

**Proposed Drilling Site
Near Llanccarfan
Vale of Glamorgan**

**Noise Impact Assessment
3081/ENS1_rev4**

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1.0 Introduction

Coastal Oil & Gas Ltd is proposing to drill on land approximately 2.5km north of Llancarfan and 1km south of the A48 road. Drilling is proposed to take place 24 hours a day for approximately 8 weeks.

Hunter Acoustics have been commissioned to monitor background noise levels prior to the drilling taking place, in order to propose noise limits at critical noise sensitive premises.

Appendix A explains acoustic terminology used in this report.

2.0 Planning Guidance

2.1 Minerals Technical Advice Note (Wales) 1

The Minerals Technical Advice Note (Wales) 1 (MTAN1) document gives the following guidance on noise limits for mineral extraction including gas:

- Daytime (0700-1900hrs) noise limits at noise-sensitive properties should be established at 10dB(A) above background levels* (subject to a maximum of 55dB(A) LAeq,1h).;
- Evening (1900-2200hrs) noise limits at NSPs should be established at 10dB(A) above background levels;
- Night-time noise limits at noise-sensitive dwellings should not exceed 42dB(A) LAeq,1h.

* Where it will be difficult not to exceed the background level by more than 10dB(A) without imposing unreasonable burdens on the mineral operator, the limit should be set as near that level as practicable and should not exceed 55dB(A)

MTAN1 also states the following;

"During temporary and short-term operations higher levels may be reasonable but should not exceed 67dB(A) for periods of up to 8 weeks in a year at specified noise sensitive properties."

The exploratory drilling operation is therefore considered a temporary / short-term operation as it is proposed to last for up to 8 weeks.

2.2 BS8233 'Sound Insulation & Noise reduction for Buildings – Code of Practice, & World Health Organisation Guidance (residential receivers)

BS8233 quotes 30dB(A) as a 'good standard, 35dB(A) as a 'reasonable' standard for noise levels in bedrooms. The 30dB(A) 'good' standard is based on The World Health Organisation (WHO) 'Guidelines for Community Noise – 1999', which quotes 30dB(A) as the threshold for sleep disturbance in bedrooms. These figures equate to an external level of 45 – 50dB(A) taking a 15dB loss through a partially open window.

2.3 Noise Predictions

Noise levels have been predicted under light winds according to *"The Propagation of Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities"* - report No.4/81 published by the Oil companies international group for CONservation of Clean Air and Water - Europe known as the CONCAWE model.

3.0 Environmental Noise Survey

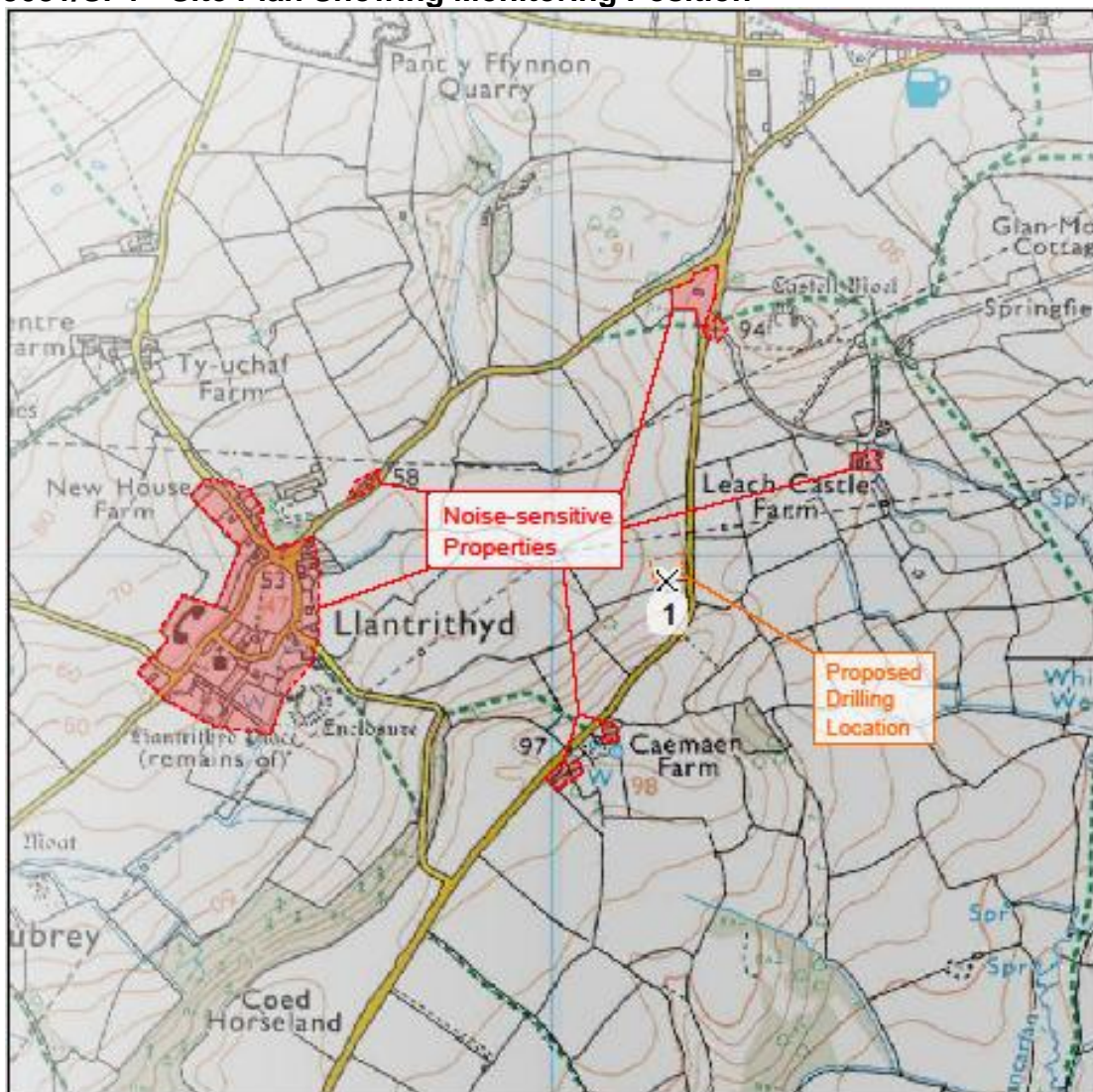
3.1 Procedure

Continuous noise monitoring was carried out over a 24-hour period starting 1500hrs on 26th February 2013 to determine existing background noise levels. Data including L_{max} , L_{eq} & L_{90} was logged at 5-minute intervals over the monitoring period.

Site plan 3081/SP1 shows the development site and the measurement position used;

Position A Located on the southern site boundary of the proposed drilling site, approximately 1.2 - 1.5m above local ground level. Background noise levels at this location are deemed representative of those at the nearest noise sensitive premises.

3081/SP1 - Site Plan Showing Monitoring Position



3.2 Equipment Used

The following equipment was used:

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
Norsonic AS	Type 1 - Integrating - averaging Sound Level Meter	140	1403003	07-Sep-11	U9668
Norsonic AS	Preamplifier	1209	12403	07-Sep-11	U9668
Norsonic AS	Microphone	1225	91797	06-Sep-11	9667
Norsonic AS	Calibrator (114.11dB @ 1001.90Hz)	1251	31826	14-Sep-12	U12037

The measurement systems were calibrated before and after the survey. No variation occurred.

3.3 Weather Conditions

Weather conditions during the survey were dry and mild with light winds.

4.0 Results

Time history graph 3081/TH1 shows L_{max} , L_{eq} & L_{90} sound pressure levels measured over consecutive 5-minute periods at position 1.

Period	Minimum Consistent L_{90}	Proposed Noise Limit
Daytime (0700-1900)	38.5dB(A)	48.5dB(A)
Evening (1900-2200)	32.7dB(A)	42.7dB(A)
Night (2200-0700)	25.1dB(A)	42.0dB(A)

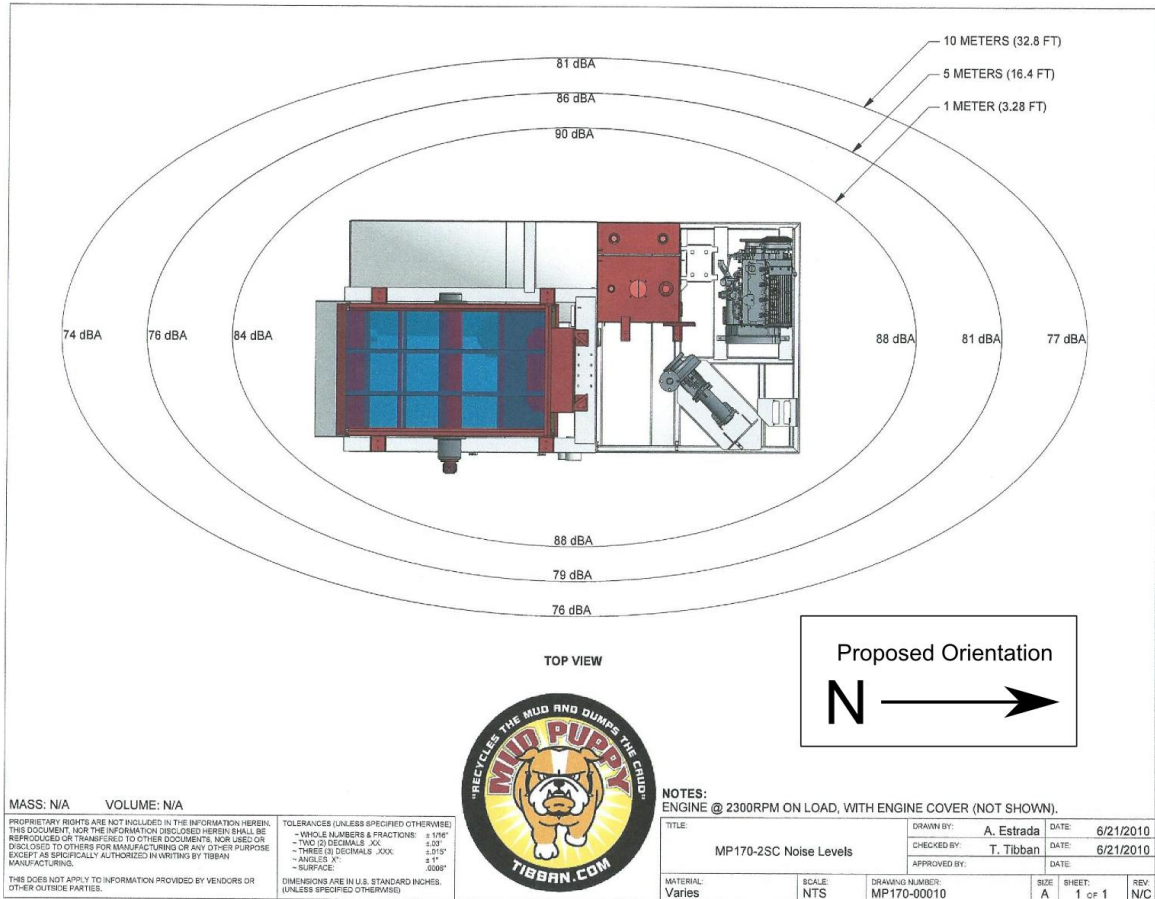
Time history graph 3081/TH1 shows L_{max} , L_{eq} & L_{90} sound pressure levels measured over consecutive 5-minute periods at position A.

As the drill rig is proposed to operate 24 hrs/day during the 8-week period, night-time is the critical period when setting noise limits at residences.

5.0 Noise Predictions

The following pattern of noise radiation for the proposed shaker/cyclone (Tibban Mud Puppy) is quoted by the manufacturer;

3081/D1 – Diagram Showing Pattern of Noise Radiation for Shaker/Cyclone



Noise levels range from 74dB(A) to 81dB(A) at 10m.

The proposed drill rig has a typical noise level of 79 dB(A) at 1m – based on data included in an email from Oliver Taylor dated 21/01/2011 with manufacturer’s specifications for a similar drill rig and our own measurements of a similar drill rig.

The manufacturer’s data sheet for the Aggreko Diesel Generating Set SHP/8035E dated September 2009 lists the sound pressure level below 60dB(A) at 7 metres and is therefore indicated not to contribute significantly to overall sound power levels.

Based on noise data for the Manitou MHT 780 TELEHANDLER and previous measurements of typical mobile plant activity, a figure of 77dB dB SPL at 10m has been used in our assessment of mobile noise, with a maximum of 50% on-time (i.e. 30 minutes operation in an hour).

Noise levels have been predicted using the CONCAWE model with the shaker/cyclone orientated such that the quietest side of the rig faces towards the nearest NSPs (see ‘Proposed Orientation’ marked on 3081/D1 above).

5.1 Noise Sensitive Properties

Locations of critical noise premises are shown in site plan 3081/SP1.

The critical noise sensitive premises appear to be houses and farms located approximately,

1. 300m south (Caemaen Farm)
2. 400m north-east (Leach Castle Farm)
3. 450m north (Church/ Bonvilston Hall)
4. starting 660m west (Llantrithyd village)

of the proposed drill site.

5.1.1 Predicted Noise Levels

At residential NSPs the following noise levels are predicted:

Note: No screening losses have been included in the predictions at this stage.

Position	Predicted noise level at residence (dB L _{Aeq}) from stationary and mobile plant combined
1. 300m south	43.9
2. 400m north-east	41.5
3. 450m north	39.7
4. 660m west	37.4

We would therefore recommend that in order to meet proposed noise criteria at noise sensitive premises, stationary and mobile plant should be fully screened to the closest residence (excludes the high level drill section). Observations at another drill site indicated that noise levels are generated by the low level generator/exhaust, not from the actual drill section.

The screen should be a minimum 10kg/m² mass per unit area, impervious, and high enough to remove line of sight to critical bedroom windows – it should therefore be located as close as practical to the noise sources in order to maximise attenuation.

Removing line of sight in this way is indicated to give 7.4dB of attenuation. Noise levels at the nearest NSPs (1. 300m south) are then indicated to fall to around 36.5dB LAeq.

This meets the most critical 42dB(A) night-time limit set in MTAN1.

Allowing for a 15dB loss through a partially open window, noise levels are also predicted to meet the 'good' standard quoted in BS8233 and therefore to be below the World Health Organisation (WHO) night-time 30dB(A) threshold for sleep disturbance.

6.0 Good Practice Guide

The following advice is given with the aim of reducing noise associated with the drilling operations by means of good practice.

- Avoid unnecessary revving of engines and switch off equipment when not required.
- Ensure plant and vehicles are properly maintained, check silencers and bearings.
- If the noise is directional, point the source away from noise-sensitive locations.
- Limit the use of particularly noisy plant or vehicles.
- Start up plant sequentially rather than together.
- Ensure plant is operated with noise control hoods closed.
- Where possible, avoid particularly noisy activities during the night-time hours (2200-0700)

7.0 Conclusion

Coastal Oil & Gas Ltd is proposing to drill on land approximately 2.5km north of Llancarfan and 1km south of the A48 road. Drilling is proposed to take place 24 hours a day for approximately 8 weeks – we understand there will also be some occasional telehandler activity.

Critical noise sensitive premises have been identified as shown on Site Plan 3081/SP1.

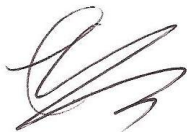
Background noise levels have been measured at a location that can be deemed to have a noise climate representative to that at the critical noise sensitive premises.

Noise limits have been proposed based on measured background noise levels and current planning guidance.

As discussed in section 5.2 of this report, a barrier should be erected to remove line of sight to low level stationary noise sources and mobile plant from nearest noise sensitive premises. Predicted noise levels with the inclusion of this barrier are indicated to fall below all MTAN1 limits and meet the BS8233 'good' standard within bedrooms.

Noise limits and criteria should be confirmed acceptable with the local planning authority/EHO.

Prepared by:



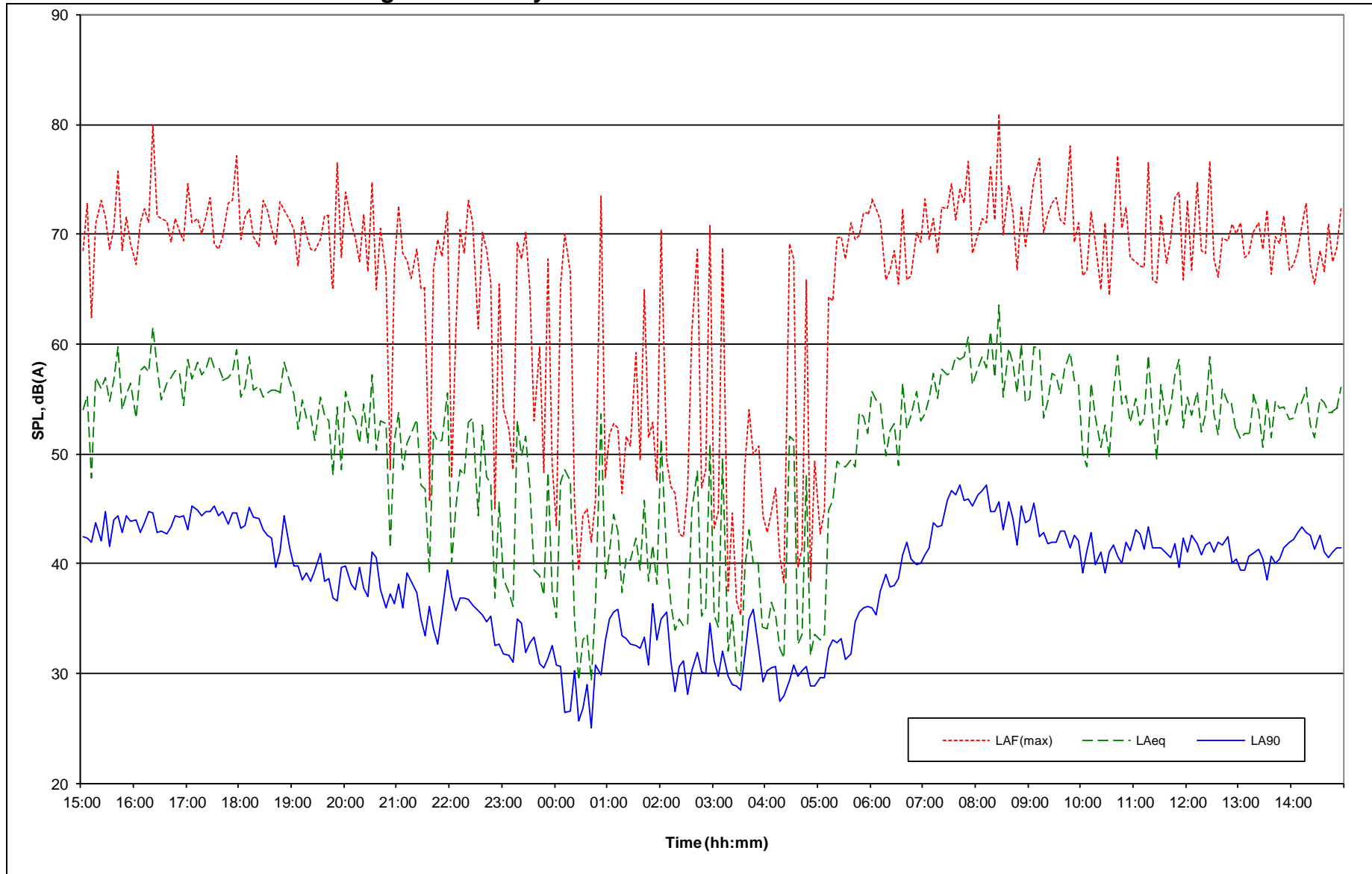
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3081/TH1 - Continuous Monitoring Time History at Position A



Appendix A

Acoustic Terminology

Human response to noise depends on a number of factors including; Loudness, Frequency content, and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'. The following units have been used in this report:

dB(A): The sound pressure level weighted to correspond with the frequency response of the human ear, and therefore a persons subjective response to frequency content.

L_{eq}: The Equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period.

L₉₀: The sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54 minutes of a 1-hour measurement. It is often used to define the background noise level.

L₁₀: The sound level which is exceeded for 10% of the measurement period. i.e. The level exceeded for 6 minutes of a 1-hour measurement

SEL: 'Sound Exposure Level', The dB(A) level which, if it lasted 1 second, would produce the same sound energy as the event in question (e.g. a train pass-by).

L_{Ar,Tr}: Rating noise level is the specific noise level plus any adjustment for the characteristic features of the noise