comment
Project 001	NSR 2	18/12/2023 13:13	00:10:00	75	59	41	Distant road traffic, M180, Occasional vehicles on B1028, distant whooshing and occasional banging likely from steelworks. Wind 2-3m/s SW so upwnd of the site. Cloud cover 90%. Site inaudible
Project 002	NSR 3	18/12/2023 13:33	00:10:00	55	44	41	Distant M180 traffic and some wind in trees. Occasional vehicles on B1028. Wind 3-4m/s SW so upwind of the site. Cloud cover 70%. Site inaudible
Project 003	NSR 4	18/12/2023 13:50	00:10:00	64	52	45	Noise from HGV at farm, mechanical plant noise from farm. Distant barking dogs from kennels. Wind 3m/s SW so crosswind from the site. Cloud cover 100%. Site inaudible.
Project 004	75mm from inlet pipe to KO pot	18/12/2023 14:27	00:00:31	90	88	87	Located after choke ball valve. Noise appears not from pipe but breakout from nearby KO pot vessel wall
Project 005	75mm from shell of KO pot	18/12/2023 14:31	00:00:32	92	91	90	Source of broad band noise likely associated with signficant pressure drop at entry to KO pot vessel.
Project 006	1m from flare air inlet	18/12/2023 14:46	00:00:51	73	70	65	One of 5 identical air inlets around 1m2, but then louvres only 10% open. Noise does not appear to be flow generated across louvres, but combustion noise
Project 007	10m from acoustic centre of 400kVA diesel generator	18/12/2023 14:50	00:00:10	69	68	67	Good standard acoustic enclosure package supplied by FF Wilson, and corrrectly labelled LwA 97dB. LpA measurement indicates an LwA within 1dB of the labelled value.
Project 008	10m from acoustic centre of road tanker passing slowly	18/12/2023 14:58	00:00:09	77	75	71	Very slow (5mph) road tanker leaving the site suggesting LwA 103 dB.
Project 009	NSR 1	18/12/2023 15:38	00:10:00	63	52	49	Farm vehicles moving around in nearby yard. Audible dryers from farm storage sheds. Occasional traffic on B1028. Distant noise from M180. Wind 2m/s SW so upwind of site. Cloud cover 100%. Site inaudible.

Comparison between attended and unattended noise data - calibration purpose

Attended/ Unattended		Start Time	Elapsed Time	LAFmax	Laeq	LAF90.0	Comment
Attended	NSR 1/NML1	18/12/2023 15:38	00:10:00	63	52	49	Farm vehicles moving around in nearby yard. Audible dryers from farm storage sheds. Occasional traffic on B1028. Distant noise from M180. Wind 2m/s SW so upwind of site. Cloud cover 100%. Site inaudible.
Unattended	**NSR 1/NML1**	**18/12/2023 15:30**	**00:15:00**	**73**	**55**	**49**	**Very good correlation especially La90. Slightly different times affects Laeq and Lamax**
Attended	NSR 1/NML1	10/01/2024 12:46	00:10:00	66	49	43	Audible dryers from farm storage sheds, wellsite vehicles reversing and clanging in distance, infrequent military jets flyover, distant road traffic, vehicles moving around farm. Cloud cover 10%, 1-2m/s East wind so downwind from site.
Unattended	**NSR 1/NML1**	**10/01/2024 11:45**	**00:15:00**	**71**	**50**	**40**	**Reasonable correlation in view of substantial farm activity and 1hr time difference.**
Attended	NSR 2	18/12/2023 13:13	00:10:00	75	59	41	Distant road traffic, M180, Occasional vehicles on B1028, distant whooshing and occasional banging likely from steelworks. Wind 2-3m/s SW so upwnd of the site. Cloud cover 90%. Site inaudible
Attended	NSR 2	10/01/2024 13:55	00:10:00	77	57	37	Adjacent road traffic on B1028, distant M180 traffic noise, infrequent jet aircraft passing by. 30% cloud coverage, 4-5m/s East wind so crosswind from site. Site inaudible.
Attended	NSR 3/NML2	18/12/2023 13:33	00:10:00	55	44	41	Distant M180 traffic and some wind in trees. Occasional vehicles on B1028. Wind 3-4m/s SW so upwind of the site. Cloud cover 70%. Site inaudible
Unattended	**NSR 3/NML2**	**18/12/2023 15:45**	**00:15:00**	**58**	**44**	**41**	**Slightly later but very good correlation**
Attended	NSR 3/NML2	10/01/2024 13:31	00:10:00	53	37	34	Distant road traffic noise from M180, infrequent jet aircraft passing by, distant construction and grinding noise. 30% cloud coverage, 3-4m/s East wind so crosswind from site. Site inaudible.
Unattended	NSR 3/NML2	**10/01/2024 12:15**	**00:15:00**	**72**	**47**	**35**	**Slightly earlier but very good correlation of La90. Likely a local vehicle affects the Laeq.**
Attended	NSR 4	18/12/2023 13:50	00:10:00	64	52	45	Noise from HGV at farm, mechanical plant noise from farm. Distant barking dogs from kennels. Wind 3m/s SW so crosswind from the site. Cloud cover 100%. Site inaudible.
Attended	NSR 4	10/01/2024 13:08	00:10:00	74	51	34	Farm vehicles moving around area next to pig farm, banging and loading noise from wellsite, distant grain dryer from farm, distant freight and passenger trains passing by. Cloud cover 10%, 3-4m/s East wind so upwind from site.

Raw data and central tendencies for location NML 1: Near NSR 1

Measure of central tendency	L_{Aeq} (dB)	L_{A90} (dB)	L_{AFMax} (dB)
Modes	39	32	51
Mean	38	35	50
Mean - 1 s.d.	34	33	-
Log Average	41	-	-

Table 4: Night-time period (23:00 to 07:00)

Date	Time	L_{Aeq} (dB)	L_{A90} (dB)	L_{AFMax} (dB)	Wind direction (°)	Wind speed (m/s)
18/12/2023	23:00	39	37	47	247.5	1.80
18/12/2023	23:15	40	37	51	247.5	2.20
18/12/2023	23:30	38	36	50	292.5	1.80
18/12/2023	23:45	37	36	43	292.5	1.80
19/12/2023	00:00	39	37	49	292.5	1.80
19/12/2023	00:15	38	37	43	247.5	0.90
19/12/2023	00:30	40	38	49	270	1.30
19/12/2023	00:45	40	37	51	270	0.90
19/12/2023	01:00	39	38	44	270	0.90
19/12/2023	01:15	41	39	59	270	0.90
19/12/2023	01:30	40	39	43	270	0.90
19/12/2023	**01:45**	**43**	**37**	**63**	**270**	**9.00**
19/12/2023	**02:00**	**39**	**38**	**48**	**270**	**9.00**
19/12/2023	**02:15**	**39**	**38**	**45**	**270**	**9.00**
19/12/2023	**02:30**	**39**	**37**	**51**	**270**	**9.00**
19/12/2023	**02:45**	**38**	**37**	**51**	**270**	**9.00**
19/12/2023	**03:00**	**38**	**36**	**50**	**270**	**9.00**
19/12/2023	**03:15**	**41**	**40**	**48**	**270**	**9.00**
19/12/2023	**03:30**	**41**	**39**	**50**	**270**	**9.00**
19/12/2023	**03:45**	**40**	**38**	**51**	**225**	**9.00**
19/12/2023	**04:00**	**39**	**37**	**64**	**270**	**9.00**
19/12/2023	**04:15**	**38**	**37**	**49**	**270**	**9.00**
19/12/2023	**04:30**	**38**	**37**	**48**	**270**	**9.00**
19/12/2023	**04:45**	**38**	**37**	**47**	**225**	**9.00**
19/12/2023	**05:00**	**38**	**37**	**49**	**270**	**9.00**
19/12/2023	05:15	41	37	59	292.5	0.90
19/12/2023	05:30	40	37	50	292.5	0.00
19/12/2023	05:45	42	37	60	292.5	0.90
19/12/2023	06:00	41	38	52	292.5	1.30
19/12/2023	06:15	47	38	68	292.5	1.30
19/12/2023	06:30	46	40	63	247.5	0.90
19/12/2023	06:45	55	40	75	270	0.90
19/12/2023	**23:00**	**40**	**38**	**46**	**292.5**	**4.00**
19/12/2023	**23:15**	**40**	**38**	**47**	**292.5**	**3.60**
19/12/2023	23:30	39	38	49	270	3.10
19/12/2023	23:45	39	38	48	270	2.20
20/12/2023	00:00	40	38	49	270	1.80
20/12/2023	00:15	39	38	48	270	1.80
20/12/2023	00:30	39	38	51	270	3.10
20/12/2023	00:45	41	38	55	292.5	2.70
20/12/2023	01:00	42	40	51	292.5	3.10

Raw data and central tendencies for location NML 2: Near NSR 3

Measure of central tendency	L_{Aeq} (dB)	L_{A90} (dB)	L_{AFMax} (dB)
Modes	35	29	44
Mean	37	34	49
Mean - 1 s.d.	32	29	-
Log Average	41	-	-

Table 4: Night-time period (23:00 to 07:00)

Date	Time	L_{Aeq} (dB)	L_{A90} (dB)	L_{AFMax} (dB)	Wind direction (°)	Wind speed (m/s)
18/12/2023	23:00	34	31	48	247.5	1.80
18/12/2023	23:15	33	31	44	247.5	2.20
18/12/2023	23:30	38	35	48	292.5	1.80
18/12/2023	23:45	35	33	50	292.5	1.80
19/12/2023	00:00	37	33	49	292.5	1.80
19/12/2023	00:15	40	36	52	247.5	0.90
19/12/2023	00:30	39	36	52	270	1.30
19/12/2023	00:45	42	33	64	270	0.90
19/12/2023	01:00	38	35	52	270	0.90
19/12/2023	01:15	38	33	46	270	0.90
19/12/2023	01:30	35	33	44	270	0.90
19/12/2023	**01:45**	**33**	**31**	**42**	**270**	**9.00**
19/12/2023	**02:00**	**32**	**30**	**43**	**270**	**9.00**
19/12/2023	**02:15**	**41**	**36**	**48**	**270**	**9.00**
19/12/2023	**02:30**	**41**	**39**	**48**	**270**	**9.00**
19/12/2023	**02:45**	**39**	**35**	**48**	**270**	**9.00**
19/12/2023	**03:00**	**35**	**33**	**41**	**270**	**9.00**
19/12/2023	**03:15**	**34**	**31**	**45**	**270**	**9.00**
19/12/2023	**03:30**	**33**	**31**	**41**	**270**	**9.00**
19/12/2023	**03:45**	**33**	**31**	**41**	**225**	**9.00**
19/12/2023	**04:00**	**33**	**31**	**45**	**270**	**9.00**
19/12/2023	**04:15**	**36**	**32**	**49**	**270**	**9.00**
19/12/2023	**04:30**	**37**	**32**	**61**	**270**	**9.00**
19/12/2023	**04:45**	**36**	**33**	**48**	**225**	**9.00**
19/12/2023	**05:00**	**37**	**33**	**47**	**270**	**9.00**
19/12/2023	05:15	37	34	49	292.5	0.90
19/12/2023	05:30	42	36	62	292.5	0.00
19/12/2023	05:45	41	37	52	292.5	0.90
19/12/2023	06:00	45	38	70	292.5	1.30
19/12/2023	06:15	44	38	63	292.5	1.30
19/12/2023	06:30	49	39	69	247.5	0.90
19/12/2023	06:45	43	40	56	270	0.90
19/12/2023	**23:00**	**36**	**34**	**45**	**292.5**	**4.00**
19/12/2023	**23:15**	**35**	**33**	**48**	**292.5**	**3.60**
19/12/2023	23:30	35	34	45	270	3.10
19/12/2023	23:45	38	34	48	270	2.20
20/12/2023	00:00	38	36	48	270	1.80
20/12/2023	00:15	38	36	53	270	1.80
20/12/2023	00:30	37	35	49	270	3.10
20/12/2023	00:45	38	35	53	292.5	2.70
20/12/2023	01:00	39	36	54	292.5	3.10

APPENDIX C

Noise source equipment sound power levels

Edit grey cells only -26.2 -16.1 -8.6 -3.2 0 1.2 1 -1.1

Equipment List Sound Power Levels - Construction phase

Insert new row (above selected cell) | Delete selected row

Equipment or source	Source Octave Band Sound Power Level, Lw (Linear) 63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Overall LwA (dB)	Comment (power, BS 5228 table ref.)
Linear band Lp at 10m										
Excavator (wheeled)	87	84	80	81	78	75	69	67	**83**	63kW - Table C.4.56
Bulldozer	83	81	76	77	82	70	65	58	**83**	134kW - Table C.5.15
Crane (Wheeled mobile)	80	76	71	63	64	63	56	50	**70**	275kW - Table C.4.43
Concrete pouring	75	76	71	70	71	68	64	60	**75**	6T - Table C4.26
Concrete vibration poker	62	70	70	64	62	61	59	56	**69**	2.2kW - Table C.4.34
HGV aggregate lorry	87	79	77	74	73	73	70	64	**79**	44T - Table C.11.7
Compactor roller	82	80	76	73	70	70	63	59	**76**	95kW - Table C.5.21
Site generator	64	61	59	53	49	47	42	35	**56**	2T - Table C.4.82
Site compressor	84	73	64	59	57	55	58	47	**66**	1T - Table C.5.5
Lighting towers	78	71	66	62	59	55	56	49	**65**	15kW - Table C.4.86
Lw values at Lp at 10m + 28 dB										
Excavator (wheeled)	115	112	108	109	106	103	97	95	**111**	63kW - Table C.4.56
Bulldozer	111	109	104	105	110	98	93	86	**111**	134kW - Table C.5.15
Crane (Wheeled mobile)	108	104	99	91	92	91	84	78	**98**	275kW - Table C.4.43
Concrete pouring	103	104	99	98	99	96	92	88	**103**	6T - Table C4.26
Concrete vibration poker	90	98	98	92	90	89	87	84	**97**	2.2kW - Table C.4.34
HGV aggregate lorry	115	107	105	102	101	101	98	92	**107**	44T - Table C.11.7
Compactor roller	110	108	104	101	98	98	91	87	**104**	95kW - Table C.5.21
Site generator	92	89	87	81	77	75	70	63	**84**	2T - Table C.4.82
Site compressor	112	101	92	87	85	83	86	75	**94**	1T - Table C.5.5
Lighting towers	106	99	94	90	87	83	84	77	**93**	15kW - Table C.4.86
For trenching work connecting to NTS										
Excavator (wheeled)	115	112	108	109	106	103	97	95	**111**	63kW - Table C.4.56
Compactor roller	110	108	104	101	98	98	91	87	**104**	95kW - Table C.5.21

Edit grey cells only -26.2 -16.1 -8.6 -3.2 0 1.2 1 -1.1

Equipment List Sound Power Levels - Phase 2 Drilling and 3 Appraisal including Proppant Squeeze

Insert new row (above selected cell) | Delete selected row

Equipment or source	Source Octave Band Sound Power Level, Lw (Linear) 63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	Overall LwA (dB)	Comment (make, model, operating condition, etc)
Drilling										
Cuadrilla Drillmec HH-220										Measured during Cuadrilla drilling at Preese Hall
BDF Rig 28 Ideco BIR5625 (drilling)										Provided by BDF
Edeco Rig 40										Measured during drilling for Caithness Energy at Lybster
Mean of candidate rigs above:	111	111	107	102	98	94	89	82	**105**	Mean of above values
Consortium Rig 4									**105**	Measured results provided by Vendor prior to extensive noise mitigation measures installed. Values are reported here to be attenuated by 5dBA which is likely to have been achieved.Updated field noise data is required for this rig to confirm stated values have been achieved, prior to any commitment.
Appraisal including Proppant Squeeze stimulation										
Upgraded Flare (Increased flow 2,400 m3/hr)	99	97	98	97	92	87	80	75	**98**	Operates only during appraisal. Increased noise as Vendor datasheet (+7dB)
Proppant Squeeze	120	120	117	115	111	108	103	98	**117**	Based on measurements made during proppant squeeze at Wressle on 25 July 2021. 3 pumps used on site. 57 dBA measured at 149m from the pumps centre for a total of 1 hour during the daytime to complete the process. Noise is primarily from diesel engines powering the pumps.
Workover										Dominant noise source from a workover rig is the operation of the diesel engine drive train for the drawworks. This is integral with the trailor and incorporates its own acoustic enclosure.
Generic/Typical	108	105	104	102	101	99	98	95	**107**	Based on Moor 475. Test report on Enerflow Mobile Service Rig advises Sound power level of 110 dBA. Octave band values estimated by Spectrum.) Mitigation includes acoustic hood installed over trailer mounted engine and gearbox and EchoBarrier screens installed locally around trailer.

Edit grey cells only -26.2 -16.1 -8.6 -3.2 0 1.2 1 -1.1

Equipment List Sound Power Levels - Current and Future Production

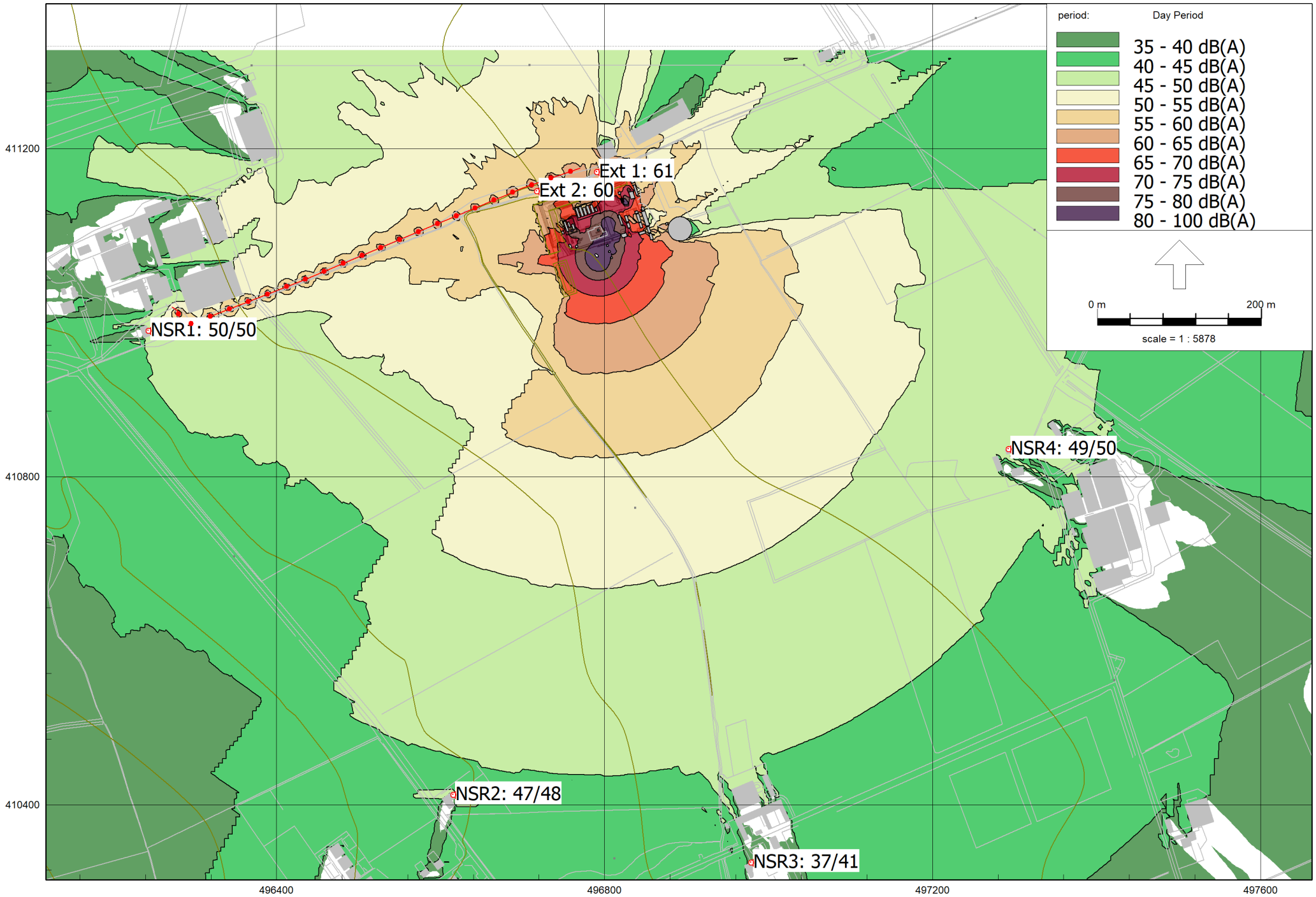
SPECTRUM ACOUSTIC CONSULTANTS

Insert new row (above selected cell) | Delete selected row

Equipment or source	Source Octave Band Sound Power Level, Lw (Linear)								Overall LwA (dB)	Comment (make, model, operating condition, etc)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz		
CURRENT OPERATING EQUIPMENT										
Flow noise into 2nd stage separator	81	78	84	85	90	95	89	81	**98**	Measured on site and calibrated with off site readings at Ext 1 and Ext 2.
Microturbine group with acoustic shield	85	86	90	99	92	91	86	83	**99**	Measured on site and calibrated with off site readings at Ext 1 and Ext 2.
Diesel generator	99	97	95	90	88	84	79	74	**93**	Measured on site and calibrated with off site readings at Ext 1 and Ext 2.
Existing Flare (500m3/hr)	92	90	91	90	85	80	73	68	**91**	Measured on site and calibrated with off site readings at Ext 1 and Ext 2.
RETAINED AND NEW EQUIPMENT										
Flow noise into 2nd stage separator	81	78	81	79	80	82	70	65	**86**	Measured and calculated with 50-75mm acoustic insulation (-12 dBA)
New separation plant	81	78	81	79	80	82	70	65	**86**	New plant will have 50-75mm acoustic insulation on piping and knock out pot
Diesel generator	99	97	95	90	88	84	79	74	**93**	Measured on site and calibrated with off site readings at Ext 1 and Ext 2.
Upgraded Flare (Increased flow 2,400 m3/hr)	97	95	96	95	90	85	78	73	**96**	Operates only during **appraisal**. Increased noise as Vendor datasheet (+5dB)
Surface lift pump (Triplex)	99	95	92	85	80	75	75	70	**88**	Installed in an acoustic enclosure (-15 dB) if necessary depending upon selection

APPENDIX D

Predicted noise levels – Construction (Phases 1 and 4a)



Construction model

Spectrum Acoustic Consultants Ltd, UK

ISO 9613, [version of Area - Phase 1 - Construction of well cellars with HGV on access track] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

Report: Table of Results
Model: Phase 1 - Construction of well cellars
LAeq per octave: total results for receivers
Group: (main group)
Group Reduction: No

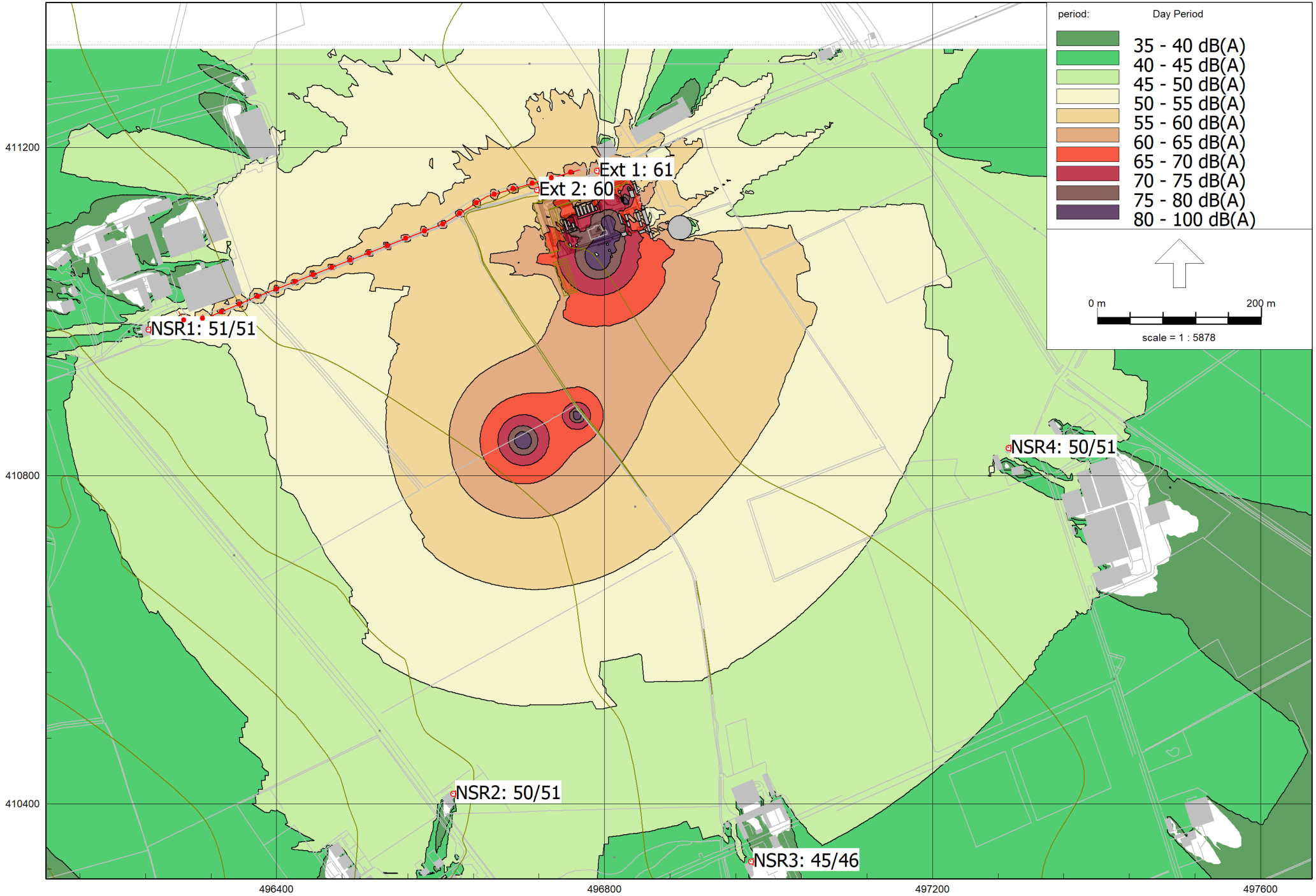
Name			Day								
Receiver	Description	Height	Total	31	63	125	250	500	1000	2000	4000	8000
Ext 1_A	Ext 1	1.50	61	--	44	48	48	53	57	54	47	36
Ext 2_A	Ext 2	1.50	59	--	42	46	45	51	57	50	42	27
NSR1_A	NSR1	1.50	48	--	30	32	32	39	46	38	25	-18
NSR1_B	NSR1	4.00	48	--	30	32	35	41	46	39	25	-18
NSR2_A	NSR2	1.50	47	--	34	31	30	37	45	38	22	-27
NSR2_B	NSR2	4.00	47	--	34	31	33	40	45	38	22	-27
NSR3_A	NSR3	1.50	37	--	26	28	29	31	32	22	2	-55
NSR3_B	NSR3	4.00	41	--	27	29	32	35	37	29	10	-46
NSR4_A	NSR4	1.50	49	--	36	34	32	39	47	41	27	-14
NSR4_B	NSR4	4.00	50	--	35	33	35	42	47	41	27	-14

All shown dB values are A-weighted

Report: Table of Results
Model: Phase 1 - Construction of well cellars
LAeq per octave: by Source/Group for receiver NSR4_A - NSR4
Group: New sources
Group Reduction: No

Name			Day								
Source/Group	Description	Height	Total	31	63	125	250	500	1000	2000	4000	8000
NSR4_A	NSR4	1.50	49	--	36	34	32	39	47	41	27	-14
Bulldozer	Bulldozer	2.00	46	--	27	26	24	34	45	33	18	-26
Excavator	Excavator	1.50	44	--	31	29	27	36	41	38	23	-16
Roller	Vibratory Compactor Roller	1.50	37	--	26	26	23	28	33	33	17	-24
HGV	HGV Aggregate Lorry	2.00	37	--	26	24	25	30	32	31	18	-25
Mixer	Concrete Pouring Mixer Truck	2.00	37	--	19	21	19	27	34	31	17	-23
Crane	Crane - wheeled mobile	1.50	31	--	24	21	18	18	27	25	9	-34
Site Comp	Site Compressor	1.00	30	--	28	19	11	11	19	18	12	-34
Poker	Concrete Vibration Poker	1.00	28	--	6	16	17	16	24	24	13	-26
LightTower	Lighting Tower	1.50	13	--	8	8	7	5	1	-7	-7	-54
Site Gen	Site Generator Diesel	1.00	0	--	-6	-6	-4	-9	-13	-13	-27	-70

All shown dB values are A-weighted



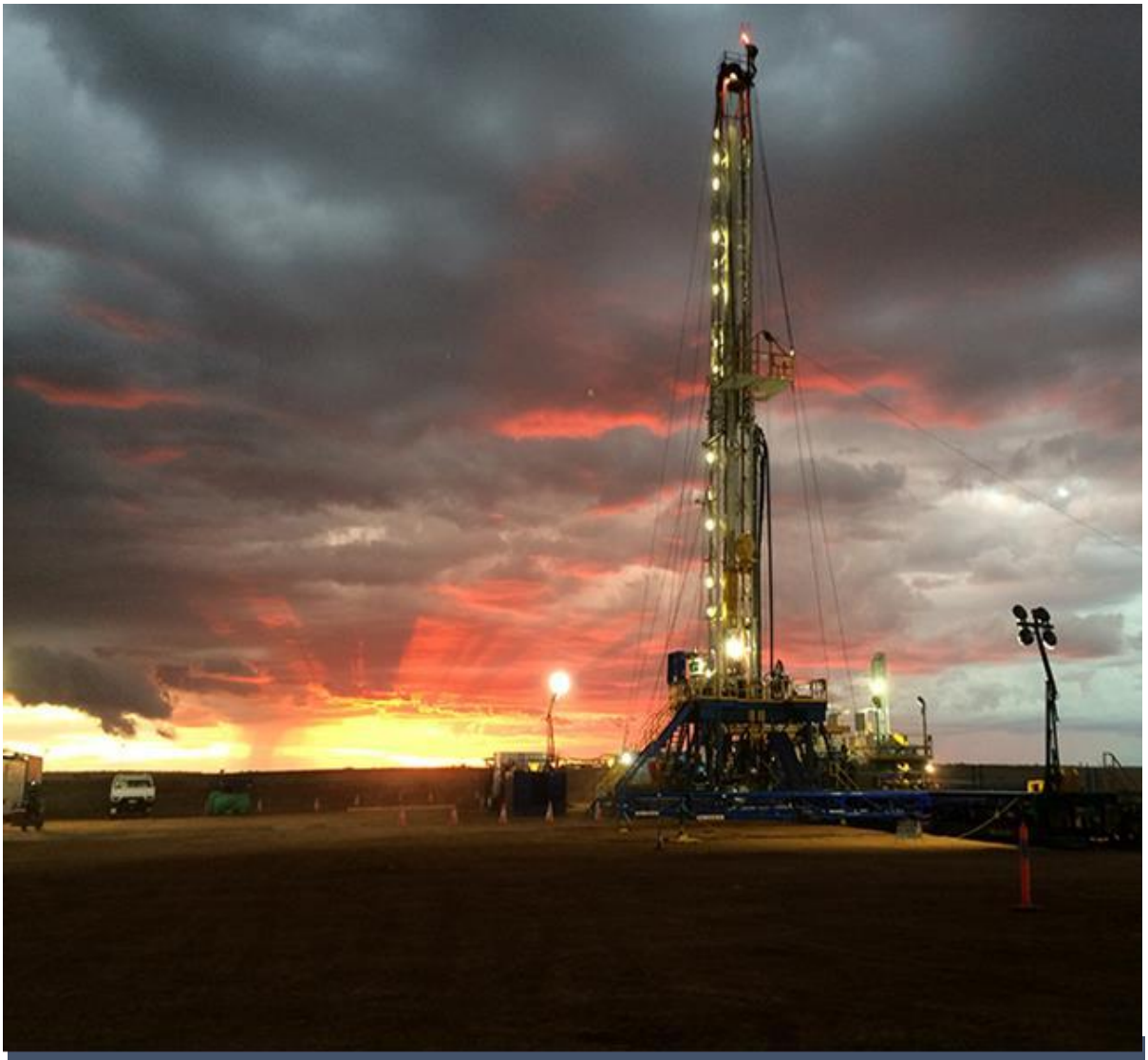
ISO 9613, [version of Area - Phase 1 - Construction with trenching] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

Construction with trenching

Spectrum Acoustic Consultants Ltd, UK

APPENDIX E

Candidate drilling rigs



Consortium Drilling Ltd
Rig 4 Inventory

 | Uncontrolled, If Printed | 20230822 Rev 1, Issue 0

Stewart & Stevenson Crown CE 1000 SD

The S&S Crown CE 1000 120,000 lb. quad suspension trailer rig is a fully mobile Pad Skidding unit that can be positioned over any well in various configurations to best suit the programme and any other activities on the wellsite.

DEPTH RATING

4 in drill pipe (m)	:	16,500 ft. (5028 m)

RIG TRAILER

Manufacturer	:	Stewart & Stevenson (S&S)
Type	:	Crown King
Engines	:	Two x Detroit Diesel Series 60 diesel engines
Power (HP)	:	14.0L, with intermittent rating of 550 BHP Each
Transmissions	:	Two x Allison CLT-5861S 5-speed (compound)
PTO	:	Two x Chelsea PTO (Transmission Mounter)
Air Compressor	:	Two x Tru-Flo 1000
Hydraulic system	:	2500 psi x 50 gpm
Levelling Jacks	:	Eight (4 x hydraulic, 4 x Mechanical)
Rear axles	:	Four x 120,000 lb
Rear tyres	:	Sixteen x 315/80R22.5

DRAWWORKS

Make	:	Crown King
Type	:	CE 1000 SD
Rating (HP)	:	1000
Depth rating (m)	:	5000 m
Drilling line	:	1-1/4” EIPS
Main brake	:	Drum type
Auxiliary Brake	:	Eaton WCBD-336 Disc Brake
Hoisting speeds	:	6
Rotary speeds	:	6
Main drum	:	22 in x 46 in

MAST

Make	:	Stewart and Stevenson
Mast Guying	:	External or Internally Guyed for skidding
Design Spec	:	API 4F, using three-dimensional nonlinear dynamic finite element software
Height (ft)	:	118
No of lines	:	10
Capacity (lb)	:	440,000
Fast sheave	:	One x 42 in
Fleet sheaves	:	Four x 36 in
Deadline sheave	:	One x 30 in
Racking Board Gross Capacity	:	4-1/2 in drill pipe 16,500ft (5028m)
Standpipe	:	4 in x 5000 psi
Tong jacks	:	Two hydraulic make up/ break out tong pull jacks

TOP DRIVE

Make	:	Tesco
Model	:	HXI 700 Top drive system
Rated capacity	:	250 Ton
HP	:	700hp 522KW
Max. Continuous drill torque	:	24,000 ft-lb 3,254.5 daN-m
Make-up/Breakout torque	:	32,000 ft-lb 4,339.4 daN-m
Max. Speed	:	200 rpm
Prime Mover	:	D4P – 700 power unit, caterpillar 700 HP C-18 Prime Mover with a 4-pump drive.

SUBSTRUCTURE

Make	:	Stewart and Stevenson
Type	:	Telescoping type substructure
Rig Floor Height	:	18ft
Clear working height (m)	:	16ft
Set-back Capacity	:	300,000lbs
Rotary Support Capacity	:	500,000lbs

BLOCKS

Make	:	Brewster
Type	:	Clevis Block
Capacity (ton)	:	300 (5-sheave)

ROTARY TABLE

Make	:	Hacker International
Model	:	OB20.5
Opening size (in)	:	20 1/2”

RIG SKIDDING SYSTEM (OPTIONAL)

Make	:	Integrated Skidding System
Type	:	Mechanical claw indexing with minimal handling
Skid Ram Length	:	Two foot (2’) incremental skid cycle
Skid Length	:	Skid rail to accommodate0ft to 80ft inline skid

NOTE: Skidding system raises floor height (1) foot when utilized. Hydraulic supply can be powered off of either Top Drive PU or Rig Carrier.

MUD PUMP #1 & #2

Make	:	IDECO
Model & Type	:	T-1600 Triplex
Number	:	Two
Drive & Transmission	:	Cummins KTA50 c/w Allison 9000Series
HP	:	1600
Liner size (in)	:	5.50 to 7.00
Max pump press rating (psi)	:	5000
Max continuous (spm)	:	100
Pre-charge pump (in)	:	5 x 6

GENERATORS

MCC Power Generation (Sound Attenuated)

Make	:	C Dean electrical
Type	:	AC Generator Class H
Gensets Number	:	Two
Size	:	575Kva, 460Kw, 873A, 380-440V, @ 50Hz
Engine	:	Scania
Model	:	DC16-45A

MUD SYSTEM

Tank volume (bbl)	:	1000 (three tanks)
Mud mix pumps number	:	2
Size (in)	:	5 x 6
Power (hp)	:	50
Rpm	:	1750
Mix hoppers	:	2
Shakers	:	Three Brandt VSM 300
Degassers	:	Atmospheric and primary
Agitators	:	Four
Type	:	Brandt & Flygt
HP	:	10

BOP SYSTEM

NOTE: Well control system in line with current API STD 53

BOP stack	:	13 5/8” 5000psi A1, R2
	:	Blind Rams
	:	VBR 2 7/8” – 5”
Valves	:	2 1/16” 5000psi Kill x 2 manual 3 1/8” 5000psi Choke x 1 3 1/8” 5000psi HCR x 1
BOP handling details	:	Trolley system
WELL CONTROL SUBS	:	IBOP to suit drill string FOSV to suit drill string

BOP CLOSING SYSTEM

Accumulator	:	Advanced Pressure Inc.
Functions	:	5 station
Size (gals)	:	200
Choke Manifold	:	Quality Valve Works USA
Pressure Rating	:	5000psi
Valves	:	Eight

REMOTE CHOKE PANEL

Make	:	Smith Willis
Type	:	Super Choke
Adjustable choke	:	Willis
Press rating (psi)	:	5M
BOP test unit	:	Hydratron

INSTRUMENTATION

Weight indicator	:	Martin Decker
Pump pressure	:	Kane Instrumentation
Standpipe pressure	:	Kane Instrumentation
Stroke counters	:	ElectroFlow
Driller's console	:	Displays all key parameters
Tesco TDS Drillers panel	:	Drill torque and RPM
Travelling Block Crown and Floor Anti-collision system	:	Rig Control Products

HANDLING EQUIPMENT

Iron Roughneck	:	FH-80
Pipe Spinner	:	FH-80
Torque Wrench	:	3 ½" to 8"
Rotary Tongs	:	3 ½" to 13 3/8"
DP & DC Slips	:	SDXL and DCS-L
Elevators	:	18° center latch G Series
Hydraulic Catwalk	:	L'IL Pipe Wrangler c/w 4 x tumble Racks

WINCHES

Hoist Winch (2)	:	Two hydraulic winches
SWL	:	5te (12,000lbs)
Model	:	PD-12C-1

NOTE: One (1) controlled at Driller's position and one (1) controlled at pipe rack side of substructure floor.

Man Riding Winch	:	Ingersoll rand, Set at 150kg with height limit switch

FUEL TANK

Capacity (l)	:	20,000 One x double skin tanks

WATER TANK

Volume (bbl)	:	250
Water pumps size (in)	:	2 x 3” x 2” centrifugal pumps
Brake Cooling Skid		

BUILDINGS

Rig Managers Office
Canteen Shack/Change Shack
Doghouse/Driller's station
Toolhouse
MCC Building
Pump Spares Container
Sub & Tubular Container
Spares Container
Mechanical store & workshop
Tumble racks
Oil Storage Container (fully bunded)

SAFETY EQUIPMENT

Stretcher	:	Collapsible steel framed
First Aid kit	:	Two fully stocked kits
Eye wash Station	:	Three Eye wash stations
Fire extinguishers	:	Twelve 9 kg dry powder Foam and CO2 extinguishers
Breathing Apparatus	:	Five 10 min positive pressure escape packs
	:	Four 30 min positive pressure back packs
Mud Saver Bucket	:	3 ½” & 4” drill pipe
Other	:	One escape buggy Two derrick man riding belts Two full safety harnesses for mast Two fall arrester

CONSORTIUM DRILLING	Applies To: Consortium Drilling Ltd	CD-04-NS-001
Prepared By: Stuart Sinclair	Uncontrolled, If Printed	Rev: 0

Consortium Rig 4

RIH - run in hole
POOH - pulling out of hole
RWD - reaming while drilling
Reaming - enlarging a well diameter

Wellsite	Date	Location Point Source	Time	Duration	LAeq	Max.level	LCPeak	TWA	Dose	Projected dose	Comments	Weather/Wind Direction	Site Operations
B Site Saltfleetby	04/02/2023	5m N of BOP	13:00	5 mins	68.1	88.2	98.4	56.8dB	0.1%	14.5%	Live gas production ops in progress	13mph WSW	RIH
		10m N of BOP	13:10	5 mins	63.4	79.6	91.1	42.0dB	0.0%	0.5%	Live gas production ops in progress	13mph WSW	RIH
		20m N of BOP	13:20	5 mins	60.4	75.9	88.9	33.2dB	0.0%	0.1%	Live gas production ops in progress	14mph WSW	RIH
		Lease Fence North	13:30	5 mins	54.5	76.5	87.7	28.0dB	0.0%	0.0%	Live gas production ops in progress	14mph WSW	RIH
		5m S of BOP	13:55	5 mins	81.7	96.9	99.8	74.0dB	7.8%	757.2%	Live gas production ops in progress	13mph WSW	RIH
		10m S of BOP	14:05	5 mins	79.8	95	99.7	70.0dB	3.1%	305.1%	Live gas production ops in progress	11mph WSW	RIH
		20m S of BOP	14:15	5 mins	77.1	91	98.9	66.8dB	1.5%	161.4%	Live gas production ops in progress	11mph WSW	RIH
		Lease Fence South	14:25	5 mins	60.9	73.5	99.3				Live gas production ops in progress	12mph WSW	RIH
		Security Office NW of BOP 92m	14:45	5 mins	57	74.9	90.1				1x Skip lorry & 1x Car passed during test	11mph WSW	RIH
		House at Entrance 335m	15:00	5 mins	51.1	67.3	82.7				1x Telehandler & 1x Car passed during test	9mph WSW	RIH
		5m W of BOP	22:00	5 mins	72.7	93.7	99.8	62.2dB	0.5%	49..1%	Live gas production ops in progress	18mph WNW	RIH
		10m W of BOP	22:10	5 mins	67.9	87.5	95.2	56.2dB	0.1%	12.5%	Live gas production ops in progress	15mph WNW	RIH
		20m W of BOP	22:20	5 mins	61	74.3	89.6				Live gas production ops in progress	13mph WNW	RIH
		Lease Fence West	22:30	5 mins	56	63.8	83.7				Live gas production ops in progress	14mph WNW	RIH
		5m E of BOP	22:40	5 mins	66.3	80	93.2	46.5dB	0.0%	1.3%	Live gas production ops in progress	15mph WNW	RIH

Prepared By:	Checked By:	Approved By:	Issued:
Danny Benniston	Stuart Sinclair	Steve Rogan	07/02/2023

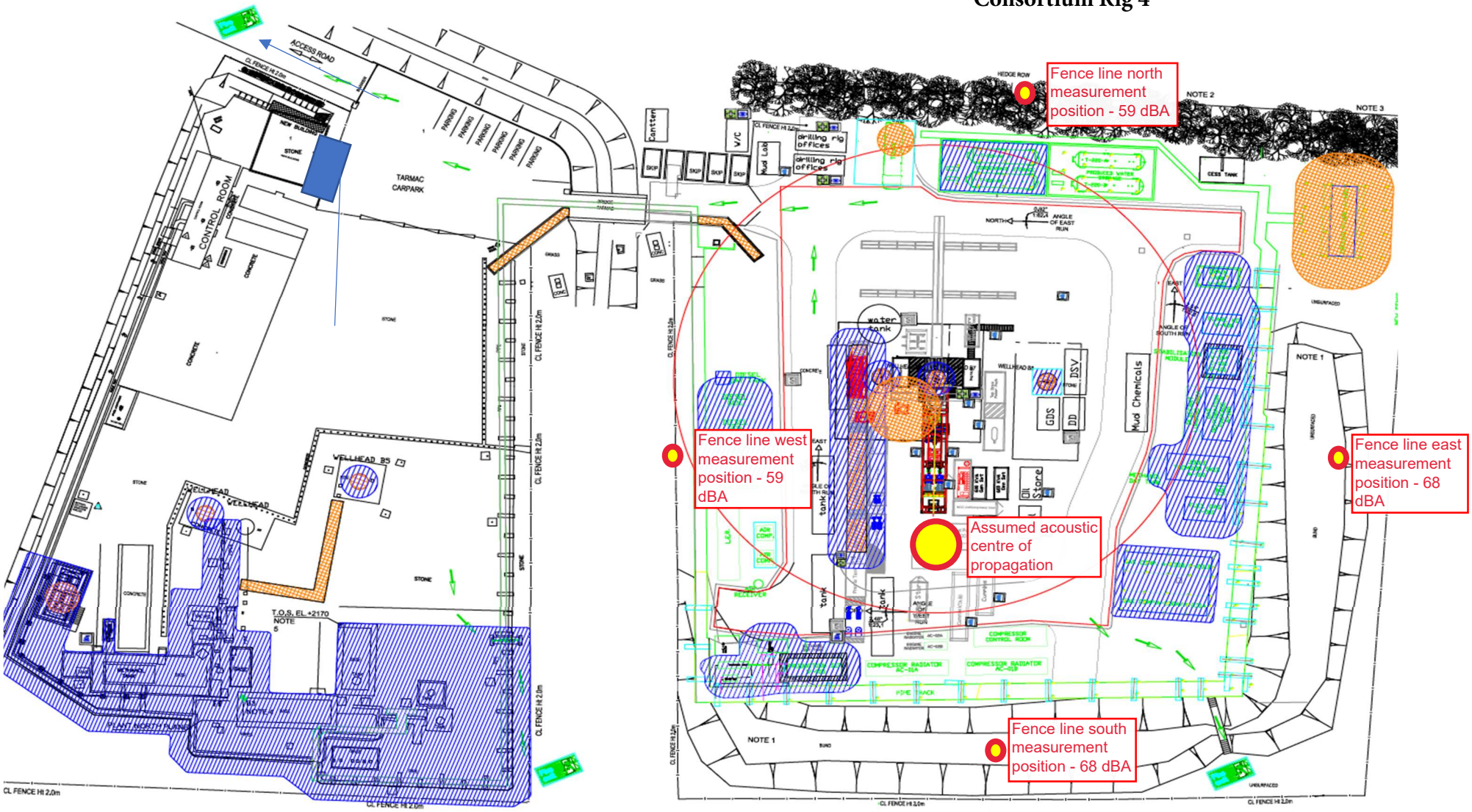
		10m E of BOP	22:50	5 mins	63.2	79.8	91.9	46.2dB	0.0%	1.2%	Live gas production ops in progress	15mph WNW	RIH
		20m E of BOP	23:00	5 mins	57.8	74.8	89.6				Diesel Jetwash started & then shut off	14mph WNW	RIH
		Lease Fence East	23:10	5 mins	57.4	69.4	92.5				Live gas production ops in progress	12mph NW	RIH
		Security Office NW of BOP	23:30	5 mins	51.1	68.2	86.5	40.6dB	0.0%	0.4%		10mph NW	RIH
		House at Site Entrance	23:45	5 mins	36.9	50.5	75.1	28.3dB	0.0%	0.0%	1x Car passed	9mph NW	RIH
	05/02/2023	5m W of BOP	12:00	5 mins	73.4	94	99.3	63.1dB	0.6%	60.7%	Live gas production ops in progress	6mph NNW	POOH
		10m W of BOP	12:10	5 mins	67.8	83.7	92.8	56.4dB	0.1%	12.9%	Live gas production ops in progress	6mph NNW	POOH
		20 W of BOP	12:20	5 mins	61.8	75.1	90.2				Live gas production ops in progress	5mph NNW	POOH
		Lease fence	12:30	5 mins	57.1	65	84				Live gas production ops in progress	4mph NW	POOH
		5m E of BOP	12:40	5 mins	71.1	89.2	99.6	60.1dB	0.3%	30.3%	Live gas production ops in progress	4mph NW	POOH
		10m E of BOP	12:50	5 mins	66.2	77.4	94.1	53.3dB	0.1%	6.0%	Live gas production ops in progress	5mph NW	POOH
		20 E of BOP	13:00	5 mins	53.2	67.6	87.8				Live gas production ops in progress	4mph NNW	POOH
		Lease Fence	13:10	5 mins	56.5	68.4	82				Live gas production ops in progress	4mph NNW	POOH
		Security Office NW of BOP	13:30	5 mins	58.1	75.8	91.1				Telehandler passed	3mph NNW	POOH
		House at Site Entrance	13:45	5 mins	51.9	67.7	84.1				1x Car & 1x tractor & trailer passed	3mph NNW	POOH
		5m S of BOP	21:45	5 mins	72.7	93.7	99.8	62.2dB	0.5%	49..1%	Live gas production ops in progress	7mph SSW	POOH
		10m S of BOP	21:55	5 mins	67.9	87.5	95.2	56.2dB	0.1%	12.5%	Live gas production ops in progress	7mph SSW	POOH
		20 S of BOP	22:10	5 mins	61	74.3	89.6				Live gas production ops in progress	7mph SSW	POOH

		Lease Fence South	22:20	5 mins	56	63.8	83.7				Live gas production ops in progress	6mph SSW	POOH
		5m N of BOP	22:35	5 mins	68.1	88.2	98.4	56.8dB	0.1%	14.5%	Live gas production ops in progress	6mph SSW	POOH
		10m N of BOP	22:45	5 mins	63.4	79.6	91.1	42.0dB	0.0%	0.5%	Live gas production ops in progress	7mph SSW	POOH
		20 N of BOP	22:55	5 mins	60.4	75.9	88.9	33.2dB	0.0%	0.1%	Live gas production ops in progress	7mp SSW	POOH
		Lease Fence North	23:05	5 mins	54.5	76.5	87.7	28.0dB	0.0%	0.0%	Live gas production ops in progress	9mph SSW	POOH
		Security Office NW of BOP	23:15	5 mins	51	67.7	86.1	41.6dB	0.0%	0.4%		11mph SSW	POOH
		House at Site Entrance	23:30	5 mins	37.5	50.8	76.2	27.3dB	0.0%	0.0%		12mph SSW	POOH
	06/02/23	5m N of BOP	09:30	5 mins	68.3	87.8	97.5	56.3dB	0.1%	14.1%	Live gas production ops in progress	8mph SSW	RIH
		10m N of BOP	09:45	5mins	62.9	78.7	90.6	41.6dB	0.0%	0.4%	Live gas production ops in progress	11mph SSW	RIH
		20 N of BOP	09:55	5mins	60.5	76	88.7	33.0dB	0.0%	0.1%	Live gas production ops in progress	12mph SSW	RIH
		Lease Fence North	10:10	5mins	54.2	76.1	87.4	28.0dB	0.0%	0.0%	Live gas production ops in progress	15mph SSW	RIH
		5m S of BOP	15:00	5mins	72.9	88.9	98.4	62.0dB	0.5%	48.8%	Live gas production ops in progress	9mph SW	RIH
		10m S of BOP	15:10	5mins	67.7	87.7	96.1	56.7dB	0.1%	12.5%	Live gas production ops in progress	10mph SSW	RIH
		20 S of BOP	15:25	5mins	62	75.1	90.1				Live gas production ops in progress	10mph SSW	RIH
		Lease Fence South	15:35	5mins	56	63.8	83.7				Live gas production ops in progress	8mph SSW	RIH
		Security Office NW of BOP	15:50	5 mins	67.1	87.3	99.1	56.9dB	0.1%	14.5%	1x Van passed	8mph SSW	RIH

		House at Site Entrance	16:00	5 mins	62.4	79.2	91.3	42.1dB	0.0%	0.5%	2x Car passed	9mph SSW	RIH
		5m W of BOP	22:00	5mins	71.3	83.4	96.2	60.9dB	0.1%	39.7%	Live gas production ops in progress	7mph SW	Reaming
		10m W of BOP	22:10	5mins	70.1	86.9	96.1	61.5dB	0.3%	31.9%	Live gas production ops in progress	7mph SW	Reaming
		20 W of BOP	22:20	5mins	61.8	62.8	86.7	53.9dB	0.1%	5.7%	Live gas production ops in progress	8mph SW	Reaming
		Lease fence	22:30	5mins	58.7	68.9	81.6	48.9dB	0.0%	2.4%	Live gas production ops in progress	8mph SW	Reaming
		5m E of BOP	22:45	5mins	74.3	91.9	96	64.5dB	0.8%	86.0%	Live gas production ops in progress	8mph S	Reaming
		10m E of BOP	22:55	5mins	77	78.3	95.1	66.9dB	1.5%	130.3%	Live gas production ops in progress	7mph S	Reaming
		20 E of BOP	23:05	5mins	74.2	76.1	96	64.7dB	0.9%	98.6%	Live gas production ops in progress	7mph S	Reaming
		Lease Fence	23:20	5 mins	68	70.5	93.1	57.8dB	0.2%	20.4%	Live gas production ops in progress	8mph SW	Reaming
		Security Office NW of BOP	23:30	5 mins	51.1	67.9	92.5	41.8dB	0.0%	0.5%		8mph SW	Reaming
		House at Site Entrance	23:45	5mins	37.9	51.3	76.9	28.0dB	0.0%	0.0%		8mph SW	Reaming
	07/02/2023	5m W of BOP	14:30	5mins	72.7	91.7	99.8	62.2dB	0.5%	49.1%	Live gas production ops in progress	12mph SSW	RIH
		10m W of BOP	14:40	5mins	67.9	87.5	95.2	56.2dB	0.1%	12.5%	Live gas production ops in progress	11mph SSW	RIH
		20 W of BOP	14:50	5mins	61	74.3	89.6				Live gas production ops in progress	10mph SSW	RIH
		Lease fence	15:00	5mins	56	63.8	83.7				Live gas production ops in progress	10mph SSW	RIH
		5m E of BOP	15:25	5mins	66.3	80	93.2	46.5dB	0.0%	1.3%	Live gas production ops in progress	10mph SSW	RIH
		10m E of BOP	15:35	5mins	63.2	79.8	91.9	46.2dB	0.0%	1.2%	Live gas production ops in progress	10mph SSW	RIH
		20 E of BOP	15:50	5 mins	57.8	74.8	89.6				Live gas production ops in progress	10mph SSW	RIH
		Lease Fence	16:00	5 mins	57.4	69.4	92.5				Live gas production ops in progress	10mph SSW	RIH

		Security Office NW of BOP	16:10	5mins	57	74.9	90.1				2x Car passed during test	10mph SSW	RIH
		House at Site Entrance	16:20	5mins	51.1	67.3	82.7				1x Car passed during test	8mph SSW	RIH
		5m N of BOP	22:25	5mins	71.1	83.6	97	61.3dB	0.1%	40.7%	Live gas production ops in progress	9mph SSW	Reaming
		10m N of BOP	22:35	5mins	70.2	84.3	96	60.5dB	0.3%	33.1%	Live gas production ops in progress	9mph SSW	Reaming
		20m N of BOP	22:50	5mins	62.8	63.9	87.4	52.9dB	0.1%	5.9%	Live gas production ops in progress	9mph SSW	Reaming
		Lease fence	23:00	5mins	59.1	69.7	82.4	49.3dB	0.0%	2.5%	Live gas production ops in progress	9mph SSW	Reaming
		5m S of BOP	23:10	5mins	74.4	92.5	96.1	64.6dB	0.9%	86.1%	Live gas production ops in progress	9mph SSW	Reaming
		10m S of BOP	23:20	5mins	77.1	78.2	95.7	67.1dB	1.6%	163.1%	Live gas production ops in progress	9mph SSW	Reaming
		20 S of BOP	23:30	5mins	74.9	76.5	96.1	64.8dB	0.9%	98.6%	Live gas production ops in progress	9mph SSW	Reaming
		Lease Fence	23:40	5 mins	68.2	70.1	93	58.1dB	0.2%	20.7%	Live gas production ops in progress	9mph SSW	Reaming
		Security Office NW of BOP	23:50	5mins	51.9	67.5	93.8	41.9dB	0.0%	0.5%	Telehandler passed	9mph SSW	Reaming
		House at Site Entrance	00:00	5mins	37.8	51.5	76.5	27.dB	0.0%	0.0%		9mph SSW	Reaming

Consortium Rig 4



Drawn By:	AK	Project	Saltfleetby SF7V Sidetrack
Checked By:	AH	Title	Field Layout - Drilling Operations
Date:	May 2022		
Status:	APPROVED	Drawing No:	Rev: 05

Measurement position (distance from acoustic centre)	Measured Sound Pressure Level (LpA)	20log(distance) + 10 (dB)	Sound Power Level, near field (LwA)
Lease fence N (68m)	59.1	46.7	105.8
Lease fence E (60m)	68.0	45.6	113.6
Lease fence S (33m)	68.2	40.4	108.6
Lease fence W (38m)	58.7	41.6	100.3
.			
Total Rig Sound Power Level (LwA)			**110**

Sound power level of Consortium Rig 4 (Drilling/Reaming) from measurements made at Saltfleetby 7/02/23

The levels appear to vary significantly in each direction, however these measurements are within the near field of the drilling rig equipment, and are both shielded and also subject localised noise sources. At distances greater than 200m, drilling rigs are generally not significantly directional in their sound radiation patterns.

Rig 18 Equipment Inventory

Rig	WEI DS 100 SLANT Hydraulic semi-trailer mounted fitted with independent hydraulic stabilizers for trailer & substructure. Manufactured 2013 (first commissioned 2019)
Drillers Control Cabin (Dog-house)	WEI hydraulically adjustable Heavy Duty steel accessible from ground level
Mast	220,000 lbs capacity 25.5 m height
Substructure	220,000 lbs setback capacity 4.45 m from GL to RT 4 m clear height under RT beams.
Catwalk	catwalk and pipe handling system, manual option used for coring 1.22 m (H) x 1.16 m (W) x 19.58 m (L)

Marriott Rig 18

Draw Works	WEI Hydrualic ram 220,000 lbs capacity 3 no. x 22 mm lines
Rig Engine	Caterpillar C-15 447 kW (600 HP)
Rig Generators	2 x Caterpillar 3406 (635 kVA)
Rotary Table	WEI non-rotating 40" maximum opening Rated to 220,000 lbs capacity c/w various size bowls
Top Drive	WEI DS100 S 220,000 lbs pull-up 3,000 psi Maximum rotary speed = 180 rpm Maximum continuous torque = 21,700 ft-lbs
Rig Floor Winches	3 no. (1t, 3t, rated capacity)
Hook	WEI casing/drill pipe Rated to 180,000 lbs
Mud Pumps	2 x 500HP Ideco T500 *(1000 HP electric drive pumps also available see Rates Table 4-1)*
Rotary Hose	3 ½" Diameter x 38 ft
Mud Tank System	Active 1 – 135 bbl Active 2 – 135 bbl Premix – 50 bbl Pill – 70 bbl Settlement – 115 bbl
Shaker Tank	120 bbl capacity
Pill Tank	70 bbl capacity
Trip Tank	30 bbl capacity
Mud and Solids Control	3 x 5" x 6" x 11" centrifugal pump 6 x 15kw Mud Agitators 2 x Derrick G 503 shale shakers 1 x Derrick G 503 desander/desilter
Mud Lab	1 x Mud lab c/w PPE store, cupboards, tool-kit, mud balance, marsh funnel, filtration kit, sand content kit and stopwatch
Water Storage Tanks	1 x 300 bbl capacity tank
Fuel Tank (Double Wall)	1 x 20,000 L double skinned Fuel Storage Tank 1 x 2,000 L mobile bunded tank
BOP Stack	7 1/16 in x 5000 psi Annular Preventer 7 1/16 in x 5000 psi Double Gate 10,000 Psi Barton chart recorder

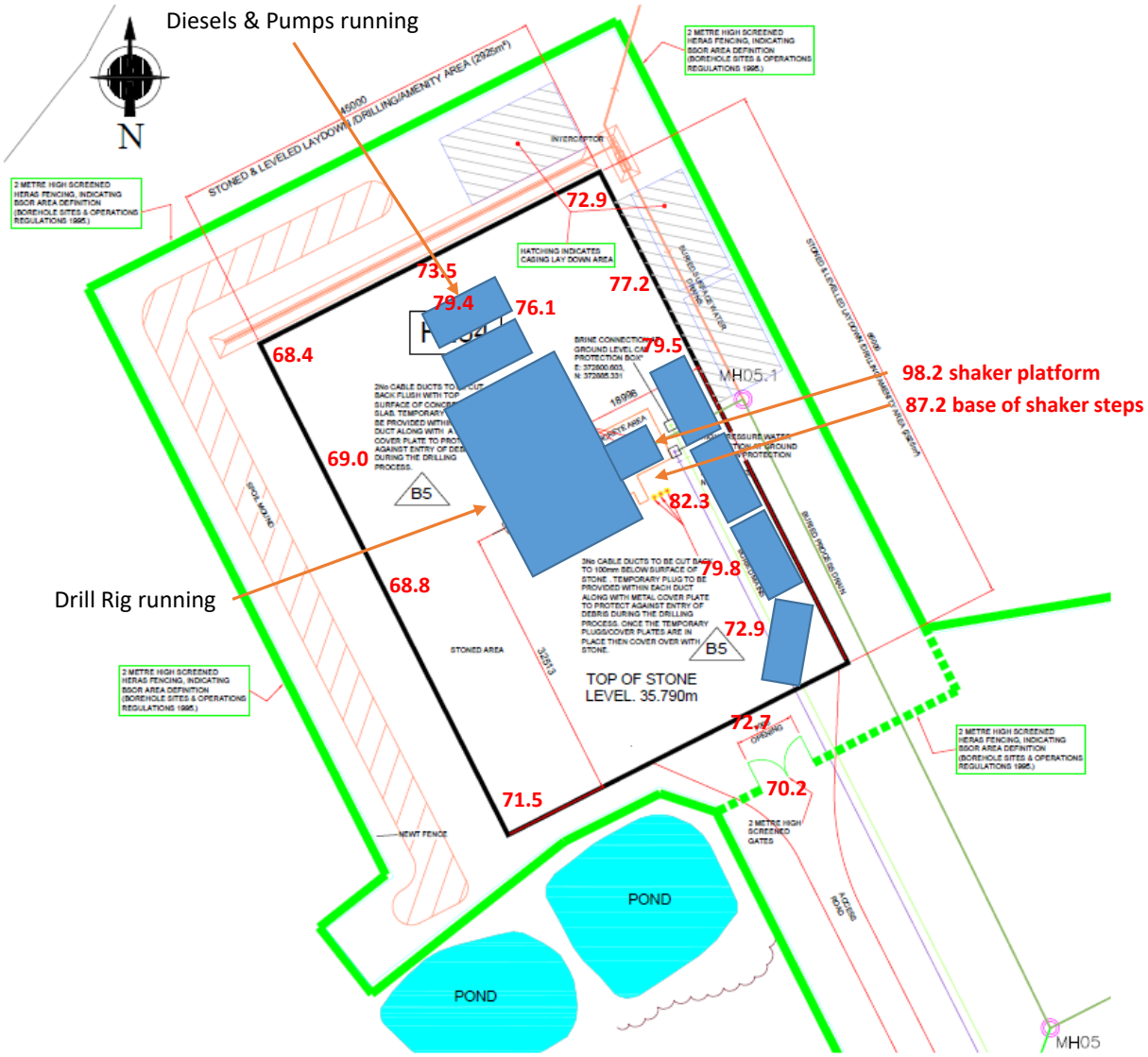
Marriott Rig 18

Koomey Unit	Control systems 26160 3B 20 Bottles - 5,500 psi working pressure 1 x electric driven hydraulic pump + 2 x air driven
Choke Manifold & Ancillaries	Sanyi 2 1/16" minimum ID (5000 psi max. working pressure) 2 1/16" Choke line 2" Kill line 2" armour cement hose x 35 ft (5000 psi)
Iron Roughneck	WEI Iron roughneck for DP tool joints and DC's from 3 ½" to 20" OD Maximum make-up torque = 57,940 ft-lbs
Compressors	1 x atlas copco GA22 13 Bar working pressure
Test Pump	1 x Enerpac 39 c/w chart recorder 15,000 psi pressure rating
Drill String Handling Tools	DP/Tubing Elevators – to suit 2 7/8", 3 ½", 4", 5" and 5 ½" Manual DP Slips - to suit 2 7/8", 3 ½", 4" and 5" Semi-automatic DP Slips - to suit 3 1/2" – 5" size range DC Slips – to suit 4 3/4" to 8 ½" size range Tubing Slips – to suit 2 3/8" to 3 ½" size range DC lift subs – 4 x 8", 8 x 6 ¾"
Elevator Links	1 x 2.6m long rated to 150 tons (3 1/8") 1 x 1.2m long rated at 50 tons (1 ¼")
Safety Valves, Crossovers and Subs	To suit all contractors drill string items provided above
Casing Running & Handling Equipment	1 x WEI make up device body – Casing make up device rotating tool for 5 ½" to 7", 7 5/8" to 9 5/8", 9 5/8" to 13 3/8" Casing bowls spider – DEN-CON 27 ½" with inserts for 5 ½ - 18 5/8" Manual casing slips – to suit 5 ½" to 13 3/8" range Side door casing elevators – to suit 5 ½" to 13 3/8" range
Bit Breakers & Gauge Rings	Bit breakers for Tri cone bits: 3 ½", 4 ¾", 6 ¾", 12 ¼", 14 ¾" and 17 ½"
Cup Testers	1 x 13 3/8" (Type F) 1 x 9 5/8" (Type F) 1 x 7 5/8" plug tester 4" IF Pin x 4" IF Box
Survey Equipment	1 x shore shot survey equipment (0-7degree range)
Buildings/Accommodation	1 x Rig Managers Office/Accommodation Unit 1 x Mechanics Accommodation Unit Spares and workshops for Contractors equipment
Pipe & Equipment Storage	Pipe baskets and half-racks to suit Contractors equipment
Forklift	Nominal 4 tonne, all terrain telehandler

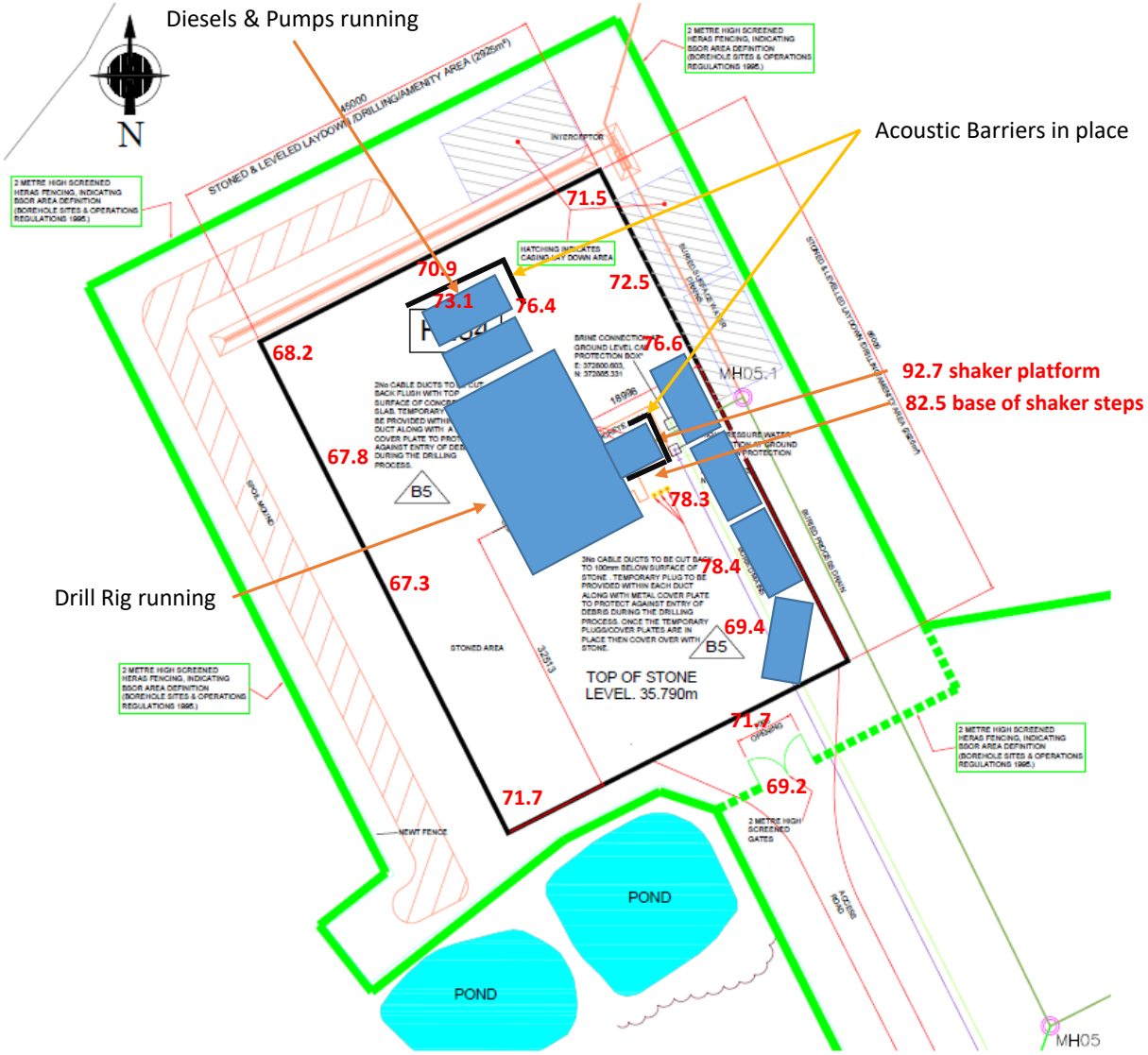
	c/w handling grab for safe operations with onsite tubulars
Welding Set	1 x 110 A Lincoln 305D Ranger portable welding set
Hand-held VHF radios	4 x Motorola VHF intrinsically safe
Safety Apparatus	2 x 30 min DRAGER BA Sets 1 x Defibrillator 1 x Stretcher 3 x H2S Detectors Fire extinguishers Pumpman escape sets 4 x First aid kits 4 x Eye-wash stations

Note

Rig inventory is subject to amendment by substitute items of equivalent size or capacity where equipment is dependent on availability and also if changes are agreed with the Company



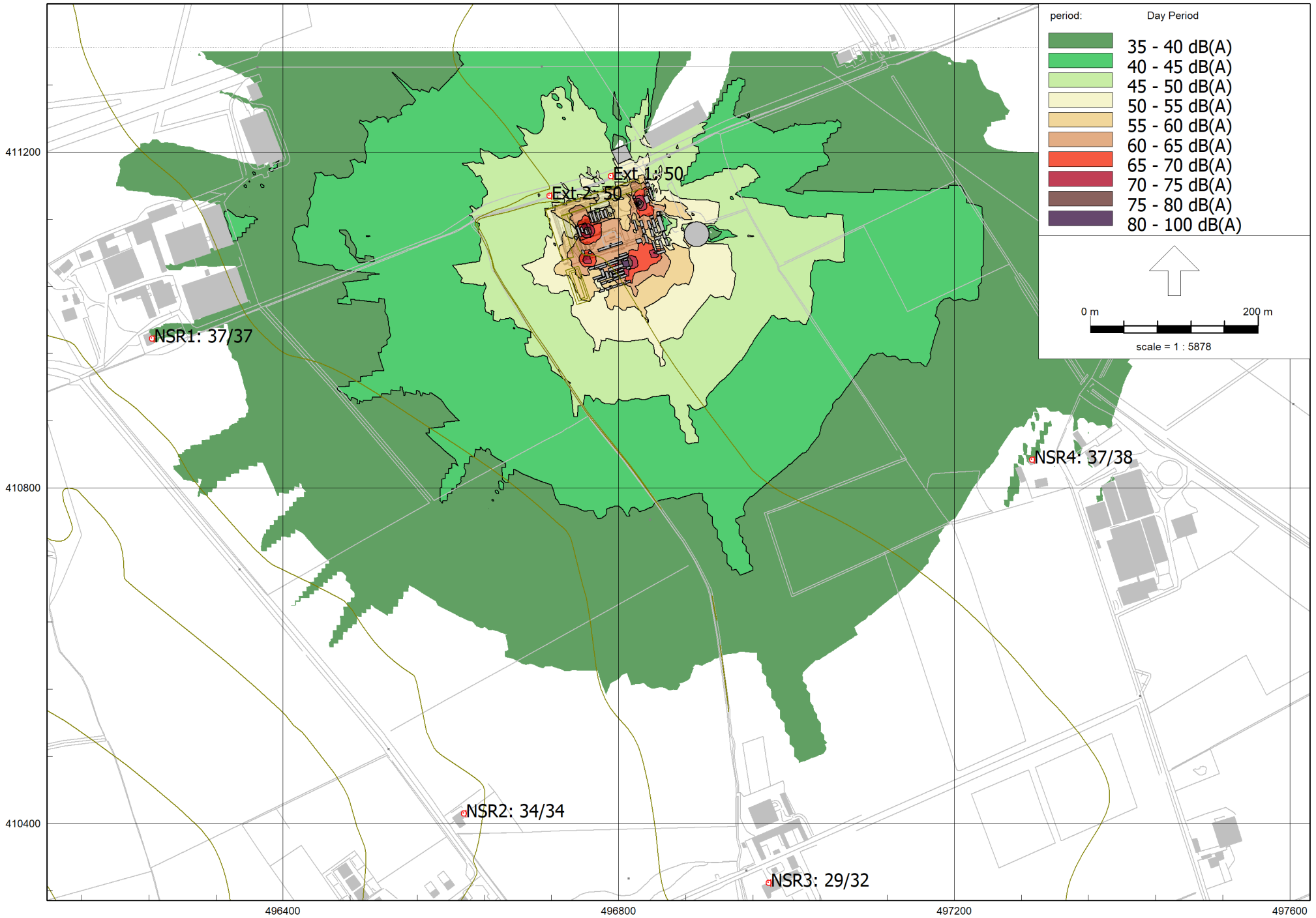
H254 Spot noise levels taken 10/06/19. Drill Rig running throughout, with the diesels, pumps & screen shaker running continuously. Intermittent vehicle movements throughout the survey, shuttling supplies to/from & around pad.



H254 Spot noise levels taken 29/07/19. Acoustic cladding fitted around the screen shaker and the diesel pumps.
Drill Rig running throughout, with the diesels, pumps & screen shaker running continuously. Intermittent vehicle movements throughout the survey, shuttling supplies to/from & around pad.

APPENDIX F

Predicted noise levels – Drilling (Phase 2a and 3b)



ISO 9613, [version of Area - Phase 2 - Drilling] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

P2a Drilling V1

Spectrum Acoustic Consultants Ltd, UK

Report: Table of Results
Model: Phase 2 - Drilling
LAeq per octave: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Day Total	31	63	125	250	500	1000	2000	4000	8000
Ext 1_A	Ext 1	1.50	50	--	31	39	41	42	42	45	37	20
Ext 2_A	Ext 2	1.50	50	--	31	38	40	42	42	45	37	21
NSR1_A	NSR1	1.50	37	--	25	28	28	31	31	27	14	-29
NSR1_B	NSR1	4.00	37	--	25	28	31	32	31	27	14	-30
NSR2_A	NSR2	1.50	34	--	21	25	27	28	27	25	11	-41
NSR2_B	NSR2	4.00	34	--	21	25	28	28	28	25	11	-41
NSR3_A	NSR3	1.50	29	--	19	23	24	22	18	11	-9	-68
NSR3_B	NSR3	4.00	32	--	19	24	27	26	24	17	-1	-59
NSR4_A	NSR4	1.50	37	--	24	28	29	31	31	29	17	-25
NSR4_B	NSR4	4.00	38	--	24	28	31	31	31	30	17	-26

All shown dB values are A-weighted

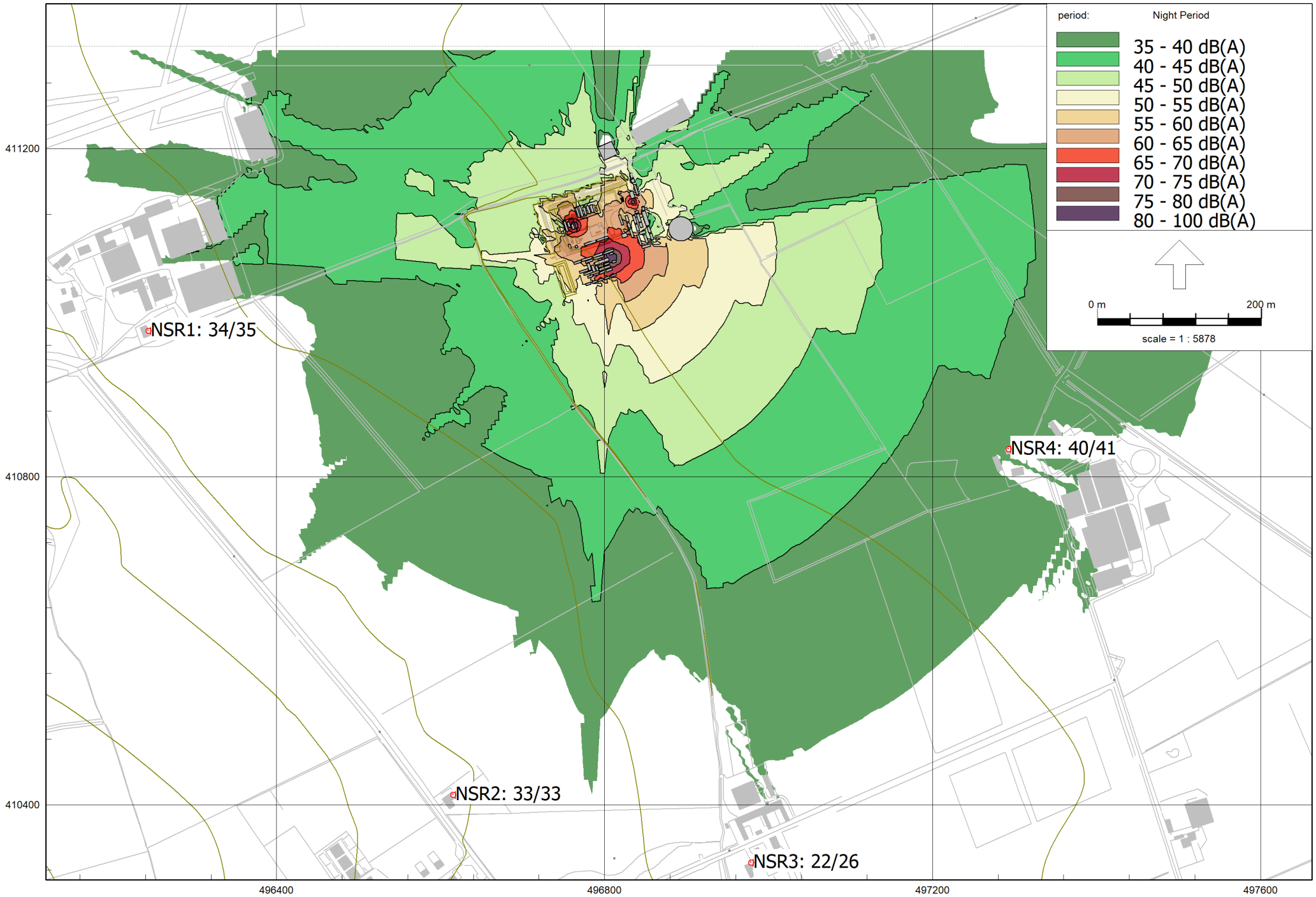
Report: Table of Results
Model: Phase 2 - Drilling
LAeq per octave: by Source/Group for receiver NSR4_B - NSR4
Group: (main group)
Group Reduction: No

Name			Day									
Source/Group	Description	Height	Total	31	63	125	250	500	1000	2000	4000	8000
NSR4_B	NSR4	4.00	38	--	24	28	31	31	31	30	17	-26
Drill Rig	Drilling Rig	3.00	37	--	17	27	30	31	30	29	15	-28
LightTower	Lighting Tower	1.50	28	--	22	17	17	21	23	19	11	-30
	2nd stage separator	1.50	24	--	-14	-7	6	11	18	22	6	-41
LightTower	Lighting Tower	1.50	22	--	11	14	16	17	16	10	2	-44
1	Microturbines (shielded)	1.50	17	--	-13	-8	3	6	13	14	-5	-52
Group	Sources	0.00	--	--	--	--	--	--	--	--	--	--
Group	MR LUKE LLOYD-270608-VML10K-WRESSLE WELLSI...	0.00	--	--	--	--	--	--	--	--	--	--

All shown dB values are A-weighted

APPENDIX G

Predicted noise levels – Well completions



Phase 2b Well Completion

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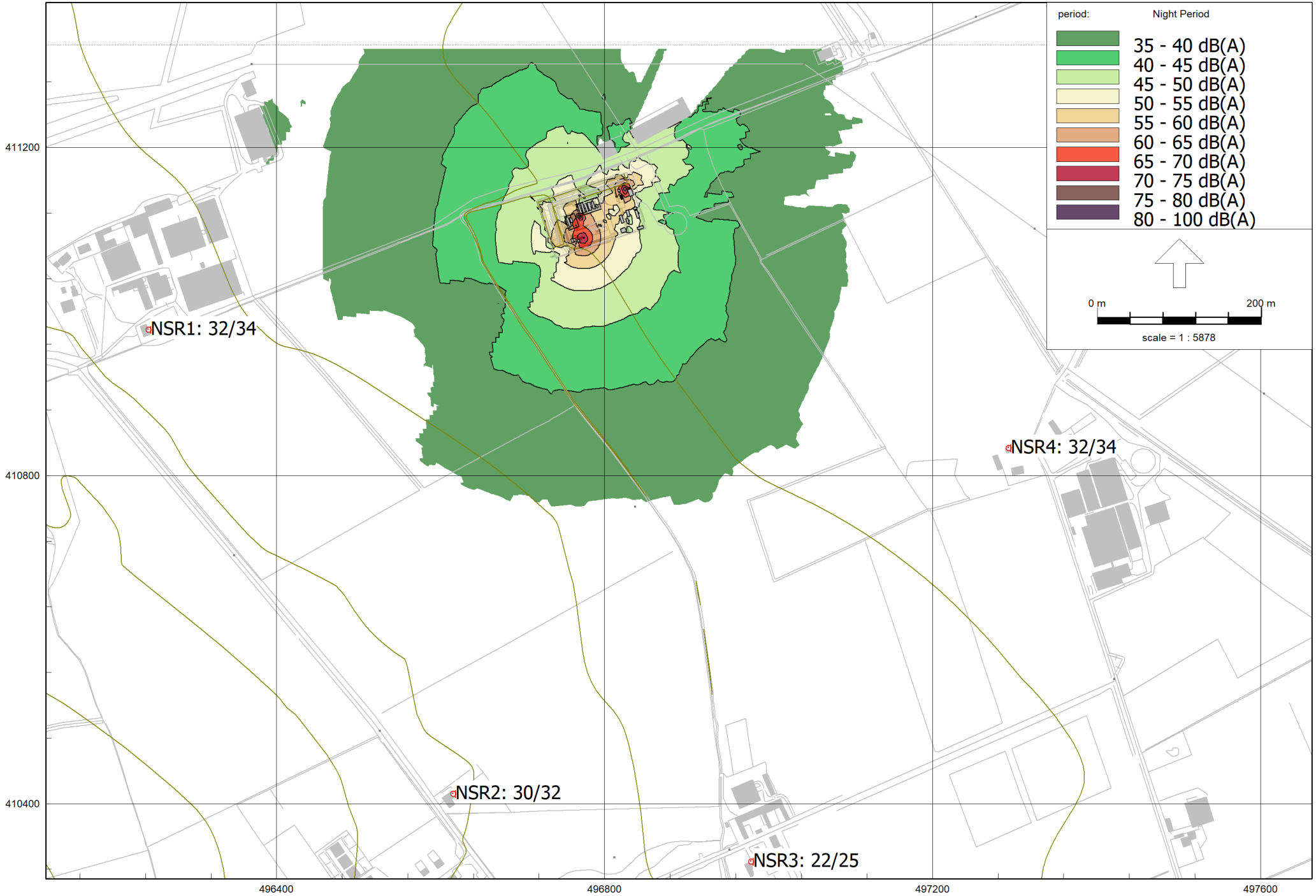
ISO 9613, [version of Area - Phase 2b- Workover for completion] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

APPENDIX H

Predicted noise levels - Production testing including flare noise details



Phase 3a- Production Testing

Spectrum Acoustic Consultants Ltd, UK

ISO 9613, [version of Area - Phase 3a - Production testing] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

Noise measurements on Enclosed Ground Flare – Wressle Wellsite 18.12.23

	dB(A)	Octave Band Centre Frequency (Hz) 31	63	125	250	500	1k	2k	4k	8k
Lp measured 1m from 90% closed air inlet	**70**	73	72	70	71	70	65	60	53	48
Lp 1m from 30% closed air inlet (+5dB) - calc	**75**	78	77	75	76	75	70	65	58	53
Lw of one 30% closed air inlet (+5dB) - calc	**80**	83	82	80	81	80	75	70	63	58
Lw of five 30% closed air inlets (+7dB) - calc	**87**	90	89	87	88	87	82	77	70	65
Lw of stack outlet approximately similar to air inlet	**87**	90	89	87	88	87	82	77	70	65

Table: Measurements (18.12.23 Wressle) and resulting sound power level (Lw) of enclosed ground flare (2,400 m^3/hr design; 500m^3/hr operating)

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JOB 1805 - NOISE REPORT – UF10-5000

Title:	UF10-5000 Stack Noise
Description:	Noise Levels related to Uniflare 'UF10' Stacks
Creator:	Alex Hughes
Report Date :	16/11/2023
Sample Date :	03/05/2023

Flare Specification:

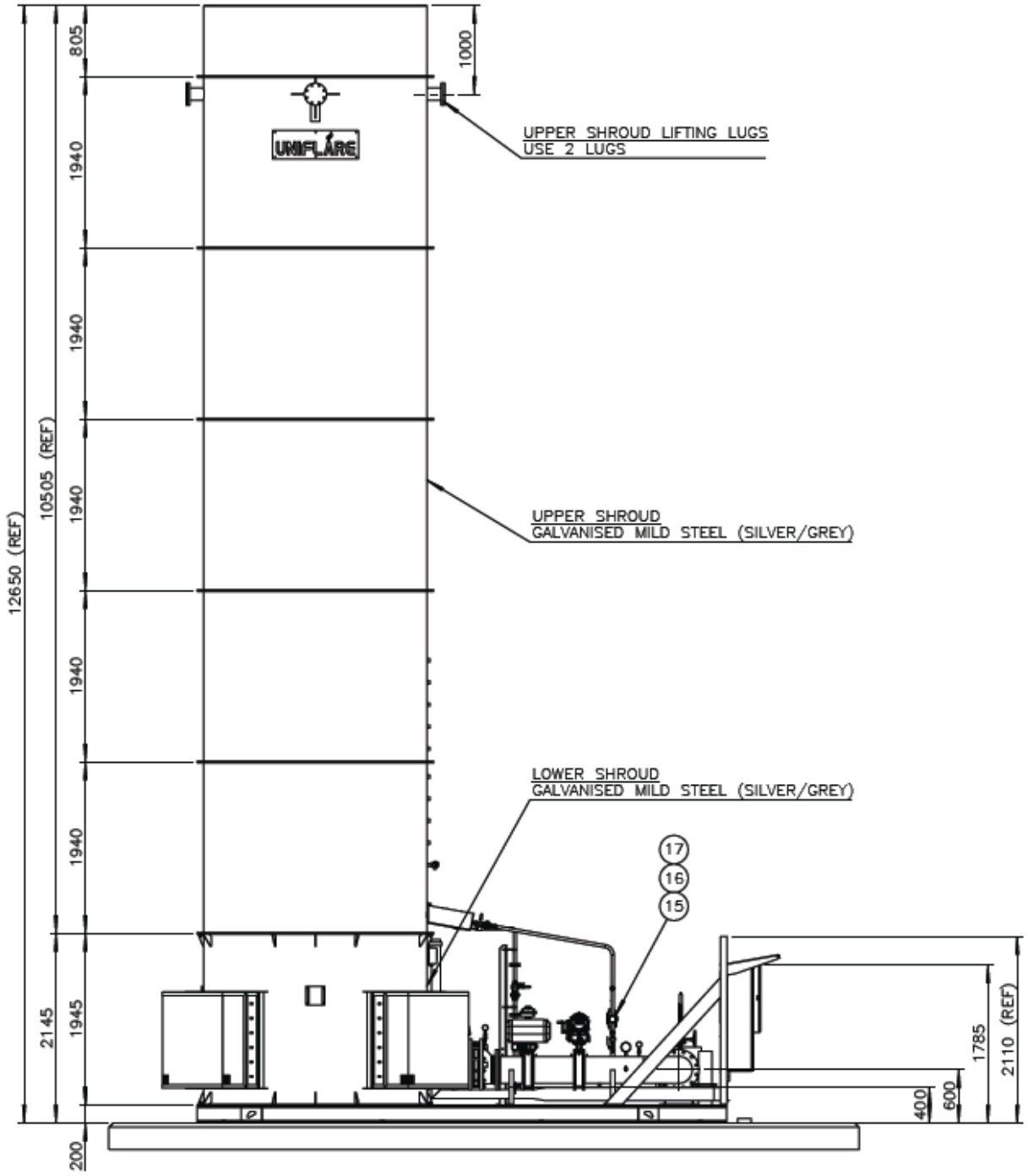
- UF10-5000 Bivalent Flare (Biogas & Biomethane)
- Stack Material : Galvanised Mild Steel 6mm THK.
- Lining Thickness : 100mm (Customer Spec)
- Design Flow Rate : 5000 Nm3/h

On Site Test Conditions

Flow Rate (Nm3/h)	5371
Gas Composition	57.1% CH4
Gas Pressure (mbar)	116
Flare Stack Temperature	1035
Ambient Noise (dB)	58

Sound Recording @ 1 metre

	dB
Sample 1	79.6
Sample 2	81.7
Sample 3	79.6



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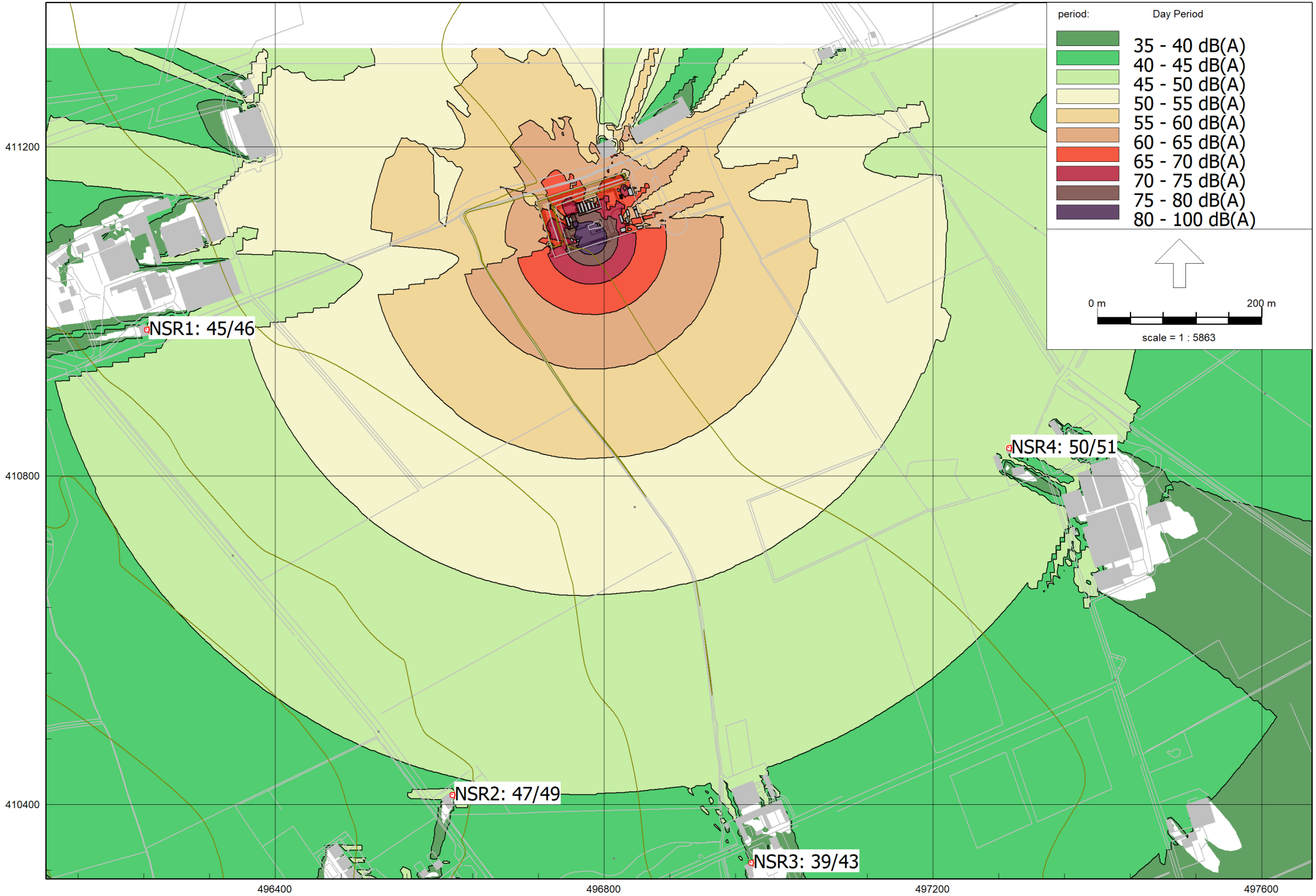
APPENDIX J

Predicted noise levels – Well stimulation including proppant squeeze noise details



Proppant Squeeze - up to 3 hours for one daytime period

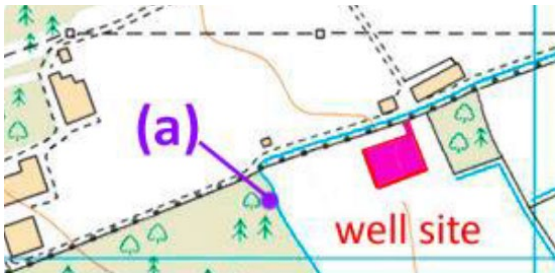
Spectrum Acoustic Consultants Ltd, UK

ISO 9613, [version of Area - Phase3 - Proppant Squeeze] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

Excerpts from report prepared by Acia, in accordance with Noise Management Plan, issued to demonstrate a daytime proppant squeeze of 1 hour duration complied with existing planning condition 10 limit of $L_{Aeq,1hr}$ of 55dB during the daytime. Value at the nearest residential receptor was determined at $L_{Aeq,1hr}$ 46dB :

Proppant squeeze at Lodge Farm, Clapp Gate, Appleby, Scunthorpe

Noise level measurements 25 July 2021



Location (a) was 149m from the pumps, and location (b) 524m, the same distance as R2 from the pumps. It was possible from these measurements to extrapolate outwards to noise-sensitive locations by adding 20 ×log (d_1/d_2) dB to each reading, where d_1 is the distance (m) from the source to measurement location, and d_2 the distance from the source to the noise-sensitive location. Thus any level measured at (a), minus 11dB, represents the maximum contribution of the proppant squeeze operation to the level at R2. The measured level at (a) minus 13dB gives the maximum contribution at

Results and conclusions

The maximum derived equivalent continuous A-weighted sound level over any five-minute period, at the closest receptor location R2, was 46dB. The maximum measured equivalent continuous A-weighted sound level over any five-minute period at any of the locations surveyed, and in the absence of parasitic noise from other sources, was 44dB. These results were comfortably within the noise limit of 55dB L_{Aeq} (Condition 10 of the applicable planning permission).

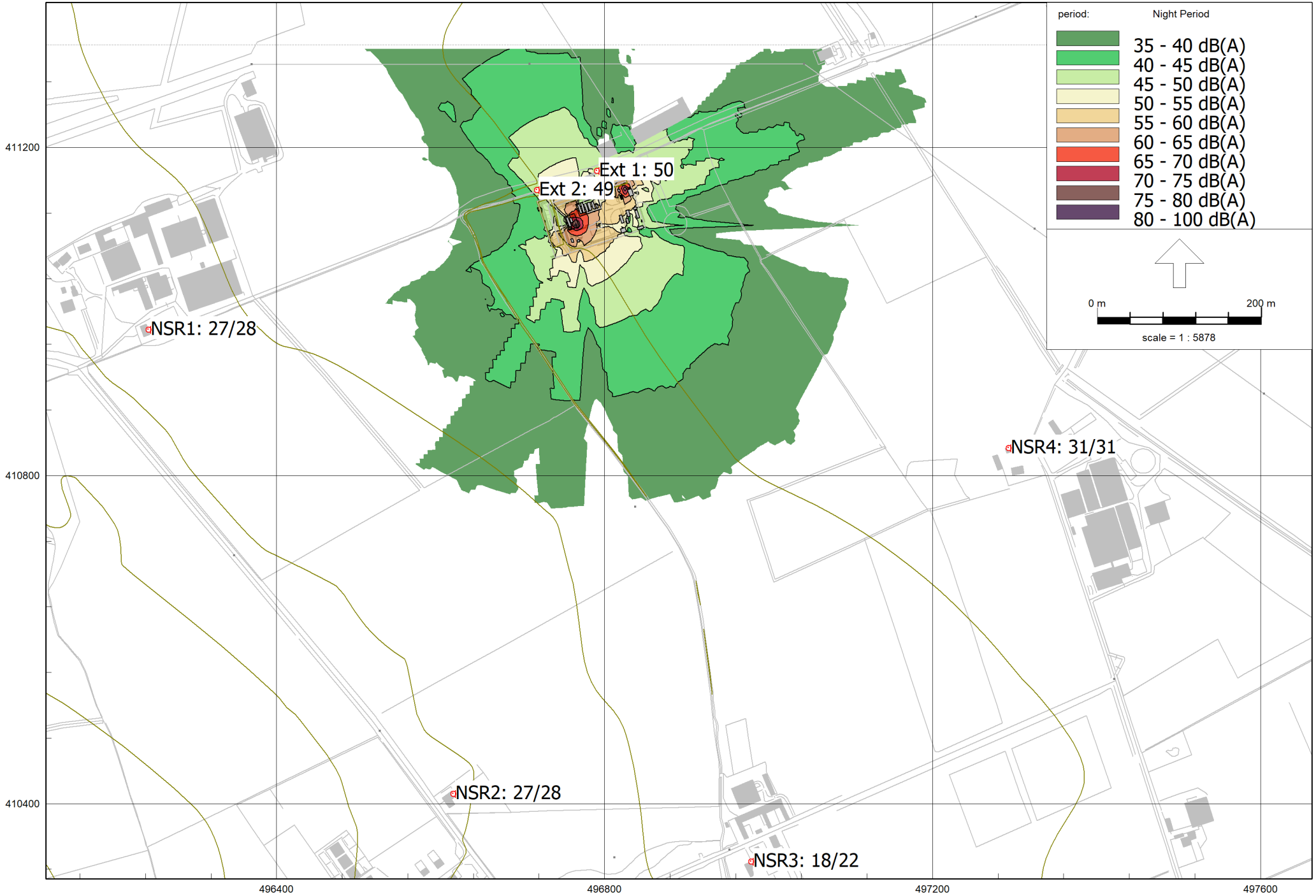
Report: Table of Results
Model: Phase3 - Proppant Squeeze
LAeq: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Day
NSR1_A	NSR1	1.50	45
NSR1_B	NSR1	4.00	46
NSR2_A	NSR2	1.50	47
NSR2_B	NSR2	4.00	49
NSR3_A	NSR3	1.50	39
NSR3_B	NSR3	4.00	43
NSR4_A	NSR4	1.50	50
NSR4_B	NSR4	4.00	51

All shown dB values are A-weighted

APPENDIX K

Predicted noise levels - Existing production with noise source details



ISO 9613, [version of Area - Phase 0 - Existing Production] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

Initital model - existing production -Calibrated with measurements 21.12.2023

Spectrum Acoustic Consultants Ltd, UK

Report: Table of Results
Model: Phase 0 - Existing Production
LAeq: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Day	Night
Ext 1_A	Ext 1	1.50	50	50
Ext 2_A	Ext 2	1.50	49	49
NSR1_A	NSR1	1.50	27	27
NSR1_B	NSR1	4.00	28	28
NSR2_A	NSR2	1.50	27	27
NSR2_B	NSR2	4.00	28	28
NSR3_A	NSR3	1.50	18	18
NSR3_B	NSR3	4.00	22	22
NSR4_A	NSR4	1.50	31	31
NSR4_B	NSR4	4.00	31	31

All shown dB values are A-weighted

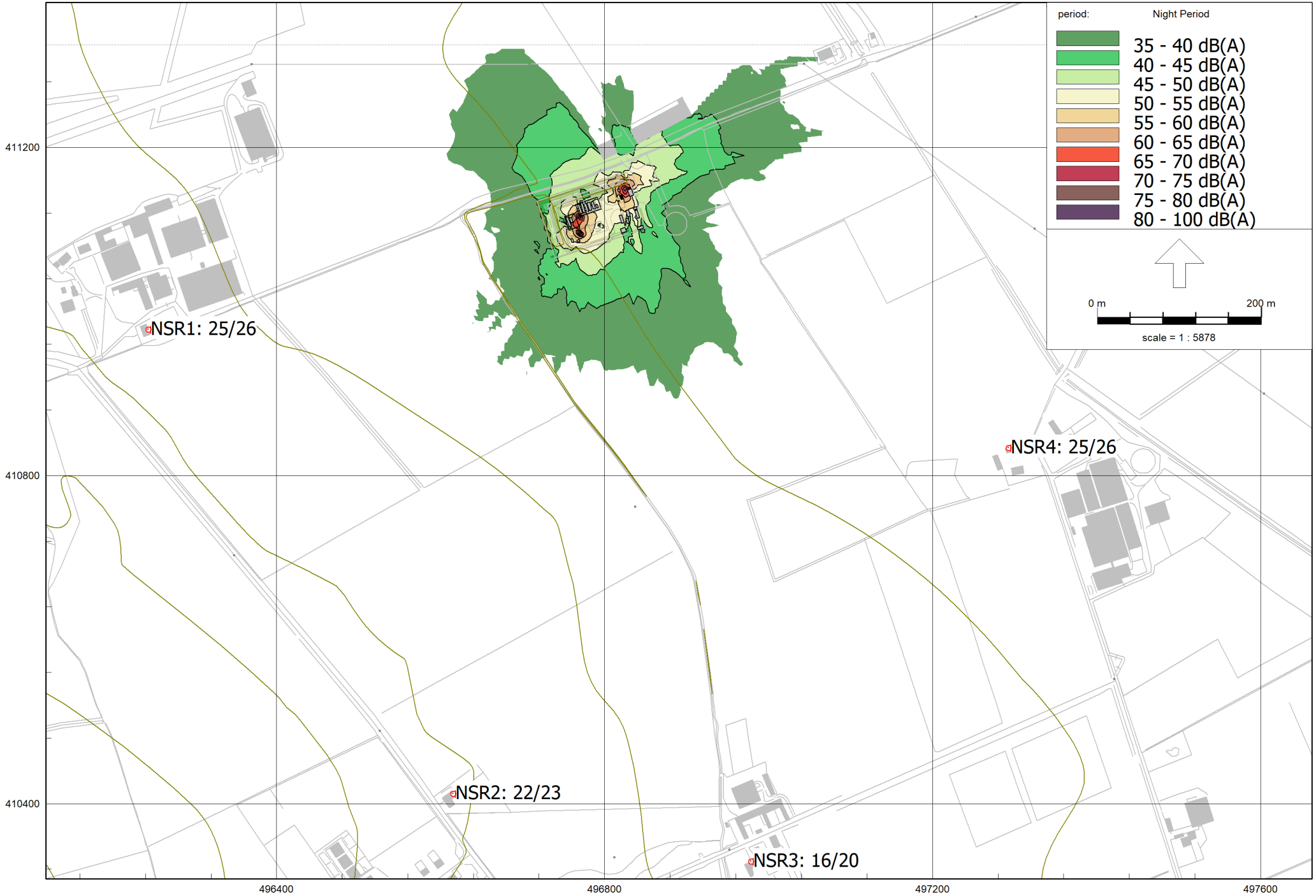
Report: Table of Results
Model: Phase 0 - Existing Production
LAeq: by Source for receiver NSR1_B - NSR1
Group: (main group)
Group Reduction: No

Name Source	Description	Height	Night
NSR1_B	NSR1	4.00	28
2 Scrubber	Second Scrubber	1.50	23
Diesel Gen	Diesel Generator	2.00	24
Flare	Flare at 500m3.hr	0.50	22

All shown dB values are A-weighted

APPENDIX L

Predicted noise levels – Expanded production



Initital model - future production

Spectrum Acoustic Consultants Ltd, UK

ISO 9613, [version of Area - Phase 0 - Future Production] , Predictor V2023 Licensed to Spectrum Acoustic Consultants Ltd, UK

Report: Table of Results
Model: Phase 0 - Future Production
LAeq: total results for receivers
Group: (main group)
Group Reduction: No

Name Receiver	Description	Height	Night
NSR1_A	NSR1	1.50	25
NSR1_B	NSR1	4.00	26
NSR2_A	NSR2	1.50	22
NSR2_B	NSR2	4.00	23
NSR3_A	NSR3	1.50	16
NSR3_B	NSR3	4.00	20
NSR4_A	NSR4	1.50	25
NSR4_B	NSR4	4.00	26

All shown dB values are A-weighted

Report: Table of Results
Model: Phase 0 - Future Production
LAeq: by Source for receiver NSR1_B - NSR1
Group: (main group)
Group Reduction: No

Name Source	Description	Height	Night
NSR1_B	NSR1	4.00	26
Diesel Gen	Diesel Generator	2.00	24
	Surface Lift Pump	1.50	19
	New Process Equipment	1.50	14
2 Scrubber	Second Scrubber	1.50	13

All shown dB values are A-weighted

Report: Table of Results
Model: Phase 0 - Future Production
LAeq: by Source for receiver NSR4_B - NSR4
Group: (main group)
Group Reduction: No

Name Source	Description	Group	Height	Night
NSR4_B	NSR4	--	4.00	26
	New Process Equipment	Sources	1.50	19
	Surface Lift Pump	--	1.50	21
2 Separato	Second Separator	Sources	1.50	19
Diesel Gen	Diesel Generator	Sources	2.00	22

All shown dB values are A-weighted

APPENDIX M

Outline Noise Management Plan

Wressle-2 Oilfield Development Project

Noise Management Plan (Draft)

Report ref.
ARC7241/23150/V3

Issued to
Egdon Resources U.K. Limited

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V1	ARC	For client comment	8/2/2024
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V3	ARC	Final	23/2/2024

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1. INTRODUCTION

This draft Noise Management Plan (NMP) updates the following NMP which is currently in place:

- *Egdon Resources UK Ltd Development of Well Site, Lodge Farm, Clapp Gate, Appleby: Noise Management Plan, Acia Engineering Acoustics, 14 May 2020*

Some changes and updates have been made, however the acoustic principles and procedures remain similar.

A Noise Management Plan (NMP) is required by Condition 4 attached to the current planning permission, which was granted on appeal on 17 January 2020 (Reference APP/Y2003/W/19/3221694). The plan will be implemented in the event of noise complaints being received, or at the specific request of the local planning authority.

There are four main stages associated with the Proposed Development:

1. Site construction
2. Drilling
3. Testing
4. Production of oil and gas
5. Well decommissioning and site restoration.

Some of these processes and activities may involve the use of noise-generating plant and equipment.

This Noise Management Plan sets out how noise emissions to the community will be minimised and controlled.

2. PLANNING CONDITIONS

The Environmental Health Department at North Lincolnshire Council, upon consultation and in its report to the Planning Committee dated 11 January 2017 in respect of a previous application for similar development at this site, proposed nine specific planning conditions in order to regulate the emission of noise from the site and its potential to impact local noise-sensitive properties. These conditions were adopted by the Inspector when granting planning permission for the Permitted Development and are set out below.

4 *Prior to the commencement of development, a Noise Management Plan (NMP) shall be submitted for written approval to the local planning authority. The NMP shall clearly set out all potential sources of noise and techniques to be used to prevent and mitigate noise which shall demonstrate compliance with noise conditions 8 – 11 below. The NMP shall also include methods to deal with noise complaints from the general public. The approved NMP shall be implemented in full for the duration of the development.*

5 *Prior to the commencement of drilling operations or well stimulation on site, the name, make, model and technical noise specification for the drilling rig shall be submitted for approval to the local planning authority. The approved rig shall not be substituted without the prior written approval of the local planning authority and all approved noise mitigation measures shall be implemented in full throughout the duration of drilling.*

6 *Assembly and demobilisation of drilling rig equipment at the production well site shall only take place between the hours of 0700 and 1900 Monday to Saturday.*

7 *Site reconfiguration, site production setup and associated HGV deliveries shall only take place between the hours of 0700 and 1900 Monday to Saturday.*

8 *Noise from the site shall not exceed 42dB Laeq,5min when measured at any noise sensitive dwelling between 1900 and 0700 hours Monday to Sunday inclusive.*

9 *Noise from the site shall not exceed 60dB Lamax when measured at any noise sensitive dwelling between 1900 and 0700 hours Monday to Sunday inclusive.*

10 *Noise from the site shall not exceed 55dB Laeq,1h when measured at any noise sensitive dwelling between 0700 and 1900 hours Monday to Sunday inclusive.*

11 *Noise from the site shall not exceed 70dB Lamax when measured at any noise sensitive dwelling between 0700 and 1900 hours Monday to Sunday inclusive.*

12 *All plant and machinery shall be maintained and silenced in accordance with the manufacturer's recommendations at all times.*

These conditions include specific limits on the noise that can be emitted by operations on the site. It has previously been demonstrated that the Developer was able to comply with similar noise conditions during earlier stages of the project, and that the exploratory borehole was drilled without objections being received by the local authority from neighbouring residential properties.

3. NOISE MANAGEMENT PLAN

3.1 SITE CONSTRUCTION

Potentially noise-making equipment use for the site extension and installation of well cellars is listed below.

- Electrical generator for security personnel
- 360º tracked excavator
- Telescopic handler/fork-lift truck
- Dumper trucks
- Roller
- JCB backhoe loader
- Aggregate vehicles HGVs
- Construction materials HGVs

Roadgoing HGVs are excluded from the noise management plan except when they are active on site. HGVs passing along the site access track, or on the highway network, do not fall within the scope of conditions 10 and/or 11.

All machinery will conform to the relevant EC Directives on the maximum permissible sound power levels emitted by construction equipment. Diesel exhaust silencers to the manufacturer's original specification shall be fitted and all deficiencies rectified before the machine is allowed to continue operating on site.

Engine covers and other noise control panels shall be kept properly closed whenever the machine is operating, and engines shall not be left running unnecessarily. At no time shall a machine operator leave the vicinity of his machine without first having switched off the engine. Any deficiencies in the manufacturer's original noise control equipment, including (but not limited to) broken, missing or deformed panels, missing insulation materials or faults in panel fasteners shall be rectified before the machine is permitted to continue operating on site.

3.2 DRILLING

Potentially noise-making machinery on site during drilling is listed below.

- .Rig engine, drawworks and top drive
- Pumps
- Electrical generators
- Screw compressor
- Hydraulic power unit
- Solids control equipment including agitators and circulation pumps

Ancillary equipment used on site during drilling:

- Fork-lift truck or telescopic handler (occasional use)

- Lighting generators (continuous during the hours of darkness)
- Electrical generator for drilling welfare facilities and security personnel (continuous)
- Crane

Large pumps and generators, the screw compressor and the hydraulic power unit will be installed in purpose-built acoustically lined housings, fitted with attenuators to allow the passage of cooling air through the housing. Diesel engines will be fitted with high-performance exhaust silencers.

Doors to acoustic enclosures and all other noise control panels shall be kept properly closed whenever machinery within is operating and shall only be opened to allow personnel to enter or leave the enclosure. Any deficiencies in the noise control equipment will be identified by inspection at the earliest opportunity, and in any event no later than the night-time noise monitoring described later in this document. Deficiencies including (but not limited to) broken, missing or deformed panels and doors, missing insulation materials, faults in panel or door fasteners and damage to attenuators or exhaust systems shall be rectified before affected machinery is permitted to continue operating on site.

3.3 TESTING

Potentially noise-making machinery which may be required for the testing phase of the development is listed below.

- Electrical generator (for security personnel)
- Wellhead pump
- Transfer pump
- Separator system
- Enclosed ground flare
- Proppant squeeze pumps
- Mixer units

3.4 PRODUCTION

Potentially noise-making machinery which may be required for the production phase of the development is listed below.

- Wellhead pumps
- Transfer pumps (3)
- Diesel generator (temporary)
- Separator system
- Enclosed ground flare

The design of the production facilities will include consideration of the noise emissions. Temporary equipment will be sourced in purpose-built acoustically lined housings and fitted with attenuators to allow the passage of cooling air through the housing. Any diesel engine will be fitted with high-performance exhaust silencers.

Doors to acoustic enclosures shall be kept properly closed whenever machinery within is operating. Any deficiencies in the noise control equipment will be identified by inspection at the earliest opportunity. Deficiencies including (but not limited to) broken, missing or deformed panels and doors,

missing insulation materials, faults in panel or door fasteners and damage to attenuators or exhaust systems shall be rectified before affected machinery is permitted to continue operating on site.

3.5 DECOMMISSIONING AND SITE RESTORATION

Most of the equipment and machinery used during this final stage of the development will be similar to relevant items of plant used in site construction stage. In addition, a workover rig, circulation pumps and a cement pump will be needed to decommission and abandon the well.

All machinery will conform to the relevant UK legislation on the maximum permissible sound power levels emitted by construction equipment. Diesel exhaust silencers to the manufacturer's original specification shall be fitted and all deficiencies rectified before the machine is allowed to continue operating on site.

3.6 ALL PHASES

Training

The site induction programme and site rules during all phases will include instructions on good working practices for site staff, managers, visitors and contractors in order to minimise noise whilst working on the site. These practices will include, but not be limited to:

- The avoidance of unnecessary revving of engines;
- Plant used intermittently to be shut down when not actually in use
- Reversing to be avoided wherever possible without comprising any site safety considerations;
- Compliance with the site speed limit at all times;
- Reporting of any defective equipment or plant as soon as possible, so that corrective maintenance can be undertaken;
- Handling materials and tools in a manner that minimises noise.

Maintenance

Maintenance of plant will be carried out routinely and in accordance with the manufacturers' guidance. Scheduled inspections of all plant and equipment recognised as potential noise sources will be undertaken to ensure that:

- All plant is in a good state of repair and fully functional;
- Any plant found to be requiring interim maintenance is identified and taken out of use wherever practicable;
- Any acoustic enclosure fitted to plant is in a good state of repair;
- Any doors and covers remain closed during operation;
- Repairs are undertaken only by fully qualified maintenance staff.

4. NOISE MONITORING

4.1 LOW NOISE LEVELS WHEN CONSTRUCTING AND OPERATING THE EXISTING FACILITIES

The planned development to the wellsite involves activities and phases of work, of a type and scale, all of which have been carried out as part of the construction and operation of the existing operating facilities.

The Noise Impact Assessment for the historic activities associated with this site predicted low levels of noise impact. Egdon Resources have confirmed that during the construction of the existing facilities, the testing phase, including well stimulation (proppant squeeze) and then subsequent oil and gas production including some flaring, no complaints from residents and neighbours were received by them either to the Company or to managers on the site. Furthermore, no complaints were made to NLC Environmental Health Department and forwarded to Egdon Resources.

4.2 TIMETABLE FOR MONITORING

Noise monitoring in accordance with this plan will normally be triggered if noise complaints are received or at the specific request of the local planning authority. Measurements will be obtained within 48 hours of a request being made, subject to weather conditions being suitable for measurements.

4.3 LOCATIONS

The nearest noise-sensitive locations are shown in the table below. Some of these locations can only be accessed over private land, so a proxy noise measurement location may be appropriate. Unless access to private land has previously been agreed for that purpose, all measurement locations must be publicly accessible.

Nearest receptors to the site

Noise Sensitive Receptor (NSR)	NSR Name	OS grid reference	Distance (m) and Direction in relation to wellsite centre
NSR1	North/South Cottages	496251E , 410984N	550m W
NSR2	1 Broughton Grange Cottage	496608E , 410415N	715m SW
NSR3	Broughton Grange	496993E , 410348N	800m S
NSR4	Decoy Cottage	497300E , 410814N	590m SE

4.4 REPORTING

On completion of a noise survey, a report shall be made available in a format suitable for submission to the Local Planning Authority. The report shall be submitted within five working days of completion of the measurements.

The report shall contain, as a minimum:

- The measured sound levels LAeq,T during site activity;
- Details of the instrumentation used including calibration dates;

- Weather observations for the date of the survey;
- Comments on the audibility of the site and regarding tonality and impulsive noise; and
- Details of any extraneous noise sources that may have influenced the noise climate.

The report shall compare the measured sound levels against the planning condition noise limits.

4.5 NOISE LIMITS

The existing noise limits in planning conditions 8 – 11 are applied to all phases of the existing development

Sound pressure level limits at residential receptors

Day/Night	Noise Metric	Limit	
Day	$L_{Aeq,1hr}$	55 dB	Monday – Sunday (inclusive)
Day	LAmax	70 dB	Monday – Sunday (inclusive)
Night	$L_{Aeq,5min}$	42 dB	Monday – Sunday (inclusive)
Night	LAmax	60 dB	Monday – Sunday (inclusive)

4.6 NOISE MITIGATION

In the event of a breach of any condition 8 to 11 inclusive the noise source(s) causing the excessive noise will be identified in consultation between the Engineer and the site manager. If the breach is likely to continue then suitable mitigation measures shall be implemented, such as replacing faulty noise control equipment, substituting quieter replacement machinery, or the installation of additional noise reduction measures.

For drilling operations, a further period of night-time noise monitoring shall be undertaken after the noise mitigation measures have been implemented, in order to demonstrate the success of the action(s).

For daytime well stimulation (proppant squeeze) activities, work should be suspended if practicable until noise mitigation measures have been put into place.

5. COMPLAINTS PROCEDURE

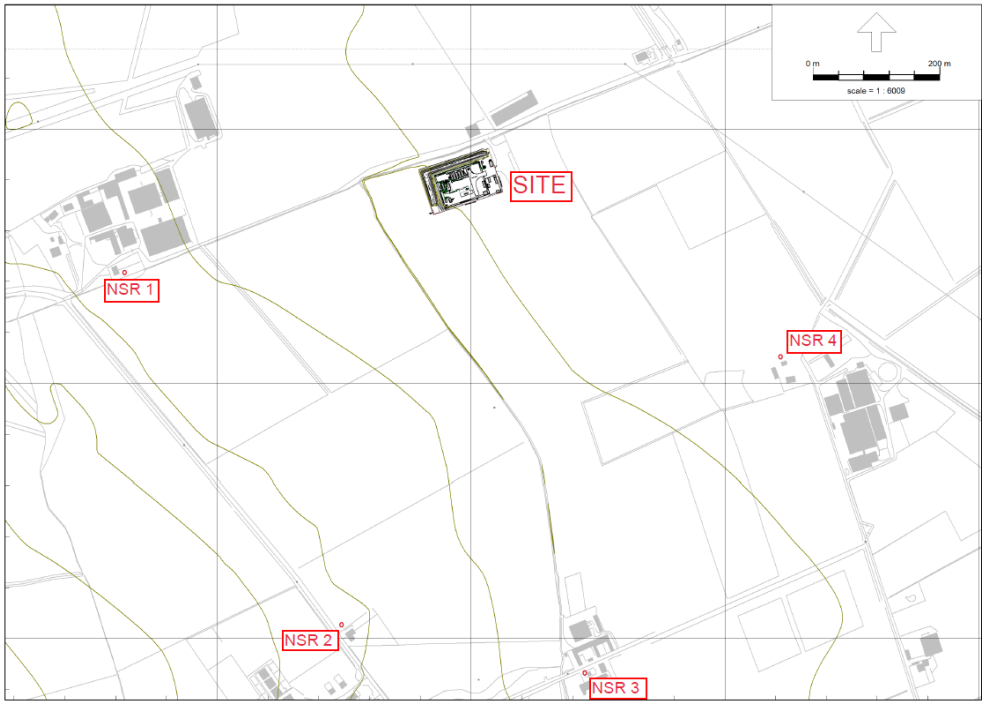
In the event of a complaint from a resident to the Minerals Planning Authority about noise during any operational phase, or a complaint made directly to the site manager or designated person, the following procedure shall be followed. Egdon Resources UK Ltd shall record the issue as per the HSE Management System procedures, and specifically the Incident Management Procedure.

In the event that the noise of concern has already been monitored according to this NMP and no excess found, this shall be taken as evidence that there is no breach of any noise planning condition. The complaint shall however be noted.

In the event that either no noise monitoring has yet been conducted for the appropriate phase of operations, such monitoring shall take place at the earliest opportunity and in any event within 48 hours of receipt of the complaint (subject to appropriate weather). The complainant shall be informed by North Lincolnshire Council that investigations are under way. If the investigations demonstrate that a breach of the conditioned limits was likely to have occurred, remedial works shall be implemented to prevent a further breach. North Lincolnshire Council shall be kept informed of progress.

If noise monitoring for the appropriate phase of operations has already been completed, and noise control actions are under way in consequence, the complainant shall be informed to that effect by North Lincolnshire Council. In any event, all parties will be further informed of the results of noise mitigation measures, once these have been demonstrated by further noise survey(s) to have been effective in meeting the conditioned noise limits.

Nearest noise-sensitive locations to the well site



In any instance of a breach of noise thresholds, across any development phases, Egdon's Production and HSE Manager must be informed immediately.

Details of any action taken to reduce noise emissions shall be recorded, and the results of noise monitoring submitted to the Environmental Health team at North Lincolnshire Council within 5 days of completion of the site visit.

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